



# Frequency of skin sensitization to specific substances and in specific occupational groups

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# **Frequency of skin sensitization to specific substances and in specific occupational groups**

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# Häufigkeit von Hautsensibilisierungen durch spezifische Stoffe und in bestimmten Personengruppen

## Kurzreferat

Die allergische Kontaktsensibilisierung, die das allergische Kontaktekzem verursacht, ist sowohl im privaten als auch im beruflichen Kontext ein gesundheitliches Problem. Das Ziel dieser Studie ist es, einen Überblick über Sensibilisierungen gegen spezifische Substanzen und in spezifischen beruflichen Gruppen zu geben. Werden diese Daten zur Zahl der Beschäftigten in Beziehung gesetzt, ergeben sich Hinweise auf relevante Stoffe und Regulationsbedarf.

Basierend auf den IVDK Daten der Jahre 2007 bis 2016 (120.977 Patienten) geben wir einen Überblick über diejenigen Allergene, auf die positive Reaktionen beobachtet wurden, mit Reaktionshäufigkeiten und Interpretationshilfen in Bezug auf die Allergene und Testzubereitungen. Die Sensibilisierungshäufigkeiten bei Patienten mit Berufsdermatose (BD) und Patienten ohne BD (Nicht-BD-Patienten) werden verglichen. Inzidenzraten von Sensibilisierungen gegen spezifische Stoffe in spezifischen Berufsgruppen werden abgeschätzt. Hierzu werden die IVDK Daten sowie die Daten der Deutschen Gesetzlichen Unfallversicherung (DGUV) und die der Bundesagentur für Arbeit (BA Arbeit) für die Jahre 2013-2015 herangezogen. Die Inzidenzraten werden als Fälle pro 100.000 Beschäftigte pro Jahr angegeben. Insgesamt wurden positive Testreaktionen auf 420 Allergene beobachtet. Trotz Begrenzung der Nickelbelastung durch EU-Regulierungen und den damit verbundenen Rückgang der Nickelsensibilisierung, bleibt Nickel aufgrund seiner weiten Verbreitung, insbesondere in Modeschmuck, das häufigste Kontaktallergen. Neben Nickel, Kobalt und Chromat zählen Duft- und Konservierungsstoffe zu den häufigsten Kontaktallergenen. Methylisothiazolinon (MI) wird zunehmend zur Konservierung von Kosmetika eingesetzt, was zu einer Epidemie der Kontaktallergie gegen MI in ganz Europa geführt hat. Die größte Patientengruppe, die in der IVDK mit berufsbedingter Dermatitis geführt wird, sind Beschäftigte im Gesundheitswesen (12,3%), Mechaniker (11,1%) Friseurinnen (6,2%) Reinigungskräfte (4,7%), Altenpflegerinnen (4,4%), Metallarbeiter (3,8%), Köche (3,7%) und Bauarbeiter (2,8%). Allergische Reaktionen auf Metalle wie Nickel, Kobalt und Chromat, Konservierungsstoffe wie MI/Methylchlorisothiazolinon (MCI), Thiurame, Mercaptobenzothiazol-Derivate und Dithiocarbamate (drei Gruppen von Gummi-Inhaltsstoffen), Kolophonium und Epoxidharz traten häufiger bei BD-Patienten auf, wohingegen allergische Reaktionen auf Duftstoffe häufiger bei Nicht-BD-Patienten beobachtet wurden. Dessen ungeachtet sind unter den BD-Patienten, die allergisch auf den Duftstoff-Mix I und den Duftstoff-Mix II reagiert haben, die Berufsgruppen der Altenpflegerinnen und Beschäftigte im Gesundheitswesen überrepräsentiert. Die höchsten Inzidenzraten der Kontaktsensibilisierung in den verschiedenen Berufsgruppen reichen von <1 für Kolophonium bei Büroangestellten bis zu >100 für einige Allergene bei Friseuren. Die Gründe für die wahrscheinliche Überschätzung der Inzidenzrate bei Friseuren wird im Detail diskutiert.

**Schlagwörter:** Sensibilisierende Stoffe, Kontaktallergie, berufliches Kontaktekzem

# Frequency of skin sensitisation to specific substances and in specific occupational groups

## Abstract

Allergic contact sensitisation, causing allergic contact dermatitis, is a health issue in the private as well as in the occupational context.

The aim of the present study is to give an overview of frequencies of sensitisation to specific substances and in specific occupational groups including patients with and without occupational dermatitis (OD). Putting this data in relation to the number of employees may lead to indications of a need for regulation.

Based on data of the Information Network of Departments of Dermatology (IVDK) of the years 2007 to 2016 (120,977 patients), an overview of all patch tested allergens which elicited positive reactions is provided, including reaction frequencies and interpretation aids for all allergens and patch test preparations. Sensitisation frequencies in OD patients and non-OD patients are compared. Incident rates of contact sensitisation to specific allergens in specific occupational groups are calculated based on data taken from the IVDK, the German Statutory Accident Insurance (Deutsche Gesetzliche Unfallversicherung; DGUV), and the German Federal Employment Agency (Bundesagentur für Arbeit; BA Arbeit) for the years 2013-2015. The incident rates are expressed as cases per 100,000 workers per year.

In total, positive test reactions were observed to 420 allergen preparations. Despite a decrease in nickel sensitisation as a result of EU regulations, nickel still remains the most frequent contact sensitiser, due to its widespread use, in particular in costume jewellery. Beyond nickel, cobalt and chromate, fragrances and preservatives are among the most frequent contact sensitisers. As a consequence of increasing use as preservative in cosmetics, contact sensitisation to methylisothiazolinone (MI) has heavily increased all over Europe. The largest groups of patients with occupational dermatitis registered in the IVDK are health care professionals (12.3%), mechanics (11.1%), hairdressers (6.2%), cleaners (4.7%), geriatric nurses (4.4%), metal workers (3.8%), cooks (3.7%), and construction workers (2.8%). Allergic reactions to metals such as nickel, cobalt and chromate, to preservatives such as methylchloroisothiazolinone / methylisothiazolinone (MCI/MI), thiurams, mercaptobenzothiazole derivatives, and dithiocarbamates (three groups of rubber ingredients), colophony, and epoxy resin occurred more frequently among OD patients than among non-OD patients, whereas allergic reactions to fragrance patch test preparations were observed more frequently among non-OD patients. Nevertheless, occupational groups such as geriatric nurses and health care professionals were for example, over-represented among OD patients who reacted to fragrance mix I and fragrance mix II as compared to OD patients who were not sensitised to the respective allergen preparation.

The highest incident rate of contact sensitisation per 100,000 workers per year in each selected occupational group ranges from < 1 for colophony in office clerks to > 100 for several allergens in 'hairdressers, barbers, beauticians, wigmakers'. The reasons for the very probable overestimation in the case of hairdressers are discussed in detail.

**Key words:** Sensitizing substances, contact allergy, occupational contact dermatitis

## Zusammenfassung

### Hintergrund und Ziel der Studie

Die allergische Kontaktsensibilisierung, die das allergische Kontaktekzem verursacht, ist sowohl im privaten als auch im beruflichen Kontext ein gesundheitliches Problem. Es gibt ein großes Spektrum an Kontaktallergenen. Unterschiedliche Berufe haben spezifische Allergenexpositionen und demzufolge unterschiedliche spezifische Sensibilisierungsmuster. Die primäre Prävention im Sinne der Verringerung der Allergenexposition hat sich als nützliche Maßnahme zur Reduzierung der Häufigkeit der spezifischen Kontaktsensibilisierung erwiesen. Daher ist es notwendig, die Kontaktsensibilisierung in spezifischen Berufen zu überwachen, um aufkommende oder persistierende Probleme zu erkennen oder den Effekt präventiver Maßnahmen zu dokumentieren. Das Ziel dieser Studie ist es, einen Überblick über Sensibilisierungen gegen spezifische Substanzen und in spezifischen beruflichen Gruppen zu geben. Werden diese Daten zur Zahl der Beschäftigten in Beziehung gesetzt, ergeben sich Hinweise auf relevante Stoffe und Regulationsbedarf.

### Das allergische Kontaktekzem

Das allergische Kontaktekzem ist die klinische Manifestation der Sensibilisierung gegen eine spezifische Substanz. Die Sensibilisierung wird für gewöhnlich durch direkten Hautkontakt erworben und kann gegen eine Vielzahl von Substanzen aus dem beruflichen oder nicht-beruflichen Umfeld gerichtet sein. Es gibt eine Überlappung zwischen der privaten und der beruflichen Exposition, weil etliche potentielle Allergene sowohl im beruflichen als auch im außerberuflichen Umfeld vorkommen können. Als Beispiel seien Duftstoffe und Konservierungsmittel angeführt. Eine private Exposition für jedermann ergibt sich durch Kosmetika und Körperpflegeprodukte. Parfümerie-Verkäuferinnen, Kosmetikerinnen, Masseur und Altenpflegerinnen sind ebenso beruflich exponiert. Mehrere Konservierungsmittel, die in Kosmetika verwendet werden, werden auch in Wandfarben, Reinigungsmitteln, industriellen Flüssigkeiten und Kühlschmierstoffen in der Metallverarbeitung eingesetzt. Eine Häufung von Sensibilisierungen gegen ein spezifisches Allergen bei Beschäftigten einer bestimmten Berufsgruppe, gibt einen Hinweis auf die Bedeutung eines Allergens in diesem spezifischen beruflichen Kontext, und ermöglicht das Ergreifen präventiver Maßnahmen.

### Epikutantestung und klinische Epidemiologie der Kontaktsensibilisierung

Die Kontaktsensibilisierung, die lebenslang bestehen bleibt und nicht therapiert werden kann, wird mit dem Epikutantest diagnostiziert: Standardisierte Allergenzubereitungen werden in Testkammern gefüllt, die auf speziellen Pflastern angebracht sind. Die Pflaster werden für zwei Tage am oberen Rücken aufgeklebt. Nach der Entfernung der Testkammern wird der Test mindestens zweimal abgelesen, nämlich wenige Minuten nach dem Entfernen der Testpflaster und am folgenden Tag. Im Fall einer Kontaktsensibilisierung tritt eine Ekzemreaktion mit Erythem, Papeln, Infiltrat oder Bläschen auf. Allerdings gibt es beim Epikutantest, wie bei jedem biologischen Test, nicht nur negative oder zweifelsfrei positive Reaktionen. Fragliche und irritative Reaktionen kommen ebenfalls vor.

Der Informationsverbund Dermatologischer Kliniken (IVDK) ist ein Verbund von derzeit 56 dermatologischen Abteilungen, der sich der klinischen Epidemiologie der Kontaktallergie widmet. In diesen Zentren werden (selbstverständlich nach Zustimmung der Patienten) Daten von allen Patienten erfasst, bei denen ein Epikutantest durchgeführt wird. Es werden alle Epikutantestungen mit allen Ablesungen dokumentiert. Zusätzlich

werden klinische und anamnestische Angaben erfasst, unter anderem Alter, Geschlecht, Beruf, Indikation zur Epikutantestung, mutmaßliche Allergenquelle, Abschlussdiagnose, Lokalisation der Hautkrankheit und die Einschätzung des Dermatologen, ob das Ekzem des Patienten berufsbedingt war.

Die Daten werden in lokalen Datenbanken gespeichert, wobei ein einheitliches Datenerfassungsprogramm verwendet wird, das von der IVDK-Zentrale entwickelt und gepflegt wird. Zweimal jährlich werden pseudonymisierte Auszüge aus den Datenbanken an die IVDK-Zentrale übermittelt, die an der Universitätsmedizin Göttingen angesiedelt ist. Hier werden alle eingehenden Daten einer Qualitätskontrolle unterzogen und schließlich in die zentrale IVDK-Datenbank integriert.

### **Wichtige Kontaktallergene**

Auf der Basis der IVDK-Daten der Jahre 2007 bis 2016 (120,977 Patienten) geben wir einen Überblick über alle diejenigen Allergene, auf die positive Reaktionen beobachtet wurden, mit Reaktionshäufigkeiten und Interpretationshilfen in Bezug auf die Allergene und Testzubereitungen. Insgesamt wurden auf 420 Allergene positive Testreaktionen beobachtet. Aufgrund seiner weiten Verbreitung ist Nickel das häufigste Kontaktallergen. Die wichtigste Allergenquelle ist Nickel in Modeschmuck. EU-Regulierungen zur Begrenzung der Nickelbelastung aus dieser Quelle haben in den letzten Jahren zu einem Rückgang der Nickelsensibilisierung bei jungen Frauen geführt. Nach Nickel gehören Kobalt und Chromat sowie Duftstoffe und Konservierungsmittel zu den häufigsten Kontaktallergenen. Methylisothiazolinon (MI) wird seit 2009 in höheren Konzentrationen als zuvor zur Konservierung von Kosmetika eingesetzt. Dies führte in den folgenden Jahren zu einer Epidemie der Kontaktallergie gegen MI in ganz Europa. Das muss bei den folgenden Datenanalysen in spezifischen Subgruppen von Patienten berücksichtigt werden.

### **Identifizierung beruflich relevanter Kontaktallergene**

Als erster Schritt zur Identifizierung beruflich relevanter Kontaktallergene werden die Sensibilisierungshäufigkeiten bei Patienten mit Berufsdermatose (BD) (n=18,877) und Patienten ohne BD (Nicht-BD-Patienten) (n=87,966) verglichen. Allergische Reaktionen auf Metalle wie Nickel, Kobalt und Chromat, auf Konservierungsmittel wie Methylchloroisothiazolinon / Methylisothiazolinon (MCI/MI), auf Thiurame, Mercaptobenzothiazol-Derivate und Dithiocarbamate (drei Gruppen von Gummi-Inhaltsstoffen), auf Kollophonium und auf Epoxidharz traten bei den BD-Patienten häufiger auf als bei den Nicht-BD-Patienten. Die größten Unterschiede wurden bei den Gummi-Allergenen und bei Epoxidharz beobachtet. Im Gegensatz dazu wurden allergische Reaktionen auf Duftstoffe bei den Nicht-BD-Patienten häufiger beobachtet. Bei der Interpretation dieser Daten gibt es Folgendes zu beachten: Die beiden verglichenen Patientengruppen (BD-Patienten und Nicht-BD-Patienten) sind unterschiedlich hinsichtlich der Verteilung von Alter, Geschlecht, Berufen, Indikation zur Epikutantestung und mutmaßlichen Allergenquellen. Dies verursacht unabhängig von einer beruflichen oder nicht-beruflichen Verursachung der Hautkrankheit unterschiedliche Häufigkeiten positiver Testreaktionen. Mit anderen Worten: Unterschiede in den Reaktionshäufigkeiten sind nicht notwendigerweise auf berufliche Expositionen zurückzuführen.

### **Berufsgruppen der Patienten mit Berufsdermatose (BD-Patienten)**

Sensibilisierungen sind nicht in allen Berufsgruppen gleich häufig, deshalb sind Angehörige mancher Gruppen häufiger als andere unter den erfassten Patienten. Es wird

eine Liste und Rangfolge der Berufsgruppen der im IVDK in den Jahren 2007 bis 2016 erfassten BD-Patienten (n=18.877) vorgestellt. Die größten Gruppen waren Beschäftigte im Gesundheitswesen (12,3%) Mechaniker (11,1%) Friseurinnen (6,2%) Reinigungskräfte (4,7%), Altenpflegerinnen (4,4%) Metallarbeiter (3,8%), Köche (3,7%) und Bauarbeiter (2,8%).

Für weitere Auswertungen ist es wichtig zu wissen, dass die Alters- und Geschlechts-Verteilungen in den Berufsgruppen sehr unterschiedlich sein können, denn dies hat Auswirkungen auf die beobachteten Häufigkeiten von Sensibilisierungen gegen ubiquitäre Allergene. So ist zum Beispiel die Nickelallergie häufiger bei jungen Frauen, während die Duftstoffallergie häufiger bei Frauen und bei älteren Patienten vorkommt. Krankenschwestern, Altenpflegerinnen, Friseurinnen und Kosmetikerinnen sind nach wie vor typisch weibliche Berufe, daher lag bei den im IVDK erfassten BD-Patienten aus diesen Berufen der Frauenanteil bei 87% bis 99%. Dagegen sind die Berufsgruppen Metallarbeiter, Mechaniker, Techniker, Maler und Lackierer sowie Bauarbeiter von Männern dominiert (87% bis 99% der im IVDK erfassten BD-Patienten aus diesen Berufen waren Männer). Friseurinnen und Bäcker waren die jüngsten Berufsgruppen mit 75% bzw. 67% der Patienten im Alter von unter 40 Jahren. Die älteste Berufsgruppe waren Reinigungskräfte sowie Installateure und Schlosser, mit jeweils 76% der Patienten im Alter von 40 Jahren und älter.

### **Kontaktallergene bei BD-Patienten: Analyse der betroffene Berufsgruppen**

Es wurde ermittelt, gegen welche Kontaktallergene die im IVDK erfassten BD-Patienten sensibilisiert waren. Für jedes einzelne der 30 häufigsten dieser Kontaktallergene wurde gesondert untersucht, welchen Berufsgruppen die gegen das betreffende Allergen sensibilisierten Patienten angehörten. Der Anteil der jeweiligen Berufsgruppen wurde als Prozent angegeben. Zum Vergleich wurde die prozentuale Häufigkeitsverteilung der Berufsgruppen unter denjenigen BD-Patienten untersucht, die *nicht* gegen das betreffende Allergen sensibilisiert waren. Ein Vergleich der prozentualen Anteile einzelner Berufsgruppen unter den BD-Patienten mit Sensibilisierung gegen ein bestimmtes Allergen mit den prozentualen Anteilen einzelner Berufsgruppen unter den BD-Patienten ohne Sensibilisierung gegen ein bestimmtes Allergen ermöglicht es, Häufungen bestimmter Berufsgruppen unter den gegen das jeweilige Allergen Sensibilisierten zu entdecken. Eine solche Häufung kann ein Hinweis darauf sein, dass das betreffende Allergen in dieser Berufsgruppe ein besonderes Problem darstellen könnte.

Berufsgruppen mit hohem Frauenanteil waren unter den BD-Patienten mit Nickel-Sensibilisierung im Vergleich zu den BD-Patienten ohne Nickelallergie überrepräsentiert. Dies waren zum Beispiel Krankenschwestern (17% der im IVDK erfassten BD-Patienten mit Nickelallergie vs. 11% der im IVDK erfassten BD-Patienten ohne Nickelallergie), Friseurinnen (9% vs. 6%), Altenpflegerinnen (5% vs. 4%) und Reinigungskräfte (8% vs. 4%). Das Gegenteil war bei typischen Männerberufen zu beobachten, wie z.B. bei Mechanikern (7% vs. 12%), Metallarbeitern (2% vs. 4%) usw. Aus früheren Untersuchungen ist bekannt, dass Altenpflegerinnen ein besonderes berufliches Risiko für eine Duftstoff-Allergie haben, wahrscheinlich durch den intensiven und häufigen Kontakt mit den Kosmetika und Körperpflegeprodukten ihrer Klienten. Übereinstimmend damit waren Altenpflegerinnen unter denjenigen im IVDK erfassten BD-Patienten, die auf den Duftstoff-Mix I reagiert haben, überrepräsentiert (7% vs. 4%). Ähnliches ergab sich für den Duftstoff-Mix II (7% vs. 4%) und den darin enthaltenen Duftstoff Hydroxyisohexyl 3-cyclohexene carboxaldehyde (10% vs. 4%). Ebenso waren Beschäftigte im Gesundheitswesen unter den im IVDK erfassten BD-Patienten

mit positiver Reaktion auf den Duftstoff-Mix I (19% vs. 11%) und Duftstoff-Mix II (23% vs. 12%) überrepräsentiert.

Unter den BD-Patienten mit Sensibilisierung gegen Methylchloroisothiazolinon / Methylisothiazolinon (MCI/MI) waren mehr Friseurinnen (9% vs. 6%), Altenpflegerinnen (6% vs. 4%) und Maler (5% vs. 2%) als unter den nicht gegen MCI/MI sensibilisierten BD-Patienten. Bei Friseurinnen und Altenpflegerinnen sind nach dem aktuellen Stand der Erkenntnisse Haarkosmetika und Körperpflegeprodukte die Ursache, bei Malern sind es wasserbasierte Wandfarben. Unter denjenigen BD-Patienten, die auf MI allergisch reagierten, waren Maler und Lackierer (7% vs. 2%) und Kosmetikerinnen (4% vs. 1%) überrepräsentiert.

Thiurame werden als Vulkanisationsbeschleuniger bei der Herstellung von Gummihandschuhen verwendet, und sie sind die häufigsten Kontaktallergene bei Patienten mit Handschuh-Ekzem. Dementsprechend waren Berufsgruppen, in denen elastische Schutzhandschuhe getragen werden, unter den gegen Thiurame sensibilisierten BD-Patienten überrepräsentiert. Dies sind Reinigungskräfte (9% vs. 4%), Köche und Nahrungsmittelverarbeiter (8% vs. 4%), Bauarbeiter (5% vs. 3%) und einige medizinische Berufe.

Eine einmal erworbene Kontaktsensibilisierung bleibt lebenslang bestehen. Diese Tatsache ist bei der Interpretation von Daten zur Chromat-Sensibilisierung von besonderer Bedeutung. Unter den BD-Patienten mit allergischer Reaktion auf Kaliumdichromat fanden sich signifikant mehr Bauarbeiter (8% vs. 2%). Dies zeigt jedoch kein aktuelles Problem an. Chromat war über Jahrzehnte das wichtigste berufliche Allergen im Baugewerbe, und daher zeigen sich bei Testungen noch immer viele Alt-Sensibilisierungen, die vor Jahren erworben wurden. Heutzutage werden im Baugewerbe aufgrund der Einführung chromatarmen Zementes praktisch keine neuen Chromatsensibilisierungen mehr erworben.

Unter den im IVDK erfassten BD-Patienten mit Sensibilisierung gegen Kolophonium waren signifikant mehr Metallarbeiter als unter den im IVDK erfassten BD-Patienten ohne Kolophonium-Allergie (10% vs. 3%). Allergene, die in Kolophonium enthalten sind, finden sich auch in Tallöldestillat, einem häufig verwendeten Grundstoff für wassermischbare Kühlschmierstoffe.

Die beruflich erworbene Kontaktallergie gegen Epoxidharz ist ein bedeutendes Thema in Baubranche. Unter den BD-Patienten mit Sensibilisierung gegen Epoxidharz waren Bauarbeiter (13% vs. 2%) und Maler (10% vs. 2%) im Vergleich zu den BD-Patienten ohne Epoxidharz-Allergie überrepräsentiert. Außerdem waren Maschinenführer in der Plastikproduktion (7% vs. 1%) und Ingenieure (6% vs. 2%) vermehrt vertreten.

Die Exposition gegenüber Haarfarben ist mit Abstand die häufigste berufliche Quelle für den Kontakt mit und die Sensibilisierung gegen p-Phenylendiamin (PPD) und Toluol-2,5-diamin (p-Toluyldiamin; PTD). Demzufolge waren signifikant mehr Friseurinnen unter den gegen PPD (50% vs. 15%) und PTD (72% vs. 54%) sensibilisierten BD-Patienten.

Unter den BD-Patienten mit Sensibilisierung gegen Formaldehyd waren Metallarbeiter überrepräsentiert (10% vs. 4%). Wassergemischte Kühlschmierstoffe waren und sind mit Formaldehydabspaltern konserviert, und die meisten Metallarbeiter haben permanenten Hautkontakt mit diesen Kühlschmierstoffen, da das Tragen von Handschuhen an Maschinen mit rotierenden Werkzeugen verboten ist.

Der Gummiinhaltsstoff 1,3-Diphenylguanidin ist in jüngster Zeit zunehmend als Kontaktallergen in medizinischen Schutzhandschuhen aufgefallen. Damit übereinstimmend fanden wir einen höheren Anteil von Ärzten unter den gegen 1,3-Diphenylguanidin sensibilisierten BD-Patienten (6% vs. 1%).

Iodpropinylbutylcarbamat (IPBC) wird als Konservierungsmittel in Körperpflegeprodukten, aber auch in industriell verwendeten Produkten wie Holzimprägnierungsmitteln oder Kühlschmierstoffen eingesetzt. Es waren jedoch lediglich Metallarbeiter mit Exposition gegenüber Kühlschmierstoffen unter den gegen IPBC sensibilisierten BD-Patienten überrepräsentiert (11% vs. 4%).

Terpentinöl war bis in die 1960er Jahre hinein das klassische Berufsallergen von Malern und Lackierern. Heutzutage wird Terpentinöl in dieser Branche kaum noch verwendet. Dementsprechend waren Maler und Lackierer unter den gegen Terpentinöl sensibilisierten BD-Patienten nicht überrepräsentiert (2% vs. 2%), Terpentinöl kann jedoch immer noch in Ölfarben für Kunstmaler vorkommen. Wir fanden unter der gegen Terpentinöl sensibilisierten BD-Patienten einen erhöhten Anteil von Künstlern, die allerdings nur eine kleine Gruppe darstellten (1,4% vs. 0,1%).

Monoethanolamin wird als Rostschutzbase mit emulgierenden Eigenschaften in wassermischbaren Kühlschmierstoffen eingesetzt und ist ein bedeutendes Allergen in diesem Bereich. Wir fanden einen erhöhten Anteil von Metallarbeitern mit Exposition gegenüber Kühlschmierstoffen unter den gegen Monoethanol sensibilisierten BD-Patienten (35% vs. 12%).

Ammoniumpersulfat ist ein weit verbreiteter Bestandteil von Blondiermitteln und ein bekanntes Friseurallergen. Friseure waren unter den gegen Ammoniumpersulfat sensibilisierten BD-Patienten überrepräsentiert (85% vs. 62%).

### **Schätzung der Inzidenzrate der Kontaktsensibilisierung gegen spezifische Allergene in ausgewählten Berufsgruppen**

Wie oben erwähnt, ist es eines der Ziele dieser Studie die beobachteten Häufigkeiten von Sensibilisierungen gegen spezifische Stoffe in spezifischen Berufsgruppen zur jeweiligen Zahl der Beschäftigten in Beziehung zu setzen. Es soll abgeschätzt werden, wie viele in einer bestimmten Berufsgruppe Beschäftigte sich pro Jahr in Deutschland gegen ein bestimmtes Allergen sensibilisieren, und die Zahl dieser neu sensibilisierten Personen soll zur Zahl der in dieser Berufsgruppe Beschäftigten in Beziehung gesetzt werden. Das Ergebnis dieser Schätzung soll ausgedrückt werden als Anzahl der neu Sensibilisierten pro 100.000 Beschäftigte pro Jahr. Diese Zahl kann man als epidemiologisch als Inzidenzrate ansehen. (Inzidenzrate bedeutet also Anzahl der neu beobachteten Fälle bezogen auf Beschäftigte und Beobachtungsjahre.) Die Berechnung der Inzidenzrate wurde vorgenommen, indem Daten des IVDK mit Daten der Deutschen Gesetzlichen Unfallversicherung (DGUV) und der Bundesagentur für Arbeit (BA Arbeit) kombiniert wurden. Aus der IVDK-Datenbank wurden Daten zur Häufigkeit der Sensibilisierungen gegen verschiedene Stoffe in verschiedenen Berufsgruppen bei Patienten mit Berufsdermatose extrahiert. Die DGUV stellte uns Zahlen zur Häufigkeit bestätigter Fälle von Berufsdermatose in verschiedenen Berufsgruppen zur Verfügung. Die Kriterien, nach denen die DGUV einen Erkrankungsfall als „bestätigte Berufsdermatose“ klassifiziert, entsprechen weitgehend den IVDK-Kriterien für eine „Berufsdermatose“. In beiden Fällen handelt es sich um eine Hautkrankheit, die nach Einschätzung des behandelnden Hautarztes durch die berufliche Tätigkeit bedingt ist. Dabei muss nicht zwangsläufig eine Berufskrankheit nach Nr. 5101 der Anlage zur Berufskrankheitenverordnung (BK 5101) vorliegen, denn die BK 5101 setzt voraus, dass der Betroffene seine Tätigkeit wegen der Hautkrankheit aufgeben muss. Die Begriffe „Berufsdermatose“ (IVDK) bzw. „bestätigte Berufsdermatose“ (DGUV) sagen nichts über einen solchen Aufgabenzwang aus; sie bestätigen lediglich die berufliche Verursachung der Hautkrankheit des Patienten. Die BA Arbeit lieferte Statistiken über die Zahl der Beschäftigten in verschiedenen Berufsgruppen.

Um die Daten zusammenführen zu können, war es zuerst erforderlich, die verschiedenen Berufscodierungen der drei Institutionen zu vereinigen. Die BA Arbeit hat ihr System zur Codierung der Berufe vor einigen Jahren geändert. Als Nebeneffekt dieser Umstellung entstand eine Datenlücke. Einheitlich codierte Daten waren nur für die Jahre 2013 bis 2015 verfügbar. Daher haben wir die Berechnung der Inzidenzrate der Kontaktallergie in bestimmten Berufen auf diese drei Jahre begrenzt und frühere Jahre nicht berücksichtigt. Basierend auf der Einschätzung von Experten und unter besonderer Berücksichtigung der beruflichen Exposition wurde die IVDK-Codierung der Berufsgruppen mit der Codierung der DGUV bzw. der BA Arbeit zusammengeführt. Aufgrund der unterschiedlichen Hintergründe der jeweiligen Codierungssysteme entstand dabei eine gewisse, unvermeidbare Ungenauigkeit.

Die Daten der drei Jahre 2013 bis 2015 wurden gemeinsam (also nicht jahresweise) verarbeitet. Unser Vorgehen war wie folgt:

Aus den IVDK-Daten der Jahre 2013 bis 2015 berechneten wir denjenigen Prozentsatz der Patienten mit Berufsdermatose (BD-Patienten) aus einer bestimmten Berufsgruppe, die gegen ein spezifisches Allergen sensibilisiert waren. Die Abteilung für Statistik der DGUV lieferte uns die Zahl der Betroffenen mit „bestätigter Berufsdermatose“, die in denselben Jahren bei der DGUV registriert worden waren, kategorisiert nach Berufsgruppen. Aufgrund der weitgehend übereinstimmenden Kriterien für die Begriffe „Berufsdermatose“ im IVDK und „bestätigte Berufsdermatose“ bei der DGUV kann man die im IVDK registrierten BD-Patienten als Stichprobe der bei der DGUV registrierten Fälle von „bestätigter Berufsdermatose“ ansehen. Daher kann man annehmen, dass der im IVDK in einer bestimmten Berufsgruppe bei BD-Patienten beobachtete Prozentsatz von Sensibilisierungen gegen ein bestimmtes Allergen auch bei den „bestätigten Fällen“ von Berufsdermatose, die bei der DGUV registriert sind, zu finden ist. Wendet man den Prozentsatz der Sensibilisierten (IVDK) auf der Anzahl der „bestätigten Fälle“ (DGUV) an, so kann man näherungsweise die Anzahl der Sensibilisierten unter den Patienten mit Berufsdermatose in Deutschland in den Jahren 2013 bis 2015 berechnen. Diese Anzahl kann man als „inzidente Fälle“ von Kontaktallergie gegen das betreffende Allergen in der jeweiligen Berufsgruppe bezeichnen. Von der BA Arbeit erhielten wir jährliche Statistiken über die Zahl der Beschäftigten in verschiedenen Berufsgruppen einzeln für die Jahre 2013, 2014 und 2015. Für jede Berufsgruppe addierten wir die Zahl der Beschäftigten aus diesen drei Jahren. Geht man davon aus, dass jeder von der BA Arbeit in dieser Statistik erfasste Beschäftigte für die Dauer eines Jahres (2013, 2014 oder 2015) tätig war, so erhält man als Ergebnis dieser Addition die Gesamtzahl der so genannten Beschäftigten-Jahre für den gesamten Zeitraum 2013 bis 2015. Diese Zahl diente uns als Nenner für weitere Berechnungen. Indem wir die berechnete Zahl inzidenter Fälle von Kontaktsensibilisierung gegen ein spezifisches Allergen bei Patienten mit Berufsdermatose aus einer bestimmten Berufsgruppe in Deutschland in den Jahren 2013 bis 2015 durch die Zahl der Beschäftigten-Jahre dividierten, berechneten wir die Inzidenzrate der Kontaktsensibilisierung gegen verschiedene Allergene in verschiedenen Berufsgruppen, ausgedrückt als Fälle pro 100.000 Beschäftigten-Jahre.

Im Folgenden werden die wichtigsten Ergebnisse dieser Berechnung für die ausgewählten Berufsgruppen vorgestellt.

Die im IVDK erfassten Patienten mit BD aus der Berufsgruppe der Beschäftigten im Gesundheitswesen sind überwiegend Frauen. Demzufolge fanden wir dort eine vergleichsweise hohe Inzidenzrate der Kontaktsensibilisierung gegen Nickel (47 Fälle pro 100.000 Beschäftigten-Jahre) und Duftstoffe. Mit 11 Fällen pro 100.000 Beschäftigten-

Jahre lag die Inzidenzrate der Kontaktsensibilisierung gegen Thiurame in dieser Berufsgruppe mehr als zehnmals so hoch wie die Inzidenzrate der Kontaktsensibilisierung gegen Dithiocarbamate (1 Fall pro 100.000 Beschäftigten-Jahre). Dies ist insofern bemerkenswert, als die großen europäischen Hersteller von medizinischen Schutzhandschuhen mehr und mehr Thiuram-freie Handschuhe anbieten, was zu einer verminderten Exposition führen sollte. Da es sich überwiegend um neu aufgetretene Fälle handeln dürfte, kann man vermuten, dass viele Arbeitgeber aufgrund der geringeren Kosten weiterhin billige medizinische Schutzhandschuhe einkaufen, die noch immer mit Thiuramen produziert werden.

Das Zusammenführen der IVDK-Berufscodierungen für Mechaniker mit den entsprechenden Codierungen der DGUV und der BA Arbeit führte aufgrund der unterschiedlichen Schwerpunkte der Codierungssysteme zu einer größeren Ungenauigkeit als bei anderen Berufen, zum Beispiel bei Krankenschwestern, Friseurinnen oder Bauarbeitern. Daher müssen die Inzidenzraten der Kontaktsensibilisierung in dieser Berufsgruppe mit besonderer Vorsicht interpretiert werden. Generell waren die Inzidenzraten der Kontaktsensibilisierung bei BD-Patienten aus dieser Berufsgruppe niedrig, und ein besonderes Sensibilisierungsmuster war nicht zu erkennen. Dies liegt wahrscheinlich an der großen Bandbreite der beruflichen Expositionen an den unterschiedlichen Arbeitsplätzen.

Die höchsten Inzidenzraten der Kontaktsensibilisierung wurden bei Friseurinnen beobachtet. Sehr wahrscheinlich handelt es sich dabei jedoch um eine Überschätzung, die aus der folgenden speziellen Konstellation resultiert: Präventionsprogramme für Berufsdermatosen im Friseurhandwerk sind seit langem etabliert, erfolgreich und weit bekannt. Daher ist es wahrscheinlich, dass Hautärzte Fälle von BD bei Friseurinnen eher und häufiger an den zuständigen Unfallversicherungsträger melden als Fälle aus anderen Berufen. Auf diese Weise ergibt sich in der Statistik der DGUV eine Vielzahl von überwiegend frühen und leichten Fällen von BD in dieser Berufsgruppe. Andererseits ist unter den im IVDK erfassten Friseurinnen mit BD etwa ein Viertel aus zwei auf schwere Erkrankungsfälle spezialisierten Zentren. Die dort beobachteten Sensibilisierungshäufigkeiten sind aufgrund der Schwere und Langwierigkeit der jeweiligen Erkrankungen sehr hoch, weil die Wahrscheinlichkeit, dass eine Kontaktallergie vorliegt, mit der Dauer und der Schwere der Hautkrankheit steigt. Dadurch, dass wir diesen hohen Prozentsatz von Sensibilisierungen, der bei überwiegend schweren Erkrankungsfällen im IVDK erhoben wurde, auf die Vielzahl von überwiegend leichten bei der DGUV gemeldeten Fällen anwendeten, überschätzten wir die Inzidenzrate der Kontaktsensibilisierung sicher deutlich. Dies ist bei der Interpretation der Daten zu beachten. Unter den typischen Berufsallergenen in dieser Berufsgruppe war die Inzidenzrate der Kontaktsensibilisierung gegen die Haarfarben-Inhaltsstoffe Toluene-2,5-diamine (p-Toluylendiamin; PTD) und p-Phenylendiamin (PPD) am höchsten, gefolgt vom Blondiermittel Ammoniumpersulfat. Fast alle auf dem Markt befindlichen Haarfarben enthalten PTD oder PPD; für diese Produktgruppe sind PPD und PTD derzeit unverzichtbar. Die Kosmetik-Industrie versucht, weniger sensibilisierende Alternativen zu entwickeln, aber dies hat noch nicht zu einem Durchbruch geführt, der es erlauben würde, auf diesen beiden hocheffizienten Haarfärbemitteln zu verzichten. Daher muss derzeit der Fokus auf der Primärprävention im Friseursalon liegen (Vermeidung des Hautkontaktes). Die hohe Inzidenzrate der Kontaktsensibilisierung gegen Nickel unter den Friseurinnen mit BD ist sehr wahrscheinlich nicht durch eine berufliche Exposition bedingt. Früheren multifaktoriellen IVDK-Datenauswertungen zufolge stellt die berufliche

Tätigkeit im Friseurhandwerk keinen Risikofaktor für eine Nickelallergie dar. Diese Berufsgruppe wird dominiert von jungen Frauen (93% Frauen, 75% weniger als 40 Jahre alt), und junge Frauen haben das höchste Risiko einer Nickelallergie, bedingt durch das Tragen von Modeschmuck.

Das Spektrum beruflicher Kontaktallergien bei Altenpflegerinnen ist im Wesentlichen bestimmt durch Körperpflegeprodukte, Lokaltherapeutika, Desinfektionsmittel und Schutzhandschuhe. Die Inzidenzrate der Kontaktsensibilisierung gegen Duftstoff-Mix I lag bei 38 Fällen pro 100.000 Beschäftigten-Jahre, und gegen MCI/MI bei 28 pro 100.000 Beschäftigten-Jahre. Um den beruflichen Hautkontakt mit solchen Allergenen zu reduzieren, sollten häufiger Schutzhandschuhe betragen werden, wenn Körperpflegeprodukte der Klienten verwendet werden.

Die berufliche Exposition von Reinigungskräften ist durch Feuchtarbeit geprägt, und daher ist zu erwarten, dass die häufigste Berufsdermatose das chronische irritative Kontaktekzem ist. Dementsprechend waren die Inzidenzrate der Kontaktsensibilisierung in dieser Berufsgruppe generell niedrig.

Wassergemischte Kühlschmierstoffe sind eine Quelle für den Kontakt mit verschiedensten Allergenen: Harzsäuren wie Abietinsäure (auch in Kolophonium enthalten), Monoethanolamin und andere Amine, Formaldehyd und Formaldehydabspalter, und Isothiazolinone wie MCI/MI, Benzisothiazolinon oder Octylisothiazolinon. Dementsprechend waren diese Stoffe die führenden Allergene bei Metallarbeitern. Die Inzidenzraten der Kontaktsensibilisierung lagen bei 19 Fällen pro 100.000 Beschäftigten-Jahre für Monoethanolamin, und jeweils 14 Fälle pro 100.000 Beschäftigten-Jahre für Kolophonium, den Formaldehydabspalter Methylen-bis(methyloxazolidin) und MI.

Bei Köchen und verwandten Berufen spielt die durch das Tragen von Schutzhandschuhen erworbene Thiuram-Allergie eine wesentliche Rolle. Wir errechneten 38 Fälle von Thiuram-Sensibilisierung pro 100.000 Beschäftigten-Jahre in dieser Berufsgruppe.

Die Kontaktallergie gegen Epoxidharz ist zurzeit ein großes Problem, insbesondere in der Baubranche. Die Inzidenzrate der Kontaktsensibilisierung gegen Epoxidharz bei Bauarbeitern lag bei 14 Fällen pro 100.000 Beschäftigten-Jahre. Außerdem befanden sich mehrere Reaktivverdünner und Härter, die in Epoxidharzsystemen verwendet werden, unter den 20 häufigsten Kontaktallergenen bei im IVDK erfassten BD-Patienten aus dieser Berufsgruppe. In den letzten Jahren wurden verschiedene Maßnahmen zur Reduzierung der Kontaktallergie gegen Epoxidharz in der Baubranche entwickelt und umgesetzt: Schulung der Beschäftigten zur Verbesserung der Arbeitshygiene, Verbesserung der Kennzeichnung und Verpackung der Epoxidharzsysteme, und die Identifizierung von Epoxidharzsystem-Komponenten mit hohem Sensibilisierungspotential.

[https://www.baua.de/DE/Themen/Arbeitsgestaltung-im-Betrieb/Gefahrstoffe/Arbeiten-mit-Gefahrstoffen/Stoffinformationen/Epoxidharze/Epoxidharze\\_node.html](https://www.baua.de/DE/Themen/Arbeitsgestaltung-im-Betrieb/Gefahrstoffe/Arbeiten-mit-Gefahrstoffen/Stoffinformationen/Epoxidharze/Epoxidharze_node.html)

Das Spektrum an klassischen beruflichen Kontaktallergenen bei Bäckern und Konditoren ist dem von Köchen und verwandten Berufen ähnlich. Bäcker und Konditoren sind aber auch gegenüber Proteinen in natürlichen Materialien wie Mehl, Früchten,

oder Enzymen exponiert, und haben daher ein erhöhtes Risiko einer Proteinkontaktdermatitis. Diese Form der allergischen Kontaktdermatitis wird durch eine durch Immunglobulin E vermittelte Allergie ausgelöst, die nicht mit dem Epikutantest diagnostiziert werden kann. Daher spiegelt sich diese wichtige Ursache des beruflichen Kontaktekzems bei Bäckern in unseren Daten nicht wieder.

Zwei Allergene dominieren das Spektrum der beruflichen Kontaktallergie bei Malern und Lackierern: Methylisothiazolinon (MI) und Epoxidharz. Die jeweiligen Inzidenzraten der Kontaktsensibilisierung lagen bei 26 Fällen von Sensibilisierung gegen MI pro 100,000 Beschäftigten-Jahre und 15 Fällen von Sensibilisierung gegen Epoxidharz pro 100,000 Beschäftigten-Jahre.

### **Einschränkungen, Betrachtung der Unsicherheiten**

Der Epikutantest kann– wie jeder biologische Test – zu falsch-positiven oder falsch-negativen Ergebnissen führen. Dennoch ist er der Goldstandard für die Diagnostik der Kontaktallergie.

Unsicherheiten in Bezug auf die klinische Epidemiologie der Kontaktallergie ergeben sich bei Allergenen, die nicht in Standard-Testreihen aufgenommen sind. Während die Standardreihen bei fast jedem entsprechenden Patienten getestet werden, hängt die Epikutantestung spezieller Allergene von unterschiedlichen Einflüssen ab wie z.B. Kenntnis der relevanten Exposition, Verfügbarkeit von Testsubstanzen, Indikation zur Epikutantestung usw.

In Bezug auf die Berechnung der Inzidenzrate der Kontaktsensibilisierung ergeben sich folgende Unsicherheiten: Wir haben keine Informationen über die individuelle berufliche Exposition der im IVDK erfassten sensibilisierten Patienten. Daher können wir keine Aussagen darüber treffen, ob die jeweiligen Sensibilisierungen in jedem Einzelfall tatsächlich am Arbeitsplatz erworben wurden. Wir wissen nicht, welcher Anteil der BD-Patienten schließlich in einer dem IVDK angeschlossenen dermatologischen Abteilung epikutan getestet wird. Es kann sein, dass sich in diesen Kliniken schwere Fälle häufen, und daher der wahre Anteil an Sensibilisierten unter den BD-Patienten niedriger ist. Anders formuliert, unser Ansatz birgt das Risiko der Überschätzung beruflicher Sensibilisierungen, insbesondere bei Friseurinnen. Zudem führt das Zusammenführen der Berufscodierungen, die im IVDK, in der DGUV und in der BA Arbeit verwendet werden, unweigerlich zu Ungenauigkeiten. Schließlich sind Allergene nie streng beruflich oder nicht-beruflich; daher ist bei einem BD-Patienten nicht jede festgestellte Sensibilisierung notwendigerweise auch beruflich bedingt.

Trotz aller dieser methodisch bedingten Unsicherheiten liefern die hier vorgestellten Daten und Zahlen eine solide Informationsbasis zur Identifizierung und Gewichtung von allergenen Stoffen im Hinblick auf regulatorische Maßnahmen.

## Summary

### **Background and aim of the study**

Allergic contact sensitisation, causing allergic contact dermatitis, is a health issue in the private as well as in the occupational context. There is a wide range of contact allergens, and different occupational groups have specific allergen exposures and consequently specific sensitisation patterns. Primary prevention, meaning reduction of allergen exposure, has proven to be a useful measure for reducing specific contact sensitisation. Hence, it is necessary to monitor contact sensitisation in specific occupational groups in order to detect upcoming or persisting problems, or to document the efficiency of preventive measures.

The aim of this study is to give an overview of frequencies of sensitisation to specific substances and in specific occupational groups. Putting this data in relation to the number of employees may lead to indications of a need for regulation.

### **Allergic contact dermatitis**

Allergic contact dermatitis is the clinical manifestation of skin sensitisation to a specific substance. Sensitisation is usually acquired by direct skin contact and can be directed to a variety of substances from the occupational or non-occupational environment. There is an overlap of private and occupational allergen exposure, because several potential allergens occur in the occupational as well as in the non-occupational environment. Fragrances and preservatives may serve as examples. Everybody has a private exposure to fragrances and preservatives from cosmetics and body care products, and perfumery saleswomen, cosmeticians, masseurs and geriatric nurses are also occupationally exposed. Several preservatives are used in cosmetics and also in wall-paints, cleaning agents, industrial fluids, or metalworking fluids. An accumulation of sensitisations to a specific allergen in employees from a specific branch suffering from occupational dermatitis, gives a clue to the importance of an allergen in the specific occupational context, and may open the door for preventive measures.

### **Patch testing and clinical epidemiology of contact sensitisation**

Contact sensitisation, which lasts lifelong and cannot be cured, is diagnosed by patch testing: standardised allergen preparations are filled into test chambers which are mounted on a special plaster. The plaster is attached to the patient's back occlusively for two days. After removal of the test chambers, the test is read at least to times, i.e. a few minutes after removal and on the next day. In case of contact sensitisation, an eczematous reaction with erythema, papules, infiltration and/or vesicles occurs. However, like every biological test, the patch test does not only show negative or unambiguous positive reactions. Doubtful and irritant reactions also occur.

The Information Network of Departments of Dermatology (IVDK) is a network of currently 56 departments of dermatology dedicated to clinical epidemiology of contact sensitisation. In these centres, after patients gave their informed consent, data from all patients who are routinely patch tested are collected. All patch tests with all readings and test results are recorded, together with clinical and anamnestic data, such as age, sex, occupation, indication for patch testing, suspected allergen source, final diagnosis, localization of the skin disease and the dermatologist's assessment whether the patient's dermatitis was occupationally induced.

Data are recorded in local databases using a uniform database management system designed and updated by the IVDK central office. Twice a year, pseudonymized excerpts of the local databases are sent to the IVDK central office which is located at the

University Medical Centre Göttingen, Germany. Here, all incoming data are subjected to a standardised quality control, and finally added to the IVDK central database.

### **Relevant contact allergens (in unselected patients)**

Based on IVDK data of the years 2007 to 2016 (120,977 patients), we give an overview of all patch tested allergens which elicited positive reactions, with reaction frequencies and interpretation aids for all allergens and patch test preparations. In all, positive test reactions were observed to 420 allergen preparations. The most frequent contact sensitiser is nickel, due to its widespread use. The most important allergen source is nickel in costume jewellery. EU regulations for quantitative limitation of nickel exposure from this source have led to a decrease in nickel sensitisation in young women in recent years. Beyond nickel, cobalt and chromate as well as fragrances and preservatives are among the most frequent contact sensitisers. Methylisothiazolinone (MI) has been used as a preservative in cosmetics at higher concentrations than before since 2009 and this has led to an epidemic of MI contact sensitisation all over Europe in the following years. This has to be considered in the following data analyses in specific subgroups of patients.

The list of 420 contact allergens to which positive test reactions were observed is accompanied by remarks to the allergens. Allergen preparations which are not sufficiently validated are marked. Allergen preparations which may elicit false-positive reactions more frequently than others are presented in detail. This allows a critical interpretation of reaction frequencies.

### **Identification of relevant occupational contact allergens**

As a first step towards identification of occupationally relevant contact allergens, sensitisation frequencies in occupational dermatitis (OD) patients (n=18,877) and patients without occupational dermatitis (non-OD) (n=87,966) are compared. Allergic reactions to metals like nickel, cobalt and chromate, to preservatives like methylchloroisothiazolinone / methylisothiazolinone (MCI/MI), to thiurams, mercaptobenzothiazole derivatives, and dithiocarbamates (three groups of rubber ingredients), to colophony, and to epoxy resin occurred more frequently among OD patients than among non-OD patients, with biggest differences observed in rubber allergens and epoxy resin. In contrast, allergic reactions to fragrance patch test preparations were observed more frequently among non-OD patients. When interpreting this data, following points have to be considered: both groups of patients (OD and non-OD patients) are heterogeneous, as far as distribution of age, sex, occupations, indication for patch testing and presumed allergen sources are concerned. This causes different proportions of positive reactions, independent of the occupational or non-occupational causation of the skin disease. In other words, any differences in sensitisation frequencies are not necessarily caused by occupational exposures.

### **Occupational groups of patients with occupational dermatitis (OD patients)**

Sensitisations are not equally frequent in all occupational groups. Therefore, members of some groups are overrepresented in the collective of all recorded patients. A list and ranking of the occupational groups of OD patients registered in the IVDK, 2007 to 2016 (n=18,877) is presented. The largest groups were health care professionals (12.3%), mechanics (11.1%), hairdressers (6.2%), cleaners (4.7%), geriatric nurses (4.4%), metal workers (3.8%), cooks (3.7%), and construction workers (2.8%).

For further evaluation it is important to know that sex and age distribution among these occupational groups differed a lot, because this has an impact on the observed frequencies of sensitisation to ubiquitous allergens. For instance, nickel sensitisation is more prevalent among young women, and fragrance allergy occurs more frequently among women and older patients. Nurses, geriatric nurses, hairdressers, and cosmeticians are still typical female occupations. Among OD patients from these occupations registered in the IVDK, 87% to 99% were women. In contrast metal workers, mechanics, technicians, painters and construction workers are dominated by males (87% to 99% of the OD patients from these occupations registered in the IVDK were men). Hairdressers and bakers were the youngest groups with 75% and 67% of the patients, respectively, being younger than 40 years. The oldest groups were cleaners and machinery mechanics and fitters, each with 76% of the patients being 40 years or older.

### **Contact sensitisers in OD patients: analysis of occupational groups concerned**

We investigated to which allergens the OD patients, who were registered in the IVDK, were sensitised. For each of the 30 most frequent of these allergens, we analysed the occupational groups of the patients sensitised. The proportions of occupational groups were presented as percentages. For comparison, percentages of occupational groups among OD patients *not* sensitised to the corresponding allergen. A comparison of the percentages of specific occupational groups among OD patients with sensitisation to a specific allergen to the percentages of occupational groups among OD patients without sensitization to this allergen allows detecting accumulations of specific occupational groups among those sensitised to the corresponding allergen. Such an accumulation may indicate that the corresponding allergen might be a specific problem in the corresponding occupational group.

Occupational groups with female predominance were over-represented among OD patients sensitised to nickel when compared to those without nickel sensitisation. These were, for instance, health care professionals (17% of the OD patients with nickel allergy registered in the IVDK vs. 11% of the OD patients without nickel allergy registered in the IVDK), hairdressers (9% vs. 6%), geriatric nurses (5% vs. 4%), and cleaners (8% vs. 4%). The opposite could be observed in typical male occupations such as mechanics (7% vs. 12%), metal workers (2% vs. 4%) etc.

From earlier investigations, it is known that geriatric nurses have a particular occupational risk of fragrance sensitisation, probably due to their intense and repetitive exposure to cosmetics and body care products of their clients. In accordance with this, geriatric nurses were over-represented among OD patients registered in the IVDK who reacted to fragrance mix I (7% vs. 4%). Similar findings were made with fragrance mix II (7% vs. 4%) and the fragrance hydroxyisohexyl 3-cyclohexene carboxaldehyde (10% vs. 4%). Health care professionals, too, were over-represented among those OD patients registered in the IVDK, who reacted to fragrance mix I (19% vs. 11%) and fragrance mix II (23% vs. 12%).

Among OD patients registered in the IVDK and sensitised to methylchloroisothiazolinone / methylisothiazolinone (MCI/MI), there were more hairdressers (9% vs. 6%), geriatric nurses (6% vs. 4%), and painters (5% vs. 2%), compared to OD patients registered in the IVDK, who were not sensitised to MCI/MI. In hairdressers and geriatric nurses, the relevant exposures are known to be hair cosmetics and body care products, and in painters, water-based wall paints. Among those reacting to MI, painters were over-represented, too (7% vs. 2%), and so were cosmeticians (4% vs. 1%).

Thiurams are used as vulcanizing agents in rubber glove production, and they are the most frequent contact allergens in patients suffering from rubber glove dermatitis. Accordingly, occupational groups in which elastic protective gloves are worn are over-represented among OD patients registered in the IVDK and sensitised to thiurams. These are cleaners (9% vs. 4%), cooks and food processors (8% vs. 4%), construction workers (5% vs. 3%), and some medical professions.

Contact sensitisation last lifelong. This fact gains importance when interpreting data on chromate sensitisation. Among OD patients with a positive reaction to potassium dichromate, there were significantly more construction workers (8% vs. 2%). However, this is not an indicator of a current problem. Dichromate has been the most important occupational allergen in the building trade for decades, and hence patch testing reveals a lot of old sensitisations, acquired years ago. Nowadays, almost no new sensitisations to chromate are acquired in the building trade, due to the introduction of chromate-reduced cement.

Among OD patients registered in the IVDK and sensitised to colophony, there were significantly more metal workers when compared to OD patients registered in the IVDK without sensitisation to colophony (10% vs. 3%). Allergens present in colophony occur in distilled tall oil, which is a frequently used basic material for water-based metalworking fluids.

Occupational contact allergy to epoxy resin is an important issue in the construction industry. Among OD patients registered in the IVDK and sensitised to epoxy resin, construction workers (13% vs. 2%) and painters (10% vs. 2%) are over-represented when compared to OD patients registered in the IVDK without sensitization to epoxy resin. In addition, plastic-product machine operators (7% vs. 1%) and engineers (6% vs. 2%) are over-represented.

Exposure to hair dyes is by far the most frequent occupational source of contact with and sensitisation to p-phenylenediamine (PPD) and toluene-2,5-diamine (p-toluenediamine; PTD). Hence, there are significantly more hairdressers among OD patients registered in the IVDK and sensitised to PPD (50% vs. 15%) and toluene-2,5-diamine (72% vs. 54%).

Among OD patients registered in the IVDK and sensitised to formaldehyde, there were significantly more metal workers than among those without patch test reaction to formaldehyde (10% vs. 4%). Water-based metal working fluids have been and still are preserved with formaldehyde releasers, and most metal workers have permanent skin contact with these metalworking fluids because wearing gloves is prohibited when working at machines with rotating tools.

1,3-Diphenylguanidine is a rubber ingredient which has gained increasing allergological attention as contact allergen in medical gloves. Accordingly, we found more medical doctors among those OD patients registered in the IVDK who were sensitised to 1,3-diphenylguanidine (6% vs. 1%).

Iodopropynyl butylcarbamate (IPBC) is being used as preservative in body care products as well as in industrial applications like wood preservation or in metalworking fluids. However, only metal workers exposed to metalworking fluids were over-represented among those OD patients registered in the IVDK who were sensitised to IPBC (11% vs. 4%).

Oil of turpentine was the classical occupational allergen in painters and varnishers until the 1960s. Nowadays, oil of turpentine is rarely used in this branch. Correspondingly, painters and varnishers were not over-represented among OD patients registered in the IVDK and sensitised to oil of turpentine (2% vs. 2%). However, oil of turpentine

may be present in oil colours for artist painters. We found an increased proportion of artists who were, however, only a small group (1.4% vs. 0.1%).

Monoethanolamine is used as rust preventing agent with emulsifying properties in water-based metalworking fluids and is an important allergen in this context. Accordingly, we found an increased proportion of metal workers exposed to metalworking fluids among OD patients registered in the IVDK who were sensitised to monoethanolamine (35% vs. 12%).

Ammonium persulfate is a frequently used ingredient of hair bleaching agents and a well-known hairdresser allergen. There were significantly more hairdressers among OD patients registered in the IVDK and sensitised to ammonium persulfate than among those OD patients not reacting to it (86% vs. 62%).

### **Estimation of the incidence rate of contact sensitisation to specific allergens in selected occupational groups**

As mentioned above, one of the aims of this study is relating the observed frequency of sensitisation to specific allergens in specific occupational groups to the corresponding numbers of employees. We intended to estimate how many employees in a specific occupational group become sensitised to a specific allergen, and relate this number of newly sensitised individuals to the number of employees working in this specific occupational group. The result of this estimation should be expressed as number of newly sensitised individuals per 100,000 employees per year. This number can be interpreted epidemiologically as incidence rate. (Incidence rate means number of newly registered cases related to number of workers and number of years of observation.) Calculation of incidence rates was done by combining IVDK data with data from the German Statutory Accident Insurance (Deutsche Gesetzliche Unfallversicherung; DGUV), and the German Federal Employment Agency (Bundesagentur für Arbeit; BA Arbeit). From the IVDK database, we extracted data on the frequencies of sensitisations against specific substances in specific occupational groups among OD patients. From the DGUV, we received statistics on the numbers of confirmed cases of occupational skin disease in different branches. Criteria according to which a case is classified as “confirmed” by the DGUV largely correspond to IVDK criteria of “occupational dermatitis”. In both cases, it is defined as a skin disease which is caused by the occupational exposure, according to the dermatologist’s assessment. This is not necessarily an occupational skin disease according to no. 5101 of the German list of occupational diseases, because the definition of an occupational skin disease no. 5101 includes that the patient was forced give up her or his job because of the skin disease. The definitions of “occupational dermatitis” (IVDK) and “confirmed occupational dermatitis” (DGUV) do not include the force to give up the occupational activity; they simply confirm the occupational causation of the skin disease. The BA Arbeit delivered statistics on numbers of employees in different occupational groups.

A prerequisite for combining data from these three sources (IVDK, DGUV, and BA Arbeit) is merging the different codes for occupational groups. The BA Arbeit has changed their coding system some years ago. As a side effect of this change, a gap in their database occurred. Homogeneously coded data from their side was available for the years 2013 to 2015. Therefore, we limited the calculations of incidence rates of contact sensitisation to specific allergens in specific occupational groups to the years 2013 to 2015, and did not consider earlier years. Based on expert judgement, and with special regard to the occupational exposure, IVDK codes of these occupational groups were matched to the codes of occupational groups used by the DGUV and the BA

Arbeit, respectively. Considering the different backgrounds of the occupational codes, it is evident that such an approach leads to a certain but inevitable inaccuracy.

Data of these three years (2013 to 2015) were processed combined (i.e. not yearly). Our approach was as follows.

From IVDK data of the years 2013 to 2015, we calculated the percentage of OD patients from a specific occupational group who are sensitised to a specific allergen. The department of statistics of the DGUV delivered the number of individuals with “confirmed OD” registered in the same years, categorized to specific occupational groups. As criteria for “occupational dermatitis” used in the IVDK and for “confirmed occupational dermatitis” used in the DGUV, the OD patients registered in the IVDK can be regarded as a sample of the cases of “confirmed OD” registered in the DGUV. Consequently, one can assume that the percentage of sensitization to a specific allergen in a specific occupational group among OD patients registered in the IVDK could also be found among patients with “confirmed OD” registered at the DGUV. By applying the percentage of sensitised patients (IVDK) to the number of “confirmed OD” cases (DGUV), the number of sensitised individuals among patients with OD in Germany in the years 2013 to 2015 can be approximated. This number of patients can be interpreted as “incident cases” of contact sensitization to a specific allergen in a specific occupational group. The BA Arbeit supplied the number of employed workers in specific occupational groups, separated for the years 2013, 2014, and 2015. We added the number of employees of these 3 years. Supposing that every worker registered in the BA Arbeit statistics was employed for one year (2013, 2014, or 2015), this addition results in the total number of so-called worker years for the total time span of the years 2013 to 2015. This number served as denominator for further calculations. By dividing the calculated number of incident cases of contact sensitisation to a specific allergen in OD patients from a specific occupational group in Germany in the years 2013 to 2015 by the number of worker years, we calculated the incidence rates of contact sensitisation to several allergens in several occupational groups, expressed as cases per 100,000 worker years.

In the following sections, the most important results of these calculations are presented.

The occupational group of health care workers with OD registered in the IVDK is dominated by women. Consequently, we found a comparably high incidence rate of contact sensitisation to nickel (47 cases per 100,000 worker years) and fragrances. With 11 cases per 100,000 worker years, the incidence rate of contact sensitisation to thiurams in this occupational group was ten times as high as the incidence rate of contact sensitisation to dithiocarbamates (1 case per 100,000 worker years). This is remarkable because the big European producers of medical gloves offer more and more thiuram-free gloves, which should result in a declining exposure. However, as many new cases are seen, it may be assumed that due to lower costs, many employers continue buying cheap medical gloves which are still produced with thiurams.

Mapping IVDK occupation codes for mechanics to corresponding codes from the DGUV and the BA Arbeit proved to create a larger degree of inaccuracy than with other occupations, for instance nurses, hairdressers, or construction workers. This is because of the different focusses of the coding systems. Hence, incidence rates of contact sensitisation in this occupational group must be interpreted with special care. Incidence rate of contact sensitisation generally was low in mechanics with OD, and

no particular sensitisation pattern could be recognized. This may be due to a large variety of occupational exposures at different workplaces.

The highest incidence rate of contact sensitisation was seen in hairdressers. However, this data has to be interpreted with care because of the following special constellation of circumstances. Secondary prevention programs for hairdressers with OD are well-established and successful in Germany. Therefore, many dermatologists tend to report corresponding OD cases among hairdressers more frequently and earlier than OD cases from other occupations. This results in a high number of early and mild OD cases in the DGUV statistics. In the IVDK data, however, severe and long-lasting cases of OD are very probably over-represented among hairdressers with OD, because two centres specialized on OD patients with severe skin diseases are part of the IVDK. In severe cases, contact sensitisation is more frequent than in the mild cases, because the probability of acquiring contact sensitisation increases with duration and severity of OD. Consequently, our approach of calculating has very probably led to an over-estimation of the incidence rate of contact sensitisation, because we applied the percentage of contact sensitisation among severe OD cases to the mostly mild cases registered in the DGUV. Concerning typical occupational allergens in this branch, incidence rate of contact sensitisation to the hair dye ingredients Toluene-2,5-diamine (p-toluenediamine; PTD) und p-phenylenediamine (PPD) were highest, followed by the bleaching agent ammonium persulfate. Most hair dyes on the market contain PTD or PPD. For this product category, PPD and PTD are indispensable. The cosmetic industry is trying to develop less sensitizing alternatives, but this has not yet led to a breakthrough allowing omitting these most efficient colouring agents. Hence, for the time being, the focus must be primary prevention in the hairdresser's saloon (avoiding skin contact). The high incidence rate of contact sensitisation to nickel among hairdressers with OD is very probably not due to occupational nickel exposure. According to earlier multifactorial IVDK data analyses, the hairdresser occupation is not a risk factor for nickel allergy. This occupational group is dominated by young women (93% females, 75% aged less than 40 years), and young women have the highest risk of nickel sensitisation due to wearing costume jewellery.

The spectrum of occupational contact sensitisation in geriatric nurses is mainly determined by body care products, topical therapeutics, disinfectants, and protective gloves. Incidence rate of contact sensitisation to fragrance mix I was 38 cases per 100,000 worker years, and to MCI/MI 28 cases per 100,000 worker years. Wearing gloves when using the clients' body care products should be promoted in order to reduce the occupational skin contact with these allergens.

Occupational skin exposure in cleaners is characterized by wet work, and hence, chronic irritant contact dermatitis can be expected to be the most important OD. Accordingly, incidence rate of contact sensitisation was generally low in this occupational group.

Water-based metalworking fluids are a source of contact to various allergens: resin acids like abietic acid (also present in colophony), monoethanolamine and other amines, formaldehyde and formaldehyde releasers, and isothiazolinones like MCI/MI, BIT or OIT. Accordingly, these were the leading allergens among metal workers.

Incidence rate of contact sensitisation was 19 cases per 100,000 worker years for monoethanolamine, and 14 cases per 100,000 worker years each for colophony, the formaldehyde releaser methylene-bis(methyloxazolidine), and MI.

Concerning cooks and related occupations, thiuram allergy caused by wearing protective gloves plays a role. We calculated 38 cases of sensitisation to thiurams per 100,000 worker years.

Contact allergy to epoxy resin is currently a big problem predominantly in the building trade. The incidence rate of contact sensitisation to epoxy resin among construction workers was 14 per 100,000 worker years. In addition, several reactive diluents used in epoxy resin systems and epoxy resin hardeners are among the top 20 allergens of OD patients registered in the IVDK. In recent years, a bunch of measures to reduce contact allergy to epoxy resins in the building trade has been developed and implemented: workers' education (to improve working hygiene), improved labelling and packaging of epoxy resin systems, and identifying epoxy resin components with high sensitizing potency [https://www.baua.de/DE/Themen/Arbeitsgestaltung-im-Betrieb/Gefahrstoffe/Arbeiten-mit-Gefahrstoffen/Stoffinformationen/Epoxidharze/Epoxidharze\\_node.html](https://www.baua.de/DE/Themen/Arbeitsgestaltung-im-Betrieb/Gefahrstoffe/Arbeiten-mit-Gefahrstoffen/Stoffinformationen/Epoxidharze/Epoxidharze_node.html).

The spectrum of classical occupational contact allergens of bakers and confectionery makers is similar to that of cooks and related occupations. However, bakers and confectionery makers are also exposed to proteins in natural materials such as flour, fruit, or enzymes, and are thus at increased risk of acquiring protein contact dermatitis. This form of allergic dermatitis is caused by immunoglobulin E-mediated allergy and it cannot be diagnosed by patch testing. Hence, this important cause of occupational contact dermatitis in bakers is not reflected in our data.

Two allergens dominate the spectrum of occupational sensitisation in painters and varnishers: methylisothiazolinone (MI) and epoxy resin. The corresponding incidence rate of contact sensitisation was 26 cases of sensitisation to MI per 100,000 worker years, and 15 cases of sensitisation to epoxy resin per 100,000 worker years.

### **Limitations, uncertainties**

A patch test can result in false-positive or false-negative reactions, like every biological test. Nevertheless, it is the gold standard for diagnosing contact sensitisation.

Uncertainties concerning clinical epidemiology in contact allergy arise in case of allergens that have not yet been included in the standardised patch test series. While the standardised series are tested in almost every corresponding patient, patch testing with special allergens is determined by unpredictable circumstances such as knowledge of relevant allergen exposure, availability of patch test preparations, indication for patch testing etc.

Concerning the estimation of incidence rates of specific sensitisations, uncertainties are as follows. We have no information about the individual occupational exposure of sensitised patients registered in the IVDK. Therefore, we cannot make any statements as to whether the respective sensitizations were acquired at the workplace in each individual case. We do not know which proportion of OD patients are eventually tested in a department of dermatology joining the IVDK. It may be that severe cases accumulate in these clinics, and hence the true proportion of sensitised individuals among OD patients might be lower. In other words, our approach bears a certain risk of over-

estimation of occupational sensitisations. Linking three different coding systems for occupations used in the IVDK, the DGUV and the BA Arbeit inevitably leads to inexactness. Allergens are never strictly occupational or strictly non-occupational. Hence, not every sensitisation diagnosed in OD patients is necessarily occupationally acquired.

In spite of all these methodical limitations and uncertainties, the figures and numbers presented provide a sound information basis for identifying and evaluating allergenic substances with a view to regulatory measures.

# 1. Introduction

## 1.1. Contact allergy and skin sensitisers

Contact allergy is an acquired pathological reaction of the immune system to an exogenous substance (allergen) manifesting itself as allergic contact dermatitis (ACD). The altered immune status leading to ACD after contact with the respective allergen is called contact sensitisation. Once a contact sensitisation is acquired, skin contact with the allergen will cause ACD. The only way a sensitised patient can remain free of dermatitis is avoiding skin contact. Up to now, there is no cure for skin sensitisation [Rustemeyer et al. 2011].

There is no inborn contact sensitisation. Contact sensitisation is acquired by skin contact to the allergen. During the so-called induction phase, specific T-lymphocytes are formed. The ACD is elicited on repeated skin contact with the allergen. Then these lymphocytes migrate to the contact area and, recruiting additional inflammatory cells, cause an inflammation of the epidermis and the dermis –. The induction phase normally passes symptomless; however, according to the chemical properties of the allergen, skin irritation may occur [Rustemeyer et al. 2011]. ACD as the expression of the elicitation phase shows erythema of the skin, infiltration and possibly vesicles, usually accompanied by itching. Often, the dermatitis exceeds the area of contact to the allergen. Mostly, ACD is elicited by direct skin contact to the allergen. However, some allergens are volatile and may cause airborne ACD in individuals already sensitised by the dermal route [Swinnen and Goossens 2013, Veien 2011].

Contact sensitisation, i.e. the pathological immune reaction, is generally directed against a specific substance, compound or molecule. It happens, however, that the reaction also spreads to chemically related compounds, a phenomenon called cross-sensitisation. This means, an individual acquires contact sensitisation to allergen A (leading to ACD on skin contact to A) and reacts with ACD to the chemically related compound B even on first skin contact ever. Examples are cross-sensitisations to palladium in patients allergic to nickel or to toluene-2,5-diamine in patients sensitised to 1,4-phenylenediamine (p-phenylenediamine; PPD) [Uter et al. 2007].

In contrast to cross-sensitisation, concomitant sensitisation describes the simultaneous acquisition of different contact sensitisations to different allergens by co-exposure. Examples are sensitisation to nickel and cobalt due to cobalt contamination of a nickel alloy or to a biocide and an emulsifier in a metalworking fluid.

## 1.2. Diagnostics of contact sensitisation

The gold standard for diagnostics of contact sensitisation is patch testing. The procedure is as follows. A standardised allergen preparation, usually in petrolatum or water, is filled into a small chamber which is mounted on adhesive plaster. The plaster is attached for 48 (or in some cases 24) hours to the patient's upper back, so that the allergen preparation has occlusive skin contact. After this time (day 2, in case of 48 hours patch test exposure time), the test chambers are removed, and their position is marked on the skin. A first reading of the test is done 20-30 min after removal. A second reading on day 3 or day 4 is obligatory. Additional later readings may be performed and usually improve the validity of the patch test [Johansen et al. 2015, Lindberg and Matura 2011].

A positive patch test, indicating contact sensitisation to the respective allergen, is characterized by erythema, infiltration and possibly vesicles in the test area (i.e., an allergic contact dermatitis). Reactions with erythema only, but without any infiltration or vesicles, may indicate weak (low grade) sensitisation or unspecific irritation by the test. Therefore, these reactions are called "doubtful" and are coded with a question mark. Clear-cut irritant reactions also may occur. Table 1.2.1 gives an overview of patch test reactions, their morphology, coding and interpretation. Allergic reactions usually increase in intensity from day 2 to day 3 (or 4), or keep their reaction strength. This course is described as "crescendo reaction" or "plateau reaction". In contrast, irritant reactions usually tend to fade or vanish from day 2 to day 3 (or 4), thus showing a "decrecendo pattern". Time course of a patch test reaction may help interpreting a reaction as irritant or (truly) allergic. Like in every biological test, false positive as well as false negative reactions may occur [Johansen et al. 2015, Lindberg and Matura 2011]. Depending on the substance, vehicle, and test concentration this may happen more or less frequently. Some patch test preparations are more prone to elicit doubtful, irritant, or weak (and putative false positive) reactions. These are commonly called "problematic allergens" (table 1.2.2.) [Geier et al. 2003a, 2010].

**Tab. 1.2.1** Patch test reactions [Schnuch et al. 2008]

Symbol (Coding)	Morphology	Interpretation
-	no reaction (normal skin)	negative
?	erythema only, no infiltration	allergic, irritant or unclear
f	few follicular papules	allergic, irritant or unclear
+	erythema, infiltration, papules	weak allergic reaction
++	erythema, infiltration, papules, vesicles	strong allergic reaction
+++	erythema, infiltration, coalescing vesicles	very strong allergic reaction
ir	soap effect, ring effect, blister, necrosis	irritant reaction

**Tab. 1.2.2** So-called problematic allergens – patch test preparations which frequently elicit doubtful, irritant or even false-positive patch test reactions [Geier et al. 2003a, 2010].

Substance	Concentration	Vehicle
Preservatives and surface disinfectants		
Benzalkonium chloride	0.1 %	petrolatum
Benzyl hemiformal	1 %	petrolatum
4-(2-Nitrobutyl)-morpholine / 4,4'-(2-Ethyl-2-nitrotri-methylene)-dimorpholine (Bioban P1487®)	1 %	petrolatum
Methylen-bis(methyloxazolidine)	1 %	petrolatum
4,4-Dimethyl-1,3-oxazolidine / 3,4,4-Trimethyl-1,3-ox-azolidine (Bioban CS 1135®)	1 %	petrolatum
7-Ethylbicyclooxazolidine (Bioban CS 1246®)	1 %	petrolatum
Glutardialdehyde	0.3 %	petrolatum
Iodopropynyl butylcarbamate	0.2 %	petrolatum
Methyldibromo Glutaronitril	0.3%	petrolatum
Ointment bases and emulsifiers		
Amerchol L-101	50 %	petrolatum
Cocamidopropyl betaine	1 %	aqua
Octyl gallate	0.3 %	petrolatum
Propylene glycol	20 %	aqua
Sorbitan sesquioleate	20 %	petrolatum
Triethanolamine (TEA)	2.5 %	petrolatum
Drug components and skin disinfectants		
Benzoyl peroxide	1 %	petrolatum
Chlorhexidine digluconate	0.5 %	aqua
Phenyl mercuric acetate	0.05 %	petrolatum
Povidone iodine	10 %	aqua

To date, about 4,500 substances (compounds) have been described to have caused allergic contact dermatitis [de Groot 2008]. About 250 allergen preparations are commercially available for patch testing. It is self-evident that not every substance can (and must) be patch tested in every patient. Selection of substances to be patch tested in every individual case mainly depends on the patient's history and the availability of corresponding patch test preparations.

In clinical routine, contact sensitisation is diagnosed according to the following pattern. A patient with suspected contact sensitisation seeks medical help. The consulted dermatologist performs a patch test. Normally, a baseline series including about 25-30 of the most frequent contact sensitisers is tested in every patient. Additional patch test series are applied according to the patient's history [Johansen et al. 2015, Lindberg and Matura 2011]. This means that the selection of allergens beyond the baseline series depends on factors which are hard to appraise, namely the patient's ability to describe her or his exposure or suspected allergen sources, the physician's knowledge of potential allergen sources and exposures and her or his ability to take a corresponding anamnesis adequately (that is, to ask the right questions). In cases of suspected occupational contact allergy, the situation may sometimes be more complicated than in non-occupational cases, because assessing potential allergen exposures requires special knowledge on both sides the patient and the physician.

Allergen preparations for patch testing are medicinal products (drugs), according to German legislation [Arzneimittelgesetz 2017]. Every patch test preparation has to be approved by the responsible authority, which is the Paul-Ehrlich-Institute (PEI), in Germany. Following the 14<sup>th</sup> amendment of the German Pharmaceutical Act in 2005, new patch test substances have to undergo a complex and costly approval procedure. This brought development of new patch preparations to a complete standstill [Mahler et al. 2016]. Therefore, one must be aware that the currently available and diagnostically used spectrum of contact allergens for patch testing does not necessarily reflect current allergen exposure in daily life or in the working environment. In this concern, we are now 12 years behind.

Currently, there is only one company offering PEI-approved patch test preparations in Germany, namely SmartPractice. Their portfolio covers the biggest part (about 90%) of patch test allergens which are recommended for patch testing in the patch test series of the German Contact Dermatitis Research Group (Deutsche Kontaktallergie-Gruppe; DKG). However, especially in the occupational field, relevant diagnostic gaps remain. There is a second company offering patch test preparations, Chemotechnique, in Sweden, which also delivers allergen preparations to Germany (at least those which are not available as PEI-approved test substances elsewhere). Although the DKG recommends patch testing with these preparations in the individual case if medically indicated, they are by far not used as commonly as the PEI-approved patch test preparations.

Summarized, it can be stated that

- patch testing is the gold standard for diagnostics of contact sensitisation,
- nevertheless, false negative as well as false positive reactions may occur,
- by far not every (current) contact allergen is available as standardised patch test preparation,
- the testing physician's allergological expertise and the patient's ability to recall the circumstances having caused his or her dermatitis substantially affect diagnostic success, particularly in the occupational context.

### 1.3. Epidemiology of contact sensitisation

Epidemiology deals with the occurrence of diseases (morbidity) in the general population or in defined populations at risk. In order to describe morbidity frequencies, certain measures are being used, preferentially prevalence and incidence [Rothman 2012, Uter and Schnuch 2009]. Because these are sometimes mixed up, we give a short definition.

Prevalence is the proportion of disease cases in a defined population at a given time, no matter when the disease was acquired. If the given time is a date, the prevalence is called point-prevalence. If a certain period of time is being observed, we speak of time-prevalence, e.g. one-year-prevalence.

Incidence is a measure for the (new) occurrence of a disease in a certain population and a certain period of time. Often it is expressed as cumulative incidence, which is the number of new disease cases within a specified time period divided by the size of the population initially at risk. (Example: If 24 out of 2,000 persons acquire a certain disease within an observation time of 2 years, then the cumulative incidence is 24 cases per 2,000 individuals per 2 years, i.e. 1.2% per 2 years = 0.6% per year). Another way to describe a disease incidence is the incidence rate in which the denominator is the sum of the person-times of the individuals at risk (time each individual was at risk to develop the disease and was observed). In the example mentioned above, we have 2,000 persons observed for 2 years, which means 4,000 person years. Those 24 new cases mean an incidence rate of  $24 / 4,000$  person years = 6 per 1,000 person years.

About 15% of the general population are sensitised to (at least) one contact allergen. A sensitised individual will avoid allergen contact if possible in order to stay symptom-free, i.e. free of dermatitis. Therefore, one-year-prevalence of allergic contact dermatitis in the general population is lower, namely about 7% [Frosch et al. 2014a].

There are few population-based studies on contact sensitisation. One of the most known is the Glostrup Allergy Study [Nielsen and Menné 1992, Nielsen et al. 2001]. In this study from 1990, a random sample of 567 individuals from the population living in western Copenhagen was patch tested with a standardized set of 23 allergens. Of the tested individuals, 86 (15.2%) had at least one positive test reaction. Positive reactions to nickel (6.7%) and thiomersal (3.4%) were found most frequently. All other allergens tested elicited positive reaction in 1.1% of the individuals or less. Nickel sensitisation was attributed to costume jewellery and thiomersal sensitisation to vaccination with vaccines contacting this preservative. In a similar study from Northern Norway, published in 2007, 1,236 adults (690 women, 546 men) randomly selected from the community of Sør-Varanger, were patch tested. At least one positive patch test reaction was observed in 35.4% of the women, and in 14.8% of the men. Contact sensitization to nickel (17.6%) and cobalt (2.8%) accounted for most of the positive reactions, followed by thiomersal (1.9%), fragrance mix (1.8%) and colophony (1.2%). All other allergens were observed in 1% or less of the tested adult population [Dotterud and Smith-Sivertsen 2007]. In a cross-sectional study on contact sensitisation in the general population, a random sample of 3,119 adults was patch tested in 2008 to 2011 in five different European countries (Sweden, the Netherlands, Germany, Italy and Portugal). In total, 27.0% of the tested individuals had at least one positive reaction, with nickel

being the most frequent contact allergen (14.5% positive reactions), followed by thiomersal (5.0%), cobalt (2.2%), and fragrance allergens (< 2%) [Diepgen et al. 2016b]. A study with a similar approach, but focussed on the hair dye ingredient p-phenylenediamine (PPD), was performed on 2,739 individuals from five European countries in 2008 to 2011. In all, 22 individuals (0.8%) had a positive patch test to PPD [Diepgen et al. 2016a]. These studies give an impression of the prevalence of contact sensitisation in the population studied.

However, all of these have their limitations, as far as correctly estimating the prevalence of contact sensitisation is concerned. Most important are three factors. First, when patch testing a sample of individuals from the general population for study purposes like this, only a limited selection of allergens is tested, largely reflecting the baseline series (if at all). Second, in most of these studies (with the exception of the Norwegian study), only one single reading of the patch tests was performed at day 2. This bears the risk of false-negative reactions, i.e. missing sensitisations because the majority of allergic reactions do not occur before day 3, or have their peak at day 3. Third, prevalence of contact sensitisation in the general population is comparably low, which negatively affects the positive predictive value of the test [Diepgen and Coenraads 2000, Uter et al. 2004a]. In other words: also, false positive reactions may occur.

The problem of over- or underestimation of the true prevalence of contact sensitisation is not (or at least less) present in studies based on clinical epidemiology, as performed in the IVDK, the European Surveillance System on Contact Allergy (ESSCA), and the North American Contact Dermatitis Group (NACDG). In all of these networks, patch tests are performed in skin clinic patients with suspected contact allergy, meaning that the (finally confirmed) prevalence of contact sensitisation is higher than in the general population, resulting in a higher positive predictive value of the patch test, for statistical reasons. In addition, in these specialized departments of dermatology, a broader spectrum of possible contact allergens is tested, according to the patients' history, and readings beyond day 2 (compliant to patch test guidelines) are regularly performed, so that the risk of false-negative reactions is reduced.

The IVDK has currently 56 members in Germany, Switzerland, and Austria. Patch test results of all patients tested in the participating departments of dermatology are documented in a standardised way, together with clinical data including age, sex, profession, allergen exposure, indication for patch testing, localization of the skin disease etc. Data are recorded in local databases and, after pseudonymization, transmitted to the IVDK central office at the University Medical Centre Göttingen twice a year. Here, data undergo a standardised quality control, are added to the central IVDK database, and eventually are analysed according to published standards [Schnuch et al. 2012, Uter et al. 2005]. Currently, data of about 11,000 patch tested patients are recorded in the IVDK per year.

Principally, ESSCA, currently consisting of 46 departments of dermatology in 12 European countries, operates similarly. However, the scale of data recorded is smaller. While the scope of clinical and anamnestic data collected is about the same, only a limited set of patch test results, mainly covering the baseline series and a few special test series, is transferred to the ESSCA headquarter at the University of Erlangen-Nürnberg in Erlangen. ESSCA data cover about 15,000 patch tested patients per year [Hegewald et al. 2008, Uter et al. 2017].

In North America, too, a network of departments of dermatology interested in patch testing exists. The NACDG publishes data collected from 13 departments of dermatology in the USA and Canada, mostly in a bi-annual rhythm [Fransway et al. 2013, Warsaw et al. 2013, 2015]. Compared to the IVDK, the extent of clinical data recorded is less; no data concerning indication for patch testing and suspected allergen sources are documented. Published patch test results mainly concern allergens from the baseline series. However, the NACDG baseline series, containing about 50 allergens, is much larger than the German or the European baseline series (ca. 30 allergens). Recent publications included data of about 2,400 patients per year [DeKoven et al. 2017].

As mentioned, sensitisation frequencies registered in clinical networks like the ones presented here, are necessarily higher than proportions of sensitisation in the general population, because clinic patients suffer from dermatitis and are tested because of suspected contact sensitisation. However, Schnuch and co-workers created a model by which prevalence of sensitisation to specific allergens from the baseline series in the general population can be calculated from IVDK data and sales figures of patch tests [Schnuch et al. 2002a]. Of course, this model, called CE-DUR (clinical epidemiology and drug-utilization research) has its limits, but a certain range of prevalence of contact sensitisation in the general population can be estimated [Thyssen et al. 2007, 2009a]. For some allergens, e.g. Nickel and PPD, the calculated sensitisation prevalence has been confirmed in population-based studies [Diepgen et al. 2016a, 2016b, Thyssen et al. 2009b].

In epidemiology of contact allergy, often so-called “charts” or “top-twenty lists” of allergens are published. When drawing conclusions from these lists, the way these data have been generated has to be considered. As mentioned above, only the baseline series is patch tested in almost every patient with suspected contact allergy, while other test series are patch tested according to the patient’s history and the physician’s assumption which allergen might be responsible for the patient’s complaints. This means that exclusively sensitisation frequencies from allergens of the baseline series are free of any selection bias caused by the patient’s and the physician’s assumptions and knowledge. With all other allergens, the frequency of confirmed cases of sensitisation strongly depends of the indication for patch testing – the stricter the indication, the higher the percentage of positive reactions, and vice versa. Therefore, allergen “charts” beyond the baseline series allergens can only give a clue to which allergens are a problem in the specifically and targeted investigated group of patients, but they do not represent a basis for a meaningful direct statistical comparison.

In addition, it has to be considered that there are general patterns of allergen exposure, independent of individual circumstances. For instance, in Europe, costume jewellery has been the most important source of exposure and sensitisation to nickel. As mainly women wear costume jewellery, the frequency of nickel sensitisation among women is much higher than among men [Garg et al. 2013, Uter et al. 2003a]. Consequently, higher proportions of nickel sensitisation are found in patient populations with a higher share of females. Sensitisation to other allergens is more frequently acquired at a higher age, for instance sensitisation to certain fragrances (those included in fragrance mix I) [Mahler 2015, Uter et al. 2002b]. This leads to higher proportions of positive reactions to these fragrances (or to fragrance mix I) in aged test populations [Uter and Schnuch 2004, Uter et al. 2015a]. Hence, sex and age may act as confounders when comparing sensitisation frequencies in different patient populations, for instance with

different occupations. As an example, if an increased frequency of sensitisation to nickel is detected among hairdressers or nurses, one has to be aware of the fact that the underlying test populations mainly consist of females [Molin et al. 2015, Uter et al. 2000a]. Therefore, nickel sensitisation cannot simply be attributed to occupation in these cases. In order to eliminate (or at least reduce) the confounding influence of sex and age on reaction frequencies in defined groups of patients, a sex- and age-standardised reaction frequency can be calculated. The principle has been described by Schnuch [Schnuch 1996]. Briefly, based on the given patch test patient population in the IVDK, standardization is done to a standard population consisting of 50% individuals below the age of 40 years, and 50% with age 40 years and more, and of 65% women, and 35% men [Schnuch et al. 1997]. Standardization is performed by analysing the percentages of positive reactions (%pos) to each allergen in four subgroups of patients, i.e. women younger than 40 years (w-40), men younger than 40 years (m-40), women aged 40 years or more (w+40), and men aged 40 years or more (m+40). For the age- and sex-standardized percentage of positive reactions (%std) to the respective allergen, these percentages are added while at the time using a weight factor according to the definition of the standard population described before:  $\%std = (\%pos_{w-40} * 0.325) + (\%pos_{w+40} * 0.325) + (\%pos_{m-40} * 0.175) + (\%pos_{m+40} * 0.175)$ .

Sex and age distribution in a patch test patient population are not the only factors influencing sensitisation frequencies. The more patients with occupational dermatitis are present, the higher is the percentage of (non-ubiquitous) specific occupational allergens, and the higher is the proportion of patients with hand dermatitis (at least as a rule of thumb) [Schnuch and Uter 2000]. Patients with atopic dermatitis may become sensitised to ingredients of emollients and therapeutic ointments. In addition, it has been speculated if they tend to have false-positive reactions to marginally irritant patch test preparations. Unspecific reactions to metal salts, often as few follicular papules only but occasionally as weak positive reactions, occur more frequently among atopic dermatitis patients [Heine et al. 2006, Schnuch et al. 2005]. Patients with (lower) leg dermatitis, often based on chronic venous insufficiency and/or leg ulcers, tend to have a particular allergen spectrum with focus on fragrances and ingredients of topical therapeutics [Erfurt-Berge et al. 2017, Uter et al. 2002b]. Patients with face dermatitis are more frequently sensitised to cosmetic ingredients, and are hence a special subgroup of patients [Schnuch et al. 2009].

For these reasons, it has become a standard to describe a patch test population by the so-called MOAHLFA-index (Table 1.3.1.) in order to allow an adequate interpretation of patch test results and observed frequencies of sensitisation [Schnuch et al. 1997, Uter et al. 2008].

**Tab. 1.3.1** MOAHLFA index for the description of patch test patient populations.

Abbreviation	Percentage of patients with characteristic
M	Male
O	Occupational dermatitis
A	Atopic Dermatitis
H	Hand dermatitis
L	Leg dermatitis
F	Face dermatitis
A	Age of 40 years or more

## 1.4. Occupational contact allergy

Occupational contact allergy is a clinically relevant contact sensitisation to an allergen to which the patients is occupationally exposed. In many cases, this allergen is a substance to which exposure is almost exclusively given in the particular occupational context. As examples, sensitisation to hardeners or reactive diluents in epoxy resin systems, or to monoethanolamine (MEA) or formaldehyde releasers in metalworking fluids are in general occupationally acquired [Geier 2010, Geier et al. 2004a, 2013, 2016a, 2016b]. However, there are several allergens, to which relevant exposure is given in the occupational as well as in the non-occupational field. For instance, methylisothiazolinone (MI) serves as a preservative in cosmetics and body care products as well as in water-based paints. Sensitisation may be acquired via both of these exposures [Geier et al. 2012a, Uter et al. 2013]. Hence, for interpreting frequencies of allergic reactions to specific allergens in subgroups of patients defined by occupation, knowledge of possible relevant exposures is crucial.

### 1.4.1. Data sources on occupational contact allergy

Knowledge about occupational contact allergy as published in the scientific literature mainly comes from targeted studies (sometimes performed in single companies due to an outbreak of dermatitis) or from retrospective data analyses, e.g. of data from the Finnish Institute of Occupational Health (FIOH) or the IVDK. The FIOH at Helsinki is a national institute caring for all patients with occupational diseases from all over Finland.

In the German social insurance system, occupational skin diseases fall in the scope of the statutory accident insurance. The parent organization of the branch-specific statutory accident insurances is the “Deutsche Gesetzliche Unfallversicherung” (DGUV), which covers most, but not all, employees. Civil servants or governmental officials, as well as farmers, gardeners and forestry workers are not covered by the DGUV. The DGUV produces statistics on occupational skin disease in different trades and branches. According to the established routine in managing occupational skin diseases in Germany, DGUV statistics cover three levels (suspected, confirmed, and recognised cases). If a dermatologist suspects a patient’s skin disease, mostly dermatitis, being caused occupationally, this should be noted to the statutory accident insurance (provided the patient agrees). These notifications are called cases of suspected occupational dermatitis (“Verdachtsfälle”; level 1). The insurance checks the case with regard to occupational exposure, course and localization of the dermatitis etc., and decides

whether or not this case can be confirmed as occupationally induced (“bestätigte Fälle”, level 2). Only if all measures of secondary prevention have failed, and the patient is forced to give up work because of the occupational dermatitis, the dermatitis is recognised as occupational skin disease according to No. 5101 of the German list of occupational diseases (“anerkannte Fälle von BK 5101”, level 3).

In the IVDK routine documentation of clinical and anamnestic patient data, the testing physician indicates whether the patient’s dermatitis is occupationally induced or not. The level of evidence for assigning this label complies with level 2 of the DGUV definitions (confirmed cases, “bestätigte Fälle”).

It is self-evident that the absolute number of cases of occupational dermatitis in a specific occupational group also depends on the number of workers (employees) in this trade or branch. The German Federal Employment Agency (Bundesagentur für Arbeit; BA Arbeit) produces statistics on numbers of employees categorized in different branches or trades.

As criteria for “occupational dermatitis” used in the IVDK and for “confirmed occupational dermatitis” used in the DGUV, the OD patients registered in the IVDK can be regarded as a sample of the cases of “confirmed OD” registered in the DGUV. Consequently, one can assume that the percentage of sensitization to a specific allergen in a specific occupational group among OD patients registered in the IVDK could also be found among patients with “confirmed OD” registered at the DGUV. By applying the percentage of sensitised patients (IVDK) to the number of “confirmed OD” cases (DGUV), the number of sensitised individuals among patients with OD in Germany in the years 2013 to 2015 can be approximated. This number of patients can be interpreted as “incident cases” of contact sensitization to a specific allergen in a specific occupational group. The BA Arbeit supplied the number of employed workers in specific occupational groups, separated for the years 2013, 2014, and 2015. We added the number of employees of these 3 years. Supposing that every worker registered in the BA Arbeit statistics was employed for one year (2013, 2014, or 2015), this addition results in the total number of so-called worker years for the total time span of the years 2013 to 2015. This number served as denominator for further calculations. By dividing the calculated number of incident cases of contact sensitisation to a specific allergen in OD patients from a specific occupational group in Germany in the years 2013 to 2015 by the number of worker years, we calculated the incidence rates of contact sensitisation to several allergens in several occupational groups, expressed as cases per 100,000 worker years.

#### **1.4.2. Published knowledge on important groups of occupational contact allergens**

In this section, information on occupationally important allergens from corresponding scientific publications is presented. This comprises mainly occupational exposure and special features of patch testing (if relevant). We focus on those allergen groups which are most frequently reported and play a role in more than one occupational field.

##### **1.4.2.1. Acrylates and methacrylates**

Acrylates and methacrylates are basic compounds of polymers for plastics, synthetic resins, lacquers, varnishes, glues etc. Sensitisation may be acquired by contact with

such monomers when producing or handling such products. In contrast, processing fully polymerized products usually poses no risk of sensitisation [Björkner et al. 2011, Sasseville 2012].

Acrylates and methacrylates are important as occupational allergens for dental technicians, nail stylists, and printers (UV cured acrylate inks) [Björkner et al. 2011, Goon et al. 2007, Sasseville 2012, Uter and Geier 2015]. Patients concerned are mostly sensitised to several acrylates and/or methacrylates, due to co-exposure or immunological cross-reactivity. Although cross-reactivity has been known for years, no screening or indicator allergen could be established. Hence, it is necessary to patch test with more than one of these compounds [Goon et al. 2007, Uter und Geier 2015]. However, it is also well-known, that patch testing with acrylates may lead to sensitisation (patch test sensitisation or iatrogenic sensitisation) [Kanerva et al. 1988, Sasseville 2012]. Therefore, repeated or unnecessary patch tests should be avoided.

#### 1.4.2.2. Disinfectants

From the allergological point of view, hand disinfectants should be separated from surface and instrument disinfectants. Both groups are frequently used by all medical, nursing and laboratory professions. Hand disinfectants are based on alcohols, mostly propanol, isopropanol, or ethanol. The debate whether or not these alcohols are relevant contact sensitisers is still ongoing [Garcia-Gavin et al. 2011, Goossens and Garcia-Gavin 2012, Löffler et al. 2012]. Surface and instrument disinfectants are mostly based on aldehydes, such as formaldehyde, glutaraldehyde (glutaral) and glyoxal, quaternary ammonium bases like benzalkonium chloride or didecyl dimethyl ammonium chloride, or on amines, for instance N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine. The commonly used patch test preparations formaldehyde 1% in aqua and glutaraldehyde 0.3% in petrolatum may cause irritant or false-positive test reactions [Geier et al. 2010]. On the other hand, tests with formaldehyde 1% in aqua may also become false-negative [Hauksson et al. 2010, Johansen et al. 2015]. There is only one quaternary ammonium base patch test preparation, namely benzalkonium chloride 0.1% in petrolatum. Cross reactivity with didecyl dimethyl ammonium chloride cannot be expected, due to different spatial configuration of the molecules [Geier et al. 2016c].

#### 1.4.2.3. Epoxy resin systems

Epoxy resin systems are used in various industrial and artisanal fields. They are very frequently used in the construction industry, where sensitisation often occurs. The most important groups of allergens in epoxy resin systems are resins, reactive diluents, and hardeners [Aalto-Korte et al. 2014, 2015, Geier et al. 2011a, 2016a, 2016b]. Most important allergens among the resins are mono- and oligomers of a resin based on diglycidylether of bisphenol A (DGEBA). A corresponding patch test preparation is part of the patch test baseline series. Important sensitisers among reactive diluents are the cross-reacting aliphatic glycidylethers 1,6-hexanediol diglycidylether and 1,4-butanediol diglycidylether, and the aromatic glycidylethers cresyl glycidylether and p-tert-butylphenyl glycidylether. Phenyl glycidylether is no longer in use, but still being patch tested. Positive test reactions are mostly due to immunological cross-reaction in patients primarily sensitised to DGEBA resin [Pontén et al. 2009]. Among the hardeners, m-xylene diamine (MXDA) is the most important allergen, followed by isophorone diamine (IPDA) and 2,4,6-tris(dimethylaminomethyl)phenol (tris-DMP) [Aalto-Korte et al. 2014, Geier et al. 2016a, 2016b]. However, positive patch test reactions to IPDA may also indicate contact sensitisation to the corresponding isocyanate, isophorone-4,4'-diisocyanate which is a basic compound of polyurethane, also used in the building

trade [Frick-Engfeldt et al. 2007, Geier et al. 2016b]. A tris-DMP patch test preparation was not available in Germany before 2016, and hence it is rarely patch tested up to now.

#### 1.4.2.4. Fragrances

Fragrance allergies are mostly acquired by private exposure to perfumes, cosmetics etc. However, there are some occupations with an increased risk of fragrance sensitisation, due to occupational exposure to fragrances [Uter et al. 2002a]. These are masseurs who have repeated and intense skin contact to scented massage oils and other perfumed occupationally used products [Uter et al. 2002a, Weißbecher et al. 2005]. Geriatric nurses, too, have a significantly increased risk of fragrance allergy, due to repeated and intense skin contact with the seniors' cosmetics and body care products [Schubert et al. 2017, Uter et al. 2002a]. Roughly the same applies to beauticians [Uter et al. 2002a, 2015].

As part of the baseline series, two fragrance mixes are patch tested in almost every patch test patient. However, a positive test reaction to one of these mixes should be not more than the starting point for further diagnostics [Geier and Uter 2015]. If fragrance allergy is suspected, a larger panel of fragrance materials is usually being tested right from the start. Fragrance mix I consists of oakmoss absolute, isoeugenol, hydroxycitronellal, eugenol, cinnamal, cinnamyl alcohol, geraniol, and amyl cinnamal, in decreasing order of importance. Oakmoss absolute (*Evernia prunastri* extract) contains chloroatranol, a very potent contact sensitiser. Fragrance mix II consists of Hydroxyisohexyl 3-cyclohexene carboxaldehyde (HICC), citral, farnesol, hexyl cinnamal, coumarin, and citronellol, also in decreasing order of allergological importance [Geier et al. 2015a, 2015b, Johansen et al. 2003]. Since 2005, an EU regulation [Directive 2003/15/EC] demands labelling of 26 fragrances if their concentration exceeds certain limits. These are the 14 fragrances of fragrance mix I and II, and alpha-isomethyl ionone, amylcinnamyl alcohol, anise alcohol, benzyl alcohol, benzyl benzoate, benzyl cinnamate, benzyl salicylate, butylphenyl methylpropional, *Evernia furfuracea* extract, limonene, linalool, and methyl 2-octynoate [Schnuch et al. 2015]. However, these 26 fragrance materials do not cover the whole spectrum of potentially sensitizing fragrances. There are lots of more. In particular, for masseurs, essential oils are of special allergological interest.

#### 1.4.2.5. Metals

An allergologically relevant occupational exposure to metals is not only given in the metalworking industry, but also in many other occupations. Three metal salts are part of the DKG baseline series: nickel sulphate, cobalt chloride, and potassium dichromate.

Nickel is the most frequent contact allergen. Sensitisation is mostly acquired by contact to costume jewellery. In addition, other long-time or repeated skin contact with nickel containing alloys, e.g. by jeans buttons, belt buckles, spectacle frames or coins may contribute to nickel sensitisation [Ahlström et al. 2017, Lidén et al. 2011]. Limitation of nickel ion release from metals surfaces designed for prolonged skin contact by EU regulations [Directive 1994/27/EC, Directive 2004/96/EC] has decreased frequency of nickel sensitisation in young women in the last years [Schnuch and Schwitulla 2013]. Relevant occupational exposure to nickel may occur by handling tools, processing nickel alloys, or by handling coins [Kicking-Lörsch et al. 2015, Thyssen et al. 2013]. The patch test preparation nickel sulphate 5% in petrolatum is well-established and reliable. Exposure to and deposition of nickel on the patient' skin can be checked by a

nickel spot test [Julander et al. 2011]. This qualitative test, based on dimethylglyoxim Since 2005, an EU regulation [Directive 2003/15/EC] demands labelling of 26 fragrances if their concentration exceeds certain limits. e, is commercially available and easy to perform. Swabs with dimethylglyoxime are rubbed on a metal surface, and the swab will turn pink in case of nickel ion release from the surface, due to formation of a chemical complex.

By the same procedures as mentioned above, occupational exposure to cobalt may occur, because cobalt is present in almost every nickel material. Cobalt is also present in hard metal alloys, posing a particular risk of sensitisation when processing these metals [Minkwitz et al. 1983]. In the past, cobalt pigments and cobalt siccativ in colours were relevant occupational cobalt exposures [Fowler 2016]. Cobalt salts are also being used as accelerators in polyester resins [Aalto-Korte et al. 2016]. Currently, cobalt exposure in leather has gained more allergological attention [Bregnbak et al. 2015a, Fowler 2016, Hamann et al. 2016, Thyssen 2012, Uter et al. 2014a]. For cobalt, too, a spot test exists [Thyssen et al. 2010]. The patch test preparation cobalt chloride 1% in petrolatum may cause irritant, petechial reactions. These are caused by aggregations of cobalt chloride crystals which may be formed during long-time storage of the patch test preparation [Hausen and Schubert 2002].

Occupational exposure to chromium or to chromate (hexavalent chromium; Cr VI) has changed a lot in recent years. Formerly, exposure to wet cement was the most important source of sensitisation to chromate. However, this is no longer true since 2000, when chromate-reduced cement was introduced in Germany. Since 2005, a European directive [Directive 2003/53/EC] prohibits marketing of cement containing more than 2 ppm of hexavalent chromium. Frequency of sensitisation to chromate among bricklayers, tile setters etc. has constantly decreased since then [Geier et al. 2011a]. Nowadays, no chromate sensitisation is acquired by handling wet cement anymore. Currently, the most important source of chromate sensitisation is contact to leather goods, particularly shoes [Bregnbak et al. 2015b, Bregnbak et al. 2015c]. For chromate, too, a spot test is available. According to another EU-regulation [Commission Regulation (EU) 301/2014] no leather goods which may come into contact with the skin, may be marketed since May 2015, if they contain more than 3 mg Cr VI per kg leather.

All three metal salt patch test preparations, i.e. nickel sulphate 5% in petrolatum, cobalt chloride 1% in petrolatum, and potassium dichromate 0.5% in petrolatum, may elicit unspecific follicular patch test reactions in patients with atopic dermatitis. These reactions usually do not indicate contact sensitisation which has to be considered when interpreting patch test reactions in such patients [Fischer und Rystedt 1985, Hegewald et al 2005].

#### 1.4.2.6. Preservatives

There are two occupationally important groups of preservatives. On the one hand, there are preservatives used in cosmetics and body care products which are not only important as occupational allergens in (geriatric) nursing and beauticians, but in other professions, too, because they may be present in skin care products. On the other hand, there are sensitizing preservatives in industrial products such as paints, varnishes, metalworking fluids etc. Some preservatives are being used in both groups of application, which complicates separating privately from occupationally acquired sensitisations, because cosmetics and body care products are used by everybody. Currently the most important preservative sensitiser is methylisothiazolinone (MI). Its increasing use in cosmetics at concentrations up to 100 ppm has caused an epidemic of contact sensitisation to MI all over Europe [Gonçalo und Goossens 2013]. This also

led to an increase in reactions to methylchloroisothiazolinone / methylisothiazolinone (MCI/MI), probably based on immunological cross-reactivity to MCI in patients primarily sensitised to MI in many cases [Geier et al. 2012b]. MCI/MI at a ratio of 3:1 has been used for years for preservation of cosmetics and body care products at 15 ppm which caused only few cases of sensitisation, if at all. MCI/MI is also being used for preserving paints and metalworking fluids. Cases of airborne allergic contact dermatitis by evaporation of MCI/MI as well as MI from wall paints have been observed [Geier et al. 2011b, Schwensen et al. 2015]. In household products, MI is frequently used together with benzisothiazolinone (BIT) for preservation. Sensitisation to BIT occurs less frequently than to MI. Octylisothiazolinone (OIT) serves for preservation of industrial products, but not for cosmetics; occasionally, sensitisation to octylisothiazolinone occurs [Geier et al. 2012a, Geier et al. 2015c].

Formaldehyde releasers are being used in industrial products as well as in cosmetics. In cosmetics and body care products, mainly diazolidinyl urea, imidazolidinyl urea, DMDM hydantoin, and Quaternium 15 are used [Geier et al. 2015d, Schnuch et al. 2011]. In the industrial field, formaldehyde releasers are frequently used in metalworking fluids. These are methylene-bis(methyloxazolidine), a mixture of 4,4-dimethyloxazolidine and 3,4,4-trimethyloxazolidine (Bioban CS 1135 ®), 7-ethylbicyclooxazolidine (Bioban CS 1246 ®), and 1,3,5-tris(2-hydroxyethyl)-hexahydrotriazine (Grotan BK ®). Reactions to oxazolidines are often weak and not reproducible [Brinkmeier et al. 2002]. Allergic reactions may be directed to formaldehyde or to the formaldehyde releaser as a whole; therefore, concomitant reactions to formaldehyde are not obligatory [Geier et al. 2013, Geier et al. 2015d].

Iodopropynyl butylcarbamate (IPBC) is being used in body care products as well as in industrial applications like wood preservation or in metalworking fluids [Schnuch et al. 2002c].

#### 1.4.2.7. Natural materials

Some natural materials are patch tested as part of the baseline series. These are Balsam of Peru, colophony, oil of turpentine, and extracts of Compositae, tested as Compositae mix, all of them being possible occupational sensitizers.

Balsam of Peru, made from secretions of the tree *Myroxylon balsamum* var. *pereirae*, is a mixture of more than 200 compounds, many of which are used in the fragrance and flavouring industry. About 20 components of Balsam of Peru are known to be contact sensitizers, e.g. cinnamyl cinnamate, cinnamic acid, cinnamal, benzoic acid, benzyl alcohol, benzyl benzoate, nerolidol, farnesol, vanillin, eugenol, isoeugenol, coniferyl benzoate etc. [Hausen 2001]. Not every potentially sensitizing component of Balsam of Peru is available as standardised patch test preparation. Occupational exposure to Balsam of Peru may occur in producing or processing of food, particularly candies, ice cream etc., or in bakery and confectionery. In perfumery, cosmetics and body care products, only Peru Balsam extracts or distillates are used which contain far less allergens than the actual Balsam of Peru [Api 2006]. Nevertheless, a positive patch test reaction to Balsam of Peru is commonly regarded as indicator of fragrance allergy.

Colophony, which also is a mixture of chemically different compounds, is obtained from conifer tree resin or by extraction from roots of such trees. Main components of colophony are resin acids such as abietic acid or hydroabietic acid, which quickly oxidize when exposed to air. Oxidation products of these acids are the most important contact allergens in colophony. In most applications, chemically modified colophony is used. Applications are numerous and diverse, e.g. in glues, sealing agents, lacquers, in print-

ing inks, as basic material for alkyd resins, as emulsifier in processing natural or synthetic rubber, in polishes, chewing gum etc. Colophony allergens were found in paper, particularly in environmentally friendly recycling paper. Colophony is an important occupational allergen in painters and printers. Carpenters and cabinetmakers exposed to dust from pine or spruce wood are at risk of sensitisation to colophony. Gardeners and florists may become sensitised by contact to corresponding plant material. Colophony may also be present in soldering flux, leading to airborne dermatitis of the face [Karlberg et al. 1995, Karlberg 2012]. Another classical application of colophony is its use as violin rosin. Contact sensitisation may not only occur in violinists themselves, but also in neighbored orchestra musicians by swirling dust [Crépy 2015].

For patch testing, colophony 20% in petrolatum is being used. In addition, a patch test preparation with abietic acid 10% in petrolatum is available. However, one has to be aware that not every sensitisation to modified colophony is detected by these patch tests [Geier und Hausen 2000a].

Tall oil is a by-product in pulp and paper production. Distilled tall oil serves as inexpensive raw material for producing water-based metalworking fluids. Distilled tall oil does not contain colophony in the narrow sense, but the same sensitizing resin acids. During use, these resin acids quickly oxidize, so that metal workers are exposed to the allergens mentioned above [Geier et al. 2004a, Karlberg 2012].

Oil of turpentine, the oily fraction of pine resin, was the classical occupational allergen in painters and varnishers until the 1960s. It was used as diluent for paints and lacquers and as solvent / cleaner for brushes [Cronin 1979]. Nowadays, oil of turpentine is rarely used in this branch. However, it may be present in oil colours for artist painters, in waxes and polishes or in hyperaemising topical therapeutics [Frosch et al. 2014b]. Most important allergens in oil of turpentine are delta-3-carene, alpha- and beta-pinene, as well as d- and l-limonene. These and similar compounds are also present in fragrance oils and in tea tree oil. Hence, a positive patch test reaction to oil of turpentine may point towards a sensitisation to terpenes from fragrance oils or tea tree oil [Treadler et al. 2000].

Compositae are a huge plant family, comprising various ornamental, crop, and medicinal plants. For instance, witloof, endive salad, lettuce, dandelion, arnica, camomile, yarrow, tansy, and feverfew are compositae plants. Sesquiterpene lactones, in particular parthenolide, alantolactone, costunolide and dehydrocostus lactone, are known as compositae allergens. However, compositae contain additional allergenic compounds, e.g. polyacetylenes. This may explain why a compositae mix, made from plant extracts, yields higher proportions of positive reactions than a sesquiterpene lactone mix or single sesquiterpene lactones [Geier and Hausen 2000b, Hausen 1996].

#### 1.4.2.8. Rubber allergens

Occupational contact with rubber is given by wearing elastic protective gloves (natural latex gloves, nitrile gloves, gloves made from synthetic rubber etc.) or by contact with rubber handles, tyres, conveyer belts, or rubber gaskets. The DKG baseline series contains several rubber allergen preparations, such as thiuram mix, mercaptobenzothiazole (MBT) and mercapto mix, zinc diethyldithiocarbamate (ZDEC), and N-isopropyl-N'-phenyl-p-phenylenediamine (IPPD).

The spectrum of rubber allergens in elastic protective gloves has been investigated comprehensively [Geier et al. 2012c]. Leading allergens are thiurams, followed by dithiocarbamates, in particular ZDEC. Thiurams and dithiocarbamates are chemically related. More than 90% of the patients allergic to dithiocarbamates also are sensitised

to thiurams; vice versa, only about 25% of the thiurams allergic patients react to dithiocarbamates. Concomitant reactions to thiurams and dithiocarbamates are probably the expression of an immunological cross-reaction in most cases, particularly in patients with high-grade thiuram sensitisation. Other patients may become sensitised to thiurams first, and then switch to thiurams-free gloves. As many thiurams-free gloves contain dithiocarbamates, these patients may then also become sensitised to dithiocarbamates.

MBT and its derivatives as contained in mercapto mix are a completely different group of chemicals. The DKG has decided to patch test both, MBT and the mercapto mix, in the baseline series, because this combination proved to have a higher sensitivity in detecting sensitisation to MBT, which is probably the actual allergen. Very probably, all MBT derivatives are metabolized to MBT in the skin [Geier et al. 2002, Hansson and Agrup 1993].

In recent years, 1,3-diphenylguanidine (1,3-DPG) has gained in importance as a sensitizing rubber accelerator, which seems to be increasingly used in rubber glove production. In several European countries, an increase in sensitisation to 1,3-DPG among medical staff has been observed [Piskin et al. 2006, Pontén et al. 2013].

IPPD is used as an antioxidant and anti-degradant in heavy duty black rubber products such as conveyer belts, tyres etc. By handling such products, sensitisation may be acquired. Chemically related compounds like N-cyclohexyl-N'-phenyl-p-phenylenediamine or N,N'-diphenyl-p-phenylenediamine are also used. There is a high degree of cross-reactivity between these chemicals, and therefore, IPPD is being tested as the only indicator substance for contact sensitization to IPPD, N-cyclohexyl-N'-phenyl-p-phenylenediamine, and N,N'-diphenyl-p-phenylenediamine in the DKG baseline series [Richter 1995a, 1995b]. IPPD is no typical rubber glove allergen.

### **1.4.3. Published knowledge on occupational contact allergy in specific occupations**

In the following sections, we compile information on occupational contact sensitisation in those nine occupational groups, which are most frequently concerned from occupational allergy contact dermatitis, and have been extensively investigated in recent years.

#### **1.4.3.1. Beauticians, cosmeticians, nail stylists**

Expectedly, beauticians are exposed to fragrances, preservatives and emulsifiers at work. As the potential spectrum of allergens is very broad, particularly in the field of fragrances, a correspondingly large panel of allergens should be patch tested in suspected occupational dermatitis. Cosmeticians frequently wear nitrile gloves, which implies a corresponding exposure to rubber allergens.

Nail styling means a special exposure from the allergological point of view. Besides gluing pre-fabricated artificial nails, modelling of finger nails in different ways is performed, using methacrylates and acrylates. Hence, the nail stylist is exposed to corresponding mono- and oligomers as powder or fluid, similar to dental technicians. Sensitisation to these allergens may present as allergic contact dermatitis after direct skin contact or as airborne dermatitis. Ideally, diagnostics is oriented closely to the individual occupational exposure. Most frequent allergens in this context are hydroxyethyl methacrylate, 2-hydroxypropyl methacrylate, ethyleneglycol dimethacrylate, and hydroxyethyl acrylate and ethyl acrylate. Unfortunately, there is no reliable "marker allergen" in this field [Gonçalo et al. 2017, Ramos et al. 2014, Uter und Geier 2015].

#### 1.4.3.2. Brick layers, tile setters, construction workers

Occupational exposure in the building trade has changed a lot within the last 20 years. Formerly, the most important occupational contact allergen was chromate, present as an impurity in wet cement [Avnstorp 1992, Uter et al. 2004b]. A European directive prohibits marketing of cement containing more than 2 ppm of hexavalent chromium since 2005 [Directive 2003/53/EC]. Frequency of sensitisation to chromate among bricklayers, tile setters etc. has constantly decreased since then. Nowadays, it seems very unlikely that chromate sensitisation can be acquired by handling wet cement. In contrast, sensitisation to epoxy resin is on the rise in the building trade. Epoxy resin systems are not only used for industrial floors or special coatings, but more and more in various other fields of application, including decorative floor coatings. Sensitizers in epoxy resin systems are not only the resins, but also reactive diluents and hardeners (see 1.4.2.3.). Additionally, polyurethane foams are frequently used, potentially meaning exposure to diisocyanates. Rubber exposure is given by tool handles, protective gloves, hoses, sealants etc. Corresponding to this pattern of exposure, sensitisation to epoxy resin components, thiurams and IPPD is frequently observed in bricklayers etc. with occupational dermatitis [Geier and Lessmann 2006a, Geier et al. 2011a, 2012d].

#### 1.4.3.3. Dental technicians

Most important contact allergens in dental laboratories are acrylates and methacrylates, and some additional synthetic resins such as melamine formaldehyde resin. For starting the polymerization reaction, benzoyl peroxide is used. Dental technicians are exposed to acrylic and methacrylic mono- and oligomers as well as to benzoyl peroxide, leading to a corresponding sensitisation spectrum. As no marker allergen exists, the DKG has compiled a comprehensive dental technicians patch test series. In addition, dental technicians may be exposed to metals, particularly to cobalt and palladium, also as metal dust during corresponding processing [Aalto-Korte et al. 2007b, Goon und Isaksson 2014, Heratizadeh et al. 2018, Peiler et al. 2000a, 2000b, 2000c, Rustemeyer and Frosch 1996].

#### 1.4.3.4. General care nurses

By wearing protective gloves, handling surface or instrument disinfectants, and medicaments for systemic or topical use, nurses are exposed to a broad spectrum of allergens. A recent analysis of IVDK data shows that nurses with occupational dermatitis frequently are sensitised to thiurams and dithiocarbamates (in elastic protective gloves), MCI/MI and bronopol (preservatives in skin care products) and colophony (possibly by plaster adhesives). Among disinfectant allergens, glutardialdehyde and glyoxal dominated, while formaldehyde sensitisation was declining, compared to earlier findings [Koch et al. 2002, Molin et al. 2015].

#### 1.4.3.5. Geriatric nurses

Occupational allergen exposure in geriatric nursing is mainly given by body care products, topical therapeutics, disinfectants, and protective gloves. Hence, there is an overlap with private exposure, particularly concerning fragrances, preservatives, and ointment bases. Clinical-epidemiological investigations are therefore of special interest when trying to describe a typical occupational allergen pattern. IVDK data from the 1990s revealed that geriatric nurses with occupational dermatitis were more frequently sensitised to fragrances, preservatives, rubber additives, formaldehyde and glutardialdehyde. The proportion of geriatric nurses among occupational dermatitis patients registered in the IVDK increased from 1.4% in 1995 to 5.2% in 2014. An update analysis

of contact sensitisation among geriatric nurses with occupational dermatitis (2005 to 2014) showed increased frequencies of sensitisation to thiurams, zinc diethyldithiocarbamate, mercaptobenzothiazole, fragrances, particularly hydroxyisohexyl 3-cyclohexene carboxaldehyde, and methylisothiazolinone. In contrast, sensitisation to formaldehyde and glutardialdehyde was declining [Proske et al. 2002, Schubert et al. 2017, Uter et al. 2002a, 2003b].

#### 1.4.3.6. Hairdressers

Most important and most frequent occupational hairdressers' allergens are ingredients of oxidative hair dyes, of which p-phenylenediamine (PPD) is the most prominent representative [Uter et al. 1996, 2000a, 2014b, 2015b]. PPD was patch tested at 1% in petrolatum in the DKG baseline series until 2004. The DKG has withdrawn this test preparation from the baseline series due to the risk of active sensitisation by patch testing. Since 2005, it is only tested in the hairdressers' series [Becker et al. 2005, Hillen et al. 2006a]. Based on immunological cross-reactivity, many patients sensitised to PPD also react to toluene-2,5-diamine (p-toluenediamine; PTD) which is even more frequently used in hair dyes in Germany than PPD. During the last 15 years, new hair dye ingredients have been developed which are not covered by the "classical" hairdressers' patch test series [Søsted et al. 2004]. Some of these compounds are added to this series in Germany in autumn 2016: cysteamine-HCl, 2-methylresorcinol, 4-amino-2-hydroxytoluene, and hydroxyethyl-p-phenylenediamine. Another important group of allergens in this trade are persulfates in bleaching agents, tested as ammonium persulfate. In the 1990s, glyceryl monothioglycolate, an ingredient of acid permanent waves, was the most frequent contact allergen in hairdressers with occupational dermatitis. The big companies have voluntarily withdrawn glyceryl monothioglycolate from the market in 1995. Since then, sensitisation to glyceryl monothioglycolate has declined to almost zero [Uter et al. 2000b, Uter et al. 2014b]. Only a few sporadic cases occur, probably due to imported products. Ingredients of newer, so-called ester-free permanent waves, such as ammonium thiolactate and thiolactic acid, do not seem to be important allergens [Uter et al. 2002c].

#### 1.4.3.7. Masseurs

By exposure to massage oils and bath additives, masseurs are exposed to a variety of fragrance and flavour compounds, essential oils, and preservatives. Skin contact is very intense, due to pressure and friction during the massage [Szliska et al. 2001, Weißbecher et al. 2005]. Usually, massaging is done without gloves. IVDK data analyses showed that masseurs with occupational dermatitis have a significantly increased risk of sensitisation to fragrances and preservatives [Uter et al. 2002a, 2003b]. However, by far not every massage oil component is covered by testing with commercially available patch test preparations. Hence, patch testing with workplace material often is essential in diagnosing occupational contact sensitisation [Frosch et al. 2011, Krautheim et al 2012].

#### 1.4.3.8. Metalworkers

Metalworking fluids are complex mixtures, undergoing changes during use. In particular, water-based metalworking fluids may irritate the skin and cause contact sensitisation [Geier et al. 2003b]. As mentioned in section 1.4.2.7., one important basic material of metal-working fluids is distilled tall oil, which contains abietic acid and chemically

related compounds. These oxidize during use, thus forming well-known sensitizers. Corresponding contact sensitization is diagnosed by patch testing with colophony and/or abietic acid. Further important metalworking fluids allergens are monoethanolamine (rust preventing agent with emulsifying properties), diglycolamine (emulsifier), formaldehyde and formaldehyde releasers, and isothiazolinones like MCI/MI, BIT or OIT [Geier et al. 2003b, 2004a, 2004b, Lessmann et al. 2009]. Normally, exposure to metals such as nickel, cobalt or chromium by metalworking fluids is low and not relevant from the allergological point of view. The only exception is hard metal processing which can cause a significant cobalt exposure [Geier and Lessmann 2006b, Lehmann and Fröhlich 1993].

#### 1.4.3.9. Painters and varnishers

Painters and varnishers are occupationally exposed to a variety of skin irritants and contact allergens, depending on their individual field of activity [Dietz et al. 2001, Hillen et al. 2001, 2004, 2006b]. Different types of paints and varnishes contain different allergens, such as preservatives or components of synthetic resins like epoxy resins, polyurethanes, acrylates etc. The level of exposure depends on the way of processing. Some allergens are volatile or are dispersed into the air by spraying, thus causing airborne dermatitis [Hillen et al. 2004]. MCI/MI or MI alone have been described to evaporate for days from wall paints, leading to airborne allergic contact dermatitis [Bohn et al. 2000, Roßkamp et al. 2001, Schnuch et al. 2002b]. In studies on occupational sensitization in painters and varnishers, sensitization to MCI/MI and epoxy resin has been observed frequently. In Denmark, additionally sensitization to BIT, OIT, formaldehyde and quaternium 15 (a formaldehyde releaser) have been observed [Mose et al. 2012, Schwensen et al. 2014].

## 1.5. Aim of the study

From this detailed introduction, it becomes clear that

- contact sensitisation is a health issue in the private as well as in the occupational context,
- there is a wide range of different contact allergens,
- different occupational groups have different allergen exposures and consequently different sensitisation patterns,
- and that primary prevention (on the level of allergen exposure reduction) has proven a useful measure for reducing specific contact sensitisation.

Hence, it is necessary to monitor contact sensitisation in specific occupational groups in order to detect upcoming or persisting problems, or to document the efficiency of preventive measures.

This study is addressed to those who want to be informed about the extent of the problem of contact sensitisation to different substances. Hence, the main focus is presenting data, while additional information is restricted to a necessary scale, allowing interpretation of the data (in particular their limitations), but no profound insight into the allergological and occupational background of each allergen. Information of this kind can be gathered from other sources, preferably the scientific literature.

The aim of this study is to give a broad overview of frequencies of sensitisation to specific substances and in specific occupational groups, based on IVDK data of the years 2007 to 2016, and to put this data in relation to the number of employees. The number of potential allergens is high. More than 400 patch tested allergens elicited positive reactions in IVDK patients with occupational dermatitis (OD patients; n=18,877) and / or in patients without OD (non-OD patients; n=87,966).

OD patients belonged to 70 different occupational groups, with health care workers and mechanics/metal workers being the biggest groups (12.3% and 11.1%, respectively). Forty-eight occupational groups represented less than 1% of the OD patients, each. Sensitisations are not evenly distributed.

Taking these facts into account, the following calculations are performed in order to recognize occupational groups with a particular risk of sensitisation to the respective allergen for those 30 allergens which elicited positive patch test reactions most frequently. For each allergen, two patient groups were selected: patients with a positive patch test reaction (i.e. sensitised patients) and those with a negative reaction. The distribution of occupational groups (percentages) in these two patient groups are calculated and compared, so that significant accumulations of specific occupational groups among patients sensitised to specific allergens can be identified.

In a last step, incidence rate of contact sensitisation to specific allergens is calculated from IVDK, DGUV, and BA Arbeit data, and expressed as cases of contact sensitisation per 100,000 worker years. This allows estimating the magnitude of the problem of contact sensitisation to specific allergens in different occupational groups.

## **2. Material and Methods**

### **2.1. Data from the IVDK network: routine operating procedures and data processing (quality control)**

The IVDK is a scientific network of currently 56 departments of dermatology from Germany, Switzerland, and Austria dedicated to surveillance and clinical epidemiology in contact allergy [Schnuch et al. 2012].

As a principle, data are collected from all patients who are routinely patch tested in these 56 departments of dermatology; patients are not specifically recruited. Of course, only data from those patients are recorded who gave informed consent. However, according to clinical experience, less than 2-3% refuse to have their pseudonymized data transmitted to the IVDK. All patch tests with all readings and test results are recorded, together with clinical and anamnestic data, such as age, sex, occupation, indication for patch testing, suspected allergen source, final diagnosis, localization of the skin disease and the assessment (professional judgement) whether the patient's dermatitis is occupationally induced. This assessment is based on the following items: ability of occupational exposure to cause skin irritation and / or contact sensitisation, work-related time course of the skin disease (improvement when off-work), and matching of localisation of the skin disease to the occupational exposure. In case of proven contact sensitisation, the presence of the allergen at the workplace is checked (based on general knowledge or – if possible – based on individual investigations). If, having regard to all these points, the dermatologist comes to the decision that the patient's dermatitis is occupationally induced, this is marked in the corresponding data base entry. If, however, it is clearly evident, that the patient's dermatitis is not occupationally, but privately caused, this is also documented as non-occupational case. Also, in doubtful cases, a corresponding entry into the database is being made.

Data are recorded in local databases in the testing departments of dermatology using a uniform database management system designed and updated by the IVDK central office. Twice a year, excerpts of the local databases are sent to the IVDK central office which is located at the University Medical Centre Göttingen, Germany. Here, all incoming data are subjected to a standardised quality control, and those data which have successfully passed this step, are added to the IVDK central database [Schnuch et al. 2012, Uter et al. 2005].

### **2.2. Statistical methods**

According to the IVDK routine procedure, patch test reactions at day 3 (or day 4) as described in Section 1.2 are considered for analyses of sensitisation frequencies. Frequencies of sensitisation to specific allergens in defined patient groups are calculated as proportions of patients with positive reactions (+, ++, or +++; numerator) of all patients tested with this specific allergen (denominator).

Proportions of occupational groups are calculated among all patients sensitised to (i.e., with a positive reaction to) a specific allergen, and in those with a definite negative reaction to this specific allergen. Comparing the proportions (percentages) of occupational groups in these two patient groups allows identifying significant accumulations of specific occupational groups among patients sensitised to specific allergens.

All quotients are accompanied by a 95% confidence interval (95%-CI). Statistical significance of differences when comparing proportions of sensitised patients in different

(independent) groups of patients, or when comparing proportions of occupational groups among patients sensitised to an allergen and those not reacting to this allergen, respectively, was established on a 5%-level by non-overlapping 95% confidence intervals of the corresponding proportions. Notes concerning statistical significance of positive reactions (\* for “significantly higher percentage in occupational dermatitis patients” or # for “significantly higher percentage in non-occupational dermatitis patients”) in the corresponding tables are limited to allergens from the baseline series (or to allergens which were tested in  $\geq 85\%$  of both studied groups). This restriction was made because a reasonable comparison of reaction frequencies is only possible for allergens tested in (almost) all patients of the corresponding groups. As far as special allergens are concerned, which are not tested in the total group, but in selected patients only, we have no information about the indication for patch testing these particular allergens. This indication may be stricter (aimed testing) or rather liberal (testing in order to exclude sensitisation) which has a great impact on the proportion of positive reactions. This kind of “selection bias” makes any statistical comparison pointless.

### **2.3. Handling of data from other sources: adaptation of occupation codes from IVDK, DGUV, and BA Arbeit**

As mentioned in Section 1.5, one of the aims of this study is to put observed frequencies of sensitisation to specific substances in specific occupational groups in relation to the corresponding number of employees. This is done by combining data from three different sources, as described in the following paragraphs. These data sources are the IVDK, the German Statutory Accident Insurance (Deutsche Gesetzliche Unfallversicherung; DGUV), and the German Federal Employment Agency (Bundesagentur für Arbeit; BA Arbeit).

The origin and content of IVDK data is described in Section 2.1. IVDK data are data from dermatitis patients patch tested in departments of dermatology, i.e. a highly selected group of individuals. This means that proportions of patients sensitised to a specific allergen in the IVDK data are not equal to sensitisation frequencies in the general population. The same applies to sensitisation frequencies observed in occupational dermatitis patients in the IVDK, which do not reflect sensitisation frequencies among all employees working in the occupations concerned.

In spite of its name (“accident insurance”), the DGUV does not only cover occupational accidents, but also occupational diseases. The DGUV operates a registry on occupational diseases called “Documentation of Incidences of Occupational Diseases” (Dokumentation des Berufskrankheitengeschehens; BK-DOK). This registry comprises all kinds of occupational diseases, including occupational dermatitis. Besides the occupational disease code (BK 5101 in the case of skin diseases) according to the German list of occupational diseases (Berufskrankheitenliste), the patient’s occupation is documented. From this data, the DGUV produces annual statistics on occupational diseases in different branches. Concerning occupational dermatitis, DGUV statistics cover three levels (suspected, confirmed, recognized), as described in Section 1.4.1. Criteria according to which a case is classified as “confirmed” by the DGUV largely correspond to IVDK criteria of “occupational dermatitis”. In both cases, it is defined as a skin disease, which is caused by the occupational exposure, according to the dermatologist’s assessment, irrespective of the specific medical diagnosis, be it irritant contact dermatitis, allergic contact dermatitis, or any other form of dermatitis. A case

of OD (IVDK) or “conformed OD” (DGUV) is not necessarily an occupational skin disease according to no. 5101 of the German list of occupational diseases, because the definition of an occupational skin disease no. 5101 includes that the patient was forced give up her or his job because of the skin disease. The definitions of “occupational dermatitis” (IVDK) and “confirmed occupational dermatitis” (DGUV) do not include the force to give up the occupational activity; they simply confirm the occupational causation of the skin disease.

The German Federal Employment Agency (BA Arbeit) generates quarterly statistics on numbers of employees in different occupational groups. For the annual statistics, an average is calculated from the quarterly data.

In order to calculate the incidence rate of contact sensitisation to specific allergens, expressed as cases of contact sensitisation per 100,000 worker years, data from IVDK, DGUV and BA Arbeit were combined. A prerequisite for combining data from these three sources is merging the different codes for occupational groups.

The IVDK uses a key based on the International Standard Classification of Occupations 1988 (ISCO-88), but repeatedly modified according to allergological needs. For IVDK purposes, coding of occupations has to reflect the occupational exposure as best as possible, which is not necessarily simply the area of business or branch. Occupations are coded with a key with up to three digits. They are summarized (according to exposure) in occupational groups which have a four-digit code number.

In BK-DOK, the DGUV, which is the parent organization of several statutory accident insurances, uses a five-digit code also originally based on ISCO-88, but modified according to their needs, which is more branch-oriented, in accordance with branch-specific insurances.

The BA Arbeit has changed the occupation documentation system some years ago. The German Classification of Occupations 1988 (Klassifikation der Berufe 1988; KIdB 1988) was used until June 2011. After structural changes at the BA Arbeit, a newer version, namely the Classification of Occupations 2010 (KIdB 2010) is being used since 2013. The KIdB 2010 is a hierarchical system with two-digit codes for occupational segments, three-digit codes for occupational groups, and four-digit codes for occupations. The structural changes which included the switch from KIdB 1988 to KIdB 2010 left a data gap from July 2011 to December 2012. Therefore, we limited the calculations of incidence rates of contact sensitisation to specific allergens in specific occupational groups to the years 2013 to 2015, and did not consider earlier years. (Date from 2016 was not yet available at the time of data processing for this study.)

For combining the three different occupational codes, we chose the following approach. From all IVDK patients of the years 2013 to 2015 ( $n=37,550$ ), we selected the subgroup of patients with OD ( $n=6,019$ ), and identified their occupational groups. Based on expert judgement, and with special regard to the occupational exposure, IVDK coding of these occupational groups was matched to the coding of occupational groups used by the DGUV and the BA Arbeit, respectively. Considering the different backgrounds of the occupational codes, it is evident that such an approach leads to a certain inaccuracy. As an example, the IVDK occupational group 1220 “metalworkers (cutting)” corresponds to the DGUV occupational groups 72141 “metalworkers”, 72231 “turners”, 72232 “milling cutters”, 72233 “drillers”, 72239 “machine tool operators (not else classified)”, and 72249 “metal grinders, polishers etc.”, and to the BA Arbeit occupational group 242 “metalworkers”.

The full list of linking occupational group codes of IVDK and DGUV is given in Tab. 2.3.1 (see Appendix), and of IVDK and BA Arbeit in Tab. 2.3.2 (see Appendix).

## **2.4. Estimation of annual incidences of contact sensitisation to specific allergens using data from IVDK, DGUV, and BA Arbeit**

In order to get an idea of the magnitude of the problem of contact sensitisation to specific allergens in specific occupational groups, sensitisation frequencies observed in the IVDK were linked to DGUV data on OD (which are incidence data), and to the number of employed individuals registered by the BA Arbeit.

IVDK data on contact sensitisation are, strictly spoken, no incidence data because, once a contact sensitisation is acquired, the corresponding patch test will remain positive life-long, and the IVDK does not record when the sensitisation was acquired. Therefore, it is not sure that every patient diagnosed with a specific sensitisation in 2013 to 2015, has acquired this sensitisation during these years. However, according to clinical experience, the majority of patients seen in departments of dermatology joining the IVDK are being patch tested because of more or less recent health events. Hence, most of the findings reflect new cases of contact allergy, and therefore IVDK data can be interpreted as incidence data (in this case: 3-year-incidence), accepting a certain degree of uncertainty.

DGUV data clearly reflect incidence of OD because, in these statistics, only those patients are registered in whom an OD is confirmed for the first (and only) time. This means, DGUV data of the years 2013 to 2015 illustrate the 3-year-incidence of OD in the corresponding occupational groups in Germany in these years.

We do not know whether every OD patient documented in the IVDK is also registered at the DGUV because IVDK data are pseudonymized, and hence, there is no common identifier. But both documentation systems recruit their patients from the same population, which are German employees, and definitions of "OD" in the IVDK and "confirmed OD" in the DGUV are almost identical (see Section 1.4.1). Hence, IVDK OD patients can be regarded as a (more or less) representative sample of the "confirmed OD" patients registered at the DGUV. This applies in particular, since physicians are advised to report cases of occupational diseases to the statutory insurances organised in DGUV.

Under these premises, the proportion of individuals sensitised to a specific allergen among IVDK OD patients from a specific occupational group can be applied to the number of "confirmed OD" patients registered at the DGUV, resulting in a number of incident "confirmed OD" cases sensitised to this specific allergen working in this particular occupational group. In a following step, this number of incident cases can be related to the number of employees, or, to be more precise, to the number of employee years. The procedure is explained in detail in the following paragraphs.

From IVDK data of the years 2013 to 2015, we calculated the percentage of OD patients from a specific occupational group who are sensitised to a specific allergen.

The department of statistics of the DGUV delivered us the number of individuals with "confirmed OD" registered in the same years, categorized into specific occupational groups.

We calculated the number of OD patients sensitised to a specific allergen in a specific occupational group in Germany (3-year-incidence, incident cases) by applying the percentage of sensitisation to a specific allergen in IVDK patients with OD from this specific occupational group to the number of patients with confirmed OD from this specific occupational group registered at the DGUV.

From the BA Arbeit, we obtained annual statistics of employees, categorized into specific occupational groups, for the years 2013 to 2015. For each occupational group, we added up the numbers of employees of these three years in order to have the total number of employee years (worker years; person years; German: Beschäftigten-Jahre; Personen-Jahre) as denominator for further calculations. The total person-time at risk (sum of individual person-times) thus is approximated by the mean population size at risk multiplied by the length of the observed period.

Relating the calculated number of incident cases of sensitisation, i.e. OD patients sensitised to a specific allergen in a particular specific occupational group in Germany, to the number of employee years, we calculated the incidence rate of sensitisation to a specific allergen in a specific occupational group, expressed as cases per 100,000 employee years.

#### An Example:

The frequency of sensitisation to monoethanolamine (MEA; CAS 141-43-5) in metalworkers with OD registered in the IVDK in the years 2013 to 2015 was 13.8% [95%-CI, 9.5% - 19.1%]. In other words: 13.8% of the metalworkers with OD registered in the IVDK in 2013 to 2015 were sensitised to MEA.

The number of metalworkers with confirmed OD in the DGUV statistics, 2013 to 2015, was 2,643.

If 13.8% of these individuals were sensitised to MEA, then their number was 364. In other words: The calculated number of metalworkers with OD sensitised to MEA in Germany, 2013 to 2015, was 13.8% of 2,643 = 364 [95%-CI; 251 - 504].

According to BA Arbeit statistics, the annual numbers of employed metalworkers in Germany in the years 2013-2015 were as follows: in 2013: 639,130 employees; in 2014: 651,115 employees; in 2015: 659,767 employees. Thus, the calculated total number of employee years for metalworkers adds up to  $639,130 + 651,115 + 659,767 = 1,950,012$  worker years.

364 cases of contact sensitisation to MEA occurring in 1,950,012 worker years equals to an incidence rate of 19 per 100,000 worker years [95%-CI; 13 - 26].

With MEA being a typical occupational allergen in metalworkers exposed to metalworking fluids (and private exposures largely excluded), this data means that 13 to 26 individuals per 100,000 metalworkers per year might become sensitised.

## **2.5. Limitations of data sources and uncertainties in the methods used in this study**

General limitations of the diagnostic procedure, i.e. patch testing, are described in Section 1.2. "Diagnostics of contact sensitisation".

General limitations of clinical epidemiology in contact allergy and of the possibilities to make extrapolations based on these data are described in Section 1.3 "Epidemiology of contact sensitisation". In particular, limitations arise from the fact that patch testing with special allergens beyond the baseline series is determined by unpredictable circumstances in the individual case, such as knowledge of relevant allergen exposure, availability of patch test preparations, indication for patch testing etc.

Concerning the estimation of incidence rates of specific sensitisations, limitations are: We have no information about the individual occupational exposure in sensitised patients registered in the IVDK. Therefore, we cannot make any statements as to whether the respective sensitizations were actually acquired at the workplace in each individual case. Our approach bears a certain risk of over-estimation of occupational sensitisations. We do not know which proportions of German OD patients are eventually tested in departments of dermatology joining the IVDK. It may be that severe cases accumulate in these clinics, and hence the true proportion of sensitised individuals among OD patients in general might be lower.

On the other hand, it is well-known that not every case of OD is reported to the DGUV. The extent of this problem of unrecorded cases is not known, but it might lead to an underestimation of OD and occupational contact sensitisation. It cannot be excluded that relevant allergens may be overlooked. We cannot guarantee that the selection of allergens tested in the individual case is sufficient and adequate, in particular against the background of the legal situation in Germany, which has impeded the development of new patch test preparations since 2005.

Not every sensitisation diagnosed in OD patients is necessarily occupationally acquired. Allergens are never strictly occupational or strictly non-occupational.

The linking of three different coding systems for occupations used in the IVDK, the DGUV and the BA Arbeit inevitably leads to inexactness (see Section 2.3).

Statistics of the DGUV cover most, but not all working people in Germany. Some occupational groups are covered by other insurances (e.g. farm workers), and self-employed workers are not obligatorily insured.

Statistics of the BA Arbeit only cover employed workers, but no self-employed workers.

Although, as demonstrated, our approach to estimate frequencies of occupationally acquired sensitisation has limitations on several levels, it gives an idea of the size of the problem. In addition, there are no better data, i.e. more detailed and reliable data available for the time being.

### 3. Results and discussion

#### 3.1. Contact sensitisers in unselected dermatitis patients (overview): IVDK data, 2007 – 2016

Altogether, 120,977 patients were patch tested in the departments of dermatology joining the IVDK in 2007 to 2016 and are thus included in this data analysis. Baseline series allergens have been patch tested in about 106,000 patients, i.e. 87.6%.

In 18,877 patients (15.6%), occupational dermatitis (OD, see Section 2.1) was diagnosed, while non-occupational dermatitis was determined in 87,966 patients (72.7%).

In 14,134 patients (11.7%), no information concerning occupational or non-occupational causation of their skin diseases was documented. Data of these patients were excluded from data analyses concerning OD and/or non-OD patients.

Based on data of all patients tested in the IVDK in 2007 to 2016, Tab. 3.1.1 (see Appendix) gives an overview of all 420 patch tested allergens which elicited positive reactions, with number of patients tested, count and percentage of patients with positive reactions, and comments on occurrence of the allergen or other special remarks.

#### 3.2. Contact allergy in occupational dermatitis patients

##### 3.2.1. Contact sensitisers in occupational dermatitis (OD) patients (overview): IVDK data, 2007 – 2016, comparison of sensitisation frequencies in OD vs. non-OD patients

Comparing frequencies of sensitisation to specific allergens in OD and non-OD patients allows identifying allergens, which are more relevant in the occupational than in the private context and vice versa. However, one has to be aware that this comparison does not necessarily point to specific occupational or non-occupational allergen exposure in every single case because, from the mere diagnosis “OD”, it cannot be deduced that every sensitisation also is occupationally acquired.

In this section, a comparison of sensitisation frequencies observed in OD patients and non-OD patients in the IVDK is given. Five of the 420 allergens from Tab. 3.1.1 are not part of this comparison because they elicited positive reactions exclusively in patients without notification if their dermatitis was occupationally caused or not. These five substances are listed in Tab. 3.2.1.1 (see Appendix).

In Tab. 3.2.1.2 (see Appendix), all 415 allergens are listed which elicited positive reactions in patients with OD (n=18,877) and/or patients without OD (n=87,966) in the IVDK, 2007-2016. This table also contains an indication whether percentages of positive reactions differed significantly between both patient groups. Significance on a 5%-level (at least) was deduced from non-overlapping 95%-CIs; calculation was limited to allergens patch tested in at least 85% of both patient groups (which are 16,045 OD patients and 74,771 non-OD patients). Allergens, which were tested in less than 85% of the respective patient population were except from this statistical comparison because these allergens were tested in a more or less targeted manner, which has an

unforeseeable impact on the proportions of positive reactions. If an allergen was tested only in patients who were definitely exposed to it and who had had skin symptoms after contact with it, then the probability of sensitisation, i.e. a positive patch test reaction, is very high. In contrast, a patch test solely based on the general assumption of patients' exposure will elicit far fewer reactions. Hence, indication for patch testing in selectively tested allergens causes a selection bias with great influence on the frequency of positive reactions. As we have no information on the indication for patch testing every single allergen, a statistical comparison of the reaction frequencies to selectively tested allergens makes no sense.

When interpreting this data, it has to be considered that both groups are very large. These large sample sizes lead to narrow 95%-CIs, and consequently to statistical significance of even small differences in reaction frequencies. Hence, not every (little) difference may be relevant, although it is statistically significant.

In addition, both groups of patients are heterogeneous, as far as distribution of age, sex, and occupations, indication for patch testing and presumed allergen sources are concerned. This will cause different proportions of positive reactions, independent of the occupational or non-occupational causation of the skin disease. In other words, any differences are not necessarily caused or even influenced by occupational exposures.

From Tab. 3.2.1.2, it can be seen that allergic reactions to metals like nickel, cobalt and chromium, to preservatives like methylchloroisothiazolinone / methylisothiazolinone (MCI/MI), to thiurams, mercaptobenzothiazol derivatives, and dithiocarbamates (rubber ingredients), to colophony, and to epoxy resin occur more frequently among OD patients than among non-OD patients, with largest differences noted in rubber allergens and epoxy resin. In contrast, allergic reactions to fragrance patch test preparations were observed more frequently among the non-OD patients. This table may indicate that contact sensitisation to rubber ingredients and epoxy resin is more likely to be an occupational problem, and fragrance allergy is often privately acquired.

### **3.2.2. Patients with occupational dermatitis in IVDK data 2007 – 2016**

Tab. 3.2.2.1 (see Appendix) gives an overview of the occupational groups of OD patients registered in the IVDK, 2007-2016 (n=18,877). The list and ranking of these occupational groups correspond largely, albeit not exactly, to the ranking in the DGUV statistics on confirmed cases of occupational dermatitis. Differences may be due to (more or less slightly) differing group definitions (see Section 2.3).

Frequencies of contact sensitisation to specific allergens in specific groups of patients do not only depend on occupational exposures, but also on other factors such as gender and age distribution in the respective group of patients, as well as proportions of patients with hand, leg, or face dermatitis [Schnuch et al.1996, 2012]. Therefore, the so-called MOAHLFA index was established for the description of patch test patient populations [Uter et al. 1999]. The acronym MOAHLFA stand for proportions of Male patients, Occupational dermatitis patients, Atopic dermatitis patients, Hand dermatitis patients, Leg dermatitis patients, Face dermatitis patients, and patients Aged 40 years or more.

Tab. 3.2.2.2 gives an overview of the MOAHLFA indices of the 20 most frequent occupational groups among OD patients registered in the IVDK, 2007-2016. As expected,

hand dermatitis is the most common localization with 80% to 90% of the patients affected, while leg dermatitis plays no role in this context. However, there are some differences concerning face dermatitis. In most occupational groups, less than 4% of the OD patients suffer from face dermatitis. Most prominent exceptions are chemists, laboratory assistants, chemical products machine operators (15.7%), office clerks (14.3%), painters and varnishers (12.8%), and construction workers (7.9%). An occupational airborne exposure to allergens leading to face dermatitis is known from epoxy resins (relevant for painters and construction workers) or preservatives (relevant for painters) [Breuer et al. 2015]. In chemical laboratories, airborne exposure to various allergens seems possible. In contrast, a relevant occupational airborne exposure to allergens in office workplaces has not been described yet. Therefore, non-occupational exposures leading to face dermatitis, e.g. cosmetics, have to be considered in these cases. In addition, Tab. 3.2.2.2 confirms that there are still typical female occupations such as nurses, geriatric nurses, hairdressers, and cosmeticians, and typical male occupations like metal workers, mechanics, technicians, painters and construction workers.

### **3.2.3. Contact sensitisers in OD patients, IVDK 2007 – 2016: analysis of occupational groups concerned**

One of the aims of this study is to describe accumulations of sensitisations to specific allergens in specific occupational groups. Therefore, we selected the 30 most frequent contact allergens among OD patients (see Tab. 3.2.1.2) and performed a comparative analysis of the proportions of occupational groups among those sensitised to the respective allergen (i.e. those with a positive patch test reaction) and those who are not sensitised (i.e. those with a negative patch test reaction). These comparisons are listed in Tab. 3.2.3.1 to Tab. 3.2.3.30 (see Appendix).

One has to be aware that this comparison only considers one single individual factor, namely the patient's occupation. However, risk of sensitisation is not only attributed to occupation, but also (in some cases even more) to age, gender etc. Hence, even significant differences are to be regarded as a starting point for a professional analysis rather than as irrevocable facts. Existing knowledge of occupational exposure and allergens (see Section 1.4.3) has to be considered when interpreting this data.

Nickel sensitisation occurs preferentially in females and is acquired by wearing costume jewellery [Uter et al. 2003a; for more information also see Section 1.4.2.5)]. Accordingly, occupational groups with female predominance like nurses, hairdressers, cleaners, cosmeticians etc. (see Tab. 3.2.2.2) are over-represented among patients sensitised to nickel (Tab. 3.2.3.1), while the opposite is true for typical male occupations such as mechanics, metal workers etc.

Fragrance allergy also occurs more frequently in women than in men [Uter et al. 2015a]. In addition, geriatric nurses seem to have a particular occupational risk of fragrance sensitisation, probably due to their intense and repetitive exposure to cosmetics and body care products of their clients [Schubert et al. 2017; for more information, see Section 1.4.2.4)]. This is reflected in Tab. 3.2.3.2, where not only geriatric nurses are over-represented among those reacting to fragrance mix I, but also other occupational groups with a higher share of women. Similar findings are made with fragrance mix II

(Tab. 3.2.3.9) and the fragrances hydroxyisohexyl 3-cyclohexene carboxaldehyde (Tab. 3.2.3.14), and ylang ylang oil (Tab. 3.2.3.25).

Among patients sensitised to MCI/MI, there were more hairdressers, geriatric nurses, and painters (Tab. 3.2.3.4), compared to those not sensitised to MCI/MI. In hairdressers and geriatric nurses, the relevant exposures probably are hair cosmetics and body care products, and in painters, water-based wall paints (see Section 1.4.2.6). Among those reacting to MI (Tab. 3.2.3.7) painters were over-represented, too, as well as cosmeticians (personal care workers). In all of these cases, it has to be considered that in recent years, there has been a cosmetic-induced epidemic of sensitisation to MI which has also led to increased reactions frequencies to MCI/MI (see Section 1.4.2.6).

Thiurams are used as vulcanizing agents in rubber glove production, and are the most frequent contact allergens in patients suffering from rubber glove dermatitis (see Section 1.4.2.8). Accordingly, occupational groups in which elastic protective gloves are worn are over-represented among patients sensitised to thiurams. These are cleaners, cooks and food processors, construction workers, medical professions, geriatric nurses etc. (Tab. 3.2.3.6).

Concerning potassium dichromate (Tab. 3.2.3.8), significantly more construction workers are among those with a positive reaction, compared to those with a negative reaction. However, this is not an indicator of a current problem. Dichromate has been the most important occupational allergen in the building trade for decades, and hence we find a lot of sensitisations which have been acquired years ago (see also Sections 1.4.2.5 and 1.4.3.2)

Among patients sensitised to colophony, there were significantly more metal workers, office clerks, and gardeners than among those without patch test reaction to colophony (Tab. 3.2.3.10). As described in section 1.4.2.7, allergens present in colophony also occur in distilled tall oil, which is a frequently used basic material for water-based metalworking fluids. Colophony allergens also may be present in recycled paper, and in woods. These exposures may (at least partly) explain the accumulation of the above-mentioned occupational groups among patients sensitised to colophony.

With methyldibromo glutaronitrile (MDBGN) (Tab. 3.2.3.11 and Tab. 3.2.3.12), the situation is special. Using an adequate test concentration, i.e. MDBGN 0.2% in petrolatum, we find a significantly increased proportion of geriatric nurses among those sensitised. As MDBGN is prohibited in cosmetics and body care products since 2008, sensitisation by this route must have been acquired before. Unfortunately, MDBGN has to be tested at 0.3% in petrolatum since spring 2016 because the preferred test preparation (0.2%) is no longer available. Since then, reaction frequencies have more than doubled – although there is no exposure of the general population. From earlier investigations it is well-known that with the higher test concentration many false-positive reactions are elicited [Schnuch et al. 2018].

Contact allergy to epoxy resin is an important issue in the construction industry. As mentioned in Section 1.4.2.3, not only the resins, but also hardeners and reactive diluents may cause allergic reactions. Among patients sensitised to epoxy resin, occupational groups from the building trade as well as painters are more frequently mentioned than among those with a negative epoxy resin patch test (Tab. 3.2.3.13). The

same applies to 1,6-hexanediol diglycidylether, a frequently used reactive diluent in epoxy resins systems (Tab. 3.2.3.23). In addition, plastic-product machine operators and engineers are over-represented. In these groups, an occupational exposure seems plausible or at least possible. However, we have no explanation for the finding that “patients with occupations with undetermined exposure”, which are all professionals, in whom the professional title allows no conclusion regarding the occupational exposure (students, trainee, unskilled workers), are over-represented among those sensitised to epoxy resin.

At a first glance, it may seem plausible that there are more health care workers among those reacting povidone iodine (a skin disinfectant) than among those with a negative patch test to povidone iodine (Tab. 3.2.3.14). However, one has to consider that povidone iodine 10% aqu., which is the most frequently used povidone iodine patch test preparation, belongs to the so-called problematic allergens with frequent false-positive reactions (see Section 1.2, Tab. 1.2.2).

Exposure to hair dyes is by far the most frequent source of contact with and sensitisation to p-phenylenediamine (PPD) and toluene-2,5-diamine. Accordingly, PPD and toluene-2,5-diamine are typical occupational allergens in hairdressers (Tab. 3.2.3.17 and Tab. 3.2.3.18) (see also Section 1.4.3.6).

Among those sensitised to formaldehyde, there are significantly more metal workers than among those without patch test reaction to formaldehyde (Tab. 3.2.3.20). Water-based metal working fluids are preserved with formaldehyde releasers, and most metal workers do have permanent skin contact with these metalworking fluids because wearing gloves is prohibited when working at machines with rotating tools (see Sections 1.4.2.6 and 1.4.3.8).

1,3-Diphenylguanidine is a rubber ingredient which has gained increasing allergological attention as contact allergen in medical gloves (see Section 1.4.2.8). Accordingly, we find more medical doctors among those sensitised to 1,3-diphenylguanidine (Tab. 3.2.3.21). Other health care professionals seem to be less concerned; however, in this occupational group, more cases of contact sensitisation to thiurams are observed (Tab. 3.2.3.6).

Iodopropynyl butylcarbamate (IPBC) is being used as preservative in body care products as well as in industrial applications like wood preservation or in metalworking fluids [Schnuch et al. 2002c]. However, only metal workers exposed to metalworking fluids are over-represented among those sensitised to IPBC, while geriatric nurses are not (Tab. 3.2.3.24). Obviously, the exposure to IPBC by metalworking fluids bears a greater risk of sensitisation than IPBC exposure by body care products.

As mentioned in Section 1.4.2.7, oil of turpentine was the classical occupational allergen in painters and varnishers until the 1960s. Nowadays, oil of turpentine is rarely used in this branch. However, it may be present in oil colours for artist painters. This is reflected in Tab. 3.2.3.25. While painters and varnishers are not over-represented among patients sensitised to oil of turpentine, we found an increased proportion of artists (who are, however, only a small group).

Benzoyl peroxide 1% pet. is a so-called problematic allergen with frequent false-positive reactions (see Section 1.2, Tab. 1.2.2). Nevertheless, it has been identified to be a relevant occupational contact allergen in dental technicians (see section 1.4.3.3). Remarkably, among those reacting to benzoyl peroxide, not dental technicians, but dentists are over-represented (Tab. 3.2.3.27). This constellation is hard to explain. Either there are dental assistants (who are subsumed in the group “dentists”) who do dental technicians’ work or some dental technicians are inaccurately documented as dentists.

Monoethanolamine is used as rust preventing agent with emulsifying properties in water-based metalworking fluids and is an important allergen in this context (see Section 1.4.3.8). Accordingly, we found an increased proportion of metal workers among patients sensitised to monoethanolamine (Tab. 3.2.3.29). Monoethanolamine may also occur in hair dyes, and hence it is being tested as part of the hairdressers’ series. However, hairdressers were significantly under-represented among those sensitised to monoethanolamine, which may indicate that it is not a significant allergological problem in this context.

Ammonium persulfate is a frequently used ingredient of hair bleaching agents and a well-known hairdresser allergen (see Section 1.4.3.6). As ammonium persulfate may also cause airway allergy, improved product formulations (cream instead of powder) have been developed to prevent airborne exposure. However, it seems like this had no significant impact on contact sensitisation by skin exposure [Uter et al. 2014b]. As can be seen from table Tab. 3.2.3.30, there are significantly more hairdressers among patients sensitised to ammonium persulfate than among those not reacting to it.

Positive patch test reactions to 4,4'-diaminodiphenylmethane (4,4'-methylenedianiline; MDA) may indicate contact sensitisation to MDA itself or be the expression of immunological cross reactivity [Geier and Lessmann 2017]. Nowadays, there is no longer any relevant (occupational) exposure to MDA, because it is a carcinogenic substance. Nevertheless, positive patch test reactions are frequently observed. In most cases, these reactions indicate contact allergy to so-called “para-substances”, which are compounds with structural similarity to p-phenylenediamine. Based on immunological cross-reactivity, these patients, who are primarily sensitised to p-phenylenediamine, do also react to other chemically related compounds, among them MDA. In addition, sensitisation to diphenylmethane-4,4'-diisocyanate (MDI) may lead to a positive patch test reaction to MDA, based on the transformation of MDI to MDA on and/or in the skin [Geier and Lessmann 2017; Hamada et al. 2017]. Correspondingly, an increased proportion of hairdressers (exposed to PPD in hair dyes), construction workers and painters (potentially exposed to MDI from polyurethane foams or lacquers) might be over-represented among those reacting to MDA. While we indeed found an increased proportion of construction workers and painters among these patients, hairdressers were not over-represented (Tab. 3.2.3.31).

### **3.3. Estimation of annual incidences of contact sensitisation to specific allergens in selected occupational groups**

As described in Section 1.5, one of the aims of this study is estimating the magnitude of the problem of contact sensitisation to specific allergens in different occupational groups. For this purpose, the incidence rate of contact sensitisation to specific allergens is calculated as cases of contact sensitisation per 100,000 worker years. As described in chapter 2.4, we estimated the annual incidence of contact sensitisation to specific allergens in selected occupational groups, based on data of the years 2013 to 2015.

In these years, 6,019 patients with OD were patch tested in the IVDK. Tab. 3.3.0.1 (see Appendix) shows the distribution of occupational groups among these patients. Of these, we selected those occupational groups comprising more than 120 individuals, i.e. more than 2% of this patient population.

In Section 2.4, we explained that IVDK OD patients can be regarded as a sample of the “confirmed OD” patients registered at the DGUV because definitions of OD in the IVDK and “confirmed OD” in the DGUV are almost identical. As data collection in the IVDK is no prospective study, it is of interest if there are recognizable differences in selection of OD patients from different occupations. Such selection differences might affect observed frequencies of contact sensitisation. Therefore, we analysed the distribution of occupational groups among OD patients registered at the DGUV and in the IVDK (Tab. 3.3.0.2, see Appendix). On the one hand, there are differences, for instance concerning mechanics etc., who are over-represented in the IVDK (11.9% vs. 7.0%). On the other hand, the majority of occupational groups are represented at similar, albeit not exactly the same, percentages in both registers.

Annual incidences of contact sensitisation (OCS) to specific allergens for the 13 most frequent occupational groups of Table 3.3.1. (group no. 1990 “occupations with undetermined exposure” was excluded) are presented in Tab. 3.3.1.1 to Tab. 3.3.13.1 (see Appendix).

#### **3.3.1. Health care professionals with OD**

Tab. 3.3.1.1 gives an overview of the incidence rates of contact sensitisations to specific allergens in health care workers with OD. Because this occupational group is dominated by women (see Tab. 3.2.2.2), a comparably high incidence rate of contact sensitisation to nickel and fragrances can be expected (see Section 3.2.3). In the scientific literature, the current spectrum of occupational contact sensitisation in nurses has been described (see Section 1.4.3.4). It includes rubber allergens like thiurams and dithiocarbamates, preservatives (to which also a private exposure is given), and disinfectants. With 11 cases per 100,000 worker years, the incidence rate of contact sensitisation to thiurams is more than ten times higher than the incidence rate of contact sensitisation to dithiocarbamates (1 case per 100,000 worker years). This is remarkable because the big European producers of medical gloves offer more and more thiuram-free gloves, which should result in a declining exposure. However, it has been assumed that, due to lower costs, many employers preferably buy cheap medical gloves which are still produced with thiurams [Geier et al. 2012c]. Glutaraldehyde is an ingredient of surface and instrument disinfectants; incidence rate of contact sensitisation to glutaraldehyde in health care workers was 7 per 100,000 worker years. As glutaraldehyde 0.3% pet. belongs to the so-called “problematic allergens” (see Tab.

1.2.2) which may elicit false-positive reactions more often than other test preparations, the incidence rate of contact sensitisation to glutardialdehyde may be over-estimated. Nevertheless, as a non-occupational exposure can largely be excluded, cases of true CS to glutardialdehyde can be attributed to occupational exposure, and a more efficient protection from direct skin contact seems advisable.

### **3.3.2. Mechanics, metal, machinery and related trades workers with OD**

Mapping IVDK codes for occupations from this group to codes from the DGUV and the BA Arbeit probably causes a larger degree of inaccuracy than with other occupations (for instance nurses, hairdressers, or construction workers) because of the different focusses of the coding systems mentioned in Section 2.3. Occupation codes used by the IVDK have their focus on allergologically relevant occupational exposure. DGUV codes are more branch-oriented, in accordance with branch-specific accident insurances, while BA Arbeit codes, which are also branch-oriented, do rather consider economical aspects. As can be seen from Tab. 3.3.2.1, IDs of CS generally are low in mechanics, metal, machinery and related trades workers with OD, and no particular sensitisation pattern can be recognized. This may be due to a large variety of occupational exposures at different workplaces. Considering the occupational skin exposure with irritating greases, oils, rust, cleaners, degreasing agents etc. in car mechanics and related jobs, it seems plausible that in this branch, OD is more frequently chronic irritant dermatitis than allergic contact dermatitis [Claßen et al. 2014].

### **3.3.3. Hairdressers, barbers, beauticians, wigmakers with OD**

It is remarkable that, according to our data, hairdressers should have by far the highest incidence rate of OD among all occupations analysed in this Section (3.3), with almost 700 cases of OD per 100,000 worker years (Tab. 3.3.3.1). In addition, CS incidence rates of contact sensitisation to several (occupational) allergens are extremely high, compared to other occupational groups. This special constellation prompts us to comment on this data more in detail.

Starting in the 1990s, occupational skin diseases in hairdressers were studied in depth and prevention programs were developed [Schwanitz et al. 1996]. Since then it is known that more than half of the hairdressers' apprentices do have hand dermatitis (mostly mild dermatitis) at least once during their apprenticeship [Uter 1999]. Prevention of occupational skin diseases in hairdressers supplied the blueprint for similar programs in other occupational groups. The responsible statutory accident insurance is known to promote secondary prevention in hairdressers with OD, and it is also known that these programs are very successful [Wulfhorst et al. 2010]. Therefore, it is very likely that dermatologists in Germany are more prone to report cases of OD among hairdressers to the responsible statutory accident insurance than they do with patients from other occupations. This may explain the comparably high incidence rate of OD among hairdressers. Secondly, one can assume that among these cases (i.e., hairdressers with confirmed OD) noted at the DGUV, there are more mild early cases of OD than among other occupations.

On the other hand, a closer look at the hairdressers with OD registered at the IVDK shows that 26% of them come from centres specialised in the treatment of severe cases of OD, with correspondingly high frequencies of contact sensitisations. In our calculation model, which is described in detail in Section 2.4, we apply the percentages of sensitised patients in the IVDK data to the number of confirmed cases of OD from

the DGUV data in order to calculate the number of sensitised individuals among the OD patients registered at the DGUV. (We argued that IVDK OD patients can be seen as a sample of DGUV OD patients.) Due to the special constellation in hairdressers that we have explained in this paragraph, this approach leads to an over-estimation of the number of sensitised individuals, because the high percentage of sensitisations in severe OD cases was applied to the high total number of predominantly mild OD cases. This over-estimation consequently leads to an over-estimation of the incidence rate of contact sensitisations. (In other words: in the case of hairdressers, IVDK OD patients cannot simply be interpreted as a sample of DGUV OD patients.) Hence, the overall situation concerning occupational sensitisation among hairdressers with OD is very probably by far not as bad as it seems from Tab. 3.3.3.1.

The most prominent allergens in hairdressers are ingredients of hair dyes such as p-phenylenediamine (PPD) and toluene-2,5-diamine (p-toluylenediamine; PTD) with frequent cross-reactions between them (see Section 1.4.3.6). This is reflected in Tab. 3.3.3.1. The highest IDs of CS to typical occupational hairdressers' allergens were noted to PTD and to PPD, followed by the bleaching agent ammonium persulfate. Most hair dyes on the market contain PTD or PPD. For hair dyeing, PPD and PTD are essential, for the time being. The cosmetic industry is trying to develop less sensitizing alternatives, but this has not yet led to a breakthrough allowing omitting these most efficient colouring agents. Hence, for the time being, the focus must be on primary prevention in the barbershop. Hairdresser apprentices must learn how to use hair dyes without having any skin contact, which is definitely possible. A recently published analysis of factors associated with PPD sensitisation, based on IVDK data of the years 2008-2013, revealed that having the own hair dyed bears a higher risk of PPD sensitisation (OR = 6.0) than having a Henna tattoo (OR = 2.4) or being a hairdresser (OR = 2.1) [Schubert et al. 2018]. The high incidence rate of contact sensitisation to nickel in hairdressers with (163 cases per 100,000 worker years) is very probably not due to occupational nickel exposure. According to multifactorial data analyses, the hairdresser occupation is not a risk factor for nickel allergy [Uter et al. 2003a]. As Tab. 3.2.2.2 indicates, this occupational group is dominated by young women (93% females, 75% aged less than 40 years), and young women have the highest risk of nickel sensitisation due to wearing costume jewellery (see Sections 1.3 and 1.4.2.5).

#### **3.3.4. Geriatric nurses, social work associate professionals with OD**

Based on IVDK data, the spectrum of occupational CS in geriatric nurses has recently been described [Schubert et al. 2017]. As mentioned in Section 1.4.3.5, their occupational allergen exposure is mainly determined by body care products, topical therapeutics, disinfectants, and protective gloves. Tab. 3.3.4.1 illustrates a corresponding sensitisation spectrum with fragrances and preservatives being among the most frequent allergens. Wearing gloves when using the clients' body care products should be promoted in order to reduce the occupational skin contact with these allergens.

### **3.3.5. Building, vehicle, street cleaners with OD**

Occupational skin exposure in cleaners is characterized by wet work, and hence, chronic irritant contact dermatitis can be expected to be the most important OD. Accordingly, as can be seen from Tab. 3.3.5.1. Incidence rate of contact sensitisation is generally low in this occupational group. About 85% of the cleaners with OD registered in the IVDK, 2007-2016, are women (see Tab. 3.2.2.2), which explains the prominent position of nickel sensitisation in this occupational group.

### **3.3.6. Metal workers (cutting) with OD**

This occupational group is exposed to metalworking fluids. Water-based metalworking fluids are a source of contact to various allergens: resin acids like abietic acid (also present in colophony), monoethanolamine and other amines, formaldehyde and formaldehyde releasers, and isothiazolinones like MCI/MI, BIT or OIT (see Sections 1.4.2.7 and 1.4.3.8). Tab. 3.3.6.1 mirrors this exposure. Most frequently observed allergens are monoethanolamine and colophony (indicating sensitisation to resin acids), followed by formaldehyde releasers and isothiazolinones. However, the IDs of CS are not particularly increased when compared to other occupational groups.

### **3.3.7. Cooks, cannery workers, fruit, vegetable and related preservers with OD**

The IVDK population of this occupational group consists of men and women in about equal parts, and is relatively young (54% younger than 40 years) (see Tab. 3.2.2.2). This constellation may have an impact on the frequency of sensitisation to nickel, resulting in a slightly increased proportion of sensitised patients. According to an earlier IVDK data analysis, the risk of nickel allergy is only slightly increased by working in this occupational group [Uter et al. 2003a]. Compared to IVDK data from the 1990s [Bauer et al. 2002], the current frequency of sensitisation to thiurams has increased, while sensitisation to fragrances and compositae has decreased (Tab. 3.3.7.1). This may be due to a change in occupational skin protection habits. Wearing elastic protective gloves more frequently in food processing reduces the exposure to compositae ingredients, but bears the risk of exposure to thiurams. Fragrance exposure may be reduced because, for food processing, fragrance-free skin protection and skin care products are promoted. However, this assumed change in exposure cannot be supported or confirmed by reliable exposure data which are not at hand.

### **3.3.8. Engineers, technicians and scientists with OD**

Tab. 3.3.8.1 shows that OD in this occupational group is hardly ever caused by common allergens which are tested routinely.

### **3.3.9. Construction workers, manufacturers of building materials with OD**

As mentioned in Section 1.4.2.3 and 1.4.3.2, contact allergy to epoxy resin is currently the biggest problem in this branch. The incidence rate of contact sensitisation to epoxy resin was 14 per 100,000 worker years (Tab. 3.3.9.1). Several reactive diluents used in epoxy resin systems and epoxy resin hardeners are among the top 20 allergens. Measures to reduce contact allergy to epoxy resins in the building trade have been developed and implemented on several levels: workers' education (to improve working hygiene), improved labelling and packaging of epoxy resin systems, and identifying epoxy resin components with high sensitizing potency in order to replace them with less sensitizing compounds, if technically possible. However, all these efforts have to be continued and intensified. In contrast, data on dichromate in Tab. 3.3.9.1 have to be interpreted with care. Keeping in mind that IVDK OD patients from this occupational group are comparably old (63% at the age of 40 years or more), and that chromate exposure from cement is almost zero since 2005 (see Sections 1.4.2.5 and 1.4.3.2), the vast majority of chromate sensitisations have been acquired years ago (historical sensitisation). Hence, in this exceptional case, our approach leads to an over-estimation of the current incidence rate of contact sensitisation.

### **3.3.10. Office clerks with OD**

Like with engineers, technicians and scientists (see Section 3.3.8), Tab. 3.3.10.1 shows that OD in office clerks is hardly ever caused by common allergens which are tested routinely.

### **3.3.11. Machinery mechanics and fitters with OD**

Similar to the occupational group "mechanics, metal, machinery and related trades workers with OD" (Section 3.3.3), mapping IVDK codes for occupations from the group "machinery mechanics and fitters" to codes from the DGUV and the BA Arbeit probably causes a larger degree of inaccuracy. Besides the different focusses of the coding systems used in these three institutions, the broad variability of possible individual occupational exposures complicates interpretation of the data on incidence rate of contact sensitisation in this group. In comparison to other occupational groups, IDs of CS is not particularly increased (Tab. 3.3.11.1). Specific preventive measures cannot be deduced from this data.

### **3.3.12. Bakers, pastry-cooks and confectionery makers with OD**

The IVDK population of this occupational group consists of 42% men and 58% women, and is very young (66.7% younger than 40 years) (see Tab. 3.2.2.2). This constellation may explain the relatively high frequency of sensitisation to nickel (Tab. 3.3.12.1). According to an earlier IVDK data analysis, there is no increased risk of nickel allergy in this occupational group [Uter et al. 2003a]. The allergen spectrum is similar to that of cooks and related occupations (see Section 3.3.7) with only non-significant differences in sensitisation frequencies. Bakers and confectionery makers are exposed to proteins in natural materials such as flour, fruit, or enzymes, and are thus at increased risk of acquiring protein contact dermatitis. This form of allergic dermatitis is caused by immunoglobulin E-mediated allergy and is not diagnosed by patch testing [Mahler et al.

2013]. Hence, this important cause of occupational contact dermatitis in bakers is not reflected in our data.

### **3.3.13. Painters, varnishers and related workers with OD**

Two allergens dominate the spectrum of occupational sensitisation in painters and varnishers: MI and epoxy resin. As mentioned in Section 1.4.3.9, MCI/MI as well as MI are being used for preservation of water-based wall paints and tend to evaporate from the paints. Thus, they are able to elicit airborne allergic contact dermatitis in sensitised individuals. This may be the explanation for the high percentage (13%) of face dermatitis among painters etc. with OD in the IVDK data (see Tab. 3.2.2.2). However, one has to consider that the epidemic of sensitisation to MI in recent years was probably primarily caused by preservation of cosmetics with MI (see Section 1.4.2.6). Painters and varnishers applying floor or wall coatings or doing stone or concrete conservation works may be exposed to epoxy resin systems. The incidence rate of contact sensitisation to epoxy resin in this group is similar to that of construction workers, namely 15 per 100,000 worker years (Tab. 3.3.13.1). For further information concerning preventive measures, see Section 3.3.9.

## 4. Summary and conclusions

The primary intention of this data analysis is to give an overview of frequencies of contact sensitisation to specific substances in specific occupations. Based on IVDK data, corresponding results are presented, together with important notes concerning adequate data interpretation and limitations of its significance, be it due to patch testing or due to data analysis methods.

In a first step, occupationally relevant contact allergens and allergen spectra of occupations frequently affected by occupational dermatitis (OD) are introduced based on published knowledge.

Then, based on data of all patients tested in the IVDK in 2007 to 2016 (n=120,977), we give an overview of all 420 patch tested allergens which elicited positive reactions, with number of patients tested, count and percentage of patients with positive reactions, and comments on occurrence of the allergen or other special remarks.

As the focus of this data analysis is on the occurrence of contact sensitisation to specific substances in specific occupations, observed frequencies of sensitisation to specific allergens are analysed separately for patients with OD and patients without OD. Therefore, a comparison of sensitisation frequencies observed in OD patients (n=18,877) and non-OD patients (n=87,966) in the IVDK is given. Additionally, distribution of occupational groups of OD patients is analysed and listed.

According to the overarching goal of this study, the 30 most frequent contact allergens among OD patients were selected. For each of these allergens, a comparative analysis of the proportions of occupational groups among those sensitised to the respective allergen (i.e. those with a positive patch test reaction) and those who are not sensitised (i.e. those with a negative patch test reaction) was performed.

In the last section, the annual incidence of occupational contact sensitisation to specific allergens in selected occupational groups was estimated. For this purpose, IVDK data on sensitisation frequencies to specific allergens in OD patients from a specific occupational group were used together with DGUV data on the frequency of confirmed cases of OD in this occupational group and employment data of the BA Arbeit. This way, an OD incidence rate (number of OD cases per 100,000 workers per year) could be calculated for 30 occupational groups. In addition, for each of these groups, contact sensitisation incidence rates to specific allergens were calculated (number of individuals sensitised to the allergen concerned per 100,000 workers per year).

Data presented in this study provide a sound information basis for regulatory questions concerning contact sensitisation.

In order to monitor contact allergy in the future, it is necessary to keep the selection of patch test allergen preparations up to date. This includes the development of new patch test substances, because new substances and compounds are continuously introduced to the market and may pose a potential allergy risk for consumers and workers. Unfortunately, the development of new patch test substances has come to a standstill since 2005 in Germany, when German legislation adopted European law. Since the 14<sup>th</sup> amendment of the German Pharmaceutical Act in 2005, studies with new patch test allergens have to fulfil the same requirements as any other drug study. This means high organisational effort, high documentation effort, expensive monitoring, and unaffordable patient insurance, which is not justified considering the extremely low risk of any harm by patch testing. As the profit margin of patch test preparations is very low, pharmaceutical companies shy away from such investments. Hence, if the law is not changed in order to facilitate patch test studies, the diagnostic gap, that we already face today, will grow.

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## 6. List of abbreviations

1,3-DPG	1,3-Diphenylguanidine
1,4-BDDGE	1,4-Butanediol diglycidylether
1,6-HDDGE	1,6-Hexanediol diglycidylether
95%-CI	95% Confidence interval
ACD	Allergic contact dermatitis
BA Arbeit	German Federal Employment Agency (Bundesagentur für Arbeit)
BIS-GMA	Bisphenol A diglycidyl methacrylate
BIT	Benzisothiazolinone
BPO	Benzoyl peroxide
CBS	N-Cyclohexyl-2-benzothiazylsulfenamide
CE-DUR	Clinical Epidemiology and Drug-Utilization Research
CPPD	N-Cyclohexyl-N'-phenyl-p-phenylenediamine
CS	Contact sensitisation
DGEBA	Diglycidylether of bisphenol A
DGUV	German Statutory Accident Insurance (Deutsche Gesetzliche Unfallversicherung)
DKG	German Dermatitis Research Group (Deutsche Kontaktallergie-Gruppe)
DPPD	N,N'-Diphenyl-p-phenylenediamine
ESSCA	European Surveillance System on Contact Allergy
FIOH	Finnish Institute of Occupational Health
HEMA	2-Hydroxyethyl methacrylate
HICC	Hydroxyisohexyl 3-cyclohexene carboxaldehyde
IPBC	Iodopropynylbutyl carbamate
IPDA	Isophorone diamine
IPPD	N-Isopropyl-N'-phenyl-p-phenylenediamine
IR	Incidence rate
ISCO-88	International Standard Classification of Occupations 1988
IVDK	Information Network of Departments of Dermatology (Informationsverbund Dermatologischer Kliniken)
KIdB 1988	German Classification of Occupations 1988 (Klassifikation der Berufe 1988)
KIdB 2010	German Classification of Occupations 2010 (Klassifikation der Berufe 2010)
MBT	Mercaptobenzothiazole
MBTS	Dibenzothiazyl disulfide (2-mercaptobenzothiazole disulphide)
MCI	Methylchloroisothiazolinone
MDA	4,4'-Diaminodiphenylmethane (4,4'-methylenedianiline)
MDBGN	Methyldibromo glutaronitrile (Dibromodicyanobutane)
MDI	Diphenylmethane-4,4'-diisocyanate
MEA	Monoethanolamine
MI	Methylisothiazolinone
MOR	Morpholinylmercaptobenzothiazole
MXDA	m-Xylylenediamine (m-Xylenediamine, m-Xylidenediamine)
NACDG	North American Contact Dermatitis Group
OD	Occupational dermatitis
OIT	Octylisothiazolinone
PEI	Paul-Ehrlich-Institute

PPD	p-Phenylenediamine
PTBPFR	p-tert-Butylphenol formaldehyde resin
PTBPGE	p-tert-Butylphenyl glycidylether
PTD	p-Toluylenediamine (Toluene-2,5-diamine)
TETD	Tetraethylthiuram disulfide
TMTD	Tetramethylthiuram disulfide
TMTM	Tetramethylthiuram monosulfide
Tris-DMP	2,4,6-Tris(dimethylaminomethyl)phenol
ZDEC	Zinc diethyldithiocarbamate

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## Appendix

Linking of occupational group categories IVDK – DGUV

**Tab. 2.3.1** Linking of occupational group categories IVDK – DGUV

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
1007	Housewife/-man, domestic helper	51219	Sonstige Hauswirtschaftliche und verwandte Berufe
		91329	Hilfskräfte und Reinigungspersonal in Büros, Hotels und sonstigen Einrichtungen
		91399	Sonstige Haushaltshilfen und verwandte Hilfskräfte, Reinigungspersonal und Wäscher, o.n.A. oder a.n.g.
1010	Wine grower, vine refiner, vintage helper	22139	Agrar- und verwandte Wissenschaftler
		92119	Landwirtschaftliche Hilfsarbeiter
		92199	Sonstige Landwirtschaftliche, Fischerei- und verwandte Hilfsarbeiter, o.n.A. oder a.n.g.
1020	Mixed-animal producers (dairy, poultry etc), fishery labourers	61299	Sonstige Tierwirtschaftliche und verwandte Berufe, o.n.A. oder a.n.g., Tierpfleger
1050	Gardeners, salespersons (fruit, flowers, vegetables)	61129	Gärtner, Saat- und Pflanzenzüchter, Landschaftsgärtner, Friedhofsgärtner, Blumenbinderhelfer, Floristen, Kranzbind
		61199	Sonstige Gärtner und Ackerbauern, o.n.A. oder a.n.g.
1070	Mining- and mineral-processing plant operators	71119	Sonstige Bergleute und Steinbrecher
		71139	Steinspalter, -bearbeiter und Steinbildhauer
		71199	Sonstige Bergleute, Sprengmeister, Steinbearbeiter und Steinbildhauer, o.n.A. oder a.n.g.
		71222	Bausteinmetze, Kunststeinschleifer, Steinbearbeiterhelfer, Steinmetze
		73139	Schmuckwarenhersteller und Edelmetallbearbeiter, Edelmetallschmiede, Edelsteinschleifer, Goldsc

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
1070	Mining- and mineral-processing plant operators (continued)	81119	Sonstige Bediener von bergbaulichen Maschinen und Anlagen
		81139	Tiefbohrer und verwandte Berufe, Steinbruchbohrer, Tiefbohrfacharbeiter
		81193	Erdöl-, Erdgasförderer
		81199	Sonstige Bediener von bergbaulichen und Mineralaufbereitungsanlagen, o.n.A. oder a.n.g.
		81519	Bediener von Brechmaschinen, Mahlwerken und Mischanlagen
		82199	Sonstige Maschinenbediener für Metall- und Mineralerzeugnisse, o.n.A. oder a.n.g.
		93119	Hilfsarbeiter im Bergbau und Steinbruch
1130	Potters, glass-makers and related trades workers	73229	Glasmacher, -schneider, -schleifer und -polierer, Glasbläser (vor der Lampe), Glasmassehersteller
		73249	Glas-, Keram- und verwandte Dekormaler, Porzellanmaler
		73299	Sonstige Töpfer, Glasmacher und verwandte Berufe, o.n.A. oder a.n.g.
		81311	Glaserhersteller
		81312	Keramiker, so weit nicht 81396-81398
		81391	Glaserhersteller, so weit nicht 81392-81395
		81393	Flachglaserhersteller, Glaskühlofensteuerer (Flachglas), Glasziehmaschinensteuerer
		81396	Keramiker, so weit nicht 81397-81398
		81397	Porzellanhersteller
		81399	Sonstige Bediener von Anlagen zur Glas- und Keramikherstellung sowie verwandte Anlagenbediener, o.n.A. oder a.n.g.
1140	Chemist, Lab assistant, Chemical-products machine operators	21139	Chemiker
		21469	Chemieingenieure
		31119	Chemo- und Physikotechniker

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
1140	Chemist, Lab assistant, Chemical-products machine operators (continued)	31169	Chemiebetriebs- und Verfahrenstechniker
		81529	Bediener von Warmbehandlungsanlagen
		81539	Bediener von Filtrier- und Trennvorrichtungen
		81599	Chemiearbeiter, -werker, Chemiekanten, Bediener chemischer Verfahrensanlagen, o.n.A. oder a.n.g.
		82229	Bediener von Maschinen zur Herstellung von Munition und explosiven Stoffen
		82299	Chemielaboranten, Chemielaborwerker, sonstige Maschinenbediener für chemische Erzeugnisse, o.n.A. oder a.n.g.
1160	papermaking-plant operators, bookbinders	73459	Buchbinder und verwandte Berufe
		81429	Sonstige Bediener von Anlagen zur Papierbreiherstellung
		81439	Sonstige Bediener von Papierherstellungsanlagen
		81499	Sonstige Bediener von Anlagen zur Holzaufbereitung und Papierherstellung, o.n.A. oder a.n.g.
		82529	Buchbindemaschinenbediener
		82531	Papierverarbeiter, o.n.A.
		82532	Verpackungsmittelmechaniker
		82539	Sonstige Bediener von Maschinen zur Herstellung von Papiererzeugnissen
		82599	Sonstige Maschinenbediener für Druck-, Buchbinde- und Papiererzeugnisse, o.n.A. oder a.n.g.
		82901	Verpackungsanlagenbediener
1170	Printing-machine operators	73429	Stereotypeure und Galvanoplastiker
		73461	Drucker, so weit nicht 73462-73466
		73462	Offsetdrucker
		73463	Tiefdrucker
		73465	Siebdrucker

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
1170	Printing-machine operators (continued)	73469	Sonstige Sieb-, Druckstock- und Textildrucker
		73499	Sonstige Druckhandwerker und verwandte Berufe, o.n.A. oder a.n.g.
		82519	Druckmaschinenbediener
1190	Metal processing plant operators, rolling mill operators	72111	Halbzeugputzer
		72119	Sonstige Former und Kernmacher (für Metallguss)
		81219	Ofenbediener (Erzschmelzen, Metallumformung und -veredlung)
		81229	Metallschmelzer, Metallgießer und Walzwerker, Formgießer, Hochofenleute, Kokkengießer, Kupolofenschmelzer
1220	Metal worker (cutting)	72141	Metallverarbeiter
		72231	Dreher
		72232	Fräser
		72233	Bohrer
		72239	Sonstige Werkzeugmaschinen-einrichter, -einsteller, -bediener, Zerspanungsmechaniker, Maschineneinrichter
		72249	Metallschleifer, Metallpolierer und Werkzeugschärfer
1230	Metal finishing-, plating- and coating-machine operators	72199	Sonstige Former (für Metallguss), Schweißer, Blechkaltverformer, Baume-tallverformer und verwandte Berufe, o.n.A. o
		72229	Werkzeugmacher und verwandte Berufe, Graveure, Ziseleure
		81239	Metallhärter, Metallvergüter
		82231	Pulverbeschichter
		82239	Sonstige Bediener von Metalloberflä-chenbearbeitungs- und -beschichtungs-maschinen, Emaillierer, Galvaniseure, Metal
1240	Welders and flamecutters	72129	Schweißer und Brennschneider, Lötler
		72143	Metallkleber
		72146	Schiffsbauer, Werftarbeiter

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
1260	Machinery mechanics and fitters	71361	Klempner, Bauflaschner, Bauspengler
		71362	Rohrinstallateure, Heizungsbauer
		71363	Rohrschlosser, Rohrleitungsbauer
		71364	Gas-, Wasserinstallateure
		71365	Klima-, Lüftungs-, Kältebauer
		71366	Blitzschutzbauer, -monteure
		71369	Sonstige Klempner, Installateure, Feinblechner
		72144	Bauschlosser
		72145	Stahlbauschlosser
		72148	Aufzugsmonteure
		72301	Schlosser, o.n.A. (weitere spezielle Schlosser in den Gruppen 71363, 72144, 72145, 72312, 72314, 72319, 72329, 723
		72312	Kfz-Schlosser, Autoschlosser, Karosseriebauer, Karosserieschlosser
		72333	Maschinenschlosser
		72334	Blechschlosser
72335	Betriebsschlosser		
1280	Mechanics, Metal, machinery and related trades workers	31419	Schiffsmaschinisten
		71211	Gerüstbauer
		72147	Monteure (Baustelle)
		72149	Sonstige Baumetallverformer und Metallbaumonteure
		72159	Verspannungsmonteure und Seilspleißer
		72311	Kfz-Mechaniker (Auto)
		72313	Zweiradmechaniker
		72315	Nutzfahrzeugmechaniker
		72316	Kfz-Mechatroniker
		72319	Sonstige Kraftfahrzeugmechaniker und -schlosser
1280	Mechanics, Metal, machinery and related trades workers (continued)	72329	Flugmotorenmechaniker und -schlosser
		72331	Landmaschinenmechaniker, -schlosser
		72332	Industriemaschinenmechaniker, -schlosser

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		72339	Sonstige Landmaschinen- oder Industriemaschinenmechaniker und -schlosser
		72399	Sonstige Maschinenmechaniker und -schlosser, o.n.A. oder a.n.g.
		74371	Sattler (Fahrzeug-, Bootssattler)
		81619	Bediener von Energieerzeugungsanlagen, Elektromaschinisten
		81629	Bediener von Dampfmaschinen und -kesseln
		81639	Bediener von Verbrennungs-, Wasserbehandlungsanlagen, Heizer, Kraftwerker, Maschinenwärter u.Ä.
		81699	Sonstige Bediener von Energieerzeugungs- und verwandten Anlagen, o.n.A. oder a.n.g.
		81709	Bediener von Industrierobotern
		82119	Sonstige Werkzeugmaschinenbediener, Bediener von Naturbearbeitungsmaschinen, Blechpresser, Blechstanzer, Steinsäge
		82762	Anlagenfahrer
		82819	Montierer (von mechanischen Bauteilen)
		82849	Montierer von Metall-, Gummi- und Kunststoffserzeugnissen
		82879	Montierer von Erzeugnissen aus unterschiedlichen Materialien
		82899	Sonstige Montierer, o.n.A. oder a.n.g.
		82902	Maschineneinrichter (außer 72239)
		82909	Maschineneinrichter (außer 72239), Maschinisten, sonstige Maschinenbediener, o.n.A. oder a.n.g.
		83329	Führer von Erdbewegungs- und verwandten Maschinen, Baggerführer, Baumaschinenführer
		83331	Fahrmischerfahrer
		83332	Betonpumpenfahrer
1280	Mechanics, Metal, machinery and related trades workers (continued)	83333	Kranführer

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		83339	Sonstige Kranführer, Aufzugsmaschinisten und Bediener verwandter Hebeeinrichtungen, Fördermaschinisten, Wasserbau
1284	Precision workers in metal and related materials	73119	Präzisionsinstrumentenmacher und -instandsetzer, Uhrmacher
		73199	Sonstige Präzisionsarbeiter für Metall und verwandte Werkstoffe, o.n.A. oder a.n.g., Feinmechaniker
1303	Dental technicians	73191	Zahntechniker
1304	Optometrists and opticians	32249	Augenoptiker
1310	Electrical and electronic equipment mechanics and fitters	31149	Elektronik- und Fernmeldetechniker
		71379	Bau- und verwandte Elektriker, Betriebselektriker, Elektroinstallateure, Energieanlagenelektroniker
		72317	Kfz-Elektriker
		72411	Elektromotorenbauer, Transformatorenbauer
		72419	Elektromechaniker, -monteure und Servicetechniker, Kundendiensttechniker, Kundendienstmonteure
		72429	Elektroniker und Service-, Kundendienstelektroniker, Funkgerätemechaniker, Tongerätemechaniker
		72442	(IT)-Systemelektroniker, EDV-Elektroniker
		72449	Telefon- und Telegrafeneinstallateure und -wartungspersonal, Fernmeldemonteure
		72459	Elektrokabel-, Elektroleitungsmonteure und -wartungspersonal
		72491	Mechatroniker
1310	Electrical and electronic equipment mechanics and fitters (continued)	72499	Sonstige Elektro- und Elektronikmechaniker und -monteure, o.n.A. oder a.n.g.
		82829	Montierer (von elektrischen Einrichtungen), Elektrogerätemontierer

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		82839	Montierer (von elektronischen Einrichtungen)
1330	Textile, garment and related trades workers	74321	Weber
		74332	Putzmacher
		74339	Sonstige Herren-, Damenschneider und Hutmacher, Änderungsschneider
		74359	Schnittmustermacher und Zuschneider (Textilien, Leder u. Ä.)
		74369	Näher, Sticker und verwandte Berufe, Oberbekleidungsnäher, Puppenmacher, Wäscheschneider
		74372	Feintäschner
		74399	Sonstige Textil-, Bekleidungs- und verwandte Berufe, o.n.A. oder a.n.g.
		82619	Sonstige Bediener von Spinnvorbereitungs-, Spinn- und Spulmaschinen, so weit nicht 82611-82615
		82629	Sonstige Bediener von Web-, Strick- und Wirkmaschinen
		82639	Nähmaschinenbediener
		82641	Bediener von Textilveredelungsmaschinen, so weit nicht 82642 82642
		82869	Montierer von Pappe-, Textil- und verwandten Erzeugnissen
1370	Manufacturers or processors of fur and leather	74419	Rauchwarenzurichter, Gerber und Fellzurichter
		74421	Schuhmacher, Schuhreparateure
		74422	Orthopädie-Schuhtechniker
		74423	Schuhfertiger
		74499	Sonstige Fell-, Lederwerker und Schuhmacher, o.n.A. oder a.n.g.
82669	Maschinenbediener für die Herstellung von Schuhen und anderen Lederwaren		
1370	Manufacturers or processors of fur and leather (continued)	82699	Sonstige Maschinenbediener für Textil-, Pelz- und Ledererzeugnisse, o.n.A. oder a.n.g.
1390	Bakers, pastry-cooks and confectionery makers	74129	Bäcker, Konditoren und Süßwarenhersteller

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
1400	Butchers, fishmongers and related food preparers	74111	Fleischer, Metzger
		74112	Wurstwarenhersteller
		74113	Ausbeiner, Zerleger
		74119	Sonstige Fleischer, Fischhändler und verwandte Berufe
		82719	Bediener von Fleisch- und Fischverarbeitungs- maschinen
1410	Cooks, Cannery workers, Fruit, vegetable and related preserv	51211	Küchenhilfe
		51212	Kantinenhilfe
		51229	Köche
		74149	Obst-, Gemüse- und verwandte Konser- vierer
		74159	Nahrungsmittel- und Getränkemischer und -klassierer
1420	Beverage industry labourers	82789	Brauer, Bediener von Wein- und sonsti- gen Getränkeherstellungsmaschinen, Küfer
1424	Tobacco produc- tion machine op- erators, salesper- son	74169	Tabakaufbereiter und Tabakwarenher- steller
		82799	Bediener von Tabakaufbereitungs- und Tabakwarenherstellungsmaschinen, sonstige Maschinenbediener Nahrungs- und Gen
1430	Food and related products ma- chine operators	74139	Molkereiwarenhersteller
		74199	Sonstige Berufe in der Nahrungsmittel- verarbeitung und verwandte Berufe, o.n.A. oder a.n.g.
		82729	Bediener von Milchverarbeitungsma- schinen
1430	Food and related products ma- chine operators (continued)	82739	Müller, Mehlhersteller, Bediener von Ge- treide- und Gewürzmühlen

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		82749	Bediener von Maschinen zur Herstellung von Backwaren, Getreide- und Schokoladerzeugnissen, Backwarenhersteller, N
		82759	Bediener von Obst-, Gemüse- und Nussverarbeitungsmaschinen
		82769	Sonstige Bediener von Zuckerherstellungsmaschinen
		82779	Bediener von Tee-, Kaffee- und Kakaoverarbeitungsmaschinen
1440	Construction workers, Manufacturers of building materials	71212	Eisenbieger, -flechter
		71214	Betonbohrer, Betonsäger
		71219	Sonstige Bauarbeiter, Bauhandwerker
		71221	Maurer
		71224	Fuger, Verfuger
		71229	Sonstige Maurer, Bausteinmetze
		71231	Estrich- und Terrazzoleger
		71232	Betonbauer
		71233	Einschaler
		71234	Bautenschützer, Betonsanierer
		71239	Sonstige Betonierer, Betonoberflächenfertigtmacher und verwandte Berufe
		71329	Fußboden- und Fliesenleger, auch Versiegler
		71339	Sonstige Verputzer, Gipser, Stuckateure
		71341	Fassadenmonteure, Fassadenbauer
		73212	Ziegler
		82126	Bediener einer Gipsherstellungsanlage
		82129	Sonstige Bediener von Maschinen zur Herstellung und Verarbeitung von Zement und verwandten Mineralien
1440	Construction workers, Manufacturers of building materials (continued)	82232	Sandstrahler, Strahler
		93139	Bauhilfsarbeiter (Gebäude), Bauhelfer
		93199	Sonstige Hilfsarbeiter im Bergbau und Baugewerbe, o.n.A. oder a.n.g.

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
1460	Construction & maintenance labourers: roads, dams & similar	71291	Straßenbauer
		71292	Kanalbauer
		71295	Pflasterer, Steinsetzer
		71299	Berufe des Tiefbaus, sonstige Baukonstruktions- und verwandte Berufe, o.n.A. oder a.n.g.
		93129	Bau- und Instandhaltungshilfsarbeiter (Straßen, Dämme u. Ä. Bauwerke), Gemeindearbeiter (soweit nicht genauer beze
1480	Building finishers and related trades workers	71223	Ofenbauer, Kachelofenbauer, Kaminbauer, Ofensetzer
		71319	Dachdecker, Dachspengler
		71349	Sonstige Isolierer, Abdichter, Säurebauarbeiter
		71351	Fensterbauer
		71359	Sonstige Glaser, Autoglaser
		71399	Sonstige Ausbau- und verwandte Berufe, o.n.A. oder a.n.g.
		81394	Glasfaser-, Dämmstoffhersteller
1500	Carpenter, cabinet maker, model maker	71241	Zimmerer, Schreiner
		71242	Bautischler
		71249	Sonstige Zimmerer, Bautischler, Stellmacher
		73319	Sonstige Kunsthandwerker für Holz und verwandte Materialien, Möbelrestauratoren, Vergolder
		74221	Modelltischler
1500	Carpenter, cabinet maker, model maker (continued)	74229	Sonstige Möbeltischler und verwandte Berufe
		74239	Holzbearbeitungsmaschineneinrichter und Einrichter/Bediener
		74249	Korbflechter, Bürstenmacher und verwandte Berufe
		74299	Sonstige Holzbearbeiter, Möbeltischler und verwandte Berufe, o.n.A. oder a.n.g.

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		81411	Bediener von Sägemaschinen
		81412	Bediener von Schleifmaschinen
		81419	Sonstige Bediener von Holzaufbereitungsanlagen
		82409	Bediener von Holzbearbeitungsmaschinen, Furnierhersteller, Sägewerker
		82859	Montierer von Holzwaren und verwandten Erzeugnissen
1510	Painters, Varnishers and related workers	71411	Industrie-, Eisenanstreicher, Korrosionsschützer
		71419	Sonstige Maler, Tapezierer und verwandte Berufe, Beizer, Farbspritzer, Lackierer, Tüncher
		71499	Sonstige Maler, Gebäudereiniger und verwandte Berufe, o.n.A. oder a.n.g.
1600	Engineers, technicians and scientists	21119	Physiker und Astronomen
		21419	Architekten, Raum- und Verkehrsplaner
		21429	Bauingenieure
		21439	Elektroingenieure
		21459	Maschinenbauingenieure, Konstrukteure (Maschinenbau)
		21479	Bergbauingenieure, Metallurgen und verwandte Wissenschaftler, Hütteningenieure
		21499	Sonstige Architekten, Ingenieure und verwandte Wissenschaftler, o.n.A. oder a.n.g.
		31129	Bautechniker, Baustoffprüfer, Vermessungstechniker
1600	Engineers, technicians and scientists (continued)	31139	Elektrotechniker
		31159	Maschinenbautechniker
		31179	Bergbau-, Hüttenentechniker
		31189	Technische Zeichner, Bauzeichner
		31199	Sonstige Technische Angestellte, Material- und ingenieurtechnische Fachkräfte, o.n.A. oder a.n.g.
		31399	Sonstige Bediener optischer und elektronischer Anlagen, o.n.A. oder a.n.g.

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		31519	Bau-, Brandschutz-, Brandinspektoren
		41329	Material-, Fertigungsplaner
1634	Photographic-products machine operators	31311	Fotografen
		73449	Fotolaboranten
1680	Salespersons and demonstrators	34159	Technische und kaufmännische Handelsvertreter
		34194	Autoverkäufer
		52299	Sonstige Verkäufer, Marktstandverkäufer und Vorführer, o.n.A. oder a.n.g.
		91119	Straßenhändler, Ambulante Händler
		91199	Sonstige Straßenhändler und verwandte Berufe, o.n.A. oder a.n.g.
1710	Drivers and mobile plant operators	31429	Schiffsführer und Lotsen, Binnenschiffer
		31459	Flugsicherungstechniker
		83123	Rangierer
		83221	Personenkraftwagenfahrer
		83223	Fahrer von Kleinlastkraftwagen (Kastenwagen) bis 3,5 t
		83229	Sonstige Personenkraftwagen- und Kleinlastkraftwagenfahrer
		83231	Busfahrer
1710	Drivers and mobile plant operators (continued)	83232	Straßenbahnführer
		83249	Fahrer schwerer Lastkraftwagen über 3,5 t, Lastkraftwagenfahrer (bis 3,5 t in 83223)
		83299	Sonstige Kraftfahrzeugführer, o.n.A. oder a.n.g.
		83319	Sonstige Führer von motorisierten land- und forstwirtschaftlichen Maschinen
		83409	Sonstiges Deckspersonal auf Schiffen und verwandte Berufe, Matrosen
1740	Storekeeper, transport labourers and freight handlers	41311	Versandfertigmacher
		41312	Lagerarbeiter

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		41319	Sonstige Lagerverwalter, Lageristen, Kommissionierer
		41399	Sonstige Materialverwaltungs- und Transportangestellte, o.n.A. oder a.n.g.
		83311	Transportgeräteführer, Staplerfahrer
		93309	Transport- und Frachtarbeiter, Verladearbeiter, Warenauszeichner, Warensortierer
1750	Office clerks	12109	Direktoren und Hauptgeschäftsführer
		12229	Manager, Produktionsleiter im Verarbeitenden Gewerbe, Betriebsleiter
		12239	Bauleiter, Manager, Produktionsleiter im Baugewerbe
		12249	Manager, Produktionsleiter im Groß- und Einzelhandel
		12259	Manager, Produktionsleiter in Restaurants und Hotels
		12279	Manager, Produktionsleiter in gewerblichen Dienstleistungsunternehmen
		12299	Sonstige Manager, Produktionsleiter, o.n.A. oder a.n.g.
		12339	Verkaufs- und Absatzleiter
		12379	Forschungs- und Entwicklungsleiter, auch Laborleiter
1750	Office clerks (continued)	12399	Sonstige Fachbereichsleiter, o.n.A. oder a.n.g.
		21319	Systemplaner, Systemanalytiker und Systemprogrammierer
		21399	Sonstige Informatiker, o.n.A. oder a.n.g.
		24523	Designer (künstlerisch tätig)
		24709	Wissenschaftliche Verwaltungsfachkräfte des Öffentlichen Dienstes
		31219	Datenverarbeitungsassistenten, EDV-Entwickler, Web-Designer
		31229	EDV-Operateure, Netzwerkadministratoren
		31299	Sonstige Datenverarbeitungsfachkräfte, o.n.A. oder a.n.g.
		34119	Effektenhändler, -makler und Finanzmakler, Bankfachleute, Bausparkassenfachleute (so weit nicht 34129)
		34169	Einkäufer
		34191	Groß- und Einzelhandelskaufleute
		34192	Industriekaufleute

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
1750	Office clerks (continued)	34193	Kaufleute für Spedition und Logistikdienstleistungen
		34199	Sonstige Kaufmännische Angestellte, Finanz- und Verkaufsfachkräfte, o.n.A. oder a.n.g.
		34291	Verlagskaufleute, Buchhändler
		34319	Verwaltungssekretäre und verwandte Fachkräfte, Heimleiter
		34339	Buchhalter
		34399	Sonstige Verwaltungsfachkräfte, o.n.A. oder a.n.g., (auch Betriebsrat, Personalrat)
		34711	Werbefachleute
		34712	Mediengestalter
		34719	Sonstige Dekorateur und gewerbliche Designer
		41159	Sekretärinnen
		41199	Sonstige Sekretärinnen, Maschinenschreibkräfte und verwandte Berufe, o.n.A. oder a.n.g.
		41219	Rechnungswesen- und Buchhaltungsangestellte
		41229	Statistik- und Finanzangestellte, Controllingberufe, Kalkulatoren, Analysten
		41299	Sonstige Angestellte im Rechnungs-, Statistik- und Finanzwesen, o.n.A. oder a.n.g.
		41339	Speditionsangestellte
		41419	Bibliotheks-, Dokumentations- und Registraturangestellte
		41909	Bürokaufleute, Sonstige Büroangestellte
		42129	Bank-, Post- und andere Schalterbedienstete
		42229	Empfangs-, Rezeptions- und Auskunftspersonal
		42299	Sonstige Kundeninformationsangestellte, o.n.A. oder a.n.g., Kundenberater
1790	Protective services workers	1109	Soldaten, Wehrdienstleistende
		31599	Sonstige Sicherheits- und Qualitätskontrolleure, o.n.A. oder a.n.g.
		51619	Feuerwehrleute
		51691	Bademeister, Rettungsschwimmer u. Ä.

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		51699	Sonstige Sicherheitsbedienstete, o.n.A. oder a.n.g.
		52203	Freizeit-, Fitness-, Wellnesspersonal (Spielhalle, Spielothek, Sauna, Sonnenstudio, Solarium u. Ä.)
		91419	Hausmeister, Hauswarte, Haustechniker und verwandte Berufe
		91529	Pförtner, Wachpersonal, Werkschutz und verwandte Berufe
		91539	Automatenkassierer, Zählerableser und verwandte Berufe
1804	Chimney sweep	71432	Schornsteinfeger, Kaminkehrer
1805	Hygiene and health surveillance	31521	Schädlingsbekämpfer, Desinfektoren
		32119	Biotechniker, Biologielaboranten, Lebensmitteltechniker, -laboranten, Präparatoren
		32199	Sonstige Biotechniker und verwandte Berufe, o.n.A.
		32229	Hygiene-, Gesundheitsaufsichts- und Umweltschutzbeamte
		51439	Leichenbestatter und Einbalsamierer, Thantologen
1830	Artists, musicians, professional sportsmen	24532	Orchestermusiker, Solomusiker (nicht 34739)
		24559	Film-, Bühnen- und sonstige Schauspieler, Regisseure, Bühnenbildner, Kostümbildner, Maskenbildner
		31312	Bediener von Bild- und Tonaufzeichnungsanlagen
		34759	Berufssportler, Sportlehrer, Sporttrainer, Amateursportler, Übungsleiter und verwandte Fachkräfte
		34799	Sonstige Künstlerische, Unterhaltungs- und Sportberufe, o.n.A. oder a.n.g.
		73399	Sonstige Kunsthandwerker für Holz, Textilien, Leder und verwandte Materialien, o.n.A. oder a.n.g.
1841	Medical doctors	22219	Ärzte
		22299	Sonstige Mediziner (ohne Krankenpflege), o.n.A. oder a.n.g.
1842	Dentists	22229	Zahnärzte

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		32251	Zahnarthelferin (Arzthelferin in 32291)
		32259	Sonstige Zahnmedizinische Assistenten, Prophylaxehelfer (Zahnmedizin)
1843	Vetenarians	22239	Tierärzte
		32271	Tierarthelfer
1844	Pharmacists	22249	Apotheker
1850	Health care professionals	22309	Wissenschaftliche Krankenpflege- und Geburtshilfefachkräfte
		31529	Sonstige Gesundheits-, Umweltschutzinspektoren und Qualitätskontrolleure, Güteprüfer, Warenprüfer
		32261	Masseure
		32262	Krankengymnasten
		32263	Ergotherapeuten, Musiktherapeuten
		32269	Sonstige Physiotherapeuten und verwandte Berufe, Arbeitstherapeuten
1850	Health care professionals (continued)	32291	Arzthelferin (außer Zahnarthelferin in 32251), Sprechstundenhilfe
		32293	Medizinische Bademeister (nicht 51691)
		32294	Sanitäter, Rettungssanitäter, Rettungsassistenten
		32296	Logopäden
		32299	Sonstige Medizinische Fachberufe (ohne Krankenpflege), o.n.A. oder a.n.g.
		32319	Krankenschwestern/-pfleger, Krankenpflegehelfer
		32329	Hebammen/Geburtshelfer
		32399	Sonstige Krankenpflege- und Geburtshilfefachkräfte, o.n.A. oder a.n.g.
		51329	Sonstige Pflegekräfte
		51339	Haus- und Familienpfleger
		51399	Sonstige Pflege- und verwandte Berufe, o.n.A. oder a.n.g.
1855	Laboratory asistants (health associate professionals)	31339	Bediener medizinischer Geräte
		32219	Medizinische Assistenten, Medizintechnische Assistenten, MTA, Medizinlaboranten, Röntgenassistenten, Sterilis
		32239	Diätassistenten und Ernährungsberater

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		32289	Pharmazeutische Assistenten, Apothekenhelfer, Pharmazeutisch technische Assistenten, PTA
		82219	Bediener von Maschinen zur Herstellung von pharmazeutischen Produkten und Toilettenartikeln, Pharmakanten
1860	Social and health associate professionals, teachers	23109	Universitäts- und Hochschullehrer (Professoren, Dozenten, Assistenten)
		23211	Haupt-, Gesamt-, Real-, Gymnasialschullehrer
		23212	Berufsschullehrer
		23219	Sonstige Lehrer des Sekundarbereiches
		23319	Lehrer des Primarbereiches, Grundschullehrer
		23399	Sonstige Lehrer des Primar- und Vorschulbereiches, o.n.A. oder a.n.g.
1860	Social and health associate professionals, teachers (continued)	23409	Sonderschullehrer
		23519	Pädagogik-, Didaktiklehrer und -berater
		23599	Sonstige Lehrkräfte, o.n.A. oder a.n.g.
		24469	Sozialarbeiter (wissenschaftlich tätig)
		33402	Fahrlehrer, Ausbilder von Staplerfahrern, Kranführern, Baumaschinenführern u. Ä.
		33409	Sonstige Lehrkräfte, Ausbilder
		34601	Sozialarbeiter (nicht 24469), Sozialtherapeuten, Streetworker
		34602	Betreuer in Behindertenwerkstätten
		34603	Heimerzieher
		34609	Sonstige Sozialpflegerische Berufe, o.n.A. oder a.n.g.
		51319	Kindergärtnerin, Kinderbetreuer, Tagesmutter, Kindergartenhelfer, Kinderpfleger, Krippenerzieher, Heilerziehungspf
1861	Geriatric nurse, social work associates	32295	Altenpfleger
		51321	Altenpfleger, Altenpflegehelfer, Seniorenbetreuer

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
1880	Scientists	21199	Sonstige Physiker, Chemiker und verwandte Wissenschaftler, o.n.A. oder a.n.g.
		22119	Biologen, Botaniker, Zoologen und verwandte Wissenschaftler
		22129	Pharmakologen, Pathologen und verwandte Wissenschaftler (nicht Ärzte)
		22199	Sonstige Biowissenschaftler, o.n.A. oder a.n.g.
		24459	Psychologen, Psychotherapeuten
1901	Hairdressers, barbers, beauticians, wigmakers	51411	Friseure
1902	Personal care and related workers	51412	Kosmetiker
		51413	Fußpfleger
		51414	Nageldesigner, Tätowierer, Piercer
		51419	Sonstige Friseure, Kosmetiker und verwandte Berufe
		51499	Sonstige personenbezogene Dienstleistungsberufe, o.n.A. oder a.n.g.
1910	Waiters and bartenders, guest attendants	51239	Kellner, Barkeeper, Chef de Rang
		51299	Sonstige Dienstleistungsberufe im hauswirtschaftlichen Bereich und im Gaststättengewerbe, o.n.A. oder a.n.g.
1933	Building, vehicle, street cleaner	71431	Gebäudereiniger
		71439	Sonstige Gebäudereiniger und Schornsteinfeger
		91319	Haushaltshilfen und Reinigungspersonal in Privathaushalten
		91421	Fahrzeugreiniger, Autowäscher
		91422	Maschinenreiniger
		91423	Fensterputzer
		91429	Sonstiges Reinigungspersonal
		91499	Sonstige Hausmeister, Fensterputzer und verwandtes Reinigungspersonal, o.n.A. oder a.n.g.
91611	Wertstoffverwerter		

IVDK occupational group no.	IVDK occupational group	DGUV occupational group no.	DGUV occupational group
		91612	Müllsammler, Entsorger
		91619	Sonstige Wertstoffverwerter, Müllsammler
		91629	Straßenkehrer und verwandte Berufe
		91699	Sonstige Wertstoffverwerter, Müllsammler und verwandte Berufe, o.n.A. oder a.n.g.

**Tab. 2.3.2** Linking of occupational group categories IVDK - BA Arbeit

IVDK occupational group no.	IVDK occupational group	BA Arbeit occupational group no.	BA Arbeit occupational group
1007	Housewife/-man, domestic helper	832	Hauswirtschaft und Verbraucherberatung
1010	Wine grower, vine refiner, vintage helper	111	Landwirtschaft
		116	Weinbau
1020	Mixed-animal producers (dairy, poultry etc), fishery labourers	112	Tierwirtschaft
		113	Pferdewirtschaft
		114	Fischwirtschaft
		115	Tierpflege
1050	Gardeners, salespersons (fruit, flowers, vegetables)	121	Gartenbau
		122	Floristik
1070	Mining- and mineral-processing plant operators	211	Berg-, Tagebau und Sprengtechnik
		212	Naturstein-, Mineral-, Baustoffherstell.
1130	Potters, glass-makers and related trades workers	213	Industrielle Glasherstell.,-verarbeitung
		214	Industrielle Keramikherstell.,-verarbeitung
1140	Chemist, Lab assistant, Chemical-products machine operators	413	Chemie
1160	papermaking-plant operators, bookbinders	231	Papier- und Verpackungstechnik
1170	Printing-machine operators	234	Drucktechnik,-weiterverarb.,Buchbinderei

IVDK occupational group no.	IVDK occupational group	BA Arbeit occupational group no.	BA Arbeit occupational group
1190	Metal processing plant operators, rolling mill operators	241	Metallerzeugung
1220	Metal worker (cutting)	242	Metallbearbeitung
1230	Metal finishing-, plating- and coating-machine operators	243	Metalloberflächenbehandlung
1240	Welders and flamecutters	244	Metallbau und Schweißtechnik
1260	Machinery mechanics and fitters	342	Klempnerei, Sanitär, Heizung, Klimatechnik
		343	Ver- und Entsorgung
1280	Mechanics, Metal, machinery and related trades workers	251	Maschinenbau- und Betriebstechnik
		252	Fahrzeug-Luft-Raumfahrt-, Schiffbautechn.
		261	Mechatronik und Automatisierungstechnik
		341	Gebäudetechnik
		8251	Berufe in der Orthopädie-, Rehathechnik
8259	Aufsicht, Führung-Med-Orthopäd, Rehathechn.		
1284	Precision workers in metal and related materials	245	Feinwerk- und Werkzeugtechnik
1303	Dental technicians	8254	Berufe in der Zahntechnik
1304	Optometrists and opticians	8252	Berufe in der Augenoptik
1310	Electrical and electronic equipment mechanics and fitters	262	Energietechnik
		263	Elektrotechnik
1330	Textile, garment and related trades workers	281	Textiltechnik und -produktion

IVDK occupational group no.	IVDK occupational group	BA Arbeit occupational group no.	BA Arbeit occupational group
		282	Textilverarbeitung
1370	Manufacturers or processors of fur and leather	283	Leder-, Pelzherstellung u. -verarbeitung
1390	Bakers, pastry-cooks and confectionery makers	2922	Berufe Back-, Konditoreiwarenherstell.
1400	Butchers, fishmongers and related food preparers	2923	Berufe in der Fleischverarbeitung
		2924	Berufe in der Fischverarbeitung
1410	Cooks, Cannery workers, Fruit, vegetable and related preserv	293	Speisenzubereitung
1420	Beverage industry labourers	291	Getränkeherstellung
1424	Tobacco production machine operators, salesperson	2927	Berufe in der Tabakwarenherstellung
1430	Food and related products machine operators	623	Verkauf von Lebensmitteln
		2920	Berufe i.d. Lebensmittelherstellung (oS)
		2921	Berufe Mühlenprodukt-, Futtermittelherst.
		2925	Berufe in der Milchproduktherstellung
		2926	Berufe in der Süßwarenherstellung
		2928	Berufe i.d. Lebensmittelherstellung (ssT)
1440	Construction workers, Manufacturers of building materials	321	Hochbau
		331	Bodenverlegung

IVDK occupational group no.	IVDK occupational group	BA Arbeit occupational group no.	BA Arbeit occupational group
1460	Construction & maintenance labourers: roads, dams & similar	322	Tiefbau
1480	Building finishers and related trades workers	333	Aus-, Trockenbau. Iso. Zimmer. Glas. Roll. bau
1500	Carpenter, cabinet maker, model maker	223	Holzbe- und -verarbeitung
1510	Painters, Varnishers and related workers	222	Farb- und Lacktechnik
		332	Maler., Stuckat., Bauwerksabd., Bautenschutz
1600	Engineers, technicians and scientists	271	Technische Forschung und Entwicklung
		272	Techn. Zeichnen, Konstruktion, Modellbau
		273	Technische Produktionsplanung, -steuerung
		311	Bauplanung u. -überwachung, Architektur
		312	Vermessung und Kartografie
		411	Mathematik und Statistik
		431	Informatik
		432	IT-Systemanalyse, Anwenderber., IT-Vertrieb
		433	IT-Netzwerk., -Koord., -Administr., -Orga.
		434	Softwareentwicklung und Programmierung
		8250	Medizintechnik (o.S.)
1634	Photographic-products machine operators	233	Fototechnik und Fotografie
1680	Salespersons and demonstrators	621	Verkauf (ohne Produktspezialisierung)
		622	Verkauf Bekleid., Elektro, KFZ, Hartwaren
		624	Verkauf drog. apotheken. Waren, Medizinbed.
1710	Drivers and mobile plant operators	511	Tech. Betrieb Eisenb., Luft, Schiffsverkehr
		512	Überwachung, Wartung Verkehrsinfrastruktur

1710	Drivers and mobile plant operators (continued)	514	Servicekräfte im Personenverkehr
		515	Überwachung u. Steuerung Verkehrsbetrieb
		521	Fahrzeugführung im Straßenverkehr
		522	Fahrzeugführung im Eisenbahnverkehr
		523	Fahrzeugführung im Flugverkehr
		524	Fahrzeugführung im Schiffsverkehr
		525	Bau- und Transportgeräteführung
1740	Storekeeper, transport labourers and freight handlers	513	Lagerwirt.,Post,Zustellung,Güterumschlag
1750	Office clerks	232	Technische Mediengestaltung
		516	Kaufleute - Verkehr und Logistik
		611	Einkauf und Vertrieb
		612	Handel
		613	Immobilienwirtschaft, Facility-Management
		625	Buch-Kunst-Antiquitäten-, Musikfachhandel
		711	Geschäftsführung und Vorstand
		712	Angeh. gesetzgeb. Körp., Interessenorg.
		713	Unternehmensorganisation und -strategie
		714	Büro und Sekretariat
		715	Personalwesen und -dienstleistung
		721	Versicherungs- u. Finanzdienstleistungen
		722	Rechnungswesen, Controlling und Revision
		723	Steuerberatung
		731	Rechtsberatung, -sprechung und -ordnung
		732	Verwaltung
		1750	Office clerks (continued)
921	Werbung und Marketing		
922	Öffentlichkeitsarbeit		
923	Verlags- und Medienwirtschaft		
924	Redaktion und Journalismus		
931	Produkt- und Industriedesign		
932	Innenarchitektur, Raumausstattung		
1790	Protective services workers	1	Angehörige der regulären Streitkräfte
		531	Obj.-,Pers.-,Brandschutz,Arbeitssicherh.
		532	Polizei,Kriminald.,Gerichts,Justizvollz.
1804	Chimney sweep	422	Umweltschutztechnik
1805	Hygiene and health surveillance	533	Gewerbe,Gesundheitsaufsicht,Desinfektion
		824	Bestattungswesen

1830	Artists, musicians, professional sportsmen	933	Kunsthandwerk und bildende Kunst
		934	Kunsthandwerkli. Keramik-, Glasgestaltung
		935	Kunsthandwerkliche Metallgestaltung
		941	Musik-, Gesang-, Dirigententätigkeiten
		942	Schauspiel, Tanz und Bewegungskunst
		943	Moderation und Unterhaltung
		944	Theater-, Film- und Fernsehproduktion
		945	Veranstaltungs-, Kamera-, Tontechnik
		946	Bühnen- und Kostümbildneri, Requisite
		947	Museumstechnik und -management
1841	Medical doctors	814	Human- und Zahnmedizin (ohne 8147)
1842	Dentists	8111	Zahnmedizinische Fachangestellte
		8147	Zahnärzte/innen, Kieferorthopäden/innen
1843	Veterinarians	815	Tiermedizin und Tierheilkunde
1844	Pharmacists	818	Pharmazie
1850	Health care professionals	811	Arzt- und Praxishilfe (ohne 8111)
		813	Gesundh., Krankenpfl., Rettungsd. Geburtsh.
		822	Ernährungs-, Gesundheitsberatung, Wellness
1855	Laboratory assistants (health associate professionals)	812	Medizinisches Laboratorium
1860	Social and health associate professionals, teachers	831	Erziehung, Sozialarb., Heilerziehungspfl.
		833	Theologie und Gemeindegarbeit
		841	Lehrtätigkeit an allgemeinbild. Schulen
		842	Lehrt.berufsb.Fächer, betr.Ausb., Betr.päd
		843	Lehr-, Forschungstätigkeit an Hochschulen
		844	Lehrtätigk. außerschul.Bildungseinricht.
		845	Fahr-, Sportunterricht außerschul. Bild.
1861	Geriatric nurse, social work associate professionals	821	Altenpflege
1880	Scientists	412	Biologie
		414	Physik
		421	Geologie, Geografie und Meteorologie
		423	Umweltmanagement und -beratung
		816	Psychologie, nichtärztl. Psychotherapie
		911	Sprach-, Literaturwissenschaften
		912	Geisteswissenschaften

		913	Gesellschaftswissenschaften
		914	Wirtschaftswissenschaften
1901	Hairdressers, barbers, beauticians, wigmakers	8231	Berufe im Friseurgewerbe
1902	Personal care and related workers	8232	Berufe in der Kosmetik
1910	Waiters and bartenders, guest attendants	631	Tourismus und Sport
		632	Hotellerie
		633	Gastronomie
		634	Veranstaltungsservice, -management
1933	Building, vehicle, street cleaner	541	Reinigung

**Tab. 3.1.1** IVDK, 2007 – 2016: compilation of all patch tested allergens (n=420) which elicited positive reactions, with number of patients tested, count and percentage of patients with positive reactions, supplemented with 95%- confidence interval (95%-CI).

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
10101-97-0	Nickel(II)-sulfate hexahydrate	106003	15631	14.7 [14.5 - 15.0]	Nickel is the most common contact allergen, due to its widespread use. Most important allergen source is costume jewellery. EU regulations for quantitative limitation of nickel exposure from this source have led to a decrease in nickel sensitization in young women in recent years.
not applicable	Fragrance mix (Fragrance mix I)	106032	9113	8.6 [8.4 - 8.8]	Fragrance mix contains 8 commonly used fragrances. The mix is no reliable indicator of fragrance allergy, as it causes many weak positive reactions of doubtful significance. Most important sensitizers in this mix are oakmoss and isoeugenol.
8007-00-9	Balsam of Peru (Myroxolon pereirae)	105894	8213	7.8 [7.6 - 7.9]	Natural extract consisting of more than 200 compounds of which at least 20 proved to be allergenic. Serves as marker of fragrance allergy, cross-reacts with propolis due to common ingredients.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
7791-13-1	Cobalt(II) chloride hexahydrate	106377	5470	5.1 [5.0 - 5.3]	Cobalt occurs as contamination in nickel products. Hence, cobalt allergy is often acquired as concomitant sensitization in patients allergic to nickel. Cobalt has been described as independent allergen in hard metals, leather etc.
not applicable	Fragrance mix II	106062	5364	5.1 [4.9 - 5.2]	This fragrance mix consists of 6 frequently used fragrances. Main sensitizer is hydroxyisohexyl 3-cyclohexene carboxaldehyde.
8050-09-7	Colophony (Rosin)	106403	4141	3.9 [3.8 - 4.0]	Natural product, used as is or in modified form in many industrial or artisanal fields of application. May serve as tackifier. Main allergens of colophony are oxidations products of abietic acid. These can also be found in water-based metalworking fluids, explaining the high proportion of positive test reactions to colophony among metalworkers with OD.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
7778-50-9	Potassium dichromate	106532	4134	3.9 [3.8 - 4.0]	Formerly, hexavalent chromium was the most important contact allergen in cement. Using chromate-reduced cement significantly decreases new sensitizations. Hexavalent chromium is also an important allergen in leather.
55965-84-9	Methylchloroisothiazolinone / Methylisothiazolinone (MCI/MI)	106386	4013	3.8 [3.7 - 3.9]	MCI/MI (3:1) is a preservative mixture frequently used in cosmetics and in industrial products. Concentration limit in cosmetics is 15 ppm.
2682-20-4	Methylisothiazolinone	70775	3387	4.8 [4.6 - 4.9]	MI was increasingly used without MCI at up to 100 ppm in cosmetics from 2009 on. This caused an epidemic of contact allergy to MI in Europe. MI is also used in wall paints, causing airborne allergic contact dermatitis in sensitized individuals.
85665-41-4	Propolis	105953	3359	3.2 [3.1 - 3.3]	Propolis (bee glue, putty resin) contains several allergens, partly also present in Balsam of Peru. It is used as topical remedy.
35691-65-7	Methyldibromo glutaronitrile (MDBGN; Dibromodicyanobutane)	106156	3064	2.9 [2.8 - 3.0]	MDBGN was used as preservative in cosmetics until 2008, when it

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					was banned in the EU due to its sensitizing properties.
	Amerchol L-101	75824	2678	3.5 [3.4 - 3.7]	This is a preparation of lanolin alcohols in mineral oil, usually tested at 50% in petrolatum in order to test for lanolin alcohol allergy. It elicits more positive reactions than lanolin alcohols 30% in petrolatum. Weak positive reactions may be false-positive.
8027-33-6	Lanolin alcohols	105975	2614	2.5 [2.4 - 2.6]	Lanolin alcohols are used in cosmetics, therapeutics and in technical applications. There are big differences in qualities.
not applicable	Thiuram mix	106302	2385	2.2 [2.2 - 2.3]	Thiurams are classical vulcanizing agents used in rubber production, and the most frequent allergens in glove dermatitis patients.
25655-41-8	Povidone iodine	27107	2216	8.2 [7.9 - 8.5]	Povidone iodine is a frequently used skin disinfectant. The commonly used test preparation 10% in aqua causes many unspecific (false-positive) reactions.
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde (HICC)	105959	2203	2.1 [2.0 - 2.2]	HICC is the most important fragrance sensitizer in fragrance mix

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					II. Its concentration limit in cosmetics has been lowered several times in recent years, due to its sensitizing properties.
8006-81-3	Ylang Ylang oil	75499	1918	2.5 [2.4 - 2.7]	Essential oil used in perfumery and in cosmetics. Not subject to labeling.
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	105245	1728	1.6 [1.6 - 1.7]	Epoxy resins are used in many industrial and artisanal branches. Allergens are mono- and oligomers in uncured resins. Most frequently, sensitization occurs in the building trade.
61789-40-0	Cocamidopropyl betaine	77859	1708	2.2 [2.1 - 2.3]	Mild tenside in body care products. Rare sensitizer. Patch test preparation may cause false-positive reactions. In the 1990s, an impurity (intermediate product) led to sensitization.
8006-64-2	Oil of turpentine	105882	1683	1.6 [1.5 - 1.7]	Classical painter allergen in the 1950s. Now less frequently used as solvent. Contains terpenes and may thus indicate terpene allergy caused by other exposures.
106-50-3	p-Phenylenediamine (PPD) (CI 76060)	23713	1679	7.1 [6.8 - 7.4]	Important contact allergen in hair dyes and temporary black Henna

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					tattoos. Mother of all so-called para amino compounds.
1034-01-1	Octyl gallate	75824	1647	2.2 [2.1 - 2.3]	Antioxidant in cosmetics. Test preparation frequently causes false-positive reactions.
1948-33-0	tert-Butylhydroquinone	75717	1615	2.1 [2.0 - 2.2]	Antioxidant and preservative with various appliances: food, cosmetics, varnishes etc.
95-70-5	Toluene-2,5-diamine (p-toulenediamine; PTD)	8129	1408	17.3 [16.5 - 18.2]	PTD is an important hair dye allergen, a so-called para amino compound. Cross reacts with PPD.
94-36-0	Benzoyl peroxide	22750	1331	5.9 [5.5 - 6.2]	BPO is commonly tested at 1% in petrolatum which elicits many false-positive reactions. BPO is used in acne therapy without inducing contact sensitization in a larger degree. At higher concentrations, it may sensitize. Thus, it is an occupational allergen in dental technicians.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
57-55-6	Propylene glycol	75688	1323	1.7 [1.7 - 1.8]	Propylene glycol is used as a humectant or solvent in many applications. Rare sensitizer. Tested at 20% in aqua, it elicits many false-positive reactions. Tested at 5% in petrolatum, hardly any reaction is observed.
50-00-0	Formaldehyde	106044	1241	1.2 [1.1 - 1.2]	Test preparation formaldehyde 1% in aqua may cause false-positive as well as false-negative reactions. Exposure to formaldehyde in the working environment is frequently given by formaldehyde releasers.
9000-64-0	Tolu balsam	11966	1212	10.1 [9.6 - 10.7]	Resembles Balsam of Peru.
7647-10-1	Palladium chloride	15256	1158	7.6 [7.2 - 8.0]	Most (but not all) cases of sensitization to palladium are due to immunological cross reactions in patients primarily sensitized to nickel.
54-64-8	Thimerosal	23045	1149	5.0 [4.7 - 5.3]	Thimerosal was used as preservative in vaccines in the 1980s. Patients having received these products often react to thimerosal in patch testing, without any clinical relevance.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
9000-50-4	Oakmoss absolute	23813	1120	4.7 [4.4 - 5.0]	Most important fragrance allergen in fragrance mix I. Contains the extremely potent allergen chloroatranol.
84776-64-7	Jasmine absolute	75471	1078	1.4 [1.3 - 1.5]	Fragrance compound used in perfumery and in cosmetics. Not subject to labelling.
8006-87-9	Sandalwood Oil	75491	1061	1.4 [1.3 - 1.5]	Essential oil used in perfumery and in cosmetics. Not subject to labelling.
10124-48-8	Ammoniated mercury	30523	1021	3.3 [3.1 - 3.6]	Serves as marker for contact sensitization to inorganic mercury compounds.
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	82632	1017	1.2 [1.2 - 1.3]	IPBC is a frequently used preservative in cosmetics, household and industrial products.
97-77-8	Tetraethylthiuram disulfide (TETD)	27388	942	3.4 [3.2 - 3.7]	Thiuram used as vulcanizing agent in rubber production; part of thiuram mix.
67762-27-0	Cetearyl alcohol	105907	932	0.9 [0.8 - 0.9]	Ointment base; rare sensitizer.
102-06-7	1,3-Diphenylguanidine (1,3-DPG)	34662	904	2.6 [2.4 - 2.8]	Vulcanizing agents used in rubber production. Test preparation may cause false-positive reactions. 1,3-DPG is being observed as relevant contact allergen in medical gloves in recent years

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
52-51-7	Bronopol (2-Bromo-2-nitro-1,3-propanediol)	97592	847	0.9 [0.8 - 0.9]	Preservative in cosmetics.
not applicable	Paraben mix	106048	842	0.8 [0.7 - 0.8]	Paraben mix contains 4 parabens and, due to its very high test concentration (16% in petrolatum, which is 20 times more than the common paraben concentration in cosmetics), paraben mix frequently causes false-positive reactions.
not applicable	Compositae Mix	54854	827	1.5 [1.4 - 1.6]	Main allergens in compositae are sesquiterpene lactones. Contact may occur in food handling and in body care products.
97-54-1	Isoeugenol	23055	821	3.6 [3.3 - 3.8]	Important fragrance allergen; contained in fragrance mix I.
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	105939	794	0.7 [0.7 - 0.8]	IPPD is a rubber additive, mainly in heavy duty black rubber, such as tyres, machine belts etc.
not applicable	Compositae Mix II	51095	745	1.5 [1.4 - 1.6]	Main allergens in compositae are sesquiterpene lactones. Contact may occur in food handling and in body care products.
2438-72-4	Bufexamac	80505	743	0.9 [0.9 - 1.0]	Bufexamac is a non-steroidal anti-inflammatory drug, topically used for dermatitis treatment. Its use is forbidden in the EU, due to its sensitizing properties. However, it is still available in Switzerland.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
97-74-5	Tetramethylthiuram monosulfide (TMTM)	27383	743	2.7 [2.5 - 2.9]	Thiuram used as vulcanizing agent in rubber production; part of thiuram mix.
not applicable	Mercapto mix (CBS, MBTS, MOR)	106385	706	0.7 [0.6 - 0.7]	This mix contains derivatives of mercaptobenzothiazole (MBT). They are rubber vulcanizing agents, occasionally causing rubber glove dermatitis.
149-30-4	Mercaptobenzothiazole	106421	651	0.6 [0.6 - 0.7]	Mercaptobenzothiazole (MBT) is a rubber vulcanizing agents, occasionally causing rubber glove dermatitis.
4065-45-6	Benzophenone-4 (Sulisobenzone)	69732	631	0.9 [0.8 - 1.0]	UV-Filter which is frequently used in cosmetics, for skin as well as for product protection.
1405-10-3	Neomycin sulfate	25891	589	2.3 [2.1 - 2.5]	Antibiotic used for topical wound treatment. Cross reacts with framycetine.
123-30-8	p-Aminophenol (CI 76550)	8134	579	7.1 [6.6 - 7.7]	Hair dye ingredient; so-called para amino compound. Cross reacts with PPD.
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	105949	562	0.5 [0.5 - 0.6]	Dithiocarbamates are rubber vulcanizing agents which may sensitize and cause rubber glove allergy. Chemically related to thiurams.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
101-77-9	4,4'-Diaminodiphenylmethane	19987	541	2.7 [2.5 - 2.9]	Exposure to MDA is extremely unlikely. Positive reactions to MDA indicate sensitization to other so-called para amino compounds or to diphenylmethane-4,4'-diisocyanate.
107-75-5	Hydroxycitronellal	25606	516	2.0 [1.8 - 2.2]	One of the 26 fragrance allergens subject to labelling.
137-26-8	Tetramethylthiuram disulfide (TMTD)	27384	511	1.9 [1.7 - 2.0]	Thiuram used as vulcanizing agent in rubber production; part of thiuram mix.
104-55-2	Cinnamal (cinnamic aldehyde)	23606	511	2.2 [2.0 - 2.4]	One of the 26 fragrance allergens subject to labelling.
868-77-9	2-Hydroxyethyl methacrylate (HEMA)	21474	496	2.3 [2.1 - 2.5]	Methacrylate used in various industrial appliances; known occupational allergen in dental technicians and in artificial nails.
68603-42-9	Coconut diethanolamide (cocamide DEA)	75478	491	0.7 [0.6 - 0.7]	Emulsifier mainly used in body care products.
923-26-2	2-Hydroxypropyl methacrylate (HPMA)	17637	483	2.7 [2.5 - 3.0]	Methacrylate used in various industrial appliances.
110-44-1	Sorbic acid	71626	477	0.7 [0.6 - 0.7]	Preservative, rare sensitizer.
25085-50-1	p-tert-Butylphenol formaldehyde resin (PTBFR)	81140	467	0.6 [0.5 - 0.6]	Allergen in leather glues, and thus in shoes.
94994-93-1	Tree moss	9437	467	4.9 [4.5 - 5.4]	One of the 26 fragrance allergens subject to labelling.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
8007-43-0	Sorbitan sesquioleate	36872	442	1.2 [1.1 - 1.3]	Emulsifier used in body care products, and also in several patch test preparations for homogenous Allergen distribution. Rare allergen.
97-90-5	Ethyleneglycol dimethacrylate	17965	429	2.4 [2.2 - 2.6]	Methacrylate used in various industrial appliances.
10210-36-3	Sodium thiosulfate aurate	13729	424	3.1 [2.8 - 3.4]	Gold salt used for diagnosing contact allergy to gold, frequently causing non-relevant positive reactions.
104-54-1	Cinnamyl alcohol	23562	422	1.8 [1.6 - 2.0]	One of the 26 fragrance allergens subject to labelling.
51229-78-8	Quaternium 15	72235	418	0.6 [0.5 - 0.6]	Formaldehyde releaser; preservative used in cosmetics.
141-43-5	Monoethanolamine (MEA)	12884	418	3.2 [2.9 - 3.6]	MEA is one of the most frequent allergens in water-based metalworking fluids. May also be found in hair dyes.
78491-02-8	Diazolidinyl urea	72120	405	0.6 [0.5 - 0.6]	Formaldehyde releaser; preservative used in cosmetics.
16096-31-4	1,6-Hexanediol diglycidylether	12805	400	3.1 [2.8 - 3.4]	1,6-HDDGE is a frequently used and frequently sensitizing reactive diluent in epoxy resins.
5392-40-5	Citral	16330	395	2.4 [2.2 - 2.7]	One of the 26 fragrance allergens subject to labelling.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
111-30-8	Glutardialdehyde (Glutaral)	33864	389	1.1 [1.0 - 1.3]	Glutaral is a frequently used surface and instrument disinfectant and an occupational allergen in medical professions.
60-09-3	4-Aminoazobenzene (CI 11000)	5833	388	6.7 [6.0 - 7.3]	Contact with 4-aminoazobenzene is unlikely. It is a so-called para amino compound cross reacting with PPD.
2634-33-5	1,2-Benzisothiazolin-3-one, sodium salt	18985	388	2.0 [1.8 - 2.3]	Benzisothiazolinone is a preservative frequently used in household and industrial products.
97-53-0	Eugenol	24633	386	1.6 [1.4 - 1.7]	One of the 26 fragrance allergens subject to labelling.
1405-41-0	Gentamicin sulfate	15201	383	2.5 [2.3 - 2.8]	Antibiotic, used systemically and topically.
730-40-5	Disperse Orange 3 (CI 11005)	10103	383	3.8 [3.4 - 4.2]	Disperse Orange 3 is a so-called para amino compound cross reacting with PPD.
7727-54-0	Ammonium persulfate	7531	374	5.0 [4.5 - 5.5]	Hair bleaching agent; hairdresser allergen.
7681-57-4	Sodium metabisulfite	11344	374	3.3 [3.0 - 3.6]	Antioxidant in various fields, e.g. in food, cosmetics, therapeutic ointments etc. Clinical relevance of positive test reactions is often hard to assess.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
79-07-2	2-Chloroacetamide	73487	369	0.5 [0.5 - 0.6]	Preservative in cosmetics, therapeutic preparations and in technical fluids.
not applicable	Sesquiterpenlactone mix	23171	364	1.6 [1.4 - 1.7]	Sesquiterpenlactones are allergens in plants of the compositae family. Contact may occur by handling plants or body care products.
514-10-3	Abietic acid	12219	360	2.9 [2.7 - 3.3]	Oxidation products of resin acids, especially abietic acid, are important allergens in colophony, and in water-based metalworking fluids (from tall oil as base material).
591-27-5	3-Aminophenol	7394	359	4.9 [4.4 - 5.4]	Hair dye ingredient (coupler).
63449-41-2	Benzalkonium chloride	31445	354	1.1 [1.0 - 1.2]	Quaternary ammonium compound. Ingredient of surface disinfectants, and also used as preservative in eye drops. Patch test preparation may cause irritation.
102-77-2	Morpholinylmercaptobenzothiazole	29207	352	1.2 [1.1 - 1.3]	MBT derivative. Vulcanizing agents, allergen in rubber gloves. Part of mercapto mix.
	Amalgam (with zinc)	10965	352	3.2 [2.9 - 3.6]	Amalgamated metals, formerly used in dentistry.
39236-46-9	Imidazolidinyl urea (Germall 115)	72030	350	0.5 [0.4 - 0.5]	Formaldehyde releaser; preservative used in cosmetics.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
98-29-3	4-tert-Butylcatechol	33715	346	1.0 [0.9 - 1.1]	Antioxidant used in oils and other technical applications. Patch testing with 4-tert-butylcatechol may induce contact sensitization.
4602-84-0	Farnesol	17035	341	2.0 [1.8 - 2.2]	One of the 26 fragrance allergens subject to labelling, frequently used in deodorants due to its antimicrobial activity. .
94-37-1	Dipentamethylenethiuram disulfide	27401	334	1.2 [1.1 - 1.4]	A thiuram used in rubber manufacture. Glove allergen.
532-32-1	Sodium benzoate	73191	328	0.4 [0.4 - 0.5]	Preservative with widespread use; extremely rare allergen.
2425-79-8	1,4-Butanediol diglycidylether	12788	328	2.6 [2.3 - 2.9]	1,4-BDDGE is a reactive diluent in epoxy resins. Despite its infrequent usage, sensitization occurs often, due to cross-reactivity with 1,6-HDDGE.
106-24-1	Geraniol	23198	323	1.4 [1.2 - 1.6]	One of the 26 fragrance allergens subject to labelling.
818-61-1	Hydroxyethyl acrylate	12837	322	2.5 [2.2 - 2.8]	Acrylate used in various industrial applications.
8007-02-1, 91844-92-7	Lemongrass oil	11868	313	2.6 [2.4 - 2.9]	Essential oil used in perfumery and in cosmetics. Not subject to labelling.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
66204-44-2	Methylene-bis(methyloxazolidine)	8221	311	3.8 [3.4 - 4.2]	Industrially used preservative, mainly in water-based metalworking fluids. Formaldehyde releaser.
121-00-6	Butylhydroxyanisole (BHA)	75800	300	0.4 [0.4 - 0.4]	Stabilizer and antioxidant used in cosmetics, therapeutic ointments, and food. Rare sensitizer.
7553-56-2	Iodine	6871	296	4.3 [3.8 - 4.8]	Allergic reactions to iodine may cause dermatitis after skin disinfection or exanthema after application of contrast media in radiology. Test reactions have to be interpreted with caution.
102-71-6	Triethanolamine	76497	294	0.4 [0.3 - 0.4]	Basic compound for many applications, e.g. in ointment bases. Very frequently used, but rarely sensitizing.
20554-84-1	Parthenolide	15654	293	1.9 [1.7 - 2.1]	A sesquiterpene lactone naturally occurring in feverfew.
80-62-6	Methylmethacrylate (MMA)	21010	284	1.4 [1.2 - 1.5]	Methacrylate used in various industrial and artisanal applications. Known allergen in modelling artificial nails, in the building trade, and in dental technicians.
122-60-1	Phenylglycidyl ether	18976	284	1.5 [1.3 - 1.7]	Reactive diluent formerly used in epoxy resin systems. Most of the

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					positive reactions are the expression of cross-reactivity in individuals sensitized to the epoxy resin monomer DGEBA.
18472-51-0	Chlorhexidine digluconate	75635	272	0.4 [0.3 - 0.4]	Antiseptic used for skin disinfection and in dentistry.
6440-58-0	DMDM Hydantoin	72772	272	0.4 [0.3 - 0.4]	Formaldehyde releaser; preservative used in cosmetics.
95-33-0	N-Cyclohexyl-2-benzothiazylsulfenamide	27315	251	0.9 [0.8 - 1.0]	CBS is a vulcanizing agent used in rubber glove production. Part of mercapto mix.
94-09-7	Benzocaine	20489	238	1.2 [1.0 - 1.3]	Local anaesthetic.
3380-34-5	Triclosan	72815	238	0.3 [0.3 - 0.4]	Antiseptic used in hospitals, but also in toothpaste etc. Less frequently used in Germany, compared to USA.
51200-87-4	4,4-Dimethyloxazolidine (Bioban CS 1135)	8214	234	2.8 [2.5 - 3.2]	Industrially used preservative, mainly in water-based metalworking fluids. Formaldehyde releaser.
51333-22-3	Budesonide	14077	232	1.6 [1.4 - 1.9]	Corticosteroid, used in nasal sprays.
9003-35-4	Phenol formaldehyde resin (Novolac)	19166	222	1.2 [1.0 - 1.3]	Synthetic resin with various applications.
103-16-2	Monobenzone	27419	221	0.8 [0.7 - 0.9]	Antidegradant used in rubber products; also called Hydroquinone monobenzylether.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
4405-13-4	Glyoxal trimer dihydrate	29682	217	0.7 [0.6 - 0.8]	Glyoxal is a frequently used surface and instrument disinfectant and an occupational allergen in medical professions.
14548-60-8	Benzyl hemiformal	8218	216	2.6 [2.3 - 3.0]	Industrially used preservative, mainly in water-based metalworking fluids. Formaldehyde releaser.
123-31-9	Hydroquinone	26064	214	0.8 [0.7 - 0.9]	Used as antioxidant, photographic developer, and skin bleaching agent.
109-16-0	Triethyleneglycol dimethacrylate (TEGDMA)	17966	213	1.2 [1.0 - 1.4]	Methacrylate used in various industrial and artisanal applications. Known occupational allergen in dental technicians.
13820-53-6	Sodium tetrachloropalladate	698	212	30.4 [27.0 - 33.9]	Rarely used patch test preparation for palladium allergy. Optimum test concentration not definitely established. High percentage of positive reaction is the result of extremely aimed testing, and has to be interpreted very carefully.
101-86-0	Hexyl cinnamal	16086	209	1.3 [1.1 - 1.5]	One of the 26 fragrance allergens subject to labelling.
69-53-4	Ampicillin	3595	204	5.7 [4.9 - 6.5]	Most patch tests with ampicillin are performed in diagnostic workup of drug eruption.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
55560-96-8	Tixocortol-pivalate	14315	199	1.4 [1.2 - 1.6]	Corticosteroid, not used in Germany. Tixocortol-pivalate serves a marker allergen.
7773-01-5	Manganese(II) chloride	5906	198	3.4 [2.9 - 3.8]	Test preparation is not sufficiently validated. Test results have to be interpreted very carefully.
4146-30-9	Framycetin sulfate	8126	195	2.4 [2.1 - 2.8]	Antibiotic used in topical preparations. Cross-reacts with neomycine.
87-66-1	Pyrogallol	7438	191	2.6 [2.2 - 3.0]	Chemical intermediate, formerly used in hair dyes.
26787-78-0	Amoxicillin	4048	186	4.6 [4.0 - 5.3]	Most patch tests with amoxicillin are performed in diagnostic workup of drug eruption.
84691-64-8	Tanacetum vulgare	9217	175	1.9 [1.6 - 2.2]	Contains sesquiterpene lactones.
1565-94-2	Bisphenol A diglycidyl methacrylate (BIS-GMA)	13352	173	1.3 [1.1 - 1.5]	Although BIS-GMA is a methacrylate, there is evidence that reactions to BIS-GMA may be cross-reaction in patients primarily sensitized to DGEBA (epoxy resin).
3101-60-8	p-tert-Butylphenyl glycidylether	10092	173	1.7 [1.5 - 2.0]	PTBPGE is a reactive diluent in epoxy resins.
140-88-5	Ethyl acrylate	8582	167	1.9 [1.7 - 2.3]	Acrylate with various applications.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
1477-55-0	m-Xylylenediamine	10864	166	1.5 [1.3 - 1.8]	MXDA is a hardener in epoxy resin systems and a frequent sensitizer in this context.
74-31-7	N,N'-Diphenyl-p-phenylenediamine (DPPD)	27298	165	0.6 [0.5 - 0.7]	DPPD is a rubber additive with similar range of application as IPPD. .
2224-44-4, 1854-23-5	(Nitrobutyl)morpholine/.. (Bioban P 1487)	7637	165	2.2 [1.8 - 2.5]	Insutrial biocide, formaldehyde releaser, formerly used in metalworking fluids; prohibited in Germany since 1993. Test preparation frequently causes false-positive reactions.
120-78-5	Dibenzothiazyl disulfide (MBTS)	27315	162	0.6 [0.5 - 0.7]	MBT derivative. Vulcanizing agent, allergen in rubber gloves. Part of mercapto mix.
100-51-6	Benzyl alcohol	74576	160	0.2 [0.2 - 0.3]	Preservative and fragrance in cosmetics, body care products and therapeutical ointments. Extremely widespread usage. Very rarely sensitizing.
65-85-0	Benzoic acid	6420	159	2.5 [2.1 - 2.9]	Preservative in body care products as well as food. Widespread usage, but rarely sensitizing.
122-40-7	Amyl cinnamal	22958	149	0.6 [0.5 - 0.8]	One of the 26 fragrance allergens subject to labelling.
106-22-9	Citronellol	18733	143	0.8 [0.6 - 0.9]	One of the 26 fragrance allergens subject to labelling.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
17796-82-6	N-(Cyclohexylthio)phthalimide	27291	141	0.5 [0.4 - 0.6]	Rubber additive; clinical relevance of positive test reactions is often hard to assess.
8000-34-8	Clove oil	10447	138	1.3 [1.1 - 1.6]	Clove oil consists of more than 90% eugenol, a fragrance allergen. Clove oil is used in dentistry to relieve toothache.
26447-14-3	Cresylglycidyl ether	13002	132	1.0 [0.9 - 1.2]	Cresylglycidyl ether is a reactive diluent in epoxy resins.
25389-94-0	Kanamycin sulfate	4225	128	3.0 [2.5 - 3.6]	Antibiotic used for topical treatment and in ophthalmic drugs.
84082-83-7	Achillea millefolium	9170	125	1.4 [1.1 - 1.6]	Contains sesquiterpene lactones.
97-63-2	Ethyl methacrylate	8551	124	1.5 [1.2 - 1.7]	Methacrylate with various applications.
9003-08-1	Melamin formaldehyde resin	17437	124	0.7 [0.6 - 0.8]	Synthetic resin with various industrial applications.
128-37-0	Butylhydroxytoluene (BHT)	75817	119	0.2 [0.1 - 0.2]	Stabilizer and antioxidant used in cosmetics, therapeutic ointments, and food. Rare sensitizer.
not applicable	Polyethylene glycol ointment DAB 8	75447	119	0.2 [0.1 - 0.2]	Frequently used ointment base. Rare sensitizer.
103694-68-4	Majantol	15593	118	0.8 [0.6 - 0.9]	Frequently used fragrance, not subject to labelling. Rare sensitizer.
30618-84-9	Glyceryl thioglycolate	7317	116	1.6 [1.3 - 1.9]	Main sensitizer in acid permanent wave solutions. Voluntarily withdrawn from the German market in

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					the mid-1990s, due to frequent sensitization in hairdressers.
8000-27-9	Cedarwood oil	10184	113	1.1 [0.9 - 1.3]	Essential oil used in perfumery and in cosmetics. Not subject to labelling.
2855-13-2	Isophorone diamine	13097	107	0.8 [0.7 - 1.0]	Isophorone diamine serves a hardener in epoxy resin systems. Frequent sensitizer in this context. Positive reactions may also indicate sensitization to isophorone diisocyanate.
333-18-6	Ethylenediamine dihydrochloride	36228	106	0.3 [0.2 - 0.4]	Excipient used in topical drug preparations and pills.
7747-35-5	7-Ethylbicyclooxazolidine	8216	104	1.3 [1.0 - 1.5]	Industrially used preservative, mainly in water-based metalworking fluids. Formaldehyde releaser.
26266-77-3, 127-36-6	Abitol (dihydroabietyl alcohol)	7089	103	1.5 [1.2 - 1.8]	Derivative of abietic acid.
111-40-0	Diethylenetriamine	12921	103	0.8 [0.7 - 1.0]	Epoxy resin hardener.
2426-08-6	Butyl glycidylether	12864	101	0.8 [0.6 - 1.0]	Reactive diluent used in epoxy resin systems.
91-64-5	Coumarin	16049	101	0.6 [0.5 - 0.8]	One of the 26 fragrance allergens subject to labelling.
61-12-1	Cinchocaine-HCl (Cincain)	4534	99	2.2 [1.8 - 2.7]	Local anaesthetic, frequently used in preparations for haemorrhoids.
13609-67-1	Hydrocortisone-17-butyrate	12814	99	0.8 [0.6 - 0.9]	Corticosteroid, used in topical preparations.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
8016-38-4, 72968-50-4	Neroli oil	10140	99	1.0 [0.8 - 1.2]	Essential oil used in perfumery and in cosmetics. Not subject to labelling.
15121-94-5	Primin	16138	98	0.6 [0.5 - 0.7]	Contact allergen in decorative plants ( <i>Primula obconica</i> ). Formerly one of the most frequent contact allergens. Nowadays, primin-free variations have been bred.
90-02-8	Salicyl aldehyde	10131	93	0.9 [0.7 - 1.1]	Fragrance compound; not subject to labelling.
25620-58-0	Trimethylhexane-1,6-diamine	10867	93	0.9 [0.7 - 1.0]	Epoxy resin hardener.
4719-04-4	1,3,5-Tris(2-hydroxyethyl)-hexahydrotriazine	5542	92	1.7 [1.3 - 2.0]	Industrially used preservative, mainly in water-based metalworking fluids. Formaldehyde releaser.
3179-89-3	Disperse Red 17 (CI 11210)	9425	92	1.0 [0.8 - 1.2]	Colourant used in hair dyes.
7772-99-8	Stannous chloride	13616	92	0.7 [0.5 - 0.8]	Patch testing with tin chloride is done in order to detect contact allergy to tin. However, this test preparation is hardly validated.
26530-20-1	Octyl isothiazolinone	10954	92	0.8 [0.7 - 1.0]	Fungicide used in paints, water-based metalworking fluids and other industrial applications.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
61-33-6	Penicillin G (Benzylpenicillin)	2969	90	3.0 [2.4 - 3.7]	Penicillin is no longer used for topical treatment. Patch tests are performed in the diagnostic workup of drug eruptions.
51022-69-6	Amcinonide	11815	89	0.8 [0.6 - 0.9]	Corticosteroid, used in topical preparations.
8014-09-3	Patchouli oil	8077	84	1.0 [0.8 - 1.3]	Essential oil used in perfumery and in cosmetics. Not subject to labeling.
111-42-2	Diethanolamine (DEA)	6548	83	1.3 [1.0 - 1.6]	Rust inhibitor in water-based metal-working fluids; regulated and limited since 1993.
2832-40-8	Disperse Yellow 3 (CI 11855)	9419	83	0.9 [0.7 - 1.1]	Azo dye compound.
100-97-0	Methenamine (hexamethylene tetramine)	27549	83	0.3 [0.2 - 0.4]	Chemical intermediate product. Formaldehyde releaser.
73-78-9	Lidocaine-HCl	4685	82	1.8 [1.4 - 2.2]	Local anaesthetic.
61-76-7	Phenylephrine-HCl	4146	82	2.0 [1.6 - 2.4]	Ophthalmic drug, in eye drops.
5421-66-9	Bismark brown R	9283	81	0.9 [0.7 - 1.1]	Azo dye compound.
136-47-0	Tetracaine-HCl (Amethocaine)	4699	80	1.7 [1.4 - 2.1]	Local anaesthetic.
2082-81-7	1,4-Butanediol dimethacrylate (BUDMA)	8537	80	0.9 [0.7 - 1.2]	Methacrylate with various industrial applications.
81-13-0	Panthenol	12487	78	0.6 [0.5 - 0.8]	Ingredient of cosmetics or therapeutic ointment, promotes wound

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					healing. Very widespread use. Rare sensitizer.
7758-99-8	Copper(II) sulfate pentahydrate	16714	75	0.4 [0.4 - 0.6]	Used for diagnosing contact allergy to copper which is extremely rare. Test preparations may cause false-positive test reactions.
2455-24-5	Tetrahydrofurfuryl methacrylate	8434	75	0.9 [0.7 - 1.1]	Methacrylate with various industrial applications.
68917-12-4	Narcissus absolute	8047	75	0.9 [0.7 - 1.2]	Fragrance compound, not subject to labelling.
929-06-6	2-(2-Aminoethoxy)ethanol (Di-glycolamine)	5542	74	1.3 [1.0 - 1.7]	Ingredient of water-based metal-working fluids.
587-98-4	Acid Yellow 36 (CI 13065)	9289	73	0.8 [0.6 - 1.0]	Also called metanil yellow, azo dye compound.
479-20-9	Atranorin	9222	71	0.8 [0.6 - 1.0]	Allergen in oakmoss.
61951-51-7	Disperse Blue 124	7376	71	1.0 [0.8 - 1.2]	Textile dye; chemically closely related to disperse blue 106.
3524-68-3	Pentaerythritol triacrylate (PETA)	8596	70	0.8 [0.6 - 1.0]	Acrylate with various industrial applications.
751-94-0	Fusidic acid sodium salt	8261	66	0.8 [0.6 - 1.0]	Fusidic acid is used as antibacterial in topical therapeutic preparations.
7718-98-1	Vanadium(III) chloride	1790	65	3.6 [2.8 - 4.6]	Patch testing with vanadium chloride is done in order to detect contact allergy to vanadium. However,

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					this test preparation is hardly validated.
7439-97-6	Mercury (metallic)	1535	64	4.2 [3.2 - 5.3]	Used to diagnose contact allergy to mercury from direct contact with this metal or to amalgam.
68516-81-4	Disperse Blue 106	7312	64	0.9 [0.7 - 1.1]	Textile dye; chemically closely related to disperse blue 124.
7562-61-0	Usnic acid	9273	63	0.7 [0.5 - 0.9]	Compound with antimicrobial properties found in lichen species.
8006-78-8, 8002-41-3	Laurel leaf oil	10171	63	0.6 [0.5 - 0.8]	Essential oil used in aromatherapy.
23593-75-1	Clotrimazole	6179	62	1.0 [0.8 - 1.3]	Antifungal medication, extremely widely used in topical preparations. Rare sensitizer.
8006-90-4	Peppermint oil	13037	62	0.5 [0.4 - 0.6]	Essential oil with various applications.
25122-46-7	Clobetasol-17-propionate	12761	59	0.5 [0.4 - 0.6]	Potent corticosteroid, in topical preparations.
50-24-8	Prednisolone	11819	59	0.5 [0.4 - 0.6]	Corticosteroid, mostly systemically but occasionally also topically used.
136-23-2	Zinc dibutyldithiocarbamate (ZDBC)	28158	58	0.2 [0.2 - 0.3]	Rubber additive (vulcanizer).
2392-39-4	Dexamethasone-21-phosphate disodium salt	11815	58	0.5 [0.4 - 0.6]	Corticosteroid, systemically and topically used.
30499-70-8	Trimethylolpropane triglycidylether	10849	57	0.5 [0.4 - 0.7]	Reactive diluent in epoxy resins.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
80-54-6	Butylphenyl methylpropional (Lilial)	10177	57	0.6 [0.4 - 0.7]	One of the 26 fragrance allergens subject to labelling.
2198-59-6	p-Aminodiphenylamine hydrochloride	431	54	12.5 [9.6 - 16.0]	Chemical intermediate; formerly used in hair dyes. So-called para amino compound.
1405-87-4	Bacitracin	9035	53	0.6 [0.4 - 0.8]	Antibiotic, topically used (skin, ears, eyes).
102-08-9	N,N'-Diphenylthiourea	31784	53	0.2 [0.1 - 0.2]	Rubber ingredient (accelerator).
72869-86-4	Diurethan dimethacrylate	8178	53	0.6 [0.5 - 0.8]	Methacrylate with various industrial applications.
2872-52-8	Disperse Red 1 (CI 11110)	9429	52	0.6 [0.4 - 0.7]	Textile dye, azo dye.
130-26-7	Clioquinol (5-Chloro-8-hydroxy-7-iodoquinoline)	8237	50	0.6 [0.5 - 0.8]	Antiseptic agent used topically.
8006-54-0	Lanolin (wool fat, wool wax)	7254	47	0.6 [0.5 - 0.9]	Wool fat from which lanolin alcohols are extracted.
	Arnica montana	13567	47	0.3 [0.3 - 0.5]	Flower, compositae family.
2152-44-5	Betamethasone-17-valerate	11813	46	0.4 [0.3 - 0.5]	Corticosteroid, topically used.
121-33-5	Vanillin	16989	46	0.3 [0.2 - 0.4]	Flavouring agent.
5421-46-5	Ammonium thioglycolate	7295	45	0.6 [0.5 - 0.8]	Ingredient of permanent wave solutions.
13820-41-2	Ammonium tetrachloroplatinate(II)	13577	43	0.3 [0.2 - 0.4]	Patch testing with this preparation is done in order to detect contact allergy to platinum. However, this test preparation is hardly validated.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
122-18-9	Cetalkonium chloride	10265	43	0.4 [0.3 - 0.6]	Quaternary ammonium compound; part of the benzalkonium chloride family.
3055-99-0	Polidocanol	4450	43	1.0 [0.7 - 1.3]	Local anaesthetic, used in antipruriginous creams.
84929-31-7, 8008-56-8	Lemon oil	10215	43	0.4 [0.3 - 0.6]	Essential oil, used in perfumes and for flavouring.
56-75-7	Chloramphenicol	5400	42	0.8 [0.6 - 1.0]	Antibiotic, formerly also used topically.
7646-85-7	Zinc chloride	2113	42	2.0 [1.4 - 2.7]	Used for testing for contact allergy to zinc. However, zinc chloride is caustic; therefore, irritant and false-positive reactions have to be expected.
not applicable	Irujol Ointment (R)	1019	42	4.1 [3.0 - 5.5]	Frequently used anti-inflammatory ointment; temporarily tested.
1338-51-8	Toluenesulfonamide formaldehyde resin	20980	42	0.2 [0.1 - 0.3]	Synthetic resin used in nail lacquers. May cause dislocated, peri-orbital dermatitis.
109-46-6	N,N'-Dibutylthiourea	27390	41	0.1 [0.1 - 0.2]	Rubber ingredient; rare sensitizer.
55-55-0	p-Methylamino phenolsulfate	565	41	7.3 [5.3 - 9.7]	Developer for black and white films
3811-73-2	Sodium-2-pyridinethiol-1-oxide	8174	39	0.5 [0.3 - 0.7]	Also known as sodium omadine; antioxidant and non-ferrous metal inhibitor in metalworking fluids.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
	Amalgam alloy metals (Ag, Cu, Sn, Zn)	11165	38	0.3 [0.2 - 0.5]	Metals formerly used in dental amalgam together with mercury.
9011-05-6	Urea formaldehyde resin	9429	37	0.4 [0.3 - 0.5]	Synthetic resin with various industrial applications.
1166-52-5	Dodecyl gallate (Lauryl gallate)	2414	36	1.5 [1.0 - 2.1]	Antioxidant used in topical preparations.
111-12-6	Methyl heptin carbonate	9421	36	0.4 [0.3 - 0.5]	Also known as methyl 2-octynoate; one of the 26 fragrances subject to labelling. May cause active sensitization when patch tested at 1% pet.
101-85-9	alpha-Amylcinnamyl alcohol	10174	34	0.3 [0.2 - 0.5]	One of the 26 fragrances subject to labelling.
8015-92-7	Chamomilla romana (Anthemis nobilis)	5532	34	0.6 [0.4 - 0.9]	Roman chamomile. Frequently used in popular remedies.
76-25-5	Triamcinolone acetonide	11899	33	0.3 [0.2 - 0.4]	Topical corticosteroid.
78-70-6	Linalool (stabilized)	10188	32	0.3 [0.2 - 0.4]	One of the 26 fragrances subject to labelling.
10025-73-7	Chromium(III) chloride	835	31	3.7 [2.5 - 5.2]	The actual allergen is hexavalent chromium (Cr VI). Routinely, patch

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					testing is done with potassium dichromate which contains hexavalent chromium. However, highly sensitized individuals may also react to patch test preparation with trivalent chromium (Cr III). Cr III binds to proteins easily and therefore, only a small amount of Cr III passes the epidermal barrier, after which it is oxidized to Cr VI.
8000-48-4, 84625-32-1	Eucalypt oil	10281	31	0.3 [0.2 - 0.4]	Essential oil used for flavouring, among others in toothpaste.
51-05-8	Procaine hydrochloride	4390	29	0.7 [0.4 - 0.9]	Local anaesthetic, also used in topical preparations.
92-88-6	4,4'-Dihydroxybiphenyl	25417	28	0.1 [0.1 - 0.2]	Rubber ingredient.
75-47-8	Iodoform	151	28	18.5 [12.7 - 25.7]	Antiseptic, formerly used more frequently. Also tested as indicator for contact allergy to iodine.
1405-20-5	Polymyxin B sulfate	4174	28	0.7 [0.4 - 1.0]	Topically used therapeutic antifungal agent.
59-50-7	4-Chloro-3-methylphenol	15781	28	0.2 [0.1 - 0.3]	Biocide.
68-89-3	Metamizole	1649	27	1.6 [1.1 - 2.4]	Systemically used pain relieving drug. Patch testing is done in the diagnostic workup of drug eruptions.
400-61-9	Nystatin	6181	27	0.4 [0.3 - 0.6]	Yeast-specific antifungal agent. Very frequently used topically and

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					in the gastro-intestinum. Not absorbed, and therefore non-toxic. Rare sensitizer.
89-78-1	Menthol	10010	27	0.3 [0.2 - 0.4]	Flavouring agent used in tooth-paste and mouth rinses.
14726-36-4	Zinc dibenzylthiocarbamate	29638	27	0.1 [0.1 - 0.1]	Rubber accelerator. Rarely used, rare sensitizer.
10108-64-2	Cadmium chloride	2736	26	1.0 [0.6 - 1.4]	Formerly used as colouring agent in synthetic resins.
62-38-4	Phenyl mercuric acetate	3017	26	0.9 [0.6 - 1.3]	Antiseptic used in eye drops, and contact lens fluids.
100-52-7	Benzaldehyde	10679	25	0.2 [0.2 - 0.3]	Benzaldehyde is used in the food industry as a flavouring and odorant.
122-99-6	2-Phenoxyethanol	8616	24	0.3 [0.2 - 0.4]	Extremely frequently used preservative in cosmetics and body care products, but also in industrial fluids. Very rare sensitizer.
7705-08-0	Iron(III) chloride	1334	24	1.8 [1.2 - 2.7]	Colourant used in cosmetics, especially in mascara, eye shadow etc. Causes irritation and false-positive patch test reactions.
not applicable	Lanolin alcohol ointment DAB 9	2063	24	1.2 [0.7 - 1.7]	Ointment base used therapeutically, based on lanolin alcohols.
8049-85-2	Amalgam (without zinc)	827	23	2.8 [1.8 - 4.1]	Mercury-containing alloy, formerly used in dentistry.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
94994-93-1	Treemoss absolute	741	22	3.0 [1.9 - 4.5]	One of the 26 fragrances subject to labelling (Evernia furfuracea extract)
35691-65-7, 122-99-6	Methylbromo glutaronitrile + 2-Phenoxyethanol	1147	21	1.8 [1.1 - 2.8]	Preservative combination frequently used in cosmetics in the 1990s. While Phenoxyethanol is no sensitizer, MDBGN caused sensitization very frequently, eventually leading to a ban from cosmetics in 2008.
50-78-2	Acetylsalicylic acid (ASS)	2171	21	1.0 [0.6 - 1.5]	Aspirin is a well-known popular remedy, rarely suspected to elicit drug eruptions. Patch testing is done in the course of the diagnostic work-up.
118-58-1	Benzyl salicylate	12580	20	0.2 [0.1 - 0.2]	One of the 26 fragrances subject to labelling.
108-46-3	Resorcinol	8324	19	0.2 [0.1 - 0.4]	Coupling agent in hair dyes.
not applicable	Carba-Mix	195	19	9.7 [6.0- 14.8]	A mixture of 3 rubber ingredients: zinc diethyldithiocarbamate, zind dibutyldithiocarbamate, and 1,3-diphenylguanidine. The mix causes irritation and false-positive reactions frequently.
28064-14-4, 54208-63-8,	Bisphenol F epoxy resin	172	19	11.0 [6.8 - 16.7]	Epoxy resin widely used; cross-reacts with the DGEBA resin from the DKG baseline series, due to close

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
57469-07-5, 2095-03-6					chemical relationship. Therefore, the DKG decided not to patch test with Bisphenol F epoxy resin routinely.
6004-24-6	Cetylpyridinium chloride	3165	18	0.6 [0.3 - 0.9]	Topical antiseptic.
8008-57-9	Orange oil	10152	18	0.2 [0.1 - 0.3]	Essential oil used in perfumery and for flavouring.
13967-50-5	Potassium dicyanoaurate	4900	17	0.3 [0.2 - 0.6]	A gold salt used in order to detect contact allergy to gold. Less sensitive than sodium aurothiomalate.
7681-11-0	Potassium iodide	149	17	11.4 [6.8 - 17.6]	Used for diagnosing contact allergy to iodine.
94-13-3	Propyl paraben	4037	17	0.4 [0.2 - 0.7]	Preservative frequently used in cosmetics and food. Rare sensitizer.
103-41-3	Benzyl cinnamate	11362	16	0.1 [0.1 - 0.2]	One of the 26 fragrances subject to labelling.
6373-73-5	Disperse Yellow 9 (CI 10375)	9320	16	0.2 [0.1 - 0.3]	Textile dye.
84961-64-8	Tansy extract	1839	16	0.9 [0.5 - 1.4]	Tansy is a plant from the compositae family. Extract contains sesquiterpene lactones.
84082-60-0	Chamomilla recutita (German chamomile)	4931	16	0.3 [0.2 - 0.5]	German chamomile, frequently used as popular remedy.
6381-92-6	Disodium EDTA	4145	15	0.4 [0.2 - 0.6]	Excipient in drugs. Rare sensitizer.
1338-43-8	Sorbitan monooleate	1626	15	0.9 [0.5 - 1.5]	Emulsifier used in ointments and creams.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
68990-11-4	Arnica montana extract	1801	15	0.8 [0.5 - 1.4]	Arnica is a plant from the compositae family. Extract contains sesquiterpene lactones.
1314-62-1	Vanadium pentoxide	4156	15	0.4 [0.2 - 0.6]	Used in order to diagnose vanadium allergy; however, this test preparation is hardly validated.
10101-53-8	Chromium-(III)-sulfate	1749	14	0.8 [0.4 - 1.3]	Another trivalent chromium, salt used to detect high grade sensitization to chromium.
131-57-7	Oxybenzone (Benzophenone-3) (Eusolex 4360)	5957	14	0.2 [0.1 - 0.4]	UV-filter used in cosmetics for skin as well as for product protection.
7487-94-7	Mercury(II) chloride	941	14	1.5 [0.8 - 2.5]	A mercury salt infrequently used in order to diagnose contact allergy to inorganic mercury compounds.
10141-00-1	Potassium chrome sulfate	1129	14	1.2 [0.7 - 2.1]	Temporarily used to test for chromium allergy.
88-04-0	4-Chloro-3,5-dimethylphenol	8505	14	0.2 [0.1 - 0.3]	Also called p-chloro-m-xyleneol (PCMX), an industrial biocide.
84082-83-7	Yarrow herb extract	1780	14	0.8 [0.4 - 1.3]	A plant from the compositae family. Extract contains sesquiterpene lactones.
89997-65-9	Featherfew flowers extract	1779	14	0.8 [0.4 - 1.3]	A plant from the compositae family. Extract contains sesquiterpene lactones.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
94-26-8	Butyl paraben	4066	13	0.3 [0.2 - 0.5]	Preservative frequently used in cosmetics and food. Rare sensitizer.
7705-14-8, 138-86-3	Dipentene (d,l-Limonene)	10609	13	0.1 [0.1 - 0.2]	One of the 26 fragrances subject to labelling. Also used as natural tenside in household products.
2475-46-9	Disperse Blue 3 (CI 61505)	9287	13	0.1 [0.1 - 0.2]	Textile dye of the anthraquinone type.
99-76-3	Methyl paraben	4287	13	0.3 [0.2 - 0.5]	Preservative frequently used in cosmetics and food. Rare sensitizer.
1330-78-5	Tricresyl phosphate	10076	13	0.1 [0.1 - 0.2]	Tricresyl phosphates were used as flame retardants and plasticizers for PVC, nitrocellulose, acrylates and varnish.
112-24-3	Triethylene tetramine	2590	13	0.5 [0.3 - 0.9]	Epoxy resin hardener.
15307-86-5	Diclofenac	1990	13	0.7 [0.3 - 1.1]	Non-steroidal anti-inflammatory drug, used systemically as well as topically.
120-47-8	Ethylparaben	4134	12	0.3 [0.2 - 0.5]	Preservative frequently used in cosmetics and food. Rare sensitizer.
50-23-7	Hydrocortisone (Cortisol)	11818	12	0.1 [0.1 - 0.2]	Mild corticosteroid, also used in therapeutic creams.
21652-27-7	1-Hydroxyethyl-2-heptadecenyl-imidazoline	599	12	2.0 [1.0 - 3.5]	Corrosion inhibitor in metal-working fluids, greases and corrosion inhibiting oils.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
84649-86-5	Anthemis nobilis (Roman chamomile)	3770	12	0.3 [0.2 - 0.6]	Roman chamomile, frequently used as popular remedy.
72-80-0	Chlorquinaldol	1081	11	1.0 [0.5 - 1.8]	Antimicrobial agent.
2872-48-2	Disperse Red 11 (CI 62015)	9327	11	0.1 [0.1 - 0.2]	Anthraquinone dye
127-51-5	Alpha-isomethyl ionone	10149	11	0.1 [0.1 - 0.2]	One of the 26 fragrances subject to labelling, sometimes also called gamma-methylionone.
98-54-4	4-tert-Butylphenol	6304	10	0.2 [0.1 - 0.3]	Monomer used in polymers, coating products, adhesives and sealants.
55-48-1	Atropin sulfate	4137	9	0.2 [0.1 - 0.4]	Ophthalmic drug, used in eye drops.
120-51-4	Benzyl benzoate	10702	9	0.1 [0.0 - 0.2]	One of the 26 fragrances subject to labelling, also used in scabies therapy.
54-71-7	Pilocarpin-HCl	4136	9	0.2 [0.1 - 0.4]	Ophthalmic drug, in eye drops.
84-74-2	Dibutyl phthalate	2376	9	0.4 [0.2 - 0.7]	Softening agent used in synthetic resins.
4074-88-8	Diethylene glycol diacrylate	133	9	6.8 [3.1 - 12.5]	Acrylate with various industrial applications.
1680-21-3	Triethylene glycol diacrylate	131	9	6.9 [3.2 - 12.6]	Acrylate with various industrial applications.
10025-83-9	Iridium(III) chloride	530	9	1.7 [0.8 - 3.2]	Used for diagnosing iridium allergy; patch test preparation is hardly validated.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
97-23-4	Dichlorophen	1964	8	0.4 [0.2 - 0.8]	Formerly used antimycotic drug.
84082-60-0	German chamomile (Chamomilla recutita)	20	8	40.0 [19.1 - 63.9]	German chamomile, frequently used as popular remedy.
79-57-2	Oxytetracycline	8104	8	0.1 [0.0 - 0.2]	Antibiotic, also used topically.
7761-88-8	Silver nitrate	1029	8	0.8 [0.3 - 1.5]	Caustic agent used in dermatology for treating warts etc.
105-13-5	Anisyl alkohole	10167	7	0.1 [0.0 - 0.1]	One of the 26 fragrances subject to labelling.
68990-11-4	Arnica montana	1189	7	0.6 [0.2 - 1.2]	A plant from the compositae family; extract contains sesquiterpene lactones.
13510-49-1	Beryllium sulfate	170	7	4.1 [1.7 - 8.3]	Used to diagnose beryllium allergy; test preparation is hardly validated.
84082-83-7	Yarrow (Achillea millefolium)	1189	7	0.6 [0.2 - 1.2]	A plant from the compositae family; extract contains sesquiterpene lactones.
not applicable	Wood tars (birch, beech, spruce, juniper)	145	7	4.8 [2.0 - 9.7]	Wood tars were used therapeutically in dermatology.
not applicable	Compositae mix	481	7	1.5 [0.6 - 3.0]	Main allergens in compositae are sesquiterpene lactones. Contact may occur in food handling and in body care products.
36322-90-4	Piroxicam	1436	7	0.5 [0.2 - 1.0]	Non-steroidal anti-inflammatory drug, also used topically.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
13463-67-7, 1317-70-0, 12188-41-9, 1317-80-2	Titanium(IV) oxide	8037	7	0.1 [0.0 - 0.2]	Titanium oxide is an inert compound extremely widely used in cosmetics, especially in sunscreens. From other exposures, a few single cases of titanium allergy have been described. Patch testing with titanium oxide is no reliable indicator for titanium allergy.
	Cycloaliphatic epoxy resin	157	7	4.5 [1.8 - 9.0]	A special epoxy resin temporarily tested in suspected cases.
624-49-7	Dimethyl fumarate	889	7	0.8 [0.3 - 1.6]	Dimethyl fumarate was used as a fungicide in leather products (shoes, chairs, sofas etc.) and caused a small epidemic of contact allergy around 2008. Banned from these goods in the EU since 2009. It is also used therapeutically for treating psoriasis, hardly ever causing cases of contact allergy or drug eruption in this context.
7173-51-5	Didecyl dimethyl ammonium chloride (Quaternium 12)	65	7	10.8 [4.4 - 20.9]	A quaternary ammonium compound frequently used in surface disinfectants. Does not cross-react with benzalkonium chloride.
36861-47-9	3-(4-Methylbenzylidene)camphor (Eusolex 6300)	1233	6	0.5 [0.2 - 1.1]	UV-filter used in cosmetics / sunscreens.
7446-70-0	Aluminium chloride	916	6	0.7 [0.2 - 1.4]	Contact allergy to aluminium is rare and not easy to diagnose Optimum

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
					patch test preparations is not yet defined. Test results are often not reproducible.
15687-27-1	Ibuprofen	2238	6	0.3 [0.1 - 0.6]	Non-steroidal anti-inflammatory drug.
63-74-1	Sulfanilamide	8292	6	0.1 [0.0 - 0.2]	Formerly used antiseptic.
8009-03-8	Petrolatum	14005	6	0.0 [0.0 - 0.1]	No sensitizer. Formerly tested for control puposes, as most patch test preparations are petrolatum-based.
73771-04-7	Prednicarbate	1023	6	0.6 [0.2 - 1.3]	Topical corticosteroid, very frequently used; rare sensitizer.
21245-02-3	2-Ethylhexyl-4-(dimethylamino)benzoate	1237	6	0.5 [0.2 - 1.1]	UV-filter used in sunscreens.
10124-36-4	Cadmium sulfate	220	5	2.3 [0.7 - 5.2]	Temporarily used for diagnosing contact allergy to cadmium; patch test preparation is hardly validated.
21462-39-5	Clindamycin hydrochloride	384	5	1.3 [0.4 - 3.0]	Antibiotic, used topically and systemically. Rare sensitizer.
10124-43-3	Cobalt sulfate	298	5	1.7 [0.5 - 3.9]	Temporarily used for diagnosing cobalt allergy. Replaced by cobalt chloride which elicits irritant and false positive reactions less frequently.
141-32-2	n-Butyl acrylate	315	5	1.6 [0.5 - 3.7]	Acrylate with various industrial applications.
92-77-3	Naphthol AS (CI 37505)	9347	5	0.1 [0.0 - 0.1]	Textile dye.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
112-92-5	Stearyl alcohol	1678	5	0.3 [0.1 - 0.7]	Ointment base, frequently used, hardly ever sensitizing.
84082-60-0	Chamomile blossoms extracts	1788	5	0.3 [0.1 - 0.7]	Chamomile is used as popular remedy; rare sensitizer.
71617-10-2	Isoamyl 4-methoxycinnamate	1230	5	0.4 [0.1 - 0.9]	UV-filter used in sunscreens.
87-08-1	Penicillin V (Phenoxymethylpenicillin)	412	5	1.2 [0.4 - 2.8]	Antibiotic, nowadays not used topically. Patch testing may be done in the course of the work-up of a drug eruption.
25584-83-2	Hydroxypropyl acrylate	133	5	3.8 [1.2 - 8.6]	Acrylate with various industrial applications.
13106-76-8	Ammonium heptamolybdate	2876	4	0.1 [0.0 - 0.4]	Used for diagnosing contact allergy to molybdenum; patch test preparation is hardly validated.
	Butanedion-diacrylat	130	4	3.1 [0.8 - 7.7]	Acrylate with various industrial applications.
136-77-6	Hexylresorcinol	144	4	2.8 [0.8 - 7.0]	Used in hair dyes and topically as antiseptic.
506-87-6, 10361-29-2	Ammonium carbonate	26	4	15.4 [4.4 - 34.9]	Used as leavening agent in bakery. No sensitizer.
4098-71-9	Isophorone diisocyanate	195	4	2.1 [0.6 - 5.2]	May cause allergic reactions of the skin and the airways (asthma). Being a highly reactive compound, no stable patch test preparation is available. Validity of patch test results is doubtful.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
99-97-8	N,N-Dimethyl-p-toluidine	5836	4	0.1 [0.0 - 0.2]	Used as accelerator for the polymerization of methacrylates.
15077-57-3	8-hydroxyquinoline potassium sulfate (Chinosol)	889	4	0.4 [0.1 - 1.1]	Formerly used as skin or mouth antiseptic.
136-36-7	Resorcinol monobenzoate	127	4	3.1 [0.9 - 7.9]	UV-light absorber added to plastic materials.
584-84-9	Toluylene diisocyanate	857	4	0.5 [0.1 - 1.2]	May cause allergic reactions of the skin and the airways (asthma). Being a highly reactive compound, no stable patch test preparation is available. Validity of patch test results is doubtful.
72869-86-4, 41137-60-4	Urethane dimethacrylate	233	4	1.7 [0.5 - 4.3]	Methacrylate with various industrial applications.
1314-23-4	Zirconium(IV) oxide	2610	4	0.2 [0.0 - 0.4]	Used for diagnosing contact allergy to zirconium; patch test preparation is hardly validated.
114-07-8	Erythromycin	1697	4	0.2 [0.1 - 0.6]	Antibiotic topically and systemically used.
5466-77-3	2-Ethylhexyl-4-methoxycinnamate	789	4	0.5 [0.1 - 1.3]	UV-absorber used in sunscreens.
137-30-4	Ziram (Zinc dimethyldithiocarbamate)	154	4	2.6 [0.7 - 6.5]	Dithiocarbamate used as fungicide.
80-05-7	4,4'-Isopropylidenediphenol (Bisphenol A)	2724	4	0.1 [0.0 - 0.4]	Basic material in the production of epoxy resins and some acrylic resins.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
53-86-1	Indomethacin	1369	4	0.3 [0.1 - 0.7]	Non-steroidal anti-inflammatory drug, used systemically and topically.
10241-05-1	Molybdenum(V) chloride	5337	4	0.1 [0.0 - 0.2]	Used for diagnosing contact allergy to molybdenum; patch test preparation is hardly validated.
not applicable	Colophony mix II	47	4	8.5 [2.4 - 20.4]	Temporarily tested (special patch test preparation).
101-68-8	Diphenylmethane-4,4'-diisocyanate	1213	4	0.3 [0.1 - 0.8]	May cause allergic reactions of the skin and the airways (asthma). Being a highly reactive compound, no stable patch test preparation is available. Validity of patch test results is doubtful.
8014-09-3	Oil of patchouli	697	4	0.6 [0.2 - 1.5]	Fragrance oil used in perfumery.
822-06-0	Hexamethylene diisocyanate (HDI)	430	4	0.9 [0.3 - 2.4]	May cause allergic reactions of the skin and the airways (asthma). Being a highly reactive compound, no stable patch test preparation is available. Validity of patch test results is doubtful.
84776-23-8	Calendula officinalis	15	3	20.0 [4.3 - 48.1]	Extract of Marigold plants; very rare sensitizer.
70-30-4	Hexachlorophene	2140	3	0.1 [0.0 - 0.4]	Topical antiseptic used in body care products. .

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
110-27-0	Isopropyl myristate (IPM)	3132	3	0.1 [0.0 - 0.3]	Ointment base, solvent; no sensitizer.
97-88-1	n-Butyl methacrylate	284	3	1.1 [0.2 - 3.1]	Methacrylate with various industrial applications.
22204-53-1	Naproxen	419	3	0.7 [0.1 - 2.1]	Non-steroidal anti-inflammatory drug, used systemically and topically.
13463-41-7	Zinc pyrithione	1768	3	0.2 [0.0 - 0.5]	Used in anti-dandruff shampoos.
30007-47-7	Bronidox L (5-Bromo-5-nitro-1,3-dioxane)	1007	3	0.3 [0.1 - 0.9]	Preservative, rarely used, rarely sensitizing.
6197-30-4	Octocrylene	2993	3	0.1 [0.0 - 0.3]	UV-filter used in sunscreens.
103597-45-1	Bisotrizole	3031	3	0.1 [0.0 - 0.3]	UV-filter used in sunscreens.
111-12-6	Methyl-2-octynoate	738	3	0.4 [0.1 - 1.2]	One of the 26 fragrances subject to labelling.
68917-12-4	Narcissus poeticus absolute	706	3	0.4 [0.1 - 1.2]	Extract used in perfumery.
134-31-6	8-Hydroxyquinoline sulfate	434	2	0.5 [0.1 - 1.7]	Antimicrobial agent for topical use.
56-95-1	Chlorhexidine diacetate	454	2	0.4 [0.1 - 1.6]	Skin disinfectant, antimicrobial agent used in cosmetics and body care products.
106-23-0	Citronellal	3055	2	0.1 [0.0 - 0.2]	Fragrance compound, related to hydroxyl citronellal, which is one of the 26 fragrances subject to labelling.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
13048-33-4	1,6-Hexanediol diacrylate	135	2	1.5 [0.2 - 5.2]	Acrylate with various industrial applications.
150-13-0	p-Aminobenzoic acid (PABA)	1239	2	0.2 [0.0 - 0.6]	Sunscreen agent.
121-79-9	Propyl gallate	241	2	0.8 [0.1 - 3.0]	Antioxidant used in cosmetics and ointments.
977032-44-2	Tansy (Tanacetum vulgare)	3	2	66.7 [9.4 - 99.2]	A compositae plant.
7440-22-4	Silver (CI 77820) (E 174)	2686	2	0.1 [0.0 - 0.3]	Hardly ever sensitizing. Patch testing with silver is not validated to a large extent.
15625-89-5	Trimethylolpropane triacrylate	132	2	1.5 [0.2 - 5.4]	Acrylate with various industrial applications.
621-82-9	Cinnamic acid	19	2	10.5 [1.3 - 33.1]	Used as flavouring agent.
131-11-3	Dimethyl phthalate	903	2	0.2 [0.0 - 0.8]	Used as plasticizer in plastic materials.
10124-48-8	Mercury ammonium chloride	67	2	3.0 [0.4- 10.4]	Formerly tested as marker for contact allergy to inorganic mercury compounds.
	Urethane diacrylate	508	2	0.4 [0.0 - 1.4]	Acrylate with various industrial applications.
103-90-2	Paracetamol	2228	2	0.1 [0.0 - 0.3]	Pain-killing drug, occasionally eliciting drug eruptions.
479-92-5	Propyphenazone	1478	2	0.1 [0.0 - 0.5]	A drug with analgesic and antipyretic effects; no longer in use in Germany.
2835-95-2	4-Amino-2-hydroxytoluene	14	2	14.3 [1.8 - 42.8]	Hair dye compound.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
90-72-2	2,4,6-Tris(dimethylaminomethyl)phenol	53	1	1.9 [0.0 - 10.1]	Accelerator and hardener in epoxy resin systems. Frequent sensitizer, according to Finnish data. Patch test preparation was not available in Germany before 2016.
583-39-1	2-Mercaptobenzimidazole	151	1	0.7 [0.0 - 3.6]	Rubber ingredient, antiaging compound.
27503-81-7	2-Phenylbenzimidazole Sulfonic Acid (Eusolex 232)	1223	1	0.1 [0.0 - 0.5]	UV-filter used in sunscreens.
148-24-3	8-Hydroxyquinoline	55	1	1.8 [0.0 - 9.7]	Used as skin disinfectant and anti-septic.
8007-70-3	Anise oil ( <i>Pimpinella anisum</i> )	181	1	0.6 [0.0 - 3.0]	Used as flavouring and fragrance compound.
7727-43-7	Barium sulfate (pigment white 21-23) (CI 77120)	276	1	0.4 [0.0 - 2.0]	Used as X-ray contrast medium. Patch test preparation is also used for diagnosing barium allergy. However, it is hardly validated.
84775-45-1	Mugwort ( <i>Artemisia vulgaris</i> )	55	1	1.8 [0.0 - 9.7]	Immediate type allergy to Mugwort pollen is a frequent cause of allergic rhinitis. However, Mugwort rarely causes contact allergy, if at all.
94-18-8	Benzyl paraben	55	1	1.8 [0.0 - 9.7]	Benzyl paraben is not allowed in food or in cosmetics in the EU since 2014.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
298-46-4	Carbamazepine	27	1	3.7 [0.1 - 19.0]	Antiepileptic drug, also used in therapy of chronic pain. May cause drug eruptions.
76-57-3	Codeine	46	1	2.2 [0.1 - 11.5]	Analgesic, antitussive, and antidiarrheal drug.
56-18-8	Dipropylenetriamine (DPTA)	17	1	5.9 [0.1- 28.7]	Epoxy resin hardener.
12222-75-2	Disperse Blue 35	261	1	0.4 [0.0 - 2.1]	Textile dye of anthraquinone type.
2581-69-3	Disperse Orange 1 (CI 11080)	122	1	0.8 [0.0 - 4.5]	Textile dye of azo type.
6402-23-9	Ethacridine lactate monohydrate (Rivanol)	275	1	0.4 [0.0 - 2.0]	Formerly used as skin antiseptic.
103-11-7	2-Ethylhexyl acrylate	223	1	0.4 [0.0 - 2.5]	Acrylate with various industrial applications.
13453-07-1	Gold(III) chloride	55	1	1.8 [0.0 - 9.7]	Used for diagnosing gold allergy. Patch test preparation is not sufficiently validated.
22071-15-4	Ketoprofen	159	1	0.6 [0.0 - 3.5]	No-steroidal anti-inflammatory drug, also used topically.
8000-28-0	Lavender oil	25	1	4.0 [0.1 - 20.4]	Fragrance oil.
119-36-8	Methyl salicylate	292	1	0.3 [0.0 - 1.9]	Used as fragrance and flavour, in foods and beverages.
9000-45-7	Myrrh resinoid	125	1	0.8 [0.0 - 4.4]	Naturally occurring fragrance material.
101-87-1	N-Cyclohexyl-N'-phenyl-p-phenylenediamine	151	1	0.7 [0.0 - 3.6]	Antioxidant used in rubber goods.
7632-00-0	Sodium nitrite	93	1	1.1 [0.0 - 5.8]	Food additive, preservative.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
1313-82-2	Sodium sulfide	2	1	50.0 [1.3 - 98.7]	Water-soluble salt, giving alkaline solutions. When exposed to moist air, it emits hydrogen sulfide, which smells like rotten eggs.
8001-25-0	Olive oil	220	1	0.5 [0.0 - 2.5]	Not only a food oil, but also used topically or as vehicle in patch testing.
138-39-6	p-Aminomethylbenzolsulfonamide (Mafenide)	114	1	0.9 [0.0 - 4.8]	Formerly topically used sulfonamide.
50-06-6	Phenobarbital	27	1	3.7 [0.1 - 19.0]	Drug, used in sleeping pills and in anaesthesia. May cause drug eruptions.
50-33-9	Phenylbutazone	14	1	7.1 [0.2 - 33.9]	Non-steroidal anti-inflammatory drug.
8003-05-2, 55-68-5	Phenyl mercuric nitrate	150	1	0.7 [0.0 - 3.7]	Formerly used as preservative in eye drops or as disinfectant.
27083-27-8	Poly(hexamethylenbiguanide)-HCl (PHMB)	44	1	2.3 [0.1 - 12.0]	Biocide, used as a water disinfectant in the treatment of swimming pool water and in various consumer products. Uncommon allergen.
9005-66-7	Polysorbate 40 (Tween 40)	286	1	0.3 [0.0 - 1.9]	Emulsifier, ointment base ingredient.
not applicable	PPD mix	25	1	4.0 [0.1 - 20.4]	Mixture of IPPD, CPPD, and DPPD. No longer used.
11006-76-1	Pristinamycin (Virginiamycin)	350	1	0.3 [0.0 - 1.6]	Antibiotic.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
64-75-5	Tetracycline hydrochloride	1166	1	0.1 [0.0 - 0.5]	Antibiotic, rarely used topically.
115-86-6	Triphenyl phosphate	705	1	0.1 [0.0 - 0.8]	Softeners for plastic materials, flame retardant, also used in hydraulic oils.
7733-02-0	Zinc sulfate	529	1	0.2 [0.0 - 1.0]	Wood preservative; diluted solution has also been used as antiseptic.
7440-67-7	Zirconium	88	1	1.1 [0.0 - 6.2]	No validated patch test substance.
70356-09-1	4-tert-Butyl-4'-methoxy-dibenzoylmethane	1235	1	0.1 [0.0 - 0.5]	UV-filter used in sunscreens.
12222-83-2	Disperse Blue 85	122	1	0.8 [0.0 - 4.5]	Azo type textile dye.
12221-69-1	Basic Red 46	122	1	0.8 [0.0 - 4.5]	Azo type textile dye.
61951-51-7 + 12223-10-7	Disperse Blue mix 124/106	184	1	0.5 [0.0 - 3.0]	Mix of 2 azo dyes used for textiles.
62931-07-1	Ethylene urea melamine formaldehyde resin	101	1	1.0 [0.0 - 5.4]	Resin used as finish in textiles or leather goods, and also in lacquers.
12024-21-4	Gallium(II) oxide	4151	1	0.0 [0.0 - 0.1]	Used for diagnosing contact allergy to gallium. However, this is no sufficiently validated patch test preparation.

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]	Comments
207398-97-8	Indium(III) nitrate	325	1	0.3 [0.0 - 1.7]	Used for diagnosing contact allergy to indium. However, this is no sufficiently validated patch test preparation.
	Sulfonic acid melamine formaldehyde resin	37	1	2.7 [0.1 - 14.2]	Special formaldehyde resin.
156-57-0	Cysteamine hydrochloride	14	1	7.1 [0.2 - 33.9]	Hair dye component.

**Tab. 3.2.1.1** IVDK, 2007-2016: 5 allergens which elicited positive reactions exclusively in patients without notion if their dermatitis was occupationally caused or not, with number of patients tested, count and percentage of patients with positive reactions, supplemented with 95%- confidence interval (95%-CI).

CAS number	Substance	Count tested	Count positive	% positive [95%-CI]
1313-82-2	Sodium sulfide	2	1	50.0 [1.3 - 98.7]
101-87-1	N-Cyclohexyl-N'-phenyl-p-phenylenediamine	151	1	0.7 [0.0 - 3.6]
8001-25-0	Olive oil	220	1	0.5 [0.0 - 2.5]
27503-81-7	2-Phenylbenzimidazole Sulfonic Acid (Eusolex 232)	1223	1	0.1 [0.0 - 0.5]
70356-09-1	4-tert-Butyl-4'-methoxy-dibenzoylmethane	1235	1	0.1 [0.0 - 0.5]

**Tab. 3.2.1.2** IVDK, 2007 – 2016: compilation of all allergens (n=415) patch tested in patients with occupational dermatitis (OD patients; n=18,877) and/or patients without OD (non-OD patients; n=87,966) which elicited positive reactions, with numbers of patients tested, counts and percentages of patients with positive reactions, supplemented with 95% confidence intervals (95%-CIs), and indication whether percentages of positive reactions differed significantly between both patient groups. Significance on a 5%-level was deduced from non-overlapping 95%-CIs; calculation was limited to allergens patch tested in at least 85% of both patient groups (16,045 OD patients and 74,771 non-OD patients) in order to avoid selection bias by differing indications for patch testing.

Coding of significance: \* = significantly higher percentage of positive reactions in OD patients;  
# = significantly higher percentage of positive reactions in non-OD patients.

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
10101-97-0	Nickel(II)-sulfate hexahydrate	16844	2645	15.7 [15.2 - 16.3]	76492	11031	14.4 [14.2 - 14.7]	*
not applicable	Fragrance mix	17034	1279	7.5 [7.1 - 7.9]	76298	6766	8.9 [8.7 - 9.1]	#
7791-13-1	Cobalt(II) chloride hexahydrate	17119	1142	6.7 [6.3 - 7.1]	76550	3603	4.7 [4.6 - 4.9]	*
55965-84-9	Methylchloroisothiazolinone/ Methylisothiazolinone (MCI/MI)	17234	998	5.8 [5.4 - 6.2]	76400	2510	3.3 [3.2 - 3.4]	*
8007-00-9	Balsam of Peru (Myroxolon pereirae)	17205	978	5.7 [5.3 - 6.0]	75991	6344	8.3 [8.2 - 8.5]	#
not applicable	Thiuram mix	17117	978	5.7 [5.4 - 6.1]	76447	1095	1.4 [1.3 - 1.5]	*
2682-20-4	Methylisothiazolinone	13789	954	6.9 [6.5 - 7.4]	48615	2000	4.1 [3.9 - 4.3]	
7778-50-9	Potassium dichromate	17201	905	5.3 [4.9 - 5.6]	76598	2692	3.5 [3.4 - 3.6]	*

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
not applicable	Fragrance mix II	17095	841	4.9 [4.6 - 5.3]	76265	3892	5.1 [4.9 - 5.3]	
8050-09-7	Colophony (Rosin)	17197	807	4.7 [4.4 - 5.0]	76470	2840	3.7 [3.6 - 3.9]	*
35691-65-7	Methyldibromo glutaronitrile (dibromdicyanobutane)	17202	637	3.7 [3.4 - 4.0]	76229	2028	2.7 [2.5 - 2.8]	*
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	16563	605	3.7 [3.4 - 3.9]	76036	921	1.2 [1.1 - 1.3]	*
97-77-8	Tetraethylthiuram disulfide (TETD)	11501	602	5.2 [4.8 - 5.7]	12269	239	1.9 [1.7 - 2.2]	
25655-41-8	Povidone iodine	8053	565	7.0 [6.5 - 7.6]	15864	1344	8.5 [8.0 - 8.9]	
97-74-5	Tetramethylthiuram monosulfide (TMTM)	11502	459	4.0 [3.6 - 4.4]	12264	203	1.7 [1.4 - 1.9]	
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	17238	436	2.5 [2.3 - 2.8]	76022	1511	2.0 [1.9 - 2.1]	*
85665-41-4	Propolis	17228	426	2.5 [2.2 - 2.7]	76016	2558	3.4 [3.2 - 3.5]	#
106-50-3	p-Phenylenediamine (PPD) (CI 76060)	4572	393	8.6 [7.8 - 9.4]	16594	1158	7.0 [6.6 - 7.4]	
95-70-5	Toluene-2,5-diamine	1836	362	19.7 [17.9 - 21.6]	5497	950	17.3 [16.3 - 18.3]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
	Amerchol L-101	14264	345	2.4 [2.2 - 2.7]	52963	2006	3.8 [3.6 - 4.0]	
50-00-0	Formaldehyde	17244	333	1.9 [1.7 - 2.1]	76089	728	1.0 [0.9 - 1.0]	*
102-06-7	1,3-Diphenylguanidine (DPG)	12164	321	2.6 [2.4 - 2.9]	18000	470	2.6 [2.4 - 2.9]	
8027-33-6	Lanolin alcohols	17244	318	1.8 [1.6 - 2.1]	76027	1930	2.5 [2.4 - 2.7]	#
137-26-8	Tetramethylthiuram disulfide (TMTD)	11499	317	2.8 [2.5 - 3.1]	12268	137	1.1 [0.9 - 1.3]	
16096-31-4	1,6-Hexanediol diglycidylether	4419	302	6.8 [6.1 - 7.6]	6690	55	0.8 [0.6 - 1.1]	
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	15855	296	1.9 [1.7 - 2.1]	57209	592	1.0 [1.0 - 1.1]	
8006-64-2	Oil of turpentine	17220	294	1.7 [1.5 - 1.9]	75966	1179	1.6 [1.5 - 1.6]	
8006-81-3	Ylang Ylang oil	13096	284	2.2 [1.9 - 2.4]	53075	1406	2.6 [2.5 - 2.8]	
94-36-0	Benzoyl peroxide	4554	281	6.2 [5.5 - 6.9]	15771	879	5.6 [5.2 - 5.9]	
61789-40-0	Cocamidopropyl betaine	14528	279	1.9 [1.7 - 2.2]	54415	1190	2.2 [2.1 - 2.3]	
141-43-5	Monoethanolamine (MEA)	4916	278	5.7 [5.0 - 6.3]	6445	96	1.5 [1.2 - 1.8]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
7727-54-0	Ammonium persulfate	1581	255	16.1 [14.3 - 18.0]	5240	91	1.7 [1.4 - 2.1]	
101-77-9	4,4'-Diaminodiphenylmethane	5806	246	4.2 [3.7 - 4.8]	11426	223	2.0 [1.7 - 2.2]	
2425-79-8	1,4-Butanediol diglycidylether	4415	242	5.5 [4.8 - 6.2]	6679	55	0.8 [0.6 - 1.1]	
66204-44-2	Methylene-bis(methyloxazolidine)	4922	237	4.8 [4.2 - 5.5]	2091	42	2.0 [1.5 - 2.7]	
149-30-4	Mercaptobenzothiazole	17230	233	1.4 [1.2 - 1.5]	76445	324	0.4 [0.4 - 0.5]	*
1034-01-1	Octyl gallate	14280	228	1.6 [1.4 - 1.8]	52928	1190	2.2 [2.1 - 2.4]	
923-26-2	2-Hydroxypropyl methacrylate (HPMA)	4316	226	5.2 [4.6 - 5.9]	11273	215	1.9 [1.7 - 2.2]	
not applicable	Mercapto mix (CBS, MBTS, MOR)	17226	223	1.3 [1.1 - 1.5]	76424	384	0.5 [0.5 - 0.6]	*
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	17233	220	1.3 [1.1 - 1.5]	76015	278	0.4 [0.3 - 0.4]	*
868-77-9	2-Hydroxyethyl methacrylate (HEMA)	4369	220	5.0 [4.4 - 5.7]	14805	234	1.6 [1.4 - 1.8]	
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	17219	219	1.3 [1.1 - 1.5]	76013	455	0.6 [0.5 - 0.7]	*
111-30-8	Glutardialdehyde (Glutaral)	9443	210	2.2 [1.9 - 2.5]	20135	126	0.6 [0.5 - 0.7]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
97-90-5	Ethyleneglycol dimethacrylate	4332	208	4.8 [4.2 - 5.5]	11573	185	1.6 [1.4 - 1.8]	
514-10-3	Abietic acid	4095	203	5.0 [4.3 - 5.7]	6542	114	1.7 [1.4 - 2.1]	
2634-33-5	1,2-Benzisothiazolin-3-one, sodium salt	7138	202	2.8 [2.5 - 3.2]	9179	137	1.5 [1.3 - 1.8]	
97-54-1	Isoeugenol	4713	200	4.2 [3.7 - 4.9]	15797	515	3.3 [3.0 - 3.5]	
9000-50-4	Oakmoss absolute	4859	194	4.0 [3.5 - 4.6]	16372	803	4.9 [4.6 - 5.2]	
122-60-1	Phenylglycidyl ether	5551	192	3.5 [3.0 - 4.0]	10793	66	0.6 [0.5 - 0.8]	
102-77-2	Morpholinylmercaptobenzothiazole	12554	189	1.5 [1.3 - 1.7]	12733	109	0.9 [0.7 - 1.0]	
51200-87-4	4,4-Dimethyloxazolidine/(Bioban CS 1135	4916	189	3.8 [3.3 - 4.4]	2090	19	0.9 [0.5 - 1.4]	
94-37-1	Dipentamethylenethiuram disulfide	11510	188	1.6 [1.4 - 1.9]	12273	103	0.8 [0.7 - 1.0]	
54-64-8	Thimerosal	2214	185	8.4 [7.2 - 9.6]	17680	768	4.3 [4.0 - 4.7]	
10124-48-8	Ammoniated mercury	4182	182	4.4 [3.8 - 5.0]	22182	680	3.1 [2.8 - 3.3]	
1948-33-0	tert-Butylhydroquinone	14268	179	1.3 [1.1 - 1.5]	52831	1261	2.4 [2.3 - 2.5]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
57-55-6	Propylene glycol	14244	175	1.2 [1.1 - 1.4]	52831	957	1.8 [1.7 - 1.9]	
818-61-1	Hydroxyethyl acrylate	4448	170	3.8 [3.3 - 4.4]	6692	122	1.8 [1.5 - 2.2]	
14548-60-8	Benzyl hemiformal	4920	168	3.4 [2.9 - 4.0]	2091	23	1.1 [0.7 - 1.6]	
not applicable	Compositae Mix	8496	164	1.9 [1.6 - 2.2]	39692	560	1.4 [1.3 - 1.5]	
52-51-7	Bronopol (2-Bromo-2-nitro-1,3-propanediol)	16581	162	1.0 [0.8 - 1.1]	69599	585	0.8 [0.8 - 0.9]	
84776-64-7	Jasmine absolute	13090	158	1.2 [1.0 - 1.4]	53062	788	1.5 [1.4 - 1.6]	
60-09-3	4-Aminoazobenzene (CI 11000)	1695	157	9.3 [7.9 - 10.7]	3310	183	5.5 [4.8 - 6.4]	
not applicable	Compositae Mix II	8805	154	1.7 [1.5 - 2.0]	36103	491	1.4 [1.2 - 1.5]	
51229-78-8	Quaternium 15	14458	138	1.0 [0.8 - 1.1]	49914	219	0.4 [0.4 - 0.5]	
1477-55-0	m-Xylylenediamine	3823	137	3.6 [3.0 - 4.2]	5610	18	0.3 [0.2 - 0.5]	
4405-13-4	Glyoxal trimer dihydrate	9740	136	1.4 [1.2 - 1.6]	16304	58	0.4 [0.3 - 0.5]	
not applicable	Paraben mix	17223	135	0.8 [0.7 - 0.9]	76112	614	0.8 [0.7 - 0.9]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
730-40-5	Disperse Orange 3 (CI 11005)	2278	132	5.8 [4.9 - 6.8]	6431	215	3.3 [2.9 - 3.8]	
94994-93-1	Tree moss	2587	132	5.1 [4.3 - 6.0]	6052	300	5.0 [4.4 - 5.5]	
95-33-0	N-Cyclohexyl-2-benzothiazyl-sulfenamide	11497	127	1.1 [0.9 - 1.3]	12217	83	0.7 [0.5 - 0.8]	
68603-42-9	Coconut diethanolamide (cocamide DEA)	14193	127	0.9 [0.7 - 1.1]	52686	294	0.6 [0.5 - 0.6]	
107-75-5	Hydroxycitronellal	5285	125	2.4 [2.0 - 2.8]	17552	333	1.9 [1.7 - 2.1]	
7647-10-1	Palladium chloride	2095	123	5.9 [4.9 - 7.0]	11843	940	7.9 [7.5 - 8.4]	
109-16-0	Triethyleneglycol dimethacrylate (TEGDMA)	4326	122	2.8 [2.3 - 3.4]	11580	73	0.6 [0.5 - 0.8]	
104-55-2	Cinnamal (cinnamic aldehyde)	4842	120	2.5 [2.1 - 3.0]	16162	332	2.1 [1.8 - 2.3]	
3101-60-8	p-tert-Butylphenyl glycidylether	3564	119	3.3 [2.8 - 4.0]	5210	36	0.7 [0.5 - 1.0]	
8006-87-9	Sandalwood Oil	13099	117	0.9 [0.7 - 1.1]	53070	825	1.6 [1.5 - 1.7]	
5392-40-5	Citral	3634	114	3.1 [2.6 - 3.8]	11038	245	2.2 [2.0 - 2.5]	
98-29-3	4-tert-Butylcatechol	12979	113	0.9 [0.7 - 1.0]	16305	189	1.2 [1.0 - 1.3]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
2224-44-4, 1854-23-5	(Nitrobutyl)morpholine/.. (Biboban P 1487)	4611	111	2.4 [2.0 - 2.9]	1917	34	1.8 [1.2 - 2.5]	
80-62-6	Methylmethacrylate (MMA)	4383	108	2.5 [2.0 - 3.0]	14332	157	1.1 [0.9 - 1.3]	
8007-02-1, 91844-92-7	Lemongrass oil	2972	108	3.6 [3.0 - 4.4]	7720	182	2.4 [2.0 - 2.7]	
not applicable	Sesquiterpenlactone mix	3475	103	3.0 [2.4 - 3.6]	17506	226	1.3 [1.1 - 1.5]	
26447-14-3	Cresylglycidyl ether	4468	103	2.3 [1.9 - 2.8]	6811	19	0.3 [0.2 - 0.4]	
20554-84-1	Parthenolide	2636	103	3.9 [3.2 - 4.7]	11484	162	1.4 [1.2 - 1.6]	
4065-45-6	Benzophenone-4 (Sulisobenzone)	13212	101	0.8 [0.6 - 0.9]	48479	440	0.9 [0.8 - 1.0]	
2438-72-4	Bufexamac	12574	99	0.8 [0.6 - 1.0]	58357	574	1.0 [0.9 - 1.1]	
9000-64-0	Tolu balsam	1214	98	8.1 [6.6 - 9.7]	9505	993	10.4 [9.8 - 11.1]	
104-54-1	Cinnamyl alcohol	4822	98	2.0 [1.7 - 2.5]	16161	265	1.6 [1.4 - 1.8]	
123-30-8	p-Aminophenol (CI 76550)	1834	97	5.3 [4.3 - 6.4]	5502	448	8.1 [7.4 - 8.9]	
1565-94-2	BIS-GMA	4037	96	2.4 [1.9 - 2.9]	7659	48	0.6 [0.5 - 0.8]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
78491-02-8	Diazolidinyl urea	14482	93	0.6 [0.5 - 0.8]	49768	251	0.5 [0.4 - 0.6]	
110-44-1	Sorbic acid	14389	91	0.6 [0.5 - 0.8]	49401	306	0.6 [0.6 - 0.7]	
67762-27-0	Cetearyl alcohol	17234	87	0.5 [0.4 - 0.6]	75978	716	0.9 [0.9 - 1.0]	#
74-31-7	N,N'-Diphenyl-p-phenylenediamine (DPPD)	11482	86	0.7 [0.6 - 0.9]	12217	54	0.4 [0.3 - 0.6]	
63449-41-2	Benzalkonium chloride	8232	84	1.0 [0.8 - 1.3]	19595	207	1.1 [0.9 - 1.2]	
79-07-2	2-Chloroacetamide	14708	84	0.6 [0.5 - 0.7]	50610	249	0.5 [0.4 - 0.6]	
25085-50-1	p-tert-Butylphenol formaldehyde resin (PTBFR)	12870	84	0.7 [0.5 - 0.8]	58452	327	0.6 [0.5 - 0.6]	
7747-35-5	7-Ethylbicyclooxazolidine	4922	84	1.7 [1.4 - 2.1]	2088	8	0.4 [0.2 - 0.8]	
2426-08-6	Butyl glycidylether	4432	82	1.9 [1.5 - 2.3]	6726	12	0.2 [0.1 - 0.3]	
120-78-5	Dibenzothiazyl disulfide (MBTS)	11495	80	0.7 [0.6 - 0.9]	12220	54	0.4 [0.3 - 0.6]	
2855-13-2	Isophorone diamine	4489	79	1.8 [1.4 - 2.2]	6861	16	0.2 [0.1 - 0.4]	
9003-35-4	Phenol formaldehyde resin (Novolac)	5581	79	1.4 [1.1 - 1.8]	10919	112	1.0 [0.8 - 1.2]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
102-71-6	Triethanolamine	14655	77	0.5 [0.4 - 0.7]	53042	169	0.3 [0.3 - 0.4]	
4719-04-4	1,3,5-Tris(2-hydroxyethyl)-hexahydrotriazine	3433	76	2.2 [1.7 - 2.8]	1259	5	0.4 [0.1 - 0.9]	
4602-84-0	Farnesol	3901	76	1.9 [1.5 - 2.4]	11380	217	1.9 [1.7 - 2.2]	
111-42-2	Diethanolamine (DEA)	3904	73	1.9 [1.5 - 2.3]	1613	5	0.3 [0.1 - 0.7]	
39236-46-9	Imidazolidinyl urea (Germall 115)	14454	73	0.5 [0.4 - 0.6]	49732	226	0.5 [0.4 - 0.5]	
26530-20-1	Octyl isothiazolinone	5513	72	1.3 [1.0 - 1.6]	3990	14	0.4 [0.2 - 0.6]	
140-88-5	Ethyl acrylate	1064	70	6.6 [5.2 - 8.2]	6718	82	1.2 [1.0 - 1.5]	
111-40-0	Diethylenetriamine	4433	68	1.5 [1.2 - 1.9]	6753	26	0.4 [0.3 - 0.6]	
17796-82-6	N-(Cyclohexylthio)phthalimide	11482	68	0.6 [0.5 - 0.8]	12207	51	0.4 [0.3 - 0.5]	
103-16-2	Monobenzene	11489	66	0.6 [0.4 - 0.7]	12314	114	0.9 [0.8 - 1.1]	
97-53-0	Eugenol	4900	65	1.3 [1.0 - 1.7]	17046	276	1.6 [1.4 - 1.8]	
532-32-1	Sodium benzoate	14469	65	0.4 [0.3 - 0.6]	50639	208	0.4 [0.4 - 0.5]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
	Amalgam (with zinc)	1279	64	5.0 [3.9 - 6.3]	8735	251	2.9 [2.5 - 3.2]	
97-63-2	Ethyl methacrylate	1033	63	6.1 [4.7 - 7.7]	6721	55	0.8 [0.6 - 1.1]	
106-24-1	Geraniol	4691	63	1.3 [1.0 - 1.7]	15918	224	1.4 [1.2 - 1.6]	
6440-58-0	DMDM Hydantoin	14427	63	0.4 [0.3 - 0.6]	50318	167	0.3 [0.3 - 0.4]	
25620-58-0	Trimethylhexane-1,6-diamine	3818	60	1.6 [1.2 - 2.0]	5616	24	0.4 [0.3 - 0.6]	
929-06-6	2-(2-Aminoethoxy)ethanol (Diglycolamine)	3433	59	1.7 [1.3 - 2.2]	1260	7	0.6 [0.2 - 1.1]	
30618-84-9	Glyceryl thioglycolate	1458	54	3.7 [2.8 - 4.8]	5185	53	1.0 [0.8 - 1.3]	
84691-64-8	Tanacetum vulgare	1624	54	3.3 [2.5 - 4.3]	6754	105	1.6 [1.3 - 1.9]	
333-18-6	Ethylenediamine dihydrochloride	12370	52	0.4 [0.3 - 0.6]	19219	46	0.2 [0.2 - 0.3]	
100-97-0	Methenamine (hexamethylene tetramine)	11555	50	0.4 [0.3 - 0.6]	12359	24	0.2 [0.1 - 0.3]	
8000-34-8	Clove oil	2779	50	1.8 [1.3 - 2.4]	6760	75	1.1 [0.9 - 1.4]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
591-27-5	3-Aminophenol	1473	47	3.2 [2.4 - 4.2]	5227	291	5.6 [5.0 - 6.2]	
9003-08-1	Melamin formaldehyde resin	3400	47	1.4 [1.0 - 1.8]	11885	56	0.5 [0.4 - 0.6]	
8007-43-0	Sorbitan sesquioleate	6702	46	0.7 [0.5 - 0.9]	25874	335	1.3 [1.2 - 1.4]	
2082-81-7	1,4-Butanediol dimethacrylate (BUDMA)	1031	45	4.4 [3.2 - 5.8]	6709	31	0.5 [0.3 - 0.7]	
18472-51-0	Chlorhexidine digluconate	15168	44	0.3 [0.2 - 0.4]	52024	189	0.4 [0.3 - 0.4]	
10210-36-3	Sodium thiosulfate aurate	2033	42	2.1 [1.5 - 2.8]	10552	354	3.4 [3.0 - 3.7]	
30499-70-8	Trimethylolpropane triglycidylether	3813	42	1.1 [0.8 - 1.5]	5608	11	0.2 [0.1 - 0.4]	
2455-24-5	Tetrahydrofurfuryl methacrylate	950	41	4.3 [3.1 - 5.8]	6696	29	0.4 [0.3 - 0.6]	
7681-57-4	Sodium metabisulfite	1246	41	3.3 [2.4 - 4.4]	9017	289	3.2 [2.9 - 3.6]	
84082-83-7	Achillea millefolium	1621	41	2.5 [1.8 - 3.4]	6712	77	1.1 [0.9 - 1.4]	
8016-38-4, 72968-50-4	Neroli oil	2855	40	1.4 [1.0 - 1.9]	6366	52	0.8 [0.6 - 1.1]	
87-66-1	Pyrogallol	1497	36	2.4 [1.7 - 3.3]	5243	138	2.6 [2.2 - 3.1]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
8000-27-9	Cedarwood oil	2862	36	1.3 [0.9 - 1.7]	6389	73	1.1 [0.9 - 1.4]	
101-86-0	Hexyl cinnamal	3615	34	0.9 [0.7 - 1.3]	10872	149	1.4 [1.2 - 1.6]	
106-22-9	Citronellol	4253	32	0.8 [0.5 - 1.1]	12636	92	0.7 [0.6 - 0.9]	
3811-73-2	Sodium-2-pyridinethiol-1-oxide	4896	31	0.6 [0.4 - 0.9]	2081	3	0.1 [0.0 - 0.4]	
121-00-6	Butylhydroxyanisole (BHA)	14292	29	0.2 [0.1 - 0.3]	52888	227	0.4 [0.4 - 0.5]	
72869-86-4	Diurethan dimethacrylate	947	28	3.0 [2.0 - 4.2]	6454	18	0.3 [0.2 - 0.4]	
136-23-2	Zinc dibutyldithiocarbamate (ZDBC)	11606	26	0.2 [0.1 - 0.3]	12871	27	0.2 [0.1 - 0.3]	
8006-78-8, 8002-41-3	Laurel leaf oil	2856	26	0.9 [0.6 - 1.3]	6396	34	0.5 [0.4 - 0.7]	
3524-68-3	Pentaerythritol triacrylate (PETA)	1081	25	2.3 [1.5 - 3.4]	6713	38	0.6 [0.4 - 0.8]	
587-98-4	Acid Yellow 36 (CI 13065)	1915	25	1.3 [0.8 - 1.9]	6080	43	0.7 [0.5 - 1.0]	
91-64-5	Coumarin	3615	25	0.7 [0.4 - 1.0]	10845	60	0.6 [0.4 - 0.7]	
1405-10-3	Neomycin sulfate	2438	23	0.9 [0.6 - 1.4]	20335	513	2.5 [2.3 - 2.7]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
5421-46-5	Ammonium thioglycolate	1463	22	1.5 [0.9 - 2.3]	5160	22	0.4 [0.3 - 0.6]	
7553-56-2	Iodine	976	22	2.3 [1.4 - 3.4]	5174	241	4.7 [4.1 - 5.3]	
68917-12-4	Narcissus absolute	2326	22	0.9 [0.6 - 1.4]	5053	44	0.9 [0.6 - 1.2]	
15121-94-5	Primin	2475	20	0.8 [0.5 - 1.2]	12211	68	0.6 [0.4 - 0.7]	
7439-97-6	Mercury (metallic)	565	20	3.5 [2.2 - 5.4]	828	36	4.3 [3.1 - 6.0]	
90-02-8	Salicyl aldehyde	2851	20	0.7 [0.4 - 1.1]	6364	69	1.1 [0.8 - 1.4]	
123-31-9	Hydroquinone	3789	19	0.5 [0.3 - 0.8]	19664	183	0.9 [0.8 - 1.1]	
7772-99-8	Stannous chloride	2095	19	0.9 [0.5 - 1.4]	10296	60	0.6 [0.4 - 0.7]	
80-54-6	Butylphenyl methylpropional (Lilial)	2850	19	0.7 [0.4 - 1.0]	6414	31	0.5 [0.3 - 0.7]	
102-08-9	N,N'-Diphenylthiourea	11702	18	0.2 [0.1 - 0.2]	16045	31	0.2 [0.1 - 0.3]	
61951-51-7	Disperse Blue 124	1687	18	1.1 [0.6 - 1.7]	4706	47	1.0 [0.7 - 1.3]	
5421-66-9	Bismark brown R	1910	18	0.9 [0.6 - 1.5]	6081	52	0.9 [0.6 - 1.1]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
94-09-7	Benzocaine	2049	17	0.8 [0.5 - 1.3]	15707	197	1.3 [1.1 - 1.4]	
103694-68-4	Majantol	3647	17	0.5 [0.3 - 0.7]	10394	97	0.9 [0.8 - 1.1]	
100-51-6	Benzyl alcohol	14634	16	0.1 [0.1 - 0.2]	51745	127	0.2 [0.2 - 0.3]	
3179-89-3	Disperse Red 17 (CI 11210)	1937	16	0.8 [0.5 - 1.3]	6180	65	1.1 [0.8 - 1.3]	
2832-40-8	Disperse Yellow 3 (CI 11855)	1934	16	0.8 [0.5 - 1.3]	6179	61	1.0 [0.8 - 1.3]	
3380-34-5	Triclosan	14441	16	0.1 [0.1 - 0.2]	50341	191	0.4 [0.3 - 0.4]	
122-40-7	Amyl cinnamal	4668	15	0.3 [0.2 - 0.5]	15759	106	0.7 [0.6 - 0.8]	
28064-14-4, 54208-63-8, 57469-07-5, 2095-03-6	Bisphenol F epoxy resin	117	15	12.8 [7.4 - 20.3]	34	2	5.9 [0.7 - 19.7]	
8014-09-3	Patchouli oil	2331	14	0.6 [0.3 - 1.0]	5078	67	1.3 [1.0 - 1.7]	
84929-31-7, 8008-56-8	Lemon oil	2890	14	0.5 [0.3 - 0.8]	6403	28	0.4 [0.3 - 0.6]	
51333-22-3	Budesonide	2447	14	0.6 [0.3 - 1.0]	10275	203	2.0 [1.7 - 2.3]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
7773-01-5	Manganese(II) chloride	276	14	5.1 [2.8 - 8.4]	5178	169	3.3 [2.8 - 3.8]	
1166-52-5	Dodecyl gallate (Lauryl gallate)	493	13	2.6 [1.4 - 4.5]	1571	22	1.4 [0.9 - 2.1]	
8000-48-4, 84625-32-1	Eucalypt oil	2857	13	0.5 [0.2 - 0.8]	6492	18	0.3 [0.2 - 0.4]	
1405-41-0	Gentamicin sulfate	964	13	1.3 [0.7 - 2.3]	13225	345	2.6 [2.3 - 2.9]	
55560-96-8	Tixocortol-pivalate	2576	13	0.5 [0.3 - 0.9]	10284	177	1.7 [1.5 - 2.0]	
68516-81-4	Disperse Blue 106	1639	13	0.8 [0.4 - 1.4]	4703	46	1.0 [0.7 - 1.3]	
not applicable	Carba-Mix	59	13	22.0 [12.3 - 34.7]	99	4	4.0 [1.1 - 10.0]	
92-88-6	4,4'-Dihydroxybiphenyl	10524	12	0.1 [0.1 - 0.2]	11574	13	0.1 [0.1 - 0.2]	
65-85-0	Benzoic acid	742	12	1.6 [0.8 - 2.8]	5002	133	2.7 [2.2 - 3.1]	
8015-92-7	Chamomilla romana (Anthemis nobilis)	819	12	1.5 [0.8 - 2.5]	4280	19	0.4 [0.3 - 0.7]	
13820-53-6	Sodium tetrachloropalladate	44	12	27.3 [15.0 - 42.8]	596	181	30.4 [26.7 - 34.2]	
479-20-9	Atranorin	1619	11	0.7 [0.3 - 1.2]	6765	48	0.7 [0.5 - 0.9]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
10025-73-7	Chromium(III) chloride	179	11	6.1 [3.1 - 10.7]	621	17	2.7 [1.6 - 4.3]	
2872-52-8	Disperse Red 1 (CI 11110)	1936	11	0.6 [0.3 - 1.0]	6184	37	0.6 [0.4 - 0.8]	
4146-30-9	Framycetin sulfate	854	11	1.3 [0.6 - 2.3]	6757	176	2.6 [2.2 - 3.0]	
9011-05-6	Urea formaldehyde resin	2586	11	0.4 [0.2 - 0.8]	5427	19	0.4 [0.2 - 0.5]	
112-24-3	Triethylene tetramine	1150	11	1.0 [0.5 - 1.7]	1023	1	0.1 [0.0 - 0.5]	
59-50-7	4-Chloro-3-methylphenol	5036	11	0.2 [0.1 - 0.4]	8544	14	0.2 [0.1 - 0.3]	
128-37-0	Butylhydroxytoluene (BHT)	14289	10	0.1 [0.0 - 0.1]	52901	101	0.2 [0.2 - 0.2]	
7758-99-8	Copper(II) sulfate pentahydrate	2107	10	0.5 [0.2 - 0.9]	13183	57	0.4 [0.3 - 0.6]	
not applicable	Polyethyleneglycol ointment DAB 8	14182	10	0.1 [0.0 - 0.1]	52671	94	0.2 [0.1 - 0.2]	
121-33-5	Vanillin	3681	10	0.3 [0.1 - 0.5]	11643	28	0.2 [0.2 - 0.3]	
7646-85-7	Zinc chloride	317	10	3.2 [1.5 - 5.7]	1606	27	1.7 [1.1 - 2.4]	
14726-36-4	Zinc dibenzylthiocarbamate	11820	10	0.1 [0.0 - 0.2]	14095	13	0.1 [0.0 - 0.2]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
122-99-6	2-Phenoxyethanol	4337	9	0.2 [0.1 - 0.4]	3049	10	0.3 [0.2 - 0.6]	
109-46-6	N,N'-Dibutylthiourea	11496	9	0.1 [0.0 - 0.1]	12267	22	0.2 [0.1 - 0.3]	
8006-90-4	Peppermint oil	3547	9	0.3 [0.1 - 0.5]	8305	47	0.6 [0.4 - 0.8]	
7562-61-0	Usnic acid	1630	9	0.6 [0.3 - 1.0]	6792	51	0.8 [0.6 - 1.0]	
2198-59-6	p-Aminodiphenylamine hydrochloride	81	9	11.1 [5.2 - 20.0]	308	39	12.7 [9.2 - 16.9]	
4074-88-8	Diethylene glycol diacrylate	90	9	10.0 [4.7 - 18.1]	.	.	. [ . - . ]	
1680-21-3	Triethylene glycol diacrylate	88	9	10.2 [4.8 - 18.5]	.	.	. [ . - . ]	
26266-77-3, 127-36-6	Abitol (dihydroabietyl alcohol)	824	8	1.0 [0.4 - 1.9]	5430	83	1.5 [1.2 - 1.9]	
100-52-7	Benzaldehyde	3009	8	0.3 [0.1 - 0.5]	6698	15	0.2 [0.1 - 0.4]	
7718-98-1	Vanadium(III) chloride	430	8	1.9 [0.8 - 3.6]	1252	51	4.1 [3.0 - 5.3]	
122-18-9	Cetalkonium chloride	853	7	0.8 [0.3 - 1.7]	8429	27	0.3 [0.2 - 0.5]	
8049-85-2	Amalgam (without zinc)	333	7	2.1 [0.8 - 4.3]	459	16	3.5 [2.0 - 5.6]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
	Amalgam alloy metals (Ag, Cu, Sn, Zn)	1278	7	0.5 [0.2 - 1.1]	8938	29	0.3 [0.2 - 0.5]	
78-70-6	Linalool (stabilized)	2860	7	0.2 [0.1 - 0.5]	6414	23	0.4 [0.2 - 0.5]	
94994-93-1	Treemoss absolute	267	7	2.6 [1.1 - 5.3]	357	14	3.9 [2.2 - 6.5]	
10108-64-2	Cadmium chloride	539	6	1.1 [0.4 - 2.4]	1851	17	0.9 [0.5 - 1.5]	
10101-53-8	Chromium-(III)-sulfate	355	6	1.7 [0.6 - 3.6]	1179	8	0.7 [0.3 - 1.3]	
111-12-6	Methyl heptincarbonate	2583	6	0.2 [0.1 - 0.5]	6043	28	0.5 [0.3 - 0.7]	
88-04-0	4-Chloro-3,5-dimethylphenol	3499	6	0.2 [0.1 - 0.4]	3863	4	0.1 [0.0 - 0.3]	
6004-24-6	Cetylpyridinium chloride	1113	5	0.4 [0.1 - 1.0]	1585	7	0.4 [0.2 - 0.9]	
13967-50-5	Potassium dicyanoaurate	880	5	0.6 [0.2 - 1.3]	3544	12	0.3 [0.2 - 0.6]	
55-55-0	p-Methylamino phenolsulfate	111	5	4.5 [1.5 - 10.2]	382	32	8.4 [5.8 - 11.6]	
1330-78-5	Tricresyl phosphate	2753	5	0.2 [0.1 - 0.4]	5829	8	0.1 [0.1 - 0.3]	
89997-65-9	Featherfew flowers extract	123	5	4.1 [1.3 - 9.2]	1383	7	0.5 [0.2 - 1.0]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
1338-51-8	Toluenesulfonamide formaldehyde resin	2610	5	0.2 [0.1 - 0.4]	15314	32	0.2 [0.1 - 0.3]	
	Cycloaliphatisches Epoxidharz	70	5	7.1 [2.4 - 15.9]	55	2	3.6 [0.4 - 12.5]	
	Arnica montana	2168	5	0.2 [0.1 - 0.5]	10078	35	0.3 [0.2 - 0.5]	
84082-60-0	Chamomilla recutita (German chamomile)	848	5	0.6 [0.2 - 1.4]	3579	9	0.3 [0.1 - 0.5]	
69-53-4	Ampicillin	29	4	13.8 [3.9 - 31.7]	3301	190	5.8 [5.0 - 6.6]	
13820-41-2	Ammonium tetrachloroplatinate(II)	1980	4	0.2 [0.1 - 0.5]	10410	35	0.3 [0.2 - 0.5]	
	Butanedion-diacrylat	89	4	4.5 [1.2 - 11.1]	.	.	. [. - .]	
2872-48-2	Disperse Red 11 (CI 62015)	1929	4	0.2 [0.1 - 0.5]	6093	5	0.1 [0.0 - 0.2]	
50-23-7	Hydrocortisone (Cortisol)	2156	4	0.2 [0.1 - 0.5]	8525	8	0.1 [0.0 - 0.2]	
13609-67-1	Hydrocortisone-17-butyrate	2331	4	0.2 [0.0 - 0.4]	9234	89	1.0 [0.8 - 1.2]	
68-89-3	Metamizole	122	4	3.3 [0.9 - 8.2]	1346	20	1.5 [0.9 - 2.3]	
8008-57-9	Orange oil	2857	4	0.1 [0.0 - 0.4]	6380	14	0.2 [0.1 - 0.4]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
98-54-4	4-tert-Butylphenol	3580	4	0.1 [0.0 - 0.3]	1772	4	0.2 [0.1 - 0.6]	
50-24-8	Prednisolone	2154	4	0.2 [0.1 - 0.5]	8529	53	0.6 [0.5 - 0.8]	
72869-86-4, 41137-60-4	Urethane dimethacrylate	96	4	4.2 [1.1 - 10.3]	.	.	. [ . - . ]	
89-78-1	Menthol	2813	4	0.1 [0.0 - 0.4]	6303	21	0.3 [0.2 - 0.5]	
25584-83-2	Hydroxypropyl acrylate	90	4	4.4 [1.2 - 11.0]	.	.	. [ . - . ]	
101-85-9	alpha-Amylcinnamyl alcohol	2848	4	0.1 [0.0 - 0.4]	6414	26	0.4 [0.3 - 0.6]	
105-13-5	Anisyl alkohole	2847	3	0.1 [0.0 - 0.3]	6408	3	0.0 [0.0 - 0.1]	
118-58-1	Benzyl salicylate	3093	3	0.1 [0.0 - 0.3]	8238	15	0.2 [0.1 - 0.3]	
23593-75-1	Clotrimazole	762	3	0.4 [0.1 - 1.1]	5081	56	1.1 [0.8 - 1.4]	
6373-73-5	Disperse Yellow 9 (CI 10375)	1928	3	0.2 [0.0 - 0.5]	6086	12	0.2 [0.1 - 0.3]	
7705-08-0	Iron(III) chloride	383	3	0.8 [0.2 - 2.3]	846	18	2.1 [1.3 - 3.3]	
751-94-0	Fusidic acid sodium salt	853	3	0.4 [0.1 - 1.0]	6895	58	0.8 [0.6 - 1.1]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
506-87-6, 10361-29-2	Ammonium carbonate	12	3	25.0 [5.5 - 57.2]	.	.	. [. - .]	
99-76-3	Methyl paraben	664	3	0.5 [0.1 - 1.3]	3033	9	0.3 [0.1 - 0.6]	
97-88-1	n-Butyl methacrylate	105	3	2.9 [0.6 - 8.1]	.	.	. [. - .]	
84961-64-8	Tansy extract	126	3	2.4 [0.5 - 6.8]	1438	11	0.8 [0.4 - 1.4]	
84082-83-7	Yarrow herb extract	123	3	2.4 [0.5 - 7.0]	1384	10	0.7 [0.3 - 1.3]	
84-74-2	Dibutyl phthalate	645	3	0.5 [0.1 - 1.4]	1390	6	0.4 [0.2 - 0.9]	
137-30-4	Ziram (Zinc dimethyldithiocarbamate)	59	3	5.1 [1.1 - 14.1]	66	1	1.5 [0.0 - 8.2]	
8006-54-0	Lanolin (wool fat, wool wax)	795	3	0.4 [0.1 - 1.1]	5650	39	0.7 [0.5 - 0.9]	
61-33-6	Penicillin G (Benzylpenicillin)	22	3	13.6 [2.9 - 34.9]	2720	80	2.9 [2.3 - 3.6]	
7173-51-5	Didecyl dimethyl ammonium chloride (Quaternium 12)	15	3	20.0 [4.3 - 48.1]	44	4	9.1 [2.5 - 21.7]	
51022-69-6	Amcinonide	2156	2	0.1 [0.0 - 0.3]	8523	81	1.0 [0.8 - 1.2]	
26787-78-0	Amoxicillin	32	2	6.3 [0.8 - 20.8]	3729	175	4.7 [4.0 - 5.4]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
103-41-3	Benzyl cinnamate	3115	2	0.1 [0.0 - 0.2]	7213	13	0.2 [0.1 - 0.3]	
61-12-1	Cinchocaine-HCl (Cincain)	436	2	0.5 [0.1 - 1.6]	3825	95	2.5 [2.0 - 3.0]	
25122-46-7	Clobetasol-17-propionate	2330	2	0.1 [0.0 - 0.3]	9190	51	0.6 [0.4 - 0.7]	
97-23-4	Dichlorophen	616	2	0.3 [0.0 - 1.2]	1038	5	0.5 [0.2 - 1.1]	
7705-14-8, 138-86-3	Dipentene (d,l-Limonene)	2870	2	0.1 [0.0 - 0.3]	6800	11	0.2 [0.1 - 0.3]	
120-47-8	Ethylparaben	719	2	0.3 [0.0 - 1.0]	2816	9	0.3 [0.1 - 0.6]	
13048-33-4	1,6-Hexanediol diacrylate	90	2	2.2 [0.3 - 7.8]	.	.	. [. - .]	
4098-71-9	Isophorone diisocyanate	111	2	1.8 [0.2 - 6.4]	56	2	3.6 [0.4 - 12.3]	
73-78-9	Lidocaine-HCl	441	2	0.5 [0.1 - 1.6]	3953	72	1.8 [1.4 - 2.3]	
141-32-2	n-Butyl acrylate	124	2	1.6 [0.2 - 5.7]	155	3	1.9 [0.4 - 5.6]	
62-38-4	Phenyl mercuric acetate	398	2	0.5 [0.1 - 1.8]	2192	23	1.0 [0.7 - 1.6]	
3055-99-0	Polidocanol	438	2	0.5 [0.1 - 1.6]	3741	37	1.0 [0.7 - 1.4]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
94-13-3	Propyl paraben	668	2	0.3 [0.0 - 1.1]	2779	14	0.5 [0.3 - 0.8]	
136-47-0	Tetracaine-HCl (Amethocaine)	446	2	0.4 [0.1 - 1.6]	3974	72	1.8 [1.4 - 2.3]	
584-84-9	Toluylene diisocyanate	335	2	0.6 [0.1 - 2.1]	374	2	0.5 [0.1 - 1.9]	
15625-89-5	Trimethylolpropane triacrylate	90	2	2.2 [0.3 - 7.8]	.	.	. [ . - . ]	
8009-03-8	Petrolatum	1537	2	0.1 [0.0 - 0.5]	10024	4	0.0 [0.0 - 0.1]	
1314-23-4	Zirconium(IV) oxide	318	2	0.6 [0.1 - 2.3]	2048	1	0.0 [0.0 - 0.3]	
10141-00-1	Potassium chrome sulfate	256	2	0.8 [0.1 - 2.8]	744	10	1.3 [0.6 - 2.5]	
84082-60-0	Chamomile blossoms extracts	123	2	1.6 [0.2 - 5.8]	1391	3	0.2 [0.0 - 0.6]	
not applicable	Wood tars (birch, beech, spruce, juniper)	30	2	6.7 [0.8 - 22.1]	102	5	4.9 [1.6 - 11.1]	
101-68-8	Diphenylmethane-4,4'-diisocyanate	391	2	0.5 [0.1 - 1.8]	.	.	. [ . - . ]	
84649-86-5	Anthemis nobilis (Roman chamomile)	814	2	0.2 [0.0 - 0.9]	2542	9	0.4 [0.2 - 0.7]	
90-72-2	2,4,6-Tris(dimethylaminomethyl)phenol	29	1	3.4 [0.1 - 17.8]	.	.	. [ . - . ]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
583-39-1	2-Mercaptobenzimidazole	59	1	1.7 [0.0 - 9.1]	.	.	. [. - .]	
13106-76-8	Ammonium heptamolybdate	401	1	0.2 [0.0 - 1.4]	2158	3	0.1 [0.0 - 0.4]	
120-51-4	Benzyl benzoate	2995	1	0.0 [0.0 - 0.2]	6742	7	0.1 [0.0 - 0.2]	
13510-49-1	Beryllium sulfate	14	1	7.1 [0.2 - 33.9]	146	6	4.1 [1.5 - 8.7]	
2152-44-5	Betamethasone-17-valerate	2155	1	0.0 [0.0 - 0.3]	8522	42	0.5 [0.4 - 0.7]	
94-26-8	Butyl paraben	681	1	0.1 [0.0 - 0.8]	2795	11	0.4 [0.2 - 0.7]	
1405-87-4	Bacitracin	860	1	0.1 [0.0 - 0.6]	7549	50	0.7 [0.5 - 0.9]	
72-80-0	Chlorquinaldol	29	1	3.4 [0.1 - 17.8]	956	9	0.9 [0.4 - 1.8]	
130-26-7	Clioquinol (5-Chloro-8-hydroxy-7-iodoquinoline)	1111	1	0.1 [0.0 - 0.5]	6437	43	0.7 [0.5 - 0.9]	
76-57-3	Codeine	9	1	11.1 [0.3 - 48.2]	.	.	. [. - .]	
81-13-0	Panthenol	1552	1	0.1 [0.0 - 0.4]	9998	72	0.7 [0.6 - 0.9]	
56-18-8	Dipropylenetriamine (DPTA)	15	1	6.7 [0.2 - 31.9]	.	.	. [. - .]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
2475-46-9	Disperse Blue 3 (CI 61505)	1916	1	0.1 [0.0 - 0.3]	6078	9	0.1 [0.1 - 0.3]	
2581-69-3	Disperse Orange 1 (CI 11080)	28	1	3.6 [0.1 - 18.3]	.	.	. [. - .]	
84082-60-0	German chamomile (Chamomilla recutita)	3	1	33.3 [0.8 - 90.6]	16	6	37.5 [15.2 - 64.6]	
35691-65-7, 122-99-6	Methylbromo glutaronitrile + 2-Phenoxyethanol	162	1	0.6 [0.0 - 3.4]	790	18	2.3 [1.4 - 3.6]	
127-51-5	Alpha-isomethyl ionone	2833	1	0.0 [0.0 - 0.2]	6409	10	0.2 [0.1 - 0.3]	
84776-23-8	Calendula officinalis	4	1	25.0 [0.6 - 80.6]	8	2	25.0 [3.2 - 65.1]	
70-30-4	Hexachlorophene	586	1	0.2 [0.0 - 0.9]	1283	1	0.1 [0.0 - 0.4]	
75-47-8	Iodoform	30	1	3.3 [0.1 - 17.2]	113	26	23.0 [15.6 - 31.9]	
25389-94-0	Kanamycin sulfate	131	1	0.8 [0.0 - 4.2]	3784	115	3.0 [2.5 - 3.6]	
92-77-3	Naphthol AS (CI 37505)	1933	1	0.1 [0.0 - 0.3]	6104	3	0.0 [0.0 - 0.1]	
400-61-9	Nystatin	761	1	0.1 [0.0 - 0.7]	5096	25	0.5 [0.3 - 0.7]	
131-57-7	Oxybenzone (Benzophenone-3)(Eusolex 4360)	585	1	0.2 [0.0 - 0.9]	4787	11	0.2 [0.1 - 0.4]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
61-76-7	Phenylephrine-HCl	122	1	0.8 [0.0 - 4.5]	3722	74	2.0 [1.6 - 2.5]	
27083-27-8	Poly(hexamethylenbiguanide)-HCl (PHMB)	15	1	6.7 [0.2 - 31.9]	.	.	. [. - .]	
121-79-9	Propyl gallate	104	1	1.0 [0.0 - 5.2]	.	.	. [. - .]	
7487-94-7	Mercury(II) chloride	108	1	0.9 [0.0 - 5.1]	788	13	1.6 [0.9 - 2.8]	
977032-44-2	Tansy (Tanacetum vulgare)	2	1	50.0 [1.3 - 98.7]	.	.	. [. - .]	
136-36-7	Resorcinol monobenzoate	22	1	4.5 [0.1 - 22.8]	77	3	3.9 [0.8 - 11.0]	
7440-22-4	Silver (CI 77820) (E 174)	577	1	0.2 [0.0 - 1.0]	1892	1	0.1 [0.0 - 0.3]	
7761-88-8	Silver nitrate	116	1	0.9 [0.0 - 4.7]	858	7	0.8 [0.3 - 1.7]	
1338-43-8	Sorbitan monooleate	75	1	1.3 [0.0 - 7.2]	1307	12	0.9 [0.5 - 1.6]	
112-92-5	Stearyl alcohol	78	1	1.3 [0.0 - 6.9]	1349	2	0.1 [0.0 - 0.5]	
not applicable	Lanolin alcohol ointment DAB 9	260	1	0.4 [0.0 - 2.1]	1469	21	1.4 [0.9 - 2.2]	
621-82-9	Cinnamic acid	6	1	16.7 [0.4 - 64.1]	8	1	12.5 [0.3 - 52.7]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
13463-41-7	Zinc pyrithione	119	1	0.8 [0.0 - 4.6]	1377	2	0.1 [0.0 - 0.5]	
73771-04-7	Prednicarbate	183	1	0.5 [0.0 - 3.0]	729	4	0.5 [0.1 - 1.4]	
68990-11-4	Arnica montana extract	123	1	0.8 [0.0 - 4.4]	1405	13	0.9 [0.5 - 1.6]	
131-11-3	Dimethyl phthalate	211	1	0.5 [0.0 - 2.6]	.	.	. [. - .]	
5466-77-3	2-Ethylhexyl-4-methoxycinnamate	54	1	1.9 [0.0 - 9.9]	645	2	0.3 [0.0 - 1.1]	
80-05-7	4,4'-Isopropylidenediphenol (Bisphenol A)	465	1	0.2 [0.0 - 1.2]	1943	3	0.2 [0.0 - 0.5]	
not applicable	Compositae mix	67	1	1.5 [0.0 - 8.0]	378	6	1.6 [0.6 - 3.4]	
12222-83-2	Disperse Blue 85	28	1	3.6 [0.1 - 18.3]	.	.	. [. - .]	
	Urethane diacrylate	150	1	0.7 [0.0 - 3.7]	256	1	0.4 [0.0 - 2.2]	
12221-69-1	Basic Red 46	28	1	3.6 [0.1 - 18.3]	.	.	. [. - .]	
30007-47-7	Bronidox L (5-Bromo-5-nitro-1,3-dioxane)	182	1	0.5 [0.0 - 3.0]	715	1	0.1 [0.0 - 0.8]	
13463-67-7, 1317-70-0,	Titanium(IV) oxide	933	1	0.1 [0.0 - 0.6]	6403	6	0.1 [0.0 - 0.2]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
12188-41-9, 1317-80-2								
	Sulfonic acid melamine formaldehyde resin	9	1	11.1 [0.3 - 48.2]	.	.	. [. - .]	
624-49-7	Dimethyl fumarate	142	1	0.7 [0.0 - 3.9]	666	6	0.9 [0.3 - 2.0]	
103597-45-1	Bisotrizole	813	1	0.1 [0.0 - 0.7]	1937	2	0.1 [0.0 - 0.4]	
111-12-6	Methyl-2-octynoate	265	1	0.4 [0.0 - 2.1]	357	2	0.6 [0.1 - 2.0]	
8014-09-3	Oil of patchouli	252	1	0.4 [0.0 - 2.2]	334	3	0.9 [0.2 - 2.6]	
822-06-0	Hexamethylene diisocyanate (HDI)	196	1	0.5 [0.0 - 2.8]	162	2	1.2 [0.1 - 4.4]	
36861-47-9	3-(4-Methylbenzylidene)camphor (Eusolex 6300)	.	.	. [. - .]	1028	5	0.5 [0.2 - 1.1]	
148-24-3	8-Hydroxyquinoline	.	.	. [. - .]	49	1	2.0 [0.1 - 10.9]	
134-31-6	8-Hydroxyquinoline sulfate	.	.	. [. - .]	162	2	1.2 [0.1 - 4.4]	
7446-70-0	Aluminum chloride	.	.	. [. - .]	811	6	0.7 [0.3 - 1.6]	
8007-70-3	Anise oil (Pimpinella anisum)	.	.	. [. - .]	116	1	0.9 [0.0 - 4.7]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
68990-11-4	Arnica montana	.	.	. [. - .]	1057	5	0.5 [0.2 - 1.1]	
55-48-1	Atropin sulfate	.	.	. [. - .]	3711	8	0.2 [0.1 - 0.4]	
7727-43-7	Barium sulfate (pigment white 21-23) (CI 77120)	.	.	. [. - .]	263	1	0.4 [0.0 - 2.1]	
84775-45-1	Mugwort ( <i>Artemisia vulgaris</i> )	.	.	. [. - .]	52	1	1.9 [0.0 - 10.3]	
94-18-8	Benzyl paraben	.	.	. [. - .]	38	1	2.6 [0.1 - 13.8]	
10124-36-4	Cadmium sulfate	.	.	. [. - .]	194	5	2.6 [0.8 - 5.9]	
298-46-4	Carbamazepine	.	.	. [. - .]	25	1	4.0 [0.1 - 20.4]	
56-75-7	Chloramphenicol	.	.	. [. - .]	4839	39	0.8 [0.6 - 1.1]	
56-95-1	Chlorhexidine diacetate	.	.	. [. - .]	261	1	0.4 [0.0 - 2.1]	
106-23-0	Citronellal	.	.	. [. - .]	1941	2	0.1 [0.0 - 0.4]	
21462-39-5	Clindamycin hydrochloride	.	.	. [. - .]	356	5	1.4 [0.5 - 3.2]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
12222-75-2	Disperse Blue 35	.	.	. [. - .]	188	1	0.5 [0.0 - 2.9]	
6381-92-6	Disodium EDTA	.	.	. [. - .]	3717	14	0.4 [0.2 - 0.6]	
6402-23-9	Ethacridine lactate monohydrate (Rivanol)	.	.	. [. - .]	247	1	0.4 [0.0 - 2.2]	
103-11-7	2-Ethylhexyl acrylate	.	.	. [. - .]	98	1	1.0 [0.0 - 5.6]	
13453-07-1	Gold(III) chloride	.	.	. [. - .]	48	1	2.1 [0.1 - 11.1]	
136-77-6	Hexylresorcinol	.	.	. [. - .]	131	4	3.1 [0.8 - 7.6]	
15687-27-1	Ibuprofen	.	.	. [. - .]	2064	5	0.2 [0.1 - 0.6]	
110-27-0	Isopropyl myristate (IPM)	.	.	. [. - .]	2370	3	0.1 [0.0 - 0.4]	
7681-11-0	Potassium iodide	.	.	. [. - .]	140	17	12.1 [7.2 - 18.7]	
22071-15-4	Ketoprofen	.	.	. [. - .]	148	1	0.7 [0.0 - 3.7]	
10124-43-3	Cobalt sulfate	.	.	. [. - .]	217	3	1.4 [0.3 - 4.0]	
8000-28-0	Lavender oil	.	.	. [. - .]	17	1	5.9 [0.1 - 28.7]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
119-36-8	Methyl salicylate	.	.	. [. - .]	243	1	0.4 [0.0 - 2.3]	
9000-45-7	Myrrh resinoid	.	.	. [. - .]	93	1	1.1 [0.0 - 5.8]	
99-97-8	N,N-Dimethyl-p-toluidine	.	.	. [. - .]	5159	4	0.1 [0.0 - 0.2]	
22204-53-1	Naproxen	.	.	. [. - .]	397	3	0.8 [0.2 - 2.2]	
7632-00-0	Sodium nitrite	.	.	. [. - .]	83	1	1.2 [0.0 - 6.5]	
15077-57-3	8-hydroxyquinoline potassium sulfate (Chinosol)	.	.	. [. - .]	791	4	0.5 [0.1 - 1.3]	
79-57-2	Oxytetracycline	.	.	. [. - .]	6742	8	0.1 [0.1 - 0.2]	
138-39-6	p-Aminomethylbenzolsulfonamide (Mafenide)	.	.	. [. - .]	91	1	1.1 [0.0 - 6.0]	
150-13-0	p-Aminobenzoic acid (PABA)	.	.	. [. - .]	1032	2	0.2 [0.0 - 0.7]	
50-06-6	Phenobarbital	.	.	. [. - .]	25	1	4.0 [0.1 - 20.4]	
50-33-9	Phenylbutazone	.	.	. [. - .]	12	1	8.3 [0.2 - 38.5]	
8003-05-2, 55-68-5	Phenyl mercuric nitrate	.	.	. [. - .]	121	1	0.8 [0.0 - 4.5]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
54-71-7	Pilocarpin-HCl	.	.	. [. - .]	3712	9	0.2 [0.1 - 0.5]	
1405-20-5	Polymyxin B sulfate	.	.	. [. - .]	3746	27	0.7 [0.5 - 1.0]	
9005-66-7	Polysorbate 40 (Tween 40)	.	.	. [. - .]	248	1	0.4 [0.0 - 2.2]	
not applicable	PPD mix	.	.	. [. - .]	23	1	4.3 [0.1 - 21.9]	
11006-76-1	Pristinamycin (Virginiamycin)	.	.	. [. - .]	318	1	0.3 [0.0 - 1.7]	
108-46-3	Resorcinol	.	.	. [. - .]	6395	18	0.3 [0.2 - 0.4]	
84082-83-7	Yarrow (Achillea millefolium)	.	.	. [. - .]	1057	7	0.7 [0.3 - 1.4]	
63-74-1	Sulfanilamide	.	.	. [. - .]	6917	5	0.1 [0.0 - 0.2]	
64-75-5	Tetracycline hydrochloride	.	.	. [. - .]	1043	1	0.1 [0.0 - 0.5]	
76-25-5	Triamcinolone acetonide	.	.	. [. - .]	8595	31	0.4 [0.2 - 0.5]	
115-86-6	Triphenyl phosphate	.	.	. [. - .]	430	1	0.2 [0.0 - 1.3]	
7733-02-0	Zinc sulfate	.	.	. [. - .]	471	1	0.2 [0.0 - 1.2]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
7440-67-7	Zirconium	.	.	. [. - .]	75	1	1.3 [0.0 - 7.2]	
114-07-8	Erythromycin	.	.	. [. - .]	1500	4	0.3 [0.1 - 0.7]	
51-05-8	Procaine hydrochloride	.	.	. [. - .]	3684	27	0.7 [0.5 - 1.1]	
21245-02-3	2-Ethylhexyl-4-(dimethylamino)benzoate	.	.	. [. - .]	1031	5	0.5 [0.2 - 1.1]	
71617-10-2	Isoamyl 4-methoxycinnamate	.	.	. [. - .]	1025	4	0.4 [0.1 - 1.0]	
87-08-1	Penicillin V (Phenoxymethylpenicillin)	.	.	. [. - .]	393	4	1.0 [0.3 - 2.6]	
10124-48-8	Mercury ammonium chloride	.	.	. [. - .]	64	2	3.1 [0.4 - 10.8]	
61951-51-7 + 12223-10-7	Disperse Blue mix 124/106	.	.	. [. - .]	143	1	0.7 [0.0 - 3.8]	
50-78-2	Acetylsalicylic acid (ASS)	.	.	. [. - .]	2001	18	0.9 [0.5 - 1.4]	
15307-86-5	Diclofenac	.	.	. [. - .]	1821	12	0.7 [0.3 - 1.1]	
62931-07-1	Ethylene urea melamine formaldehyde resin	.	.	. [. - .]	75	1	1.3 [0.0 - 7.2]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
12024-21-4	Gallium(II) oxide	.	.	. [. - .]	2704	1	0.0 [0.0 - 0.2]	
207398-97-8	Indium(III) nitrate	.	.	. [. - .]	281	1	0.4 [0.0 - 2.0]	
53-86-1	Indomethacin	.	.	. [. - .]	1256	3	0.2 [0.0 - 0.7]	
10025-83-9	Iridium(III) chloride	.	.	. [. - .]	459	8	1.7 [0.8 - 3.4]	
not applicable	Irujol Ointment (R)	.	.	. [. - .]	966	42	4.3 [3.2 - 5.8]	
10241-05-1	Molybdenum(V) chloride	.	.	. [. - .]	4438	4	0.1 [0.0 - 0.2]	
103-90-2	Paracetamol	.	.	. [. - .]	2054	2	0.1 [0.0 - 0.4]	
36322-90-4	Piroxicam	.	.	. [. - .]	1338	7	0.5 [0.2 - 1.1]	
479-92-5	Propyphenazone	.	.	. [. - .]	1367	2	0.1 [0.0 - 0.5]	
21652-27-7	1-Hydroxyethyl-2-heptadecenyl-imidazoline	.	.	. [. - .]	431	10	2.3 [1.1 - 4.2]	
not applicable	Colophony mix II	.	.	. [. - .]	38	4	10.5 [2.9 - 24.8]	
2392-39-4	Dexamethasone-21-phosphate disodium salt	.	.	. [. - .]	8524	55	0.6 [0.5 - 0.8]	

CAS number	Substance	OD patients tested	OD patients positive	OD patients % positive [95%-CI]	Non-OD patients tested	Non-OD patients positive	non-OD patients % positive [95%-CI]	Significance
1314-62-1	Vanadium pentoxide	.	.	. [. - .]	3751	14	0.4 [0.2 - 0.6]	
6197-30-4	Octocrylene	.	.	. [. - .]	1921	2	0.1 [0.0 - 0.4]	
68917-12-4	Narcissus poeticus absolute	.	.	. [. - .]	332	2	0.6 [0.1 - 2.2]	
156-57-0	Cysteamine hydrochloride	.	.	. [. - .]	12	1	8.3 [0.2 - 38.5]	
2835-95-2	4-Amino-2-hydroxytoluene	.	.	. [. - .]	12	2	16.7 [2.1 - 48.4]	

**Tab. 3.2.2.1** IVDK, 2007 – 2016, patients with occupational dermatitis (n=18,877): occupational groups.

Ocup. no.	Occupational group	Patient count	Percent of 18,877
1850	Health care professionals	2325	12.3
1280	Mechanics, metal, machinery and related trades workers	2091	11.1
1990	Occupations with undetermined exposure	1588	8.4
1901	Hairdressers, barbers, beauticians, wigmakers	1174	6.2
1933	Building, vehicle, street cleaners	885	4.7
1861	Geriatric nurses, social work associate professionals	826	4.4
1220	Metal workers (cutting)	726	3.8
1410	Cooks, cannery workers, fruit, vegetable and related preservers	705	3.7
1440	Construction workers, manufacturers of building materials	520	2.8
1750	Office clerks	489	2.6
1600	Engineers, technicians and scientists	458	2.4
1260	Machinery mechanics and fitters	432	2.3
1510	Painters, varnishers and related workers	405	2.1
1390	Bakers, pastry-cooks and confectionery makers	372	2.0
1050	Gardeners, salespersons (fruit, flowers, vegetables)	356	1.9
1842	Dentists	327	1.7
1310	Electrical and electronic equipment mechanics and fitters	316	1.7
1902	Personal care and related workers	309	1.6
1740	Storekeeper, transport labourers and freight handlers	280	1.5
1140	Chemist, lab assistant, chemical products machine operators	274	1.5
1007	Housewife/-man, domestic helper	271	1.4
1855	Laboratory assistants (health associate professionals)	228	1.2
1500	Carpenter, cabinet maker, model maker	227	1.2
9999	missing data	227	1.2
1680	Salespersons and demonstrators	216	1.1
1841	Medical doctors	205	1.1
1860	Social and health associate professionals, teachers	202	1.1
1910	Waiters and bartenders, guest attendants	180	1.0
1150	Plastic-products machine operators	158	0.8

Occup. no.	Occupational group	Patient count	Percent of 18,877
1303	Dental technicians	148	0.8
1400	Butchers, fishmongers and related food preparers	146	0.8
1710	Drivers and mobile plant operators	141	0.7
1010	Wine grower, wine refiner, vintage helper	131	0.7
1284	Precision workers in metal and related materials	126	0.7
1240	Welders and flame cutters	106	0.6
1170	Printing-machine operators	100	0.5
1790	Protective services workers	95	0.5
1480	Building finishers and related trades workers	85	0.5
1530	Labourer, unknown or not classifiable	79	0.4
1460	Construction & maintenance labourers: roads, dams & similar	76	0.4
1330	Textile, garment and related trades workers	69	0.4
1430	Food and related products machine operators	67	0.4
1190	Metal processing plant operators, rolling mill operators	66	0.3
1230	Metal finishing-, plating- and coating-machine operators	62	0.3
1020	Mixed-animal producers (dairy, poultry etc.), fishery labourers	53	0.3
1773	Cashiers, tellers and related clerks	51	0.3
1160	papermaking-plant operators, bookbinders	47	0.2
1130	Potters, glass-makers and related trades workers	41	0.2
1070	Mining and mineral-processing plant operators	40	0.2
1210	Metal worker (non-cutting)	39	0.2
1843	Veterinarians	37	0.2
1370	Manufacturers or processors of fur and leather	36	0.2
1930	Domestic and related helpers, cleaners and launderers	35	0.2
1730	Communication professions	33	0.2
1143	Rubber-products machine operators, vulcanizers	27	0.1
1830	Artists, musicians, professional sportsmen	26	0.1
1805	Hygiene and health surveillance	21	0.1
1490	Interior decorators, upholsterers	20	0.1
1844	Pharmacists	19	0.1
1686	Petrol pump attendant	11	0.1

Occup. no.	Occupational group	Patient count	Percent of 18,877
1060	Forestry and related workers	10	0.1
1304	Optometrists and opticians	10	0.1
1420	Beverage industry labourers	9	0.0
1634	Photographic-products machine operators	8	0.0
1851	Alternative medicine practitioners	8	0.0
1880	Scientists NEC	8	0.0
1250	Blacksmiths, hammer-smiths and forging-press workers	7	0.0
1804	Chimney sweep	7	0.0
1305	Musical-instrument makers, model makers, taxidermists	4	0.0
1424	Tobacco production machine operators, salesperson	1	0.0

**Tab. 3.2.2.2** IVDK, 2007 – 2016, patients with occupational dermatitis (n=18,877): MOAHLFA indices of the 20 most frequent occupational groups.

Occup. no.	Occupational group	Patient count	Male patients	Occupational dermatitis patients	Atopic dermatitis patients	Hand dermatitis patients	Leg dermatitis patients	Face dermatitis patients	Age of 40 years or more
1850	Health care professionals	2325	12.7%	100%	45.2%	87.6%	0.3%	3.6%	52.0%
1280	Mechanics, metal, machinery and related trades workers	2091	88.4%	100%	28.4%	82.6%	0.6%	3.3%	55.1%
1990	Occupations with undetermined exposure	1588	55.1%	100%	30.5%	71.9%	1.9%	7.3%	58.6%
1901	Hairdressers, barbers, beauticians, wigmakers	1174	7.0%	100%	40.6%	86.7%	0.2%	3.8%	25.1%
1933	Building, vehicle, street cleaners	885	15.5%	100%	25.8%	82.7%	0.6%	3.6%	76.4%
1861	Geriatric nurses, social work associate professionals	826	6.4%	100%	56.3%	93.2%	0.1%	2.2%	63.1%
1220	Metal workers (cutting)	726	94.4%	100%	23.4%	90.6%	0.4%	2.8%	68.7%
1410	Cooks, cannery workers, fruit, vegetable and related preservers	705	51.3%	100%	34.5%	89.9%	0.0%	1.8%	45.8%
1440	Construction workers, manufacturers of building materials	520	98.5%	100%	25.6%	75.4%	1.9%	7.9%	62.9%
1750	Office clerks	489	42.3%	100%	28.0%	65.6%	0.8%	14.3%	61.3%
1600	Engineers, technicians and scientists	458	89.1%	100%	23.8%	71.4%	1.3%	7.0%	56.8%

Occup. no.	Occupational group	Patient count	Male patients	Occupational dermatitis patients	Atopic dermatitis patients	Hand dermatitis patients	Leg dermatitis patients	Face dermatitis patients	Age of 40 years or more
1260	Machinery mechanics and fitters	432	97.7%	100%	27.3%	83.6%	0.7%	3.2%	76.2%
1510	Painters, varnishers and related workers	405	86.9%	100%	22.0%	65.2%	1.2%	12.8%	55.6%
1390	Bakers, pastry-cooks and confectionery makers	372	41.9%	100%	42.7%	81.5%	0.3%	5.4%	33.3%
1050	Gardeners, salespersons (fruit, flowers, vegetables)	356	31.5%	100%	34.3%	79.8%	0.0%	7.0%	54.5%
1842	Dentists	327	5,2%	100%	36.4%	81.3%	0.0%	7.6%	25.4%
1310	Electrical and electronic equipment mechanics and fitters	316	89.2%	100%	35.8%	80.1%	1.6%	5.4%	48.7%
1902	Personal care and related workers	309	1.0%	100%	36.6%	86.1%	0.0%	5.5%	47.6%
1740	Storekeeper, transport labourers and freight handlers	280	78.6%	100%	24.3%	77.1%	0.4%	6.4%	62.5%
1140	Chemist, lab assistant, chemical products machine operators	274	58.4%	100%	27.0%	62.4%	0.7%	15.7%	52.2%

**Tab. 3.2.3.1** IVDK, 2007-2016, OD patients with positive and negative reaction to nickel(II)-sulfate hexahydrate (CAS:10101-97-0), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 2,645

Number of patients not sensitized to the allergen (negative reaction): 13,799

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to nickel(II)-sulfate hexahydrate (CAS:10101-97-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to nickel(II)-sulfate hexahydrate (CAS:10101-97-0)	Significance
Health care professionals	16.7 [15.3 - 18.1]	11.2 [10.7 - 11.7]	*
Hairdressers, barbers, beauticians, wigmakers	8.7 [7.6 - 9.8]	5.5 [5.1 - 5.9]	*
Occupations with undetermined exposure	8.0 [7.0 - 9.1]	8.5 [8.0 - 9.0]	
Building, vehicle, street cleaner	7.7 [6.7 - 8.8]	4.1 [3.8 - 4.5]	*
Mechanics, Metal, machinery and related trades workers	6.5 [5.6 - 7.5]	12.0 [11.5 - 12.6]	#
Geriatric nurse, social work associate professionals	5.2 [4.4 - 6.1]	3.8 [3.5 - 4.2]	*
Cooks, Cannery workers, Fruit, vegetable and related preservers	4.0 [3.3 - 4.8]	3.9 [3.6 - 4.2]	
Office clerks	3.1 [2.5 - 3.8]	2.4 [2.1 - 2.7]	
Dentists	2.6 [2.1 - 3.3]	1.5 [1.3 - 1.7]	*
Personal care and related workers	2.5 [2.0 - 3.2]	1.5 [1.3 - 1.7]	*
Housewife/-man, domestic helper	2.4 [1.9 - 3.1]	1.3 [1.1 - 1.5]	*

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to nickel(II)-sulfate hexahydrate (CAS:10101-97-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to nickel(II)-sulfate hexahydrate (CAS:10101-97-0)	Significance
Gardeners, salespersons (fruit, flowers, vegetables)	2.2 [1.7 - 2.8]	1.9 [1.7 - 2.1]	
Bakers, pastry-cooks and confectionery makers	2.0 [1.5 - 2.6]	2.1 [1.9 - 2.3]	
Laboratory assistants (health associate professionals)	1.9 [1.4 - 2.5]	1.1 [0.9 - 1.2]	*
Salespersons and demonstrators	1.8 [1.3 - 2.4]	1.0 [0.9 - 1.2]	*
Storekeeper, transport labour and freight handlers	1.7 [1.2 - 2.2]	1.4 [1.2 - 1.6]	
Metal worker (cutting)	1.5 [1.1 - 2.0]	4.3 [4.0 - 4.6]	#
Waiters and bartenders, guest attendants	1.4 [1.0 - 2.0]	0.9 [0.8 - 1.1]	
Chemist, Lab assistant, Chemical-products machine operators	1.2 [0.9 - 1.7]	1.5 [1.3 - 1.7]	
Social and health associate professionals, teachers	1.2 [0.8 - 1.7]	1.0 [0.9 - 1.2]	
Engineers, technicians and scientists	1.1 [0.8 - 1.6]	2.7 [2.5 - 3.0]	#
Missing information	1.1 [0.7 - 1.6]	1.3 [1.1 - 1.5]	
Painters, lacquerers and related workers	1.0 [0.7 - 1.5]	2.4 [2.1 - 2.7]	#
Construction workers, Manufacturers of building materials	1.0 [0.6 - 1.4]	3.1 [2.8 - 3.4]	#
Cashiers, tellers and related clerks	0.9 [0.6 - 1.3]	0.2 [0.1 - 0.2]	*
Dental technicians	0.9 [0.6 - 1.3]	0.8 [0.6 - 0.9]	
Butchers, fishmongers and related food preparers	0.9 [0.6 - 1.3]	0.7 [0.6 - 0.9]	
Medical doctors	0.8 [0.5 - 1.3]	1.2 [1.0 - 1.4]	
Electrical and electronic equipment mechanics and fitters	0.8 [0.5 - 1.2]	1.9 [1.6 - 2.1]	#

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to nickel(II)-sulfate hexahydrate (CAS:10101-97-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to nickel(II)-sulfate hexahydrate (CAS:10101-97-0)	Significance
Wine grower, vine refiner, vintage helper	0.6 [0.4 - 1.0]	0.7 [0.6 - 0.9]	
Food and related products machine operators	0.6 [0.4 - 1.0]	0.3 [0.2 - 0.4]	
Machinery mechanics and fitters	0.6 [0.3 - 1.0]	2.8 [2.5 - 3.0]	#
Textile, garment and related trades workers	0.6 [0.3 - 1.0]	0.3 [0.2 - 0.4]	
Metal finishing-, plating- and coating-machine operators	0.6 [0.3 - 0.9]	0.3 [0.2 - 0.4]	
Precision workers in metal and related materials	0.5 [0.3 - 0.8]	0.7 [0.6 - 0.9]	
Drivers and mobile plant operators	0.5 [0.3 - 0.8]	0.8 [0.6 - 0.9]	
Plastic-products machine operators	0.4 [0.2 - 0.7]	0.9 [0.8 - 1.1]	#
Printing-machine operators	0.4 [0.2 - 0.7]	0.6 [0.5 - 0.7]	
Labour, unknown or not classifiable other occupation	0.4 [0.2 - 0.7]	0.4 [0.3 - 0.6]	
Communication professions	0.4 [0.2 - 0.7]	0.1 [0.1 - 0.2]	
Protective services workers	0.4 [0.2 - 0.7]	0.6 [0.5 - 0.7]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.3 [0.2 - 0.6]	0.3 [0.2 - 0.4]	
Carpenter, cabinet maker, model maker	0.3 [0.1 - 0.6]	1.4 [1.2 - 1.6]	#
Building finishers and related trades workers	0.3 [0.1 - 0.5]	0.5 [0.4 - 0.6]	
Domestic and related helpers, cleaners and launderers	0.2 [0.1 - 0.5]	0.2 [0.1 - 0.3]	
Mining- and mineral-processing plant operators	0.2 [0.1 - 0.4]	0.2 [0.2 - 0.3]	
papermaking-plant operators, bookbinders	0.2 [0.1 - 0.4]	0.3 [0.2 - 0.4]	
Construction & maintenance labour: roads, dams & similar	0.2 [0.1 - 0.4]	0.5 [0.4 - 0.6]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to nickel(II)-sulfate hexahydrate (CAS:10101-97-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to nickel(II)-sulfate hexahydrate (CAS:10101-97-0)	Significance
Veterinarians	0.2 [0.1 - 0.4]	0.2 [0.1 - 0.3]	
Metal worker (non-cutting)	0.2 [0.0 - 0.4]	0.2 [0.2 - 0.3]	
Welders and flame cutters	0.2 [0.0 - 0.4]	0.6 [0.5 - 0.8]	#
Potters, glass-makers and related trades workers	0.1 [0.0 - 0.3]	0.2 [0.2 - 0.3]	
Metal processing plant operators, rolling mill operators	0.1 [0.0 - 0.3]	0.4 [0.3 - 0.5]	
Manufacturers or processors of fur and leather	0.1 [0.0 - 0.3]	0.2 [0.1 - 0.3]	
Hygiene and health surveillance	0.1 [0.0 - 0.3]	0.1 [0.1 - 0.2]	
Artists, musicians, professional sportsmen	0.1 [0.0 - 0.3]	0.2 [0.1 - 0.2]	
Rubber-products machine operators, vulcanizers	0.1 [0.0 - 0.3]	0.1 [0.1 - 0.2]	
Optometrists and opticians	0.1 [0.0 - 0.3]	0.1 [0.0 - 0.1]	
Beverage industry labour	0.1 [0.0 - 0.3]	0.1 [0.0 - 0.1]	
Photographic-products machine operators	0.1 [0.0 - 0.3]	0.0 [0.0 - 0.1]	
Pharmacists	0.1 [0.0 - 0.3]	0.1 [0.1 - 0.2]	
Scientists	0.0 [0.0 - 0.2]	0.1 [0.0 - 0.1]	

**Tab. 3.2.3.2** IVDK, 2007-2016, OD patients with positive and negative reaction to fragrance mix (CAS: not applicable), respectively: Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 1,279

Number of patients not sensitized to the allergen (negative reaction): 14,827

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;  
# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to fragrance mix (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to fragrance mix (CAS: not applicable)	Significance
Health care professionals	19.2 [17.0 - 21.4]	11.4 [10.9 - 11.9]	*
Occupations with undetermined exposure	7.9 [6.5 - 9.5]	8.5 [8.1 - 9.0]	
Mechanics, Metal, machinery and related trades workers	7.6 [6.2 - 9.2]	11.2 [10.7 - 11.7]	#
Geriatric nurse, social work associate professionals	7.1 [5.8 - 8.7]	3.8 [3.5 - 4.2]	*
Hairdressers, barbers, beauticians, wigmakers	6.1 [4.9 - 7.6]	6.2 [5.8 - 6.6]	
Building, vehicle, street cleaner	5.0 [3.9 - 6.3]	4.8 [4.5 - 5.2]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	3.6 [2.6 - 4.8]	4.0 [3.7 - 4.3]	
Metal worker (cutting)	2.9 [2.0 - 4.0]	3.8 [3.5 - 4.1]	
Engineers, technicians and scientists	2.7 [1.8 - 3.7]	2.5 [2.2 - 2.7]	
Office clerks	2.5 [1.7 - 3.5]	2.5 [2.3 - 2.8]	
Personal care and related workers	2.5 [1.7 - 3.5]	1.5 [1.3 - 1.7]	*
Gardeners, salespersons (fruit, flowers, vegetables)	2.0 [1.3 - 2.9]	1.9 [1.7 - 2.1]	
Medical doctors	1.8 [1.1 - 2.7]	1.0 [0.9 - 1.2]	
Housewife/-man, domestic helper	1.6 [1.0 - 2.5]	1.5 [1.3 - 1.7]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to fragrance mix (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to fragrance mix (CAS: not applicable)	Significance
Dentists	1.6 [1.0 - 2.5]	1.7 [1.5 - 1.9]	
Machinery mechanics and fitters	1.6 [1.0 - 2.4]	2.5 [2.2 - 2.7]	
Bakers, pastry-cooks and confectionery makers	1.5 [0.9 - 2.3]	2.1 [1.8 - 2.3]	
Electrical and electronic equipment mechanics and fitters	1.3 [0.8 - 2.1]	1.7 [1.5 - 1.9]	
Painters, lacquerers and related workers	1.3 [0.8 - 2.1]	2.3 [2.0 - 2.5]	
Social and health associate professionals, teachers	1.3 [0.8 - 2.1]	1.0 [0.9 - 1.2]	
Laboratory assistants (health associate professionals)	1.3 [0.7 - 2.0]	1.2 [1.0 - 1.4]	
Dental technicians	1.2 [0.7 - 1.9]	0.7 [0.6 - 0.9]	
Salespersons and demonstrators	1.2 [0.7 - 1.9]	1.2 [1.0 - 1.4]	
Chemist, Lab assistant, Chemical-products machine operators	1.1 [0.6 - 1.8]	1.5 [1.3 - 1.7]	
Storekeeper, transport labour and freight handlers	1.1 [0.6 - 1.8]	1.5 [1.3 - 1.7]	
Construction workers, Manufacturers of building materials	1.0 [0.5 - 1.7]	2.8 [2.6 - 3.1]	#
Waiters and bartenders, guest attendants	0.9 [0.5 - 1.6]	1.0 [0.9 - 1.2]	
Missing information	0.8 [0.4 - 1.4]	1.3 [1.1 - 1.5]	
Plastic-products machine operators	0.7 [0.3 - 1.3]	0.9 [0.7 - 1.0]	
Printing-machine operators	0.6 [0.3 - 1.2]	0.6 [0.4 - 0.7]	
Butchers, fishmongers and related food preparers	0.6 [0.3 - 1.2]	0.8 [0.6 - 0.9]	
Carpenter, cabinet maker, model maker	0.6 [0.3 - 1.2]	1.3 [1.1 - 1.5]	
Drivers and mobile plant operators	0.6 [0.3 - 1.2]	0.8 [0.6 - 0.9]	
Wine grower, vine refiner, vintage helper	0.5 [0.2 - 1.1]	0.7 [0.6 - 0.8]	
Precision workers in metal and related materials	0.5 [0.2 - 1.1]	0.7 [0.6 - 0.8]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to fragrance mix (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to fragrance mix (CAS: not applicable)	Significance
Labour, unknown or not classifiable, „other occupation“	0.5 [0.2 - 1.1]	0.4 [0.3 - 0.5]	
Welders and flame cutters	0.5 [0.2 - 1.0]	0.6 [0.4 - 0.7]	
Protective services workers	0.5 [0.2 - 1.0]	0.5 [0.4 - 0.7]	
Mining- and mineral-processing plant operators	0.4 [0.1 - 0.9]	0.2 [0.1 - 0.3]	
Textile, garment and related trades workers	0.4 [0.1 - 0.9]	0.4 [0.3 - 0.5]	
Potters, glass-makers and related trades workers	0.3 [0.1 - 0.8]	0.2 [0.1 - 0.3]	
Metal processing plant operators, rolling mill operators	0.3 [0.1 - 0.8]	0.4 [0.3 - 0.5]	
Food and related products machine operators	0.3 [0.1 - 0.8]	0.4 [0.3 - 0.5]	
Building finishers and related trades workers	0.3 [0.1 - 0.8]	0.5 [0.4 - 0.6]	
Communication professions	0.2 [0.0 - 0.7]	0.2 [0.1 - 0.3]	
Cashiers, tellers and related clerks	0.2 [0.0 - 0.7]	0.3 [0.2 - 0.4]	
Domestic and related helpers, cleaners and launderers	0.2 [0.0 - 0.7]	0.2 [0.1 - 0.3]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.2 [0.0 - 0.6]	0.3 [0.2 - 0.4]	
Forestry and related workers	0.2 [0.0 - 0.6]	0.0 [0.0 - 0.1]	
Metal worker (non-cutting)	0.2 [0.0 - 0.6]	0.2 [0.2 - 0.3]	
Blacksmiths, hammer-smiths and forging-press workers	0.2 [0.0 - 0.6]	0.0 [0.0 - 0.1]	
Manufacturers or processors of fur and leather	0.2 [0.0 - 0.6]	0.2 [0.1 - 0.3]	
Veterinarians	0.2 [0.0 - 0.6]	0.2 [0.1 - 0.3]	
Alternative medicine practitioners	0.2 [0.0 - 0.6]	0.0 [0.0 - 0.1]	
papermaking-plant operators, bookbinders	0.1 [0.0 - 0.4]	0.3 [0.2 - 0.4]	
Metal finishing-, plating- and coating-machine operators	0.1 [0.0 - 0.4]	0.4 [0.3 - 0.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to fragrance mix (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to fragrance mix (CAS: not applicable)	Significance
Optometrists and opticians	0.1 [0.0 - 0.4]	0.1 [0.0 - 0.1]	
Musical-instrument makers and tuners, model makers, taxidermists	0.1 [0.0 - 0.4]	0.0 [0.0 - 0.8]	
Beverage industry labour	0.1 [0.0 - 0.4]	0.1 [0.0 - 0.1]	
Construction & maintenance labour: roads, dams & similar	0.1 [0.0 - 0.4]	0.5 [0.4 - 0.6]	
Interior decorators, upholsterers	0.1 [0.0 - 0.4]	0.1 [0.1 - 0.2]	
Hygiene and health surveillance	0.1 [0.0 - 0.4]	0.1 [0.1 - 0.2]	
Artists, musicians, professional sportsmen	0.1 [0.0 - 0.4]	0.2 [0.1 - 0.2]	
Pharmacists	0.1 [0.0 - 0.4]	0.1 [0.0 - 0.1]	

**Tab. 3.2.3.3** IVDK, 2007-2016, OD patients with positive and negative reaction to cobalt(II) chloride hexahydrate (CAS: 7791-13-1), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 1,142

Number of patients not sensitized to the allergen (negative reaction): 14,689

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to cobalt(II) chloride hexahydrate (CAS: 7791-13-1)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to cobalt(II) chloride hexahydrate (CAS: 7791-13-1)	Significance
Health care professionals	11.5 [9.7 - 13.5]	12.1 [11.6 - 12.6]	
Occupations with undetermined exposure	10.4 [8.7 - 12.3]	8.3 [7.9 - 8.8]	
Mechanics, Metal, machinery and related trades workers	9.2 [7.6 - 11.0]	11.2 [10.7 - 11.7]	
Building, vehicle, street cleaner	5.7 [4.4 - 7.2]	4.7 [4.4 - 5.1]	
Geriatric nurse, social work associate professionals	5.5 [4.3 - 7.0]	4.0 [3.7 - 4.4]	
Hairdressers, barbers, beauticians, wigmakers	5.3 [4.1 - 6.8]	6.2 [5.8 - 6.6]	
Construction workers, Manufacturers of building materials	3.9 [2.8 - 5.1]	2.7 [2.4 - 2.9]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	3.4 [2.4 - 4.6]	3.9 [3.6 - 4.3]	
Metal worker (cutting)	2.5 [1.7 - 3.6]	3.9 [3.6 - 4.2]	
Dentists	2.5 [1.7 - 3.6]	1.6 [1.4 - 1.8]	
Gardeners, salespersons (fruit, flowers, vegetables)	2.4 [1.6 - 3.4]	2.0 [1.7 - 2.2]	
Office clerks	2.4 [1.6 - 3.4]	2.5 [2.3 - 2.8]	
Engineers, technicians and scientists	2.2 [1.4 - 3.2]	2.5 [2.2 - 2.8]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to cobalt(II) chloride hexahydrate (CAS: 7791-13-1)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to cobalt(II) chloride hexahydrate (CAS: 7791-13-1)	Significance
Housewife/-man, domestic helper	2.0 [1.3 - 3.0]	1.5 [1.3 - 1.7]	
Painters, lacquerers and related workers	1.9 [1.2 - 2.9]	2.2 [2.0 - 2.5]	
Salespersons and demonstrators	1.9 [1.2 - 2.9]	1.1 [0.9 - 1.2]	
Bakers, pastry-cooks and confectionery makers	1.7 [1.0 - 2.6]	2.1 [1.9 - 2.3]	
Storekeeper, transport labour and freight handlers	1.7 [1.0 - 2.6]	1.4 [1.2 - 1.6]	
Laboratory assistants (health associate professionals)	1.7 [1.0 - 2.6]	1.1 [1.0 - 1.3]	
Waiters and bartenders, guest attendants	1.6 [0.9 - 2.5]	1.0 [0.8 - 1.1]	
Chemist, Lab assistant, Chemical-products machine operators	1.5 [0.9 - 2.4]	1.5 [1.3 - 1.7]	
Machinery mechanics and fitters	1.5 [0.9 - 2.4]	2.5 [2.2 - 2.7]	
Personal care and related workers	1.5 [0.9 - 2.4]	1.6 [1.4 - 1.8]	
Medical doctors	1.2 [0.7 - 2.0]	1.1 [0.9 - 1.3]	
Electrical and electronic equipment mechanics and fitters	1.1 [0.6 - 1.9]	1.7 [1.5 - 1.9]	
Missing information	1.1 [0.5 - 1.8]	1.3 [1.1 - 1.5]	
Social and health associate professionals, teachers	1.0 [0.5 - 1.7]	1.1 [0.9 - 1.3]	
Precision workers in metal and related materials	0.9 [0.4 - 1.6]	0.6 [0.5 - 0.8]	
Drivers and mobile plant operators	0.9 [0.4 - 1.6]	0.7 [0.6 - 0.9]	
Plastic-products machine operators	0.7 [0.3 - 1.4]	0.9 [0.7 - 1.0]	
Metal finishing-, plating- and coating-machine operators	0.7 [0.3 - 1.4]	0.3 [0.2 - 0.4]	
Food and related products machine operators	0.7 [0.3 - 1.4]	0.3 [0.2 - 0.4]	
Construction & maintenance labour: roads, dams & similar	0.7 [0.3 - 1.4]	0.4 [0.3 - 0.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to cobalt(II) chloride hexahydrate (CAS: 7791-13-1)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to cobalt(II) chloride hexahydrate (CAS: 7791-13-1)	Significance
Cashiers, tellers and related clerks	0.7 [0.3 - 1.4]	0.3 [0.2 - 0.4]	
Wine grower, vine refiner, vintage helper	0.5 [0.2 - 1.1]	0.7 [0.6 - 0.9]	
Dental technicians	0.5 [0.2 - 1.1]	0.8 [0.6 - 0.9]	
Butchers, fishmongers and related food preparers	0.5 [0.2 - 1.1]	0.8 [0.6 - 0.9]	
Printing-machine operators	0.4 [0.1 - 1.0]	0.6 [0.5 - 0.7]	
Building finishers and related trades workers	0.4 [0.1 - 1.0]	0.5 [0.4 - 0.6]	
Carpenter, cabinet maker, model maker	0.4 [0.1 - 1.0]	1.3 [1.1 - 1.5]	#
Labour, unknown or not classifiable, „other occupation“	0.4 [0.1 - 1.0]	0.4 [0.3 - 0.6]	
Protective services workers	0.4 [0.1 - 1.0]	0.5 [0.4 - 0.7]	
Metal processing plant operators, rolling mill operators	0.4 [0.1 - 0.9]	0.4 [0.3 - 0.5]	
Welders and flame cutters	0.4 [0.1 - 0.9]	0.6 [0.5 - 0.7]	
Communication professions	0.4 [0.1 - 0.9]	0.1 [0.1 - 0.2]	
Veterinarians	0.4 [0.1 - 0.9]	0.2 [0.1 - 0.3]	
Textile, garment and related trades workers	0.3 [0.1 - 0.8]	0.3 [0.3 - 0.5]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.2 [0.0 - 0.6]	0.3 [0.2 - 0.4]	
Mining- and mineral-processing plant operators	0.2 [0.0 - 0.6]	0.2 [0.1 - 0.3]	
papermaking-plant operators, bookbinders	0.2 [0.0 - 0.6]	0.3 [0.2 - 0.4]	
Metal worker (non-cutting)	0.2 [0.0 - 0.6]	0.2 [0.1 - 0.3]	
Potters, glass-makers and related trades workers	0.1 [0.0 - 0.5]	0.2 [0.1 - 0.3]	
Manufacturers or processors of fur and leather	0.1 [0.0 - 0.5]	0.2 [0.1 - 0.3]	
Beverage industry labour	0.1 [0.0 - 0.5]	0.1 [0.0 - 0.1]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to cobalt(II) chloride hexahydrate (CAS: 7791-13-1)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to cobalt(II) chloride hexahydrate (CAS: 7791-13-1)	Significance
Artists, musicians, professional sportsmen	0.1 [0.0 - 0.5]	0.2 [0.1 - 0.2]	
Domestic and related helpers, cleaners and launderers	0.1 [0.0 - 0.5]	0.2 [0.1 - 0.3]	

**Tab. 3.2.3.4** IVDK, 2007-2016, OD patients with positive and negative reaction to methylchloroisothiazolinone/methylisothiazolinone (MCI/MI) (CAS: 55965-84-9), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 998

Number of patients not sensitized to the allergen (negative reaction): 16,046

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methylchloro-isothiazolinone / methylisothiazolinone (MCI/MI) (CAS: 55965-84-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methylchloro-isothiazolinone / methylisothiazolinone (MCI/MI) (CAS: 55965-84-9)	Significance
Health care professionals	14.3 [12.2 - 16.7]	12.3 [11.8 - 12.9]	
Mechanics, Metal, machinery and related trades workers	11.2 [9.3 - 13.3]	10.8 [10.4 - 11.3]	
Hairdressers, barbers, beauticians, wigmakers	8.9 [7.2 - 10.9]	5.9 [5.5 - 6.3]	*
Occupations with undetermined exposure	8.9 [7.2 - 10.9]	8.3 [7.9 - 8.7]	
Geriatric nurse, social work associate professionals	6.0 [4.6 - 7.7]	4.3 [4.0 - 4.6]	*
Painters, lacquerers and related workers	5.2 [3.9 - 6.8]	2.0 [1.7 - 2.2]	*
Building, vehicle, street cleaner	4.0 [2.9 - 5.4]	4.9 [4.5 - 5.2]	
Metal worker (cutting)	3.5 [2.5 - 4.8]	3.7 [3.4 - 4.0]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	2.8 [1.9 - 4.0]	3.9 [3.6 - 4.3]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methylchloro-isothiazolinone / methylisothiazolinone (MCI/MI) (CAS: 55965-84-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methylchloro-isothiazolinone / methylisothiazolinone (MCI/MI) (CAS: 55965-84-9)	Significance
Chemist, Lab assistant, Chemical-products machine operators	2.7 [1.8 - 3.9]	1.4 [1.2 - 1.6]	*
Personal care and related workers	2.7 [1.8 - 3.9]	1.5 [1.3 - 1.7]	*
Office clerks	2.4 [1.5 - 3.6]	2.6 [2.3 - 2.8]	
Machinery mechanics and fitters	2.3 [1.5 - 3.4]	2.4 [2.2 - 2.6]	
Construction workers, Manufacturers of building materials	2.0 [1.2 - 3.1]	2.7 [2.5 - 3.0]	
Gardeners, salespersons (fruit, flowers, vegetables)	1.9 [1.2 - 3.0]	1.9 [1.7 - 2.1]	
Bakers, pastry-cooks and confectionery makers	1.7 [1.0 - 2.7]	2.1 [1.8 - 2.3]	
Engineers, technicians and scientists	1.7 [1.0 - 2.7]	2.5 [2.2 - 2.7]	
Salespersons and demonstrators	1.5 [0.8 - 2.5]	1.2 [1.0 - 1.4]	
Electrical and electronic equipment mechanics and fitters	1.3 [0.7 - 2.2]	1.7 [1.5 - 1.9]	
Dental technicians	1.1 [0.6 - 2.0]	0.7 [0.6 - 0.9]	
Storekeeper, transport labour and freight handlers	1.1 [0.6 - 2.0]	1.5 [1.3 - 1.6]	
Medical doctors	0.9 [0.4 - 1.7]	1.1 [1.0 - 1.3]	
Social and health associate professionals, teachers	0.9 [0.4 - 1.7]	1.1 [0.9 - 1.3]	
Dentists	0.8 [0.3 - 1.6]	1.8 [1.6 - 2.0]	
Laboratory assistants (health associate professionals)	0.8 [0.3 - 1.6]	1.2 [1.1 - 1.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methylchloro-isothiazolinone / methylisothiazolinone (MCI/MI) (CAS: 55965-84-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methylchloro-isothiazolinone / methylisothiazolinone (MCI/MI) (CAS: 55965-84-9)	Significance
Housewife/-man, domestic helper	0.7 [0.3 - 1.4]	1.5 [1.3 - 1.7]	
Plastic-products machine operators	0.7 [0.3 - 1.4]	0.8 [0.7 - 1.0]	
Printing-machine operators	0.6 [0.2 - 1.3]	0.6 [0.4 - 0.7]	
Butchers, fishmongers and related food preparers	0.6 [0.2 - 1.3]	0.8 [0.6 - 0.9]	
Carpenter, cabinet maker, model maker	0.6 [0.2 - 1.3]	1.3 [1.1 - 1.4]	
Wine grower, vine refiner, vintage helper	0.5 [0.2 - 1.2]	0.7 [0.6 - 0.9]	
Textile, garment and related trades workers	0.4 [0.1 - 1.0]	0.4 [0.3 - 0.5]	
Building finishers and related trades workers	0.4 [0.1 - 1.0]	0.5 [0.4 - 0.6]	
Missing information	0.3 [0.1 - 0.9]	1.3 [1.1 - 1.5]	#
Mining- and mineral-processing plant operators	0.3 [0.1 - 0.9]	0.2 [0.2 - 0.3]	
Welders and flame cutters	0.3 [0.1 - 0.9]	0.5 [0.4 - 0.7]	
Precision workers in metal and related materials	0.3 [0.1 - 0.9]	0.7 [0.6 - 0.8]	
Construction & maintenance labour: roads, dams & similar	0.3 [0.1 - 0.9]	0.4 [0.3 - 0.6]	
Labour, unknown, or not classifiable other occupation	0.3 [0.1 - 0.9]	0.4 [0.3 - 0.6]	
Drivers and mobile plant operators	0.3 [0.1 - 0.9]	0.7 [0.6 - 0.9]	
Waiters and bartenders, guest attendants	0.3 [0.1 - 0.9]	1.0 [0.9 - 1.2]	#
Rubber-products machine operators, vulcanizers	0.2 [0.0 - 0.7]	0.1 [0.1 - 0.2]	
Metal processing plant operators, rolling mill operators	0.2 [0.0 - 0.7]	0.3 [0.3 - 0.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methylchloro-isothiazolinone / methylisothiazolinone (MCI/MI) (CAS: 55965-84-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methylchloro-isothiazolinone / methylisothiazolinone (MCI/MI) (CAS: 55965-84-9)	Significance
Petrol pump attendant	0.2 [0.0 - 0.7]	0.0 [0.0 - 0.1]	
Communication professions	0.2 [0.0 - 0.7]	0.2 [0.1 - 0.3]	
Cashiers, tellers and related clerks	0.2 [0.0 - 0.7]	0.3 [0.2 - 0.4]	
Protective services workers	0.2 [0.0 - 0.7]	0.5 [0.4 - 0.7]	
Domestic and related helpers, cleaners and launderers	0.2 [0.0 - 0.7]	0.2 [0.1 - 0.3]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.1 [0.0 - 0.6]	0.3 [0.2 - 0.4]	
Potters, glass-makers and related trades workers	0.1 [0.0 - 0.6]	0.2 [0.2 - 0.3]	
papermaking-plant operators, bookbinders	0.1 [0.0 - 0.6]	0.3 [0.2 - 0.4]	
Metal finishing-, plating- and coating-machine operators	0.1 [0.0 - 0.6]	0.3 [0.3 - 0.5]	
Beverage industry labour	0.1 [0.0 - 0.6]	0.0 [0.0 - 0.1]	
Food and related products machine operators	0.1 [0.0 - 0.6]	0.4 [0.3 - 0.5]	
Photographic-products machine operators	0.1 [0.0 - 0.6]	0.0 [0.0 - 0.1]	
Veterinarians	0.1 [0.0 - 0.6]	0.2 [0.1 - 0.3]	
Pharmacists	0.1 [0.0 - 0.6]	0.1 [0.1 - 0.2]	

**Tab. 3.2.3.5** IVDK, 2007-2016, OD patients with positive and negative reaction to Balsam of Peru (*Myroxolon pereirae*) (CAS: 8007-00-9), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 978

Number of patients not sensitized to the allergen (negative reaction): 15,240

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Balsam of Peru ( <i>Myroxolon pereirae</i> ) (CAS: 8007-00-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Balsam of Peru ( <i>Myroxolon pereirae</i> ) (CAS: 8007-00-9)	Significance
Health care professionals	16.2 [13.9 - 18.6]	12.0 [11.5 - 12.5]	*
Occupations with undetermined exposure	10.0 [8.2 - 12.1]	8.3 [7.8 - 8.7]	
Mechanics, Metal, machinery and related trades workers	9.3 [7.6 - 11.3]	11.1 [10.6 - 11.6]	
Geriatric nurse, social work associate professionals	5.5 [4.2 - 7.1]	4.1 [3.8 - 4.4]	
Building, vehicle, street cleaner	5.4 [4.1 - 7.0]	4.7 [4.3 - 5.0]	
Hairdressers, barbers, beauticians, wigmakers	4.5 [3.3 - 6.0]	6.3 [5.9 - 6.7]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	2.9 [1.9 - 4.1]	4.0 [3.7 - 4.3]	
Office clerks	2.8 [1.8 - 4.0]	2.5 [2.2 - 2.7]	
Metal worker (cutting)	2.7 [1.7 - 3.9]	3.8 [3.5 - 4.1]	
Personal care and related workers	2.5 [1.6 - 3.6]	1.6 [1.4 - 1.8]	
Gardeners, salespersons (fruit, flowers, vegetables)	2.4 [1.5 - 3.5]	1.9 [1.7 - 2.2]	
Construction workers, Manufacturers of building materials	2.4 [1.5 - 3.5]	2.7 [2.5 - 3.0]	
Painters, lacquerers and related workers	1.9 [1.2 - 3.0]	2.2 [2.0 - 2.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Balsam of Peru ( <i>Myroxolon pereirae</i> ) (CAS: 8007-00-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Balsam of Peru ( <i>Myroxolon pereirae</i> ) (CAS: 8007-00-9)	Significance
Chemist, Lab assistant, Chemical-products machine operators	1.8 [1.1 - 2.9]	1.5 [1.3 - 1.7]	
Bakers, pastry-cooks and confectionery makers	1.8 [1.1 - 2.9]	2.1 [1.9 - 2.4]	
Salespersons and demonstrators	1.8 [1.1 - 2.9]	1.1 [1.0 - 1.3]	
Housewife/-man, domestic helper	1.7 [1.0 - 2.8]	1.5 [1.3 - 1.7]	
Machinery mechanics and fitters	1.7 [1.0 - 2.8]	2.3 [2.1 - 2.6]	
Carpenter, cabinet maker, model maker	1.4 [0.8 - 2.4]	1.2 [1.0 - 1.4]	
Storekeeper, transport labour and freight handlers	1.3 [0.7 - 2.3]	1.4 [1.3 - 1.6]	
Engineers, technicians and scientists	1.1 [0.6 - 2.0]	2.5 [2.3 - 2.8]	#
Drivers and mobile plant operators	1.1 [0.6 - 2.0]	0.7 [0.6 - 0.9]	
Medical doctors	1.1 [0.6 - 2.0]	1.1 [0.9 - 1.3]	
Laboratory assistants (health associate professionals)	1.1 [0.6 - 2.0]	1.2 [1.0 - 1.4]	
Electrical and electronic equipment mechanics and fitters	1.0 [0.5 - 1.9]	1.7 [1.5 - 1.9]	
Dentists	1.0 [0.5 - 1.9]	1.8 [1.6 - 2.0]	
Plastic-products machine operators	0.9 [0.4 - 1.7]	0.8 [0.7 - 1.0]	
Social and health associate professionals, teachers	0.9 [0.4 - 1.7]	1.1 [0.9 - 1.2]	
Missing information	0.8 [0.4 - 1.6]	1.3 [1.1 - 1.5]	
Protective services workers	0.8 [0.4 - 1.6]	0.5 [0.4 - 0.6]	
Waiters and bartenders, guest attendants	0.8 [0.4 - 1.6]	1.0 [0.9 - 1.2]	
Butchers, fishmongers and related food preparers	0.7 [0.3 - 1.5]	0.7 [0.6 - 0.9]	
Construction & maintenance labour: roads, dams & similar	0.7 [0.3 - 1.5]	0.4 [0.3 - 0.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Balsam of Peru ( <i>Myroxolon pereirae</i> ) (CAS: 8007-00-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Balsam of Peru ( <i>Myroxolon pereirae</i> ) (CAS: 8007-00-9)	Significance
Printing-machine operators	0.6 [0.2 - 1.3]	0.6 [0.5 - 0.7]	
Food and related products machine operators	0.6 [0.2 - 1.3]	0.4 [0.3 - 0.5]	
Wine grower, vine refiner, vintage helper	0.5 [0.2 - 1.2]	0.7 [0.6 - 0.8]	
Mining- and mineral-processing plant operators	0.5 [0.2 - 1.2]	0.2 [0.1 - 0.3]	
Communication professions	0.5 [0.2 - 1.2]	0.2 [0.1 - 0.2]	
Metal finishing-, plating- and coating-machine operators	0.4 [0.1 - 1.0]	0.3 [0.2 - 0.4]	
Dental technicians	0.4 [0.1 - 1.0]	0.8 [0.6 - 0.9]	
Forestry and related workers	0.3 [0.1 - 0.9]	0.0 [0.0 - 0.1]	
Potters, glass-makers and related trades workers	0.3 [0.1 - 0.9]	0.2 [0.1 - 0.3]	
papermaking-plant operators, bookbinders	0.3 [0.1 - 0.9]	0.3 [0.2 - 0.4]	
Precision workers in metal and related materials	0.3 [0.1 - 0.9]	0.6 [0.5 - 0.8]	
Manufacturers or processors of fur and leather	0.3 [0.1 - 0.9]	0.2 [0.1 - 0.3]	
Building finishers and related trades workers	0.3 [0.1 - 0.9]	0.5 [0.4 - 0.6]	
Labour, unknown or not classifiable, „other occupation“	0.3 [0.1 - 0.9]	0.4 [0.3 - 0.6]	
Artists, musicians, professional sportsmen	0.3 [0.1 - 0.9]	0.1 [0.1 - 0.2]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.2 [0.0 - 0.7]	0.3 [0.2 - 0.4]	
Metal processing plant operators, rolling mill operators	0.2 [0.0 - 0.7]	0.4 [0.3 - 0.5]	
Welders and flame cutters	0.2 [0.0 - 0.7]	0.6 [0.5 - 0.7]	
Textile, garment and related trades workers	0.2 [0.0 - 0.7]	0.4 [0.3 - 0.5]	
Cashiers, tellers and related clerks	0.2 [0.0 - 0.7]	0.3 [0.2 - 0.4]	
Pharmacists	0.2 [0.0 - 0.7]	0.1 [0.0 - 0.1]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Balsam of Peru ( <i>Myroxolon pereirae</i> ) (CAS: 8007-00-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Balsam of Peru ( <i>Myroxolon pereirae</i> ) (CAS: 8007-00-9)	Significance
Domestic and related helpers, cleaners and launderers	0.2 [0.0 - 0.7]	0.2 [0.1 - 0.3]	
Metal worker (non-cutting)	0.1 [0.0 - 0.6]	0.2 [0.2 - 0.3]	
Musical-instrument makers and tuners, model makers, taxidermists	0.1 [0.0 - 0.6]	0.0 [0.0 - 0.8]	

**Tab. 3.2.3.6** IVDK, 2007-2016, OD patients with positive and negative reaction to thiuram mix (CAS: not applicable), respectively: Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 978

Number of patients not sensitized to the allergen (negative reaction): 15,555

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;  
# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to thiuram mix (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to thiuram mix (CAS: not applicable)	Significance
Health care professionals	14.5 [12.4 - 16.9]	12.0 [11.5 - 12.5]	
Building, vehicle, street cleaner	9.2 [7.5 - 11.2]	4.4 [4.1 - 4.8]	*
Occupations with undetermined exposure	9.0 [7.3 - 11.0]	8.4 [8.0 - 8.8]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	7.9 [6.3 - 9.7]	3.6 [3.3 - 3.9]	*
Mechanics, Metal, machinery and related trades workers	7.1 [5.5 - 8.8]	11.2 [10.7 - 11.7]	#
Construction workers, Manufacturers of building materials	5.1 [3.8 - 6.7]	2.6 [2.3 - 2.8]	*
Geriatric nurse, social work associate professionals	4.8 [3.6 - 6.3]	4.2 [3.9 - 4.5]	
Dentists	3.3 [2.2 - 4.6]	1.6 [1.4 - 1.8]	*
Metal worker (cutting)	2.7 [1.7 - 3.9]	3.9 [3.6 - 4.2]	
Hairdressers, barbers, beauticians, wigmakers	2.6 [1.7 - 3.8]	6.4 [6.0 - 6.8]	#
Medical doctors	2.4 [1.5 - 3.5]	1.0 [0.8 - 1.2]	*
Butchers, fishmongers and related food preparers	2.1 [1.3 - 3.3]	0.7 [0.5 - 0.8]	*

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to thiuram mix (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to thiuram mix (CAS: not applicable)	Significance
Bakers, pastry-cooks and confectionery makers	1.9 [1.2 - 3.0]	2.1 [1.9 - 2.3]	
Housewife/-man, domestic helper	1.7 [1.0 - 2.8]	1.5 [1.3 - 1.7]	
Gardeners, salespersons (fruit, flowers, vegetables)	1.7 [1.0 - 2.8]	1.9 [1.7 - 2.2]	
Storekeeper, transport labour and freight handlers	1.7 [1.0 - 2.8]	1.4 [1.3 - 1.6]	
Office clerks	1.6 [0.9 - 2.6]	2.6 [2.4 - 2.9]	
Chemist, Lab assistant, Chemical-products machine operators	1.4 [0.8 - 2.4]	1.5 [1.3 - 1.7]	
Painters, lacquerers and related workers	1.3 [0.7 - 2.3]	2.3 [2.0 - 2.5]	
Engineers, technicians and scientists	1.3 [0.7 - 2.3]	2.5 [2.3 - 2.8]	#
Laboratory assistants (health associate professionals)	1.2 [0.6 - 2.1]	1.2 [1.0 - 1.4]	
Waiters and bartenders, guest attendants	1.2 [0.6 - 2.1]	1.0 [0.9 - 1.2]	
Missing information	1.1 [0.6 - 2.0]	1.2 [1.1 - 1.4]	
Machinery mechanics and fitters	1.1 [0.6 - 2.0]	2.5 [2.2 - 2.7]	#
Mixed-animal producers (dairy, poultry etc.), fishery labour	1.0 [0.5 - 1.9]	0.2 [0.1 - 0.3]	*
Personal care and related workers	1.0 [0.5 - 1.9]	1.6 [1.4 - 1.9]	
Salespersons and demonstrators	0.9 [0.4 - 1.7]	1.2 [1.0 - 1.4]	
Social and health associate professionals, teachers	0.8 [0.4 - 1.6]	1.1 [0.9 - 1.3]	
Wine grower, vine refiner, vintage helper	0.7 [0.3 - 1.5]	0.7 [0.6 - 0.8]	
Construction & maintenance labour: roads, dams & similar	0.7 [0.3 - 1.5]	0.4 [0.3 - 0.5]	
Plastic-products machine operators	0.6 [0.2 - 1.3]	0.9 [0.7 - 1.0]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to thiuram mix (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to thiuram mix (CAS: not applicable)	Significance
Labour, unknown or not classifiable, „other occupation“	0.6 [0.2 - 1.3]	0.4 [0.3 - 0.5]	
Food and related products machine operators	0.5 [0.2 - 1.2]	0.4 [0.3 - 0.5]	
Welders and flame cutters	0.4 [0.1 - 1.0]	0.6 [0.5 - 0.7]	
Printing-machine operators	0.3 [0.1 - 0.9]	0.6 [0.5 - 0.7]	
Precision workers in metal and related materials	0.3 [0.1 - 0.9]	0.7 [0.6 - 0.8]	
Carpenter, cabinet maker, model maker	0.3 [0.1 - 0.9]	1.3 [1.1 - 1.5]	#
Drivers and mobile plant operators	0.3 [0.1 - 0.9]	0.8 [0.6 - 0.9]	
papermaking-plant operators, bookbinders	0.2 [0.0 - 0.7]	0.3 [0.2 - 0.4]	
Metal processing plant operators, rolling mill operators	0.2 [0.0 - 0.7]	0.4 [0.3 - 0.5]	
Dental technicians	0.2 [0.0 - 0.7]	0.8 [0.7 - 0.9]	
Electrical and electronic equipment mechanics and fitters	0.2 [0.0 - 0.7]	1.7 [1.5 - 2.0]	#
Textile, garment and related trades workers	0.2 [0.0 - 0.7]	0.4 [0.3 - 0.5]	
Manufacturers or processors of fur and leather	0.2 [0.0 - 0.7]	0.2 [0.1 - 0.3]	
Building finishers and related trades workers	0.2 [0.0 - 0.7]	0.5 [0.4 - 0.6]	
Interior decorators, upholsterers	0.2 [0.0 - 0.7]	0.1 [0.0 - 0.2]	
Communication professions	0.2 [0.0 - 0.7]	0.2 [0.1 - 0.2]	
Domestic and related helpers, cleaners and launderers	0.2 [0.0 - 0.7]	0.2 [0.1 - 0.3]	
Mining- and mineral-processing plant operators	0.1 [0.0 - 0.6]	0.2 [0.2 - 0.3]	
Metal worker (non-cutting)	0.1 [0.0 - 0.6]	0.2 [0.1 - 0.3]	
Metal finishing-, plating- and coating-machine operators	0.1 [0.0 - 0.6]	0.4 [0.3 - 0.5]	
Blacksmiths, hammer-smiths and forging-press workers	0.1 [0.0 - 0.6]	0.0 [0.0 - 0.1]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to thiuram mix (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to thiuram mix (CAS: not applicable)	Significance
Optometrists and opticians	0.1 [0.0 - 0.6]	0.0 [0.0 - 0.1]	
Beverage industry labour	0.1 [0.0 - 0.6]	0.1 [0.0 - 0.1]	
Petrol pump attendant	0.1 [0.0 - 0.6]	0.1 [0.0 - 0.1]	
Cashiers, tellers and related clerks	0.1 [0.0 - 0.6]	0.3 [0.2 - 0.4]	
Protective services workers	0.1 [0.0 - 0.6]	0.5 [0.4 - 0.6]	
Hygiene and health surveillance	0.1 [0.0 - 0.6]	0.1 [0.1 - 0.2]	
Veterinarians	0.1 [0.0 - 0.6]	0.2 [0.1 - 0.3]	
Pharmacists	0.1 [0.0 - 0.6]	0.1 [0.0 - 0.1]	

**Tab. 3.2.3.7** IVDK, 2007-2016, OD patients with positive and negative reaction to methylisothiazolinone (CAS: 2682-20-4), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 954

Number of patients not sensitized to the allergen (negative reaction): 12,663

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methylisothiazolinone (CAS: 2682-20-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methylisothiazolinone (CAS: 2682-20-4)	Significance to
Mechanics, Metal, machinery and related trades workers	12.6 [10.5 - 14.9]	11.5 [11.0 - 12.1]	
Health care professionals	10.6 [8.7 - 12.7]	13.7 [13.1 - 14.3]	#
Hairdressers, barbers, beauticians, wigmakers	8.1 [6.4 - 10.0]	6.1 [5.7 - 6.6]	
Occupations with undetermined exposure	7.4 [5.9 - 9.3]	7.6 [7.2 - 8.1]	
Painters, lacquerers and related workers	7.0 [5.5 - 8.8]	1.8 [1.6 - 2.1]	*
Geriatric nurse, social work associate professionals	5.8 [4.4 - 7.4]	5.0 [4.6 - 5.4]	
Metal worker (cutting)	4.7 [3.5 - 6.3]	4.2 [3.8 - 4.5]	
Personal care and related workers	4.0 [2.8 - 5.4]	1.4 [1.2 - 1.6]	*
Building, vehicle, street cleaner	4.0 [2.8 - 5.4]	4.7 [4.4 - 5.1]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	2.9 [2.0 - 4.2]	3.6 [3.2 - 3.9]	
Construction workers, Manufacturers of building materials	2.8 [1.9 - 4.1]	2.6 [2.4 - 2.9]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methylisothiazolinone (CAS: 2682-20-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methylisothiazolinone (CAS: 2682-20-4)	Significance
Chemist, Lab assistant, Chemical-products machine operators	2.4 [1.5 - 3.6]	1.3 [1.1 - 1.5]	*
Engineers, technicians and scientists	2.3 [1.5 - 3.5]	2.4 [2.1 - 2.7]	
Office clerks	2.1 [1.3 - 3.2]	2.1 [1.9 - 2.4]	
Machinery mechanics and fitters	1.8 [1.0 - 2.8]	2.4 [2.1 - 2.7]	
Gardeners, salespersons (fruit, flowers, vegetables)	1.6 [0.9 - 2.6]	1.8 [1.6 - 2.1]	
Salespersons and demonstrators	1.6 [0.9 - 2.6]	1.2 [1.0 - 1.4]	
Social and health associate professionals, teachers	1.4 [0.7 - 2.3]	1.1 [0.9 - 1.3]	
Storekeeper, transport labour and freight handlers	1.2 [0.6 - 2.1]	1.4 [1.2 - 1.6]	
Bakers, pastry-cooks and confectionery makers	1.0 [0.5 - 1.9]	2.1 [1.8 - 2.3]	
Electrical and electronic equipment mechanics and fitters	0.9 [0.4 - 1.8]	1.8 [1.6 - 2.1]	
Carpenter, cabinet maker, model maker	0.9 [0.4 - 1.8]	1.1 [1.0 - 1.3]	
Dentists	0.9 [0.4 - 1.8]	1.6 [1.4 - 1.8]	
Housewife/-man, domestic helper	0.8 [0.4 - 1.6]	1.5 [1.3 - 1.7]	
Medical doctors	0.8 [0.4 - 1.6]	1.1 [0.9 - 1.2]	
Missing information	0.6 [0.2 - 1.4]	1.3 [1.1 - 1.6]	
Wine grower, vine refiner, vintage helper	0.6 [0.2 - 1.4]	0.7 [0.5 - 0.8]	
Dental technicians	0.6 [0.2 - 1.4]	0.7 [0.6 - 0.9]	
Butchers, fishmongers and related food preparers	0.6 [0.2 - 1.4]	0.7 [0.6 - 0.9]	
Drivers and mobile plant operators	0.6 [0.2 - 1.4]	0.7 [0.6 - 0.9]	
Waiters and bartenders, guest attendants	0.6 [0.2 - 1.4]	0.8 [0.7 - 1.0]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methylisothiazolinone (CAS: 2682-20-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methylisothiazolinone (CAS: 2682-20-4)	Significance
Plastic-products machine operators	0.5 [0.2 - 1.2]	0.7 [0.6 - 0.9]	
Printing-machine operators	0.5 [0.2 - 1.2]	0.5 [0.4 - 0.6]	
Precision workers in metal and related materials	0.5 [0.2 - 1.2]	0.7 [0.5 - 0.8]	
Mining- and mineral-processing plant operators	0.4 [0.1 - 1.1]	0.2 [0.1 - 0.2]	
Metal processing plant operators, rolling mill operators	0.3 [0.1 - 0.9]	0.3 [0.2 - 0.4]	
Welders and flame cutters	0.3 [0.1 - 0.9]	0.6 [0.5 - 0.7]	
Textile, garment and related trades workers	0.3 [0.1 - 0.9]	0.3 [0.2 - 0.4]	
Construction & maintenance labour: roads, dams & similar	0.3 [0.1 - 0.9]	0.4 [0.3 - 0.5]	
Building finishers and related trades workers	0.3 [0.1 - 0.9]	0.5 [0.3 - 0.6]	
Cashiers, tellers and related clerks	0.3 [0.1 - 0.9]	0.2 [0.2 - 0.3]	
Laboratory assistants (health associate professionals)	0.3 [0.1 - 0.9]	1.3 [1.1 - 1.5]	#
Potters, glass-makers and related trades workers	0.2 [0.0 - 0.8]	0.2 [0.1 - 0.3]	
Rubber-products machine operators, vulcanizers	0.2 [0.0 - 0.8]	0.1 [0.1 - 0.2]	
Metal worker (non-cutting)	0.2 [0.0 - 0.8]	0.2 [0.1 - 0.3]	
Labour, unknown, or not classifiable other occupation	0.2 [0.0 - 0.8]	0.4 [0.3 - 0.5]	
Petrol pump attendant	0.2 [0.0 - 0.8]	0.0 [0.0 - 0.1]	
Veterinarians	0.2 [0.0 - 0.8]	0.2 [0.1 - 0.3]	
Pharmacists	0.2 [0.0 - 0.8]	0.1 [0.0 - 0.1]	
Domestic and related helpers, cleaners and launderers	0.2 [0.0 - 0.8]	0.2 [0.1 - 0.3]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.1 [0.0 - 0.6]	0.3 [0.2 - 0.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methylisothiazolinone (CAS: 2682-20-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methylisothiazolinone (CAS: 2682-20-4)	Significance
papermaking-plant operators, bookbinders	0.1 [0.0 - 0.6]	0.3 [0.2 - 0.4]	
Metal finishing-, plating- and coating-machine operators	0.1 [0.0 - 0.6]	0.3 [0.3 - 0.5]	
Food and related products machine operators	0.1 [0.0 - 0.6]	0.4 [0.3 - 0.5]	
Communication professions	0.1 [0.0 - 0.6]	0.1 [0.1 - 0.2]	
Artists, musicians, professional sportsmen	0.1 [0.0 - 0.6]	0.1 [0.1 - 0.2]	

**Tab. 3.2.3.8** IVDK, 2007-2016, OD patients with positive and negative reaction to potassium dichromate (CAS: 7778-50-9), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 905

Number of patients not sensitized to the allergen (negative reaction): 15,651

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to potassium dichromate (CAS: 7778-50-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to potassium dichromate (CAS: 7778-50-9)	Significance
Occupations with undetermined exposure	12.3 [10.2 - 14.6]	8.1 [7.7 - 8.6]	*
Mechanics, Metal, machinery and related trades workers	11.3 [9.3 - 13.5]	10.8 [10.3 - 11.3]	
Health care professionals	9.7 [7.9 - 11.8]	12.5 [12.0 - 13.0]	#
Construction workers, Manufacturers of building materials	7.5 [5.9 - 9.4]	2.3 [2.1 - 2.5]	*
Building, vehicle, street cleaner	4.6 [3.4 - 6.2]	4.8 [4.5 - 5.2]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	4.2 [3.0 - 5.7]	3.9 [3.6 - 4.2]	
Geriatric nurse, social work associate professionals	4.2 [3.0 - 5.7]	4.4 [4.1 - 4.7]	
Engineers, technicians and scientists	2.4 [1.5 - 3.7]	2.4 [2.2 - 2.7]	
Machinery mechanics and fitters	2.3 [1.4 - 3.5]	2.3 [2.1 - 2.6]	
Salespersons and demonstrators	2.3 [1.4 - 3.5]	1.1 [1.0 - 1.3]	*
Storekeeper, transport labour and freight handlers	2.3 [1.4 - 3.5]	1.4 [1.2 - 1.6]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to potassium dichromate (CAS: 7778-50-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to potassium dichromate (CAS: 7778-50-9)	Significance
Hairdressers, barbers, beauticians, wigmakers	2.3 [1.4 - 3.5]	6.4 [6.0 - 6.8]	#
Housewife/-man, domestic helper	2.1 [1.3 - 3.3]	1.5 [1.3 - 1.7]	
Office clerks	2.0 [1.2 - 3.1]	2.5 [2.3 - 2.8]	
Medical doctors	1.9 [1.1 - 3.0]	1.1 [0.9 - 1.3]	
Gardeners, salespersons (fruit, flowers, vegetables)	1.7 [0.9 - 2.7]	2.0 [1.7 - 2.2]	
Metal worker (cutting)	1.7 [0.9 - 2.7]	3.9 [3.6 - 4.2]	#
Waiters and bartenders, guest attendants	1.7 [0.9 - 2.7]	1.0 [0.8 - 1.2]	
Missing information	1.5 [0.8 - 2.6]	1.2 [1.1 - 1.4]	
Chemist, Lab assistant, Chemical-products machine operators	1.3 [0.7 - 2.3]	1.5 [1.3 - 1.7]	
Electrical and electronic equipment mechanics and fitters	1.3 [0.7 - 2.3]	1.7 [1.5 - 1.9]	
Painters, lacquerers and related workers	1.3 [0.7 - 2.3]	2.2 [2.0 - 2.5]	
Drivers and mobile plant operators	1.3 [0.7 - 2.3]	0.7 [0.6 - 0.8]	
Construction & maintenance labour: roads, dams & similar	1.2 [0.6 - 2.2]	0.4 [0.3 - 0.5]	*
Protective services workers	1.1 [0.5 - 2.0]	0.5 [0.4 - 0.6]	
Social and health associate professionals, teachers	1.1 [0.5 - 2.0]	1.1 [0.9 - 1.3]	
Bakers, pastry-cooks and confectionery makers	1.0 [0.5 - 1.9]	2.1 [1.9 - 2.3]	
Welders and flame cutters	0.9 [0.4 - 1.7]	0.5 [0.4 - 0.6]	
Laboratory assistants (health associate professionals)	0.9 [0.4 - 1.7]	1.2 [1.0 - 1.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to potassium dichromate (CAS: 7778-50-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to potassium dichromate (CAS: 7778-50-9)	Significance
Personal care and related workers	0.9 [0.4 - 1.7]	1.7 [1.5 - 1.9]	
Wine grower, vine refiner, vintage helper	0.8 [0.3 - 1.6]	0.7 [0.6 - 0.8]	
Plastic-products machine operators	0.8 [0.3 - 1.6]	0.8 [0.7 - 1.0]	
Carpenter, cabinet maker, model maker	0.8 [0.3 - 1.6]	1.2 [1.1 - 1.4]	
Metal finishing-, plating- and coating-machine operators	0.7 [0.2 - 1.4]	0.3 [0.2 - 0.4]	
Mining- and mineral-processing plant operators	0.6 [0.2 - 1.3]	0.2 [0.1 - 0.3]	
Precision workers in metal and related materials	0.6 [0.2 - 1.3]	0.7 [0.6 - 0.8]	
Butchers, fishmongers and related food preparers	0.6 [0.2 - 1.3]	0.8 [0.6 - 0.9]	
Building finishers and related trades workers	0.6 [0.2 - 1.3]	0.4 [0.3 - 0.6]	
Dentists	0.6 [0.2 - 1.3]	1.7 [1.5 - 1.9]	#
Metal processing plant operators, rolling mill operators	0.4 [0.1 - 1.1]	0.3 [0.3 - 0.4]	
Dental technicians	0.4 [0.1 - 1.1]	0.8 [0.7 - 1.0]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.3 [0.1 - 1.0]	0.3 [0.2 - 0.4]	
papermaking-plant operators, bookbinders	0.3 [0.1 - 1.0]	0.2 [0.2 - 0.3]	
Metal worker (non-cutting)	0.3 [0.1 - 1.0]	0.2 [0.1 - 0.3]	
Labour, unknown, or not classifiable other occupation	0.3 [0.1 - 1.0]	0.4 [0.3 - 0.6]	
Communication professions	0.3 [0.1 - 1.0]	0.2 [0.1 - 0.3]	
Textile, garment and related trades workers	0.2 [0.0 - 0.8]	0.4 [0.3 - 0.5]	
Food and related products machine operators	0.2 [0.0 - 0.8]	0.4 [0.3 - 0.5]	
Cashiers, tellers and related clerks	0.2 [0.0 - 0.8]	0.3 [0.2 - 0.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to potassium dichromate (CAS: 7778-50-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to potassium dichromate (CAS: 7778-50-9)	Significance
Forestry and related workers	0.1 [0.0 - 0.6]	0.1 [0.0 - 0.1]	
Manufacturers or processors of fur and leather	0.1 [0.0 - 0.6]	0.2 [0.1 - 0.3]	
Beverage industry labour	0.1 [0.0 - 0.6]	0.1 [0.0 - 0.1]	
Interior decorators, upholsterers	0.1 [0.0 - 0.6]	0.1 [0.1 - 0.2]	
Veterinarians	0.1 [0.0 - 0.6]	0.2 [0.1 - 0.3]	
Pharmacists	0.1 [0.0 - 0.6]	0.1 [0.0 - 0.1]	

**Tab. 3.2.3.9** IVDK, 2007-2016, OD patients with positive and negative reaction to fragrance mix II (CAS: not applicable), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 841

Number of patients not sensitized to the allergen (negative reaction): 15,656

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to fragrance mix II (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to fragrance mix II (CAS: not applicable)	Significance
Health care professionals	23.1 [20.3 - 26.1]	11.7 [11.2 - 12.2]	*
Mechanics, Metal, machinery and related trades workers	8.3 [6.5 - 10.4]	11.0 [10.5 - 11.5]	#
Occupations with undetermined exposure	7.1 [5.5 - 9.1]	8.4 [8.0 - 8.9]	
Geriatric nurse, social work associate professionals	6.5 [5.0 - 8.4]	4.1 [3.8 - 4.4]	*
Hairdressers, barbers, beauticians, wigmakers	5.2 [3.8 - 7.0]	6.2 [5.9 - 6.6]	
Building, vehicle, street cleaner	4.5 [3.2 - 6.1]	4.8 [4.5 - 5.1]	
Metal worker (cutting)	3.6 [2.4 - 5.1]	3.8 [3.5 - 4.1]	
Personal care and related workers	3.1 [2.0 - 4.5]	1.6 [1.4 - 1.8]	*
Office clerks	2.6 [1.6 - 3.9]	2.6 [2.3 - 2.8]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	2.4 [1.5 - 3.6]	4.0 [3.7 - 4.3]	#
Machinery mechanics and fitters	2.1 [1.3 - 3.4]	2.4 [2.2 - 2.6]	
Engineers, technicians and scientists	2.1 [1.3 - 3.4]	2.5 [2.2 - 2.7]	
Dentists	1.9 [1.1 - 3.1]	1.7 [1.5 - 1.9]	
Medical doctors	1.7 [0.9 - 2.8]	1.1 [0.9 - 1.3]	
Housewife/-man, domestic helper	1.4 [0.7 - 2.5]	1.5 [1.3 - 1.7]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to fragrance mix II (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to fragrance mix II (CAS: not applicable)	Significance
Gardeners, salespersons (fruit, flowers, vegetables)	1.4 [0.7 - 2.5]	2.0 [1.7 - 2.2]	
Salespersons and demonstrators	1.4 [0.7 - 2.5]	1.2 [1.0 - 1.4]	
Missing information	1.3 [0.7 - 2.3]	1.2 [1.1 - 1.4]	
Laboratory assistants (health associate professionals)	1.2 [0.6 - 2.2]	1.2 [1.0 - 1.4]	
Social and health associate professionals, teachers	1.2 [0.6 - 2.2]	1.0 [0.9 - 1.2]	
Electrical and electronic equipment mechanics and fitters	1.1 [0.5 - 2.0]	1.6 [1.4 - 1.8]	
Painters, lacquerers and related workers	1.1 [0.5 - 2.0]	2.2 [2.0 - 2.5]	
Storekeeper, transport labour and freight handlers	1.1 [0.5 - 2.0]	1.5 [1.3 - 1.7]	
Chemist, Lab assistant, Chemical-products machine operators	1.0 [0.4 - 1.9]	1.5 [1.4 - 1.7]	
Carpenter, cabinet maker, model maker	1.0 [0.4 - 1.9]	1.2 [1.0 - 1.4]	
Waiters and bartenders, guest attendants	1.0 [0.4 - 1.9]	1.0 [0.8 - 1.2]	
Bakers, pastry-cooks and confectionery makers	0.8 [0.3 - 1.7]	2.1 [1.9 - 2.3]	#
Construction workers, Manufacturers of building materials	0.8 [0.3 - 1.7]	2.8 [2.5 - 3.0]	#
Protective services workers	0.8 [0.3 - 1.7]	0.5 [0.4 - 0.6]	
Wine grower, vine refiner, vintage helper	0.7 [0.3 - 1.5]	0.7 [0.6 - 0.8]	
Drivers and mobile plant operators	0.7 [0.3 - 1.5]	0.7 [0.6 - 0.8]	
Dental technicians	0.6 [0.2 - 1.4]	0.8 [0.6 - 0.9]	
Butchers, fishmongers and related food preparers	0.6 [0.2 - 1.4]	0.8 [0.6 - 0.9]	
Communication professions	0.6 [0.2 - 1.4]	0.2 [0.1 - 0.3]	
Cashiers, tellers and related clerks	0.6 [0.2 - 1.4]	0.3 [0.2 - 0.4]	
Textile, garment and related trades workers	0.5 [0.1 - 1.2]	0.4 [0.3 - 0.5]	
Building finishers and related trades workers	0.5 [0.1 - 1.2]	0.5 [0.4 - 0.6]	
Plastic-products machine operators	0.4 [0.1 - 1.0]	0.9 [0.7 - 1.0]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to fragrance mix II (CAS: not applicable)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to fragrance mix II (CAS: not applicable)	Significance
Printing-machine operators	0.4 [0.1 - 1.0]	0.6 [0.5 - 0.7]	
Precision workers in metal and related materials	0.4 [0.1 - 1.0]	0.7 [0.5 - 0.8]	
Veterinarians	0.4 [0.1 - 1.0]	0.2 [0.1 - 0.3]	
Domestic and related helpers, cleaners and launderers	0.4 [0.1 - 1.0]	0.2 [0.1 - 0.3]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.2 [0.0 - 0.9]	0.3 [0.2 - 0.4]	
Potters, glass-makers and related trades workers	0.2 [0.0 - 0.9]	0.2 [0.2 - 0.3]	
Food and related products machine operators	0.2 [0.0 - 0.9]	0.4 [0.3 - 0.5]	
Labour, unknown or not classifiable, „other occupation“	0.2 [0.0 - 0.9]	0.4 [0.3 - 0.5]	
Pharmacists	0.2 [0.0 - 0.9]	0.1 [0.0 - 0.1]	
Alternative medicine practitioners	0.2 [0.0 - 0.9]	0.0 [0.0 - 0.1]	
Forestry and related workers	0.1 [0.0 - 0.7]	0.1 [0.0 - 0.1]	
Mining- and mineral-processing plant operators	0.1 [0.0 - 0.7]	0.2 [0.2 - 0.3]	
papermaking-plant operators, bookbinders	0.1 [0.0 - 0.7]	0.3 [0.2 - 0.3]	
Metal finishing-, plating- and coating-machine operators	0.1 [0.0 - 0.7]	0.3 [0.3 - 0.4]	
Blacksmiths, hammer-smiths and forging-press workers	0.1 [0.0 - 0.7]	0.0 [0.0 - 0.1]	
Manufacturers or processors of fur and leather	0.1 [0.0 - 0.7]	0.2 [0.1 - 0.3]	
Construction & maintenance labour: roads, dams & similar	0.1 [0.0 - 0.7]	0.4 [0.3 - 0.6]	
Interior decorators, upholsterers	0.1 [0.0 - 0.7]	0.1 [0.1 - 0.2]	
Hygiene and health surveillance	0.1 [0.0 - 0.7]	0.1 [0.1 - 0.2]	
Artists, musicians, professional sportsmen	0.1 [0.0 - 0.7]	0.2 [0.1 - 0.2]	

**Tab. 3.2.3.10** IVDK, 2007-2016, OD patients with positive and negative reaction to colophony (rosin) (CAS: 8050-09-7), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 807

Number of patients not sensitized to the allergen (negative reaction): 15,753

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to colophony (rosin) (CAS: 8050-09-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to colophony (rosin) (CAS: 8050-09-7)	Significance
Mechanics, Metal, machinery and related trades workers	12.4 [10.2 - 14.9]	10.8 [10.4 - 11.3]	
Metal worker (cutting)	10.2 [8.2 - 12.5]	3.3 [3.1 - 3.6]	*
Health care professionals	10.0 [8.1 - 12.3]	12.3 [11.8 - 12.9]	
Occupations with undetermined exposure	8.9 [7.0 - 11.1]	8.3 [7.9 - 8.7]	
Office clerks	4.2 [2.9 - 5.8]	2.5 [2.2 - 2.7]	*
Geriatric nurse, social work associate professionals	3.8 [2.6 - 5.4]	4.3 [4.0 - 4.6]	
Hairdressers, barbers, beauticians, wigmakers	3.7 [2.5 - 5.3]	6.3 [6.0 - 6.7]	#
Cooks, Cannery workers, Fruit, vegetable and related preservers	3.6 [2.4 - 5.1]	3.9 [3.6 - 4.2]	
Gardeners, salespersons (fruit, flowers, vegetables)	3.3 [2.2 - 4.8]	1.9 [1.7 - 2.1]	*
Building, vehicle, street cleaner	3.3 [2.2 - 4.8]	4.8 [4.5 - 5.2]	
Engineers, technicians and scientists	2.6 [1.6 - 4.0]	2.4 [2.2 - 2.7]	
Machinery mechanics and fitters	2.2 [1.3 - 3.5]	2.4 [2.2 - 2.6]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to colophony (rosin) (CAS: 8050-09-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to colophony (rosin) (CAS: 8050-09-7)	Significance
Salespersons and demonstrators	1.9 [1.0 - 3.0]	1.2 [1.0 - 1.3]	
Electrical and electronic equipment mechanics and fitters	1.6 [0.9 - 2.7]	1.7 [1.5 - 1.9]	
Construction workers, Manufacturers of building materials	1.6 [0.9 - 2.7]	2.8 [2.5 - 3.0]	
Carpenter, cabinet maker, model maker	1.5 [0.8 - 2.6]	1.2 [1.1 - 1.4]	
Personal care and related workers	1.5 [0.8 - 2.6]	1.6 [1.4 - 1.8]	
Chemist, Lab assistant, Chemical-products machine operators	1.4 [0.7 - 2.4]	1.5 [1.3 - 1.7]	
Painters, lacquerers and related workers	1.4 [0.7 - 2.4]	2.2 [2.0 - 2.5]	
Medical doctors	1.4 [0.7 - 2.4]	1.0 [0.9 - 1.2]	
Storekeeper, transport labour and freight handlers	1.2 [0.6 - 2.3]	1.4 [1.3 - 1.6]	
Housewife/-man, domestic helper	1.1 [0.5 - 2.1]	1.5 [1.3 - 1.7]	
Dentists	1.1 [0.5 - 2.1]	1.7 [1.5 - 1.9]	
Laboratory assistants (health associate professionals)	1.1 [0.5 - 2.1]	1.2 [1.0 - 1.4]	
Social and health associate professionals, teachers	1.1 [0.5 - 2.1]	1.0 [0.9 - 1.2]	
Missing information	1.0 [0.4 - 1.9]	1.3 [1.1 - 1.4]	
Dental technicians	1.0 [0.4 - 1.9]	0.7 [0.6 - 0.9]	
Precision workers in metal and related materials	0.9 [0.3 - 1.8]	0.7 [0.5 - 0.8]	
Bakers, pastry-cooks and confectionery makers	0.9 [0.3 - 1.8]	2.1 [1.9 - 2.3]	#
Drivers and mobile plant operators	0.7 [0.3 - 1.6]	0.7 [0.6 - 0.9]	
Waiters and bartenders, guest attendants	0.7 [0.3 - 1.6]	1.0 [0.9 - 1.2]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to colophony (rosin) (CAS: 8050-09-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to colophony (rosin) (CAS: 8050-09-7)	Significance
Plastic-products machine operators	0.6 [0.2 - 1.4]	0.9 [0.7 - 1.0]	
papermaking-plant operators, bookbinders	0.6 [0.2 - 1.4]	0.2 [0.2 - 0.3]	
Butchers, fishmongers and related food preparers	0.6 [0.2 - 1.4]	0.8 [0.6 - 0.9]	
Communication professions	0.6 [0.2 - 1.4]	0.2 [0.1 - 0.2]	
Cashiers, tellers and related clerks	0.6 [0.2 - 1.4]	0.3 [0.2 - 0.4]	
Protective services workers	0.6 [0.2 - 1.4]	0.5 [0.4 - 0.6]	
Wine grower, vine refiner, vintage helper	0.5 [0.1 - 1.3]	0.7 [0.6 - 0.9]	
Food and related products machine operators	0.5 [0.1 - 1.3]	0.4 [0.3 - 0.5]	
Labour, unknown or not classifiable, „other occupation“	0.5 [0.1 - 1.3]	0.4 [0.3 - 0.5]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.4 [0.1 - 1.1]	0.3 [0.2 - 0.4]	
Printing-machine operators	0.4 [0.1 - 1.1]	0.6 [0.5 - 0.7]	
Metal processing plant operators, rolling mill operators	0.4 [0.1 - 1.1]	0.4 [0.3 - 0.5]	
Mining- and mineral-processing plant operators	0.2 [0.0 - 0.9]	0.2 [0.2 - 0.3]	
Potters, glass-makers and related trades workers	0.2 [0.0 - 0.9]	0.2 [0.1 - 0.3]	
Building finishers and related trades workers	0.2 [0.0 - 0.9]	0.5 [0.4 - 0.6]	
Petrol pump attendant	0.2 [0.0 - 0.9]	0.1 [0.0 - 0.1]	
Forestry and related workers	0.1 [0.0 - 0.7]	0.1 [0.0 - 0.1]	
Metal finishing-, plating- and coating-machine operators	0.1 [0.0 - 0.7]	0.3 [0.3 - 0.5]	
Welders and flame cutters	0.1 [0.0 - 0.7]	0.6 [0.5 - 0.7]	
Textile, garment and related trades workers	0.1 [0.0 - 0.7]	0.4 [0.3 - 0.5]	
Manufacturers or processors of fur and leather	0.1 [0.0 - 0.7]	0.2 [0.1 - 0.3]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to colophony (rosin) (CAS: 8050-09-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to colophony (rosin) (CAS: 8050-09-7)	Significance
Hygiene and health surveillance	0.1 [0.0 - 0.7]	0.1 [0.1 - 0.2]	
Artists, musicians, professional sportsmen	0.1 [0.0 - 0.7]	0.2 [0.1 - 0.2]	
Veterinarians	0.1 [0.0 - 0.7]	0.2 [0.1 - 0.3]	
Scientists	0.1 [0.0 - 0.7]	0.0 [0.0 - 0.1]	
Domestic and related helpers, cleaners and launderers	0.1 [0.0 - 0.7]	0.2 [0.1 - 0.3]	

**Tab. 3.2.3.11** IVDK, 2007-2016, OD patients with positive and negative reaction to methyl dibromo glutaronitrile (CAS: 35691-65-7) (0.2% pet.), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 457

Number of patients not sensitized to the allergen (negative reaction): 12,722

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methyl dibromo glutaronitrile (0.2% pet.) (CAS: 35691-65-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methyl dibromo glutaronitrile (0.2% pet.) (CAS: 35691-65-7)	Significance
Health care professionals	13.1 [10.2 - 16.6]	12.3 [11.7 - 12.9]	
Mechanics, Metal, machinery and related trades workers	12.0 [9.2 - 15.4]	11.1 [10.6 - 11.6]	
Geriatric nurse, social work associate professionals	7.0 [4.8 - 9.7]	4.4 [4.1 - 4.8]	*
Building, vehicle, street cleaner	6.1 [4.1 - 8.7]	4.8 [4.4 - 5.1]	
Hairdressers, barbers, beauticians, wigmakers	5.9 [3.9 - 8.5]	6.3 [5.8 - 6.7]	
Occupations with undetermined exposure	5.7 [3.7 - 8.2]	8.2 [7.7 - 8.7]	
Metal worker (cutting)	4.2 [2.5 - 6.4]	3.8 [3.5 - 4.1]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	3.7 [2.2 - 5.9]	3.8 [3.5 - 4.1]	
Machinery mechanics and fitters	3.3 [1.8 - 5.4]	2.4 [2.1 - 2.6]	
Engineers, technicians and scientists	2.8 [1.5 - 4.8]	2.5 [2.3 - 2.8]	
Painters, lacquerers and related workers	2.6 [1.4 - 4.5]	2.2 [2.0 - 2.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methyl dibromo glutaronitrile (0.2% pet.) (CAS: 35691-65-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methyl dibromo glutaronitrile (0.2% pet.) (CAS: 35691-65-7)	Significance
Office clerks	2.4 [1.2 - 4.3]	2.5 [2.2 - 2.8]	
Gardeners, salespersons (fruit, flowers, vegetables)	2.0 [0.9 - 3.7]	1.9 [1.7 - 2.1]	
Construction workers, Manufacturers of building materials	2.0 [0.9 - 3.7]	2.7 [2.4 - 3.0]	
Salespersons and demonstrators	1.8 [0.8 - 3.4]	1.2 [1.0 - 1.4]	
Housewife/-man, domestic helper	1.5 [0.6 - 3.1]	1.5 [1.3 - 1.7]	
Dental technicians	1.5 [0.6 - 3.1]	0.7 [0.6 - 0.9]	
Electrical and electronic equipment mechanics and fitters	1.5 [0.6 - 3.1]	1.7 [1.5 - 2.0]	
Bakers, pastry-cooks and confectionery makers	1.5 [0.6 - 3.1]	2.2 [1.9 - 2.4]	
Drivers and mobile plant operators	1.3 [0.5 - 2.8]	0.7 [0.6 - 0.9]	
Storekeeper, transport labour and freight handlers	1.3 [0.5 - 2.8]	1.5 [1.3 - 1.7]	
Social and health associate professionals, teachers	1.3 [0.5 - 2.8]	1.1 [0.9 - 1.3]	
Missing information	1.1 [0.4 - 2.5]	0.8 [0.7 - 1.0]	
Chemist, Lab assistant, Chemical-products machine operators	1.1 [0.4 - 2.5]	1.5 [1.3 - 1.8]	
Butchers, fishmongers and related food preparers	1.1 [0.4 - 2.5]	0.7 [0.6 - 0.9]	
Building finishers and related trades workers	1.1 [0.4 - 2.5]	0.5 [0.4 - 0.7]	
Metal processing plant operators, rolling mill operators	0.9 [0.2 - 2.2]	0.3 [0.2 - 0.4]	
Laboratory assistants (health associate professionals)	0.9 [0.2 - 2.2]	1.2 [1.0 - 1.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methyl dibromo glutaronitrile (0.2% pet.) (CAS: 35691-65-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methyl dibromo glutaronitrile (0.2% pet.) (CAS: 35691-65-7)	Significance
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.7 [0.1 - 1.9]	0.3 [0.2 - 0.4]	
Plastic-products machine operators	0.7 [0.1 - 1.9]	0.8 [0.6 - 1.0]	
Welders and flame cutters	0.7 [0.1 - 1.9]	0.5 [0.4 - 0.7]	
Construction & maintenance labour: roads, dams & similar	0.7 [0.1 - 1.9]	0.4 [0.3 - 0.5]	
Medical doctors	0.7 [0.1 - 1.9]	1.1 [0.9 - 1.3]	
Dentists	0.7 [0.1 - 1.9]	1.6 [1.4 - 1.8]	
Personal care and related workers	0.7 [0.1 - 1.9]	1.6 [1.4 - 1.9]	
Wine grower, vine refiner, vintage helper	0.4 [0.1 - 1.6]	0.7 [0.6 - 0.9]	
Food and related products machine operators	0.4 [0.1 - 1.6]	0.4 [0.3 - 0.5]	
Carpenter, cabinet maker, model maker	0.4 [0.1 - 1.6]	1.3 [1.1 - 1.5]	
Communication professions	0.4 [0.1 - 1.6]	0.1 [0.1 - 0.2]	
Protective services workers	0.4 [0.1 - 1.6]	0.5 [0.4 - 0.7]	
Domestic and related helpers, cleaners and launderers	0.4 [0.1 - 1.6]	0.2 [0.1 - 0.3]	
Mining- and mineral-processing plant operators	0.2 [0.0 - 1.2]	0.2 [0.1 - 0.3]	
Rubber-products machine operators, vulcanizers	0.2 [0.0 - 1.2]	0.1 [0.1 - 0.2]	
Precision workers in metal and related materials	0.2 [0.0 - 1.2]	0.7 [0.6 - 0.9]	
Musical-instrument makers and tuners, model makers, taxidermists	0.2 [0.0 - 1.2]	0.0 [0.0 - 0.1]	
Labour, unknown or not classifiable, „other occupation“	0.2 [0.0 - 1.2]	0.4 [0.3 - 0.6]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methyl dibromo glutaronitrile (0.2% pet.) (CAS: 35691-65-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methyl dibromo glutaronitrile (0.2% pet.) (CAS: 35691-65-7)	Significance
Photographic-products machine operators	0.2 [0.0 - 1.2]	0.0 [0.0 - 0.1]	
Petrol pump attendant	0.2 [0.0 - 1.2]	0.1 [0.0 - 0.1]	
Pharmacists	0.2 [0.0 - 1.2]	0.1 [0.0 - 0.1]	
Waiters and bartenders, guest attendants	0.2 [0.0 - 1.2]	0.9 [0.8 - 1.1]	

**Tab. 3.2.3.12** IVDK, 2007-2016, OD patients with positive and negative reaction to methyldibromo glutaronitrile (CAS: 35691-65-7) (0.3% pet.), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 184

Number of patients not sensitized to the allergen (negative reaction): 3,331

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methyldibromo glutaronitrile (0.3% pet.) (CAS: 35691-65-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methyldibromo glutaronitrile (0.3% pet.) (CAS: 35691-65-7)	Significance
Health care professionals	13.6 [9.0 - 19.4]	11.2 [10.1 - 12.3]	
Occupations with undetermined exposure	9.8 [5.9 - 15.0]	9.1 [8.1 - 10.1]	
Mechanics, Metal, machinery and related trades workers	8.2 [4.6 - 13.1]	11.0 [10.0 - 12.2]	
Geriatric nurse, social work associate professionals	5.4 [2.6 - 9.8]	3.3 [2.7 - 4.0]	
Metal worker (cutting)	4.9 [2.3 - 9.1]	4.0 [3.3 - 4.7]	
Office clerks	4.9 [2.3 - 9.1]	2.8 [2.2 - 3.4]	
Hairdressers, barbers, beauticians, wigmakers	4.9 [2.3 - 9.1]	5.9 [5.2 - 6.8]	
Building, vehicle, street cleaner	4.3 [1.9 - 8.4]	4.7 [4.0 - 5.5]	
Missing information	3.8 [1.5 - 7.7]	2.5 [2.0 - 3.1]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	3.8 [1.5 - 7.7]	4.2 [3.5 - 4.9]	
Machinery mechanics and fitters	3.3 [1.2 - 7.0]	2.3 [1.9 - 2.9]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methyl dibromo glutaronitrile (0.3% pet.) (CAS: 35691-65-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methyl dibromo glutaronitrile (0.3% pet.) (CAS: 35691-65-7)	Significance
Housewife/-man, domestic helper	2.7 [0.9 - 6.2]	1.4 [1.1 - 1.9]	
Painters, lacquerers and related workers	2.7 [0.9 - 6.2]	1.9 [1.5 - 2.4]	
Construction workers, Manufacturers of building materials	2.2 [0.6 - 5.5]	2.8 [2.3 - 3.4]	
Engineers, technicians and scientists	2.2 [0.6 - 5.5]	2.3 [1.8 - 2.8]	
Personal care and related workers	2.2 [0.6 - 5.5]	1.5 [1.1 - 2.0]	
Gardeners, salespersons (fruit, flowers, vegetables)	1.6 [0.3 - 4.7]	1.9 [1.4 - 2.4]	
Salespersons and demonstrators	1.6 [0.3 - 4.7]	1.3 [0.9 - 1.7]	
Medical doctors	1.6 [0.3 - 4.7]	1.0 [0.7 - 1.4]	
Social and health associate professionals, teachers	1.6 [0.3 - 4.7]	0.9 [0.6 - 1.3]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	1.1 [0.1 - 3.9]	0.3 [0.1 - 0.5]	
Chemist, Lab assistant, Chemical-products machine operators	1.1 [0.1 - 3.9]	1.2 [0.9 - 1.6]	
Welders and flame cutters	1.1 [0.1 - 3.9]	0.5 [0.3 - 0.8]	
Dentists	1.1 [0.1 - 3.9]	2.1 [1.6 - 2.6]	
Laboratory assistants (health associate professionals)	1.1 [0.1 - 3.9]	1.0 [0.7 - 1.4]	
Waiters and bartenders, guest attendants	1.1 [0.1 - 3.9]	1.2 [0.9 - 1.7]	
Wine grower, vine refiner, vintage helper	0.5 [0.0 - 3.0]	0.8 [0.5 - 1.1]	
Potters, glass-makers and related trades workers	0.5 [0.0 - 3.0]	0.3 [0.1 - 0.6]	
Plastic-products machine operators	0.5 [0.0 - 3.0]	1.1 [0.7 - 1.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to methyl dibromo glutaronitrile (0.3% pet.) (CAS: 35691-65-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to methyl dibromo glutaronitrile (0.3% pet.) (CAS: 35691-65-7)	Significance
Printing-machine operators	0.5 [0.0 - 3.0]	0.7 [0.4 - 1.0]	
Metal worker (non-cutting)	0.5 [0.0 - 3.0]	0.3 [0.1 - 0.5]	
Precision workers in metal and related materials	0.5 [0.0 - 3.0]	0.6 [0.3 - 0.9]	
Dental technicians	0.5 [0.0 - 3.0]	0.7 [0.4 - 1.0]	
Textile, garment and related trades workers	0.5 [0.0 - 3.0]	0.6 [0.3 - 0.9]	
Bakers, pastry-cooks and confectionery makers	0.5 [0.0 - 3.0]	1.9 [1.5 - 2.4]	
Butchers, fishmongers and related food preparers	0.5 [0.0 - 3.0]	0.8 [0.6 - 1.2]	
Carpenter, cabinet maker, model maker	0.5 [0.0 - 3.0]	1.3 [0.9 - 1.7]	
Drivers and mobile plant operators	0.5 [0.0 - 3.0]	0.6 [0.4 - 0.9]	
Storekeeper, transport labour and freight handlers	0.5 [0.0 - 3.0]	1.4 [1.1 - 1.9]	
Protective services workers	0.5 [0.0 - 3.0]	0.4 [0.2 - 0.7]	
Domestic and related helpers, cleaners and launderers	0.5 [0.0 - 3.0]	0.2 [0.1 - 0.4]	

**Tab. 3.2.3.13** IVDK, 2007-2016, OD patients with positive and negative reaction to epoxy resin (CAS: 25068-38-6, 25089-99-8, 1675-54-3), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 605

Number of patients not sensitized to the allergen (negative reaction): 15,446

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to epoxy resin (CAS: 25068-38-6, 25089-99-8, 1675-54-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to epoxy resin (CAS: 25068-38-6, 25089-99-8, 1675-54-3)	Significance
Occupations with undetermined exposure	14.5 [11.8 - 17.6]	8.2 [7.8 - 8.7]	*
Construction workers, Manufacturers of building materials	13.2 [10.6 - 16.2]	2.4 [2.1 - 2.6]	*
Mechanics, Metal, machinery and related trades workers	10.4 [8.1 - 13.1]	11.3 [10.8 - 11.8]	
Painters, lacquerers and related workers	10.2 [7.9 - 12.9]	1.9 [1.7 - 2.2]	*
Plastic-products machine operators	7.1 [5.2 - 9.5]	0.6 [0.5 - 0.8]	*
Engineers, technicians and scientists	5.5 [3.8 - 7.6]	2.4 [2.1 - 2.6]	*
Machinery mechanics and fitters	3.0 [1.8 - 4.7]	2.4 [2.2 - 2.7]	
Construction & maintenance labour: roads, dams & similar	2.1 [1.1 - 3.6]	0.4 [0.3 - 0.5]	*
Carpenter, cabinet maker, model maker	2.1 [1.1 - 3.6]	1.3 [1.1 - 1.4]	
Missing information	2.0 [1.0 - 3.4]	1.2 [1.1 - 1.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to epoxy resin (CAS: 25068-38-6, 25089-99-8, 1675-54-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to epoxy resin (CAS: 25068-38-6, 25089-99-8, 1675-54-3)	Significance
Health care professionals	1.8 [0.9 - 3.2]	12.0 [11.5 - 12.6]	#
Chemist, Lab assistant, Chemical-products machine operators	1.7 [0.8 - 3.0]	1.5 [1.3 - 1.7]	
Metal worker (cutting)	1.7 [0.8 - 3.0]	3.9 [3.6 - 4.3]	#
Electrical and electronic equipment mechanics and fitters	1.7 [0.8 - 3.0]	1.6 [1.4 - 1.8]	
Drivers and mobile plant operators	1.7 [0.8 - 3.0]	0.7 [0.6 - 0.9]	
Office clerks	1.7 [0.8 - 3.0]	2.6 [2.4 - 2.9]	
Building, vehicle, street cleaner	1.7 [0.8 - 3.0]	4.8 [4.5 - 5.2]	#
Building finishers and related trades workers	1.5 [0.7 - 2.8]	0.5 [0.4 - 0.6]	*
Storekeeper, transport labour and freight handlers	1.2 [0.5 - 2.4]	1.5 [1.3 - 1.7]	
Mining- and mineral-processing plant operators	1.0 [0.4 - 2.1]	0.2 [0.1 - 0.3]	*
Dentists	1.0 [0.4 - 2.1]	1.7 [1.5 - 1.9]	
Geriatric nurse, social work associate professionals	1.0 [0.4 - 2.1]	4.0 [3.7 - 4.3]	#
Housewife/-man, domestic helper	0.8 [0.3 - 1.9]	1.5 [1.3 - 1.7]	
Gardeners, salespersons (fruit, flowers, vegetables)	0.7 [0.2 - 1.7]	2.0 [1.8 - 2.3]	#
Metal finishing-, plating- and coating-machine operators	0.7 [0.2 - 1.7]	0.3 [0.3 - 0.4]	
Textile, garment and related trades workers	0.7 [0.2 - 1.7]	0.4 [0.3 - 0.5]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	0.7 [0.2 - 1.7]	4.0 [3.7 - 4.3]	#

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to epoxy resin (CAS: 25068-38-6, 25089-99-8, 1675-54-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to epoxy resin (CAS: 25068-38-6, 25089-99-8, 1675-54-3)	Significance
Labour, unknown or not classifiable, „other occupation“	0.7 [0.2 - 1.7]	0.4 [0.3 - 0.5]	
Salespersons and demonstrators	0.7 [0.2 - 1.7]	1.2 [1.0 - 1.4]	
Protective services workers	0.7 [0.2 - 1.7]	0.5 [0.4 - 0.7]	
papermaking-plant operators, bookbinders	0.5 [0.1 - 1.4]	0.3 [0.2 - 0.3]	
Metal processing plant operators, rolling mill operators	0.5 [0.1 - 1.4]	0.4 [0.3 - 0.5]	
Welders and flame cutters	0.5 [0.1 - 1.4]	0.6 [0.5 - 0.7]	
Precision workers in metal and related materials	0.5 [0.1 - 1.4]	0.7 [0.5 - 0.8]	
Food and related products machine operators	0.5 [0.1 - 1.4]	0.4 [0.3 - 0.5]	
Hairdressers, barbers, beauticians, wigmakers	0.5 [0.1 - 1.4]	6.1 [5.8 - 6.5]	#
Wine grower, vine refiner, vintage helper	0.3 [0.0 - 1.2]	0.7 [0.6 - 0.9]	
Potters, glass-makers and related trades workers	0.3 [0.0 - 1.2]	0.2 [0.1 - 0.3]	
Printing-machine operators	0.3 [0.0 - 1.2]	0.6 [0.5 - 0.7]	
Bakers, pastry-cooks and confectionery makers	0.3 [0.0 - 1.2]	2.1 [1.9 - 2.4]	#
Interior decorators, upholsterers	0.3 [0.0 - 1.2]	0.1 [0.0 - 0.2]	
Artists, musicians, professional sportsmen	0.3 [0.0 - 1.2]	0.1 [0.1 - 0.2]	
Personal care and related workers	0.3 [0.0 - 1.2]	1.7 [1.5 - 1.9]	#
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.2 [0.0 - 0.9]	0.3 [0.2 - 0.4]	
Metal worker (non-cutting)	0.2 [0.0 - 0.9]	0.2 [0.2 - 0.3]	
Blacksmiths, hammer-smiths and forging-press workers	0.2 [0.0 - 0.9]	0.0 [0.0 - 0.1]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to epoxy resin (CAS: 25068-38-6, 25089-99-8, 1675-54-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to epoxy resin (CAS: 25068-38-6, 25089-99-8, 1675-54-3)	Significance
Dental technicians	0.2 [0.0 - 0.9]	0.8 [0.6 - 0.9]	
Manufacturers or processors of fur and leather	0.2 [0.0 - 0.9]	0.2 [0.1 - 0.3]	
Butchers, fishmongers and related food preparers	0.2 [0.0 - 0.9]	0.7 [0.6 - 0.9]	
Communication professions	0.2 [0.0 - 0.9]	0.2 [0.1 - 0.3]	
Medical doctors	0.2 [0.0 - 0.9]	1.1 [1.0 - 1.3]	#
Laboratory assistants (health associate professionals)	0.2 [0.0 - 0.9]	1.3 [1.1 - 1.5]	#
Waiters and bartenders, guest attendants	0.2 [0.0 - 0.9]	1.1 [0.9 - 1.2]	

**Tab. 3.2.3.14** IVDK, 2007-2016, OD patients with positive and negative reaction to povidone iodine (CAS: 25655-41-8), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 565

Number of patients not sensitized to the allergen (negative reaction): 16,155

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to povidone iodine (CAS: 25655-41-8)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to povidone iodine (CAS: 25655-41-8)	Significance
Health care professionals	31.3 [27.5 - 35.3]	22.3 [21.3 - 23.4]	*
Geriatric nurse, social work associate professionals	10.4 [8.0 - 13.3]	7.7 [7.1 - 8.4]	
Building, vehicle, street cleaner	9.9 [7.6 - 12.7]	7.4 [6.8 - 8.1]	
Occupations with undetermined exposure	6.4 [4.5 - 8.7]	6.5 [5.9 - 7.1]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	6.0 [4.2 - 8.3]	5.8 [5.3 - 6.4]	
Social and health associate professionals, teachers	2.5 [1.4 - 4.1]	1.4 [1.1 - 1.8]	
Hairdressers, barbers, beauticians, wigmakers	2.5 [1.4 - 4.1]	4.4 [3.9 - 4.9]	
Mechanics, Metal, machinery and related trades workers	2.3 [1.2 - 3.9]	6.6 [6.0 - 7.3]	#
Medical doctors	2.3 [1.2 - 3.9]	1.8 [1.5 - 2.2]	
Dentists	2.1 [1.1 - 3.7]	3.2 [2.8 - 3.7]	
Laboratory assistants (health associate professionals)	2.1 [1.1 - 3.7]	1.8 [1.5 - 2.1]	
Office clerks	1.6 [0.7 - 3.0]	1.5 [1.2 - 1.8]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to povidone iodine (CAS: 25655-41-8)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to povidone iodine (CAS: 25655-41-8)	Significance
Personal care and related workers	1.6 [0.7 - 3.0]	2.1 [1.8 - 2.5]	
Missing information	1.2 [0.5 - 2.5]	0.8 [0.6 - 1.1]	
Housewife/-man, domestic helper	1.1 [0.4 - 2.3]	2.0 [1.6 - 2.4]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	1.1 [0.4 - 2.3]	0.4 [0.3 - 0.6]	
Chemist, Lab assistant, Chemical-products machine operators	1.1 [0.4 - 2.3]	1.3 [1.1 - 1.7]	
Salespersons and demonstrators	1.1 [0.4 - 2.3]	1.1 [0.8 - 1.4]	
Waiters and bartenders, guest attendants	1.1 [0.4 - 2.3]	1.4 [1.1 - 1.7]	
Dental technicians	0.9 [0.3 - 2.1]	1.0 [0.8 - 1.3]	
Wine grower, vine refiner, vintage helper	0.7 [0.2 - 1.8]	0.6 [0.4 - 0.8]	
Gardeners, salespersons (fruit, flowers, vegetables)	0.7 [0.2 - 1.8]	0.9 [0.7 - 1.2]	
Metal worker (cutting)	0.7 [0.2 - 1.8]	1.9 [1.6 - 2.3]	
Machinery mechanics and fitters	0.7 [0.2 - 1.8]	1.2 [0.9 - 1.5]	
Bakers, pastry-cooks and confectionery makers	0.7 [0.2 - 1.8]	2.5 [2.1 - 2.9]	#
Butchers, fishmongers and related food preparers	0.7 [0.2 - 1.8]	1.3 [1.0 - 1.6]	
Construction workers, Manufacturers of building materials	0.7 [0.2 - 1.8]	1.3 [1.0 - 1.6]	
Labour, unknown or not classifiable, „other occupation“	0.7 [0.2 - 1.8]	0.1 [0.1 - 0.3]	
Storekeeper, transport labour and freight handlers	0.7 [0.2 - 1.8]	0.8 [0.6 - 1.1]	
Food and related products machine operators	0.5 [0.1 - 1.5]	0.5 [0.3 - 0.7]	
Engineers, technicians and scientists	0.5 [0.1 - 1.5]	1.0 [0.8 - 1.3]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to povidone iodine (CAS: 25655-41-8)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to povidone iodine (CAS: 25655-41-8)	Significance
Domestic and related helpers, cleaners and launderers	0.5 [0.1 - 1.5]	0.2 [0.1 - 0.4]	
Potters, glass-makers and related trades workers	0.4 [0.0 - 1.3]	0.1 [0.0 - 0.2]	
Painters, lacquerers and related workers	0.4 [0.0 - 1.3]	1.1 [0.8 - 1.4]	
Protective services workers	0.4 [0.0 - 1.3]	0.4 [0.3 - 0.6]	
Hygiene and health surveillance	0.4 [0.0 - 1.3]	0.2 [0.1 - 0.3]	
Veterinarians	0.4 [0.0 - 1.3]	0.3 [0.2 - 0.5]	
Plastic-products machine operators	0.2 [0.0 - 1.0]	0.2 [0.1 - 0.4]	
papermaking-plant operators, bookbinders	0.2 [0.0 - 1.0]	0.2 [0.1 - 0.4]	
Printing-machine operators	0.2 [0.0 - 1.0]	0.4 [0.2 - 0.6]	
Metal worker (non-cutting)	0.2 [0.0 - 1.0]	0.1 [0.0 - 0.2]	
Precision workers in metal and related materials	0.2 [0.0 - 1.0]	0.3 [0.2 - 0.5]	
Electrical and electronic equipment mechanics and fitters	0.2 [0.0 - 1.0]	0.6 [0.4 - 0.8]	
Manufacturers or processors of fur and leather	0.2 [0.0 - 1.0]	0.1 [0.0 - 0.2]	
Construction & maintenance labour: roads, dams & similar	0.2 [0.0 - 1.0]	0.2 [0.1 - 0.4]	
Artists, musicians, professional sportsmen	0.2 [0.0 - 1.0]	0.0 [0.0 - 0.1]	
Pharmacists	0.2 [0.0 - 1.0]	0.1 [0.1 - 0.3]	

**Tab. 3.2.3.15** IVDK, 2007-2016, OD patients with positive and negative reaction to hydroxyisohexyl 3-cyclohexene carboxaldehyde (CAS: 31906-04-4), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 436

Number of patients not sensitized to the allergen (negative reaction): 16,619

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to hydroxyisohexyl 3-cyclohexene carboxaldehyde (CAS: 31906-04-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to hydroxyisohexyl 3-cyclohexene carboxaldehyde (CAS: 31906-04-4)	Significance
Health care professionals	20.2 [16.5 - 24.3]	12.2 [11.7 - 12.7]	*
Geriatric nurse, social work associate professionals	9.6 [7.0 - 12.8]	4.2 [3.9 - 4.5]	*
Mechanics, Metal, machinery and related trades workers	7.1 [4.9 - 9.9]	11.0 [10.5 - 11.5]	#
Occupations with undetermined exposure	7.1 [4.9 - 9.9]	8.3 [7.9 - 8.8]	
Building, vehicle, street cleaner	4.8 [3.0 - 7.3]	4.8 [4.5 - 5.1]	
Hairdressers, barbers, beauticians, wigmakers	4.6 [2.8 - 7.0]	6.2 [5.8 - 6.6]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	3.4 [1.9 - 5.6]	3.9 [3.6 - 4.2]	
Metal worker (cutting)	2.8 [1.4 - 4.8]	3.8 [3.5 - 4.1]	
Machinery mechanics and fitters	2.5 [1.3 - 4.5]	2.4 [2.2 - 2.6]	
Dentists	2.5 [1.3 - 4.5]	1.7 [1.5 - 1.9]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to hydroxyisohexyl 3-cyclohexene carboxaldehyde (CAS: 31906-04-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to hydroxyisohexyl 3-cyclohexene carboxaldehyde (CAS: 31906-04-4)	Significance
Engineers, technicians and scientists	2.1 [0.9 - 3.9]	2.4 [2.2 - 2.7]	
Office clerks	2.1 [0.9 - 3.9]	2.6 [2.3 - 2.8]	
Medical doctors	2.1 [0.9 - 3.9]	1.1 [0.9 - 1.2]	
Housewife/-man, domestic helper	1.8 [0.8 - 3.6]	1.5 [1.3 - 1.7]	
Social and health associate professionals, teachers	1.8 [0.8 - 3.6]	1.0 [0.9 - 1.2]	
Personal care and related workers	1.8 [0.8 - 3.6]	1.6 [1.4 - 1.8]	
Bakers, pastry-cooks and confectionery makers	1.6 [0.6 - 3.3]	2.0 [1.8 - 2.3]	
Missing information	1.4 [0.5 - 3.0]	1.2 [1.0 - 1.4]	
Chemist, Lab assistant, Chemical-products machine operators	1.4 [0.5 - 3.0]	1.5 [1.3 - 1.7]	
Dental technicians	1.4 [0.5 - 3.0]	0.7 [0.6 - 0.9]	
Salespersons and demonstrators	1.4 [0.5 - 3.0]	1.2 [1.0 - 1.4]	
Storekeeper, transport labour and freight handlers	1.4 [0.5 - 3.0]	1.5 [1.3 - 1.7]	
Laboratory assistants (health associate professionals)	1.4 [0.5 - 3.0]	1.2 [1.0 - 1.4]	
Precision workers in metal and related materials	1.1 [0.4 - 2.7]	0.7 [0.5 - 0.8]	
Construction workers, Manufacturers of building materials	1.1 [0.4 - 2.7]	2.7 [2.5 - 3.0]	
Wine grower, vine refiner, vintage helper	0.9 [0.3 - 2.3]	0.7 [0.6 - 0.8]	
Electrical and electronic equipment mechanics and fitters	0.9 [0.3 - 2.3]	1.6 [1.5 - 1.8]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to hydroxyisohexyl 3-cyclohexene carboxaldehyde (CAS: 31906-04-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to hydroxyisohexyl 3-cyclohexene carboxaldehyde (CAS: 31906-04-4)	Significance
Communication professions	0.9 [0.3 - 2.3]	0.2 [0.1 - 0.2]	*
Protective services workers	0.9 [0.3 - 2.3]	0.5 [0.4 - 0.6]	
Carpenter, cabinet maker, model maker	0.7 [0.1 - 2.0]	1.2 [1.1 - 1.4]	
Cashiers, tellers and related clerks	0.7 [0.1 - 2.0]	0.3 [0.2 - 0.4]	
Gardeners, salespersons (fruit, flowers, vegetables)	0.5 [0.1 - 1.6]	1.9 [1.7 - 2.2]	#
Potters, glass-makers and related trades workers	0.5 [0.1 - 1.6]	0.2 [0.1 - 0.3]	
Plastic-products machine operators	0.5 [0.1 - 1.6]	0.8 [0.7 - 1.0]	
Printing-machine operators	0.5 [0.1 - 1.6]	0.6 [0.5 - 0.7]	
Textile, garment and related trades workers	0.5 [0.1 - 1.6]	0.4 [0.3 - 0.5]	
Food and related products machine operators	0.5 [0.1 - 1.6]	0.4 [0.3 - 0.5]	
Painters, lacquerers and related workers	0.5 [0.1 - 1.6]	2.2 [2.0 - 2.5]	#
Labour, unknown or not classifiable, „other occupation“	0.5 [0.1 - 1.6]	0.4 [0.3 - 0.5]	
Drivers and mobile plant operators	0.5 [0.1 - 1.6]	0.7 [0.6 - 0.9]	
Veterinarians	0.5 [0.1 - 1.6]	0.2 [0.1 - 0.3]	
Pharmacists	0.5 [0.1 - 1.6]	0.1 [0.0 - 0.1]	
Waiters and bartenders, guest attendants	0.5 [0.1 - 1.6]	1.0 [0.9 - 1.2]	
Domestic and related helpers, cleaners and launderers	0.5 [0.1 - 1.6]	0.2 [0.1 - 0.3]	
Blacksmiths, hammer-smiths and forging-press workers	0.2 [0.0 - 1.3]	0.0 [0.0 - 0.1]	
Butchers, fishmongers and related food preparers	0.2 [0.0 - 1.3]	0.8 [0.6 - 0.9]	

**Tab. 3.2.3.16** IVDK, 2007-2016, OD patients with positive and negative reaction to propolis (CAS: 85665-41-4), respectively: Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 426

Number of patients not sensitized to the allergen (negative reaction): 15,937

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;  
# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to propolis (CAS: 85665-41-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to propolis (CAS: 85665-41-4)	Significance
Health care professionals	13.6 [10.5 - 17.2]	12.1 [11.6 - 12.7]	
Occupations with undetermined exposure	10.3 [7.6 - 13.6]	8.3 [7.9 - 8.7]	
Mechanics, Metal, machinery and related trades workers	8.2 [5.8 - 11.2]	11.0 [10.5 - 11.5]	
Bakers, pastry-cooks and confectionery makers	4.7 [2.9 - 7.2]	2.0 [1.8 - 2.2]	*
Cooks, Cannery workers, Fruit, vegetable and related preservers	4.0 [2.3 - 6.3]	3.9 [3.6 - 4.2]	
Hairdressers, barbers, beauticians, wigmakers	4.0 [2.3 - 6.3]	6.3 [5.9 - 6.7]	
Metal worker (cutting)	3.8 [2.2 - 6.0]	3.7 [3.5 - 4.0]	
Office clerks	3.8 [2.2 - 6.0]	2.6 [2.3 - 2.8]	
Carpenter, cabinet maker, model maker	3.3 [1.8 - 5.5]	1.2 [1.0 - 1.4]	*
Building, vehicle, street cleaner	3.3 [1.8 - 5.5]	4.8 [4.5 - 5.2]	
Geriatric nurse, social work associate professionals	3.1 [1.6 - 5.2]	4.2 [3.9 - 4.6]	
Machinery mechanics and fitters	2.8 [1.5 - 4.9]	2.4 [2.2 - 2.6]	
Engineers, technicians and scientists	2.8 [1.5 - 4.9]	2.4 [2.2 - 2.7]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to propolis (CAS: 85665-41-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to propolis (CAS: 85665-41-4)	Significance
Personal care and related workers	2.8 [1.5 - 4.9]	1.6 [1.4 - 1.8]	
Gardeners, salespersons (fruit, flowers, vegetables)	1.9 [0.8 - 3.7]	2.0 [1.7 - 2.2]	
Construction workers, Manufacturers of building materials	1.9 [0.8 - 3.7]	2.7 [2.4 - 3.0]	
Storekeeper, transport labour and freight handlers	1.9 [0.8 - 3.7]	1.4 [1.3 - 1.6]	
Medical doctors	1.6 [0.7 - 3.4]	1.1 [0.9 - 1.2]	
Dentists	1.6 [0.7 - 3.4]	1.7 [1.5 - 1.9]	
Wine grower, vine refiner, vintage helper	1.4 [0.5 - 3.0]	0.7 [0.6 - 0.8]	
Protective services workers	1.4 [0.5 - 3.0]	0.5 [0.4 - 0.6]	
Laboratory assistants (health associate professionals)	1.4 [0.5 - 3.0]	1.1 [1.0 - 1.3]	
Housewife/-man, domestic helper	1.2 [0.4 - 2.7]	1.5 [1.3 - 1.7]	
Electrical and electronic equipment mechanics and fitters	1.2 [0.4 - 2.7]	1.7 [1.5 - 1.9]	
Butchers, fishmongers and related food preparers	1.2 [0.4 - 2.7]	0.8 [0.6 - 0.9]	
Painters, lacquerers and related workers	1.2 [0.4 - 2.7]	2.2 [2.0 - 2.5]	
Chemist, Lab assistant, Chemical-products machine operators	0.9 [0.3 - 2.4]	1.5 [1.3 - 1.7]	
Plastic-products machine operators	0.9 [0.3 - 2.4]	0.8 [0.7 - 1.0]	
Precision workers in metal and related materials	0.9 [0.3 - 2.4]	0.7 [0.5 - 0.8]	
Construction & maintenance labour: roads, dams & similar	0.9 [0.3 - 2.4]	0.4 [0.3 - 0.5]	
Dental technicians	0.7 [0.1 - 2.0]	0.8 [0.6 - 0.9]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to propolis (CAS: 85665-41-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to propolis (CAS: 85665-41-4)	Significance
Salespersons and demonstrators	0.7 [0.1 - 2.0]	1.2 [1.0 - 1.4]	
Social and health associate professionals, teachers	0.7 [0.1 - 2.0]	1.1 [0.9 - 1.2]	
Waiters and bartenders, guest attendants	0.7 [0.1 - 2.0]	1.0 [0.9 - 1.2]	
Metal processing plant operators, rolling mill operators	0.5 [0.1 - 1.7]	0.3 [0.3 - 0.4]	
Metal finishing-, plating- and coating-machine operators	0.5 [0.1 - 1.7]	0.3 [0.3 - 0.4]	
Welders and flame cutters	0.5 [0.1 - 1.7]	0.5 [0.4 - 0.7]	
Building finishers and related trades workers	0.5 [0.1 - 1.7]	0.5 [0.4 - 0.6]	
Labour, unknown or not classifiable, „other occupation“	0.5 [0.1 - 1.7]	0.4 [0.3 - 0.5]	
Drivers and mobile plant operators	0.5 [0.1 - 1.7]	0.7 [0.6 - 0.9]	
Missing information	0.2 [0.0 - 1.3]	1.3 [1.1 - 1.5]	
Mining- and mineral-processing plant operators	0.2 [0.0 - 1.3]	0.2 [0.1 - 0.3]	
papermaking-plant operators, bookbinders	0.2 [0.0 - 1.3]	0.3 [0.2 - 0.4]	
Textile, garment and related trades workers	0.2 [0.0 - 1.3]	0.4 [0.3 - 0.5]	
Food and related products machine operators	0.2 [0.0 - 1.3]	0.4 [0.3 - 0.5]	
Interior decorators, upholsterers	0.2 [0.0 - 1.3]	0.1 [0.1 - 0.2]	
Cashiers, tellers and related clerks	0.2 [0.0 - 1.3]	0.3 [0.2 - 0.4]	
Artists, musicians, professional sportsmen	0.2 [0.0 - 1.3]	0.2 [0.1 - 0.2]	
Pharmacists	0.2 [0.0 - 1.3]	0.1 [0.0 - 0.1]	
Alternative medicine practitioners	0.2 [0.0 - 1.3]	0.0 [0.0 - 0.1]	

**Tab. 3.2.3.17** IVDK, 2007-2016, OD patients with positive and negative reaction to p-phenylenediamine (PPD) (CI 76060) (CAS: 106-50-3), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 393

Number of patients not sensitized to the allergen (negative reaction): 4,063

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to p-phenylenediamine (PPD) (CI 76060) (CAS: 106-50-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to p-phenylenediamine (PPD) (CI 76060) (CAS: 106-50-3)	Significance
Hairdressers, barbers, beauticians, wigmakers	50.4 [45.3 - 55.4]	14.9 [13.8 - 16.0]	*
Occupations with undetermined exposure	8.9 [6.3 - 12.2]	8.5 [7.7 - 9.4]	
Mechanics, Metal, machinery and related trades workers	4.3 [2.5 - 6.8]	12.2 [11.2 - 13.3]	#
Personal care and related workers	3.8 [2.2 - 6.2]	1.4 [1.1 - 1.8]	*
Building, vehicle, street cleaner	2.5 [1.2 - 4.6]	3.5 [3.0 - 4.1]	
Salespersons and demonstrators	2.3 [1.1 - 4.3]	1.4 [1.1 - 1.8]	
Health care professionals	2.3 [1.1 - 4.3]	6.9 [6.2 - 7.8]	#
Bakers, pastry-cooks and confectionery makers	1.8 [0.7 - 3.6]	1.6 [1.3 - 2.1]	
Office clerks	1.8 [0.7 - 3.6]	2.4 [1.9 - 2.9]	
Construction workers, Manufacturers of building materials	1.5 [0.6 - 3.3]	2.8 [2.3 - 3.3]	
Housewife/-man, domestic helper	1.3 [0.4 - 2.9]	1.1 [0.8 - 1.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to p-phenylenediamine (PPD) (CI 76060) (CAS: 106-50-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to p-phenylenediamine (PPD) (CI 76060) (CAS: 106-50-3)	Significance
Machinery mechanics and fitters	1.3 [0.4 - 2.9]	3.1 [2.5 - 3.6]	
Painters, lacquerers and related workers	1.3 [0.4 - 2.9]	2.5 [2.0 - 3.0]	
Geriatric nurse, social work associate professionals	1.3 [0.4 - 2.9]	2.5 [2.0 - 3.0]	
Chemist, Lab assistant, Chemical-products machine operators	1.0 [0.3 - 2.6]	2.1 [1.7 - 2.6]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	1.0 [0.3 - 2.6]	3.2 [2.7 - 3.8]	#
Storekeeper, transport labour and freight handlers	1.0 [0.3 - 2.6]	1.8 [1.4 - 2.3]	
Missing information	0.8 [0.2 - 2.2]	1.0 [0.7 - 1.3]	
Plastic-products machine operators	0.8 [0.2 - 2.2]	0.6 [0.4 - 0.9]	
Electrical and electronic equipment mechanics and fitters	0.8 [0.2 - 2.2]	1.5 [1.1 - 1.9]	
Construction & maintenance labour: roads, dams & similar	0.8 [0.2 - 2.2]	0.5 [0.3 - 0.7]	
Carpenter, cabinet maker, model maker	0.8 [0.2 - 2.2]	1.2 [0.9 - 1.5]	
Drivers and mobile plant operators	0.8 [0.2 - 2.2]	1.2 [0.9 - 1.6]	
Waiters and bartenders, guest attendants	0.8 [0.2 - 2.2]	0.9 [0.6 - 1.2]	
Printing-machine operators	0.5 [0.1 - 1.8]	1.0 [0.7 - 1.4]	
Metal worker (cutting)	0.5 [0.1 - 1.8]	3.5 [3.0 - 4.1]	#
Manufacturers or processors of fur and leather	0.5 [0.1 - 1.8]	0.3 [0.2 - 0.5]	
Building finishers and related trades workers	0.5 [0.1 - 1.8]	0.5 [0.3 - 0.8]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to p-phenylenediamine (PPD) (CI 76060) (CAS: 106-50-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to p-phenylenediamine (PPD) (CI 76060) (CAS: 106-50-3)	Significance
Dentists	0.5 [0.1 - 1.8]	1.2 [0.9 - 1.6]	
Social and health associate professionals, teachers	0.5 [0.1 - 1.8]	0.6 [0.4 - 0.9]	
Wine grower, vine refiner, vintage helper	0.3 [0.0 - 1.4]	0.4 [0.2 - 0.6]	
Gardeners, salespersons (fruit, flowers, vegetables)	0.3 [0.0 - 1.4]	1.6 [1.3 - 2.1]	
Rubber-products machine operators, vulcanizers	0.3 [0.0 - 1.4]	0.2 [0.1 - 0.5]	
Precision workers in metal and related materials	0.3 [0.0 - 1.4]	0.8 [0.6 - 1.2]	
Textile, garment and related trades workers	0.3 [0.0 - 1.4]	0.7 [0.4 - 1.0]	
Butchers, fishmongers and related food preparers	0.3 [0.0 - 1.4]	0.5 [0.3 - 0.8]	
Engineers, technicians and scientists	0.3 [0.0 - 1.4]	2.5 [2.0 - 3.0]	#
Communication professions	0.3 [0.0 - 1.4]	0.1 [0.0 - 0.3]	
Cashiers, tellers and related clerks	0.3 [0.0 - 1.4]	0.1 [0.1 - 0.3]	
Protective services workers	0.3 [0.0 - 1.4]	0.8 [0.6 - 1.1]	
Artists, musicians, professional sportsmen	0.3 [0.0 - 1.4]	0.1 [0.1 - 0.3]	
Medical doctors	0.3 [0.0 - 1.4]	0.6 [0.4 - 0.8]	
Veterinarians	0.3 [0.0 - 1.4]	0.1 [0.0 - 0.3]	
Laboratory assistants (health associate professionals)	0.3 [0.0 - 1.4]	0.4 [0.3 - 0.7]	
Domestic and related helpers, cleaners and launderers	0.3 [0.0 - 1.4]	0.0 [0.0 - 0.2]	

**Tab. 3.2.3.18** IVDK, 2007-2016, OD patients with positive and negative reaction to toluene-2,5-diamine (CAS: 95-70-5), respectively:

percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 362

Number of patients not sensitized to the allergen (negative reaction): 1,290

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to toluene-2,5-diamine (CAS: 95-70-5)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to toluene-2,5-diamine (CAS: 95-70-5)	Significance
Hairdressers, barbers, beauticians, wigmakers	71.8 [66.9 - 76.4]	53.6 [50.8 - 56.3]	*
Occupations with undetermined exposure	4.7 [2.8 - 7.4]	7.5 [6.1 - 9.1]	
Personal care and related workers	3.6 [1.9 - 6.1]	2.6 [1.8 - 3.6]	
Office clerks	2.8 [1.3 - 5.0]	2.5 [1.7 - 3.5]	
Mechanics, Metal, machinery and related trades workers	1.9 [0.8 - 3.9]	3.6 [2.7 - 4.8]	
Housewife/-man, domestic helper	1.7 [0.6 - 3.6]	1.0 [0.5 - 1.7]	
Building, vehicle, street cleaner	1.7 [0.6 - 3.6]	1.9 [1.2 - 2.8]	
Painters, lacquerers and related workers	1.4 [0.4 - 3.2]	3.3 [2.4 - 4.5]	
Salespersons and demonstrators	1.1 [0.3 - 2.8]	1.4 [0.8 - 2.2]	
Health care professionals	1.1 [0.3 - 2.8]	1.9 [1.3 - 2.8]	
Missing information	0.8 [0.2 - 2.4]	0.7 [0.3 - 1.3]	
Gardeners, salespersons (fruit, flowers, vegetables)	0.6 [0.1 - 2.0]	0.9 [0.5 - 1.6]	
Machinery mechanics and fitters	0.6 [0.1 - 2.0]	1.3 [0.8 - 2.1]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to toluene-2,5-diamine (CAS: 95-70-5)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to toluene-2,5-diamine (CAS: 95-70-5)	Significance
Electrical and electronic equipment mechanics and fitters	0.6 [0.1 - 2.0]	0.8 [0.4 - 1.4]	
Drivers and mobile plant operators	0.6 [0.1 - 2.0]	0.4 [0.1 - 0.9]	
Social and health associate professionals, teachers	0.6 [0.1 - 2.0]	0.6 [0.3 - 1.2]	
Geriatric nurse, social work associate professionals	0.6 [0.1 - 2.0]	1.3 [0.8 - 2.1]	
Waiters and bartenders, guest attendants	0.6 [0.1 - 2.0]	0.4 [0.1 - 0.9]	
Rubber-products machine operators, vulcanizers	0.3 [0.0 - 1.5]	0.1 [0.0 - 0.4]	
Printing-machine operators	0.3 [0.0 - 1.5]	1.4 [0.8 - 2.2]	
Precision workers in metal and related materials	0.3 [0.0 - 1.5]	0.4 [0.1 - 0.9]	
Textile, garment and related trades workers	0.3 [0.0 - 1.5]	0.3 [0.1 - 0.8]	
Butchers, fishmongers and related food preparers	0.3 [0.0 - 1.5]	0.2 [0.0 - 0.7]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	0.3 [0.0 - 1.5]	0.4 [0.1 - 0.9]	
Construction workers, Manufacturers of building materials	0.3 [0.0 - 1.5]	1.2 [0.7 - 2.0]	
Carpenter, cabinet maker, model maker	0.3 [0.0 - 1.5]	0.5 [0.2 - 1.1]	
Photographic-products machine operators	0.3 [0.0 - 1.5]	0.1 [0.0 - 0.4]	
Communication professions	0.3 [0.0 - 1.5]	0.2 [0.0 - 0.6]	
Cashiers, tellers and related clerks	0.3 [0.0 - 1.5]	0.1 [0.0 - 0.4]	
Hygiene and health surveillance	0.3 [0.0 - 1.5]	0.1 [0.0 - 0.4]	
Laboratory assistants (health associate professionals)	0.3 [0.0 - 1.5]	0.5 [0.2 - 1.0]	

**Tab. 3.2.3.19** IVDK, 2007-2016, OD patients with positive and negative reaction to Amerchol L-101, respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 345

Number of patients not sensitized to the allergen (negative reaction): 13,136

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Amerchol L-101	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Amerchol L-101	Significance
Health care professionals	15.1 [11.5 - 19.3]	13.1 [12.5 - 13.7]	
Mechanics, Metal, machinery and related trades workers	10.4 [7.4 - 14.2]	11.4 [10.9 - 12.0]	
Occupations with undetermined exposure	8.7 [5.9 - 12.2]	8.0 [7.5 - 8.4]	
Hairdressers, barbers, beauticians, wigmakers	5.5 [3.3 - 8.5]	6.6 [6.2 - 7.1]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	4.9 [2.9 - 7.8]	3.9 [3.6 - 4.3]	
Geriatric nurse, social work associate professionals	4.1 [2.2 - 6.7]	5.1 [4.7 - 5.5]	
Engineers, technicians and scientists	3.8 [2.0 - 6.4]	2.2 [2.0 - 2.5]	
Housewife/-man, domestic helper	3.5 [1.8 - 6.0]	1.4 [1.2 - 1.7]	*
Building, vehicle, street cleaner	3.5 [1.8 - 6.0]	4.7 [4.4 - 5.1]	
Laboratory assistants (health associate professionals)	2.6 [1.2 - 4.9]	1.1 [0.9 - 1.2]	
Social and health associate professionals, teachers	2.6 [1.2 - 4.9]	1.0 [0.8 - 1.2]	*
Metal worker (cutting)	2.3 [1.0 - 4.5]	4.1 [3.7 - 4.4]	
Office clerks	2.3 [1.0 - 4.5]	2.1 [1.9 - 2.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Amerchol L-101	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Amerchol L-101	Significance
Electrical and electronic equipment mechanics and fitters	2.0 [0.8 - 4.1]	1.8 [1.6 - 2.1]	
Salespersons and demonstrators	2.0 [0.8 - 4.1]	1.2 [1.0 - 1.4]	
Wine grower, vine refiner, vintage helper	1.7 [0.6 - 3.7]	0.7 [0.5 - 0.8]	
Medical doctors	1.7 [0.6 - 3.7]	1.0 [0.8 - 1.2]	
Personal care and related workers	1.7 [0.6 - 3.7]	1.7 [1.5 - 2.0]	
Waiters and bartenders, guest attendants	1.7 [0.6 - 3.7]	0.9 [0.8 - 1.1]	
Construction workers, Manufacturers of building materials	1.4 [0.5 - 3.3]	2.5 [2.2 - 2.8]	
Dentists	1.4 [0.5 - 3.3]	1.7 [1.5 - 1.9]	
Gardeners, salespersons (fruit, flowers, vegetables)	1.2 [0.3 - 2.9]	1.8 [1.6 - 2.1]	
Machinery mechanics and fitters	1.2 [0.3 - 2.9]	2.6 [2.3 - 2.9]	
Dental technicians	1.2 [0.3 - 2.9]	0.7 [0.6 - 0.9]	
Carpenter, cabinet maker, model maker	1.2 [0.3 - 2.9]	1.1 [0.9 - 1.2]	
Bakers, pastry-cooks and confectionery makers	0.9 [0.2 - 2.5]	2.0 [1.8 - 2.2]	
Butchers, fishmongers and related food preparers	0.9 [0.2 - 2.5]	0.8 [0.7 - 1.0]	
Painters, lacquerers and related workers	0.9 [0.2 - 2.5]	1.9 [1.7 - 2.2]	
Drivers and mobile plant operators	0.9 [0.2 - 2.5]	0.7 [0.6 - 0.9]	
Storekeeper, transport labour and freight handlers	0.9 [0.2 - 2.5]	1.4 [1.2 - 1.6]	
Missing information	0.6 [0.1 - 2.1]	1.2 [1.0 - 1.4]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.6 [0.1 - 2.1]	0.2 [0.2 - 0.3]	
Mining- and mineral-processing plant operators	0.6 [0.1 - 2.1]	0.2 [0.1 - 0.3]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Amerchol L-101	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Amerchol L-101	Significance
Chemist, Lab assistant, Chemical-products machine operators	0.6 [0.1 - 2.1]	1.1 [0.9 - 1.3]	
Welders and flame cutters	0.6 [0.1 - 2.1]	0.6 [0.4 - 0.7]	
Beverage industry labour	0.6 [0.1 - 2.1]	0.0 [0.0 - 0.1]	
Protective services workers	0.6 [0.1 - 2.1]	0.4 [0.3 - 0.6]	
Pharmacists	0.6 [0.1 - 2.1]	0.1 [0.0 - 0.1]	
Printing-machine operators	0.3 [0.0 - 1.6]	0.5 [0.4 - 0.6]	
Metal processing plant operators, rolling mill operators	0.3 [0.0 - 1.6]	0.3 [0.2 - 0.4]	
Metal worker (non-cutting)	0.3 [0.0 - 1.6]	0.2 [0.2 - 0.3]	
Metal finishing-, plating- and coating-machine operators	0.3 [0.0 - 1.6]	0.3 [0.2 - 0.5]	
Precision workers in metal and related materials	0.3 [0.0 - 1.6]	0.6 [0.5 - 0.8]	
Manufacturers or processors of fur and leather	0.3 [0.0 - 1.6]	0.1 [0.1 - 0.2]	
Food and related products machine operators	0.3 [0.0 - 1.6]	0.4 [0.3 - 0.5]	
Cashiers, tellers and related clerks	0.3 [0.0 - 1.6]	0.3 [0.2 - 0.4]	
Veterinarians	0.3 [0.0 - 1.6]	0.2 [0.1 - 0.3]	
Scientists	0.3 [0.0 - 1.6]	0.0 [0.0 - 0.1]	
Domestic and related helpers, cleaners and launderers	0.3 [0.0 - 1.6]	0.1 [0.1 - 0.2]	

**Tab. 3.2.3.20** IVDK, 2007-2016, OD patients with positive and negative reaction to formaldehyde (CAS: 50-00-0), respectively: Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 333

Number of patients not sensitized to the allergen (negative reaction): 16,679

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to formaldehyde (CAS: 50-00-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to formaldehyde (CAS: 50-00-0)	Significance
Health care professionals	15.3 [11.6 - 19.6]	12.3 [11.8 - 12.8]	
Mechanics, Metal, machinery and related trades workers	13.8 [10.3 - 18.0]	10.8 [10.4 - 11.3]	
Metal worker (cutting)	9.6 [6.7 - 13.3]	3.6 [3.4 - 3.9]	*
Occupations with undetermined exposure	9.6 [6.7 - 13.3]	8.3 [7.9 - 8.8]	
Geriatric nurse, social work associate professionals	6.0 [3.7 - 9.1]	4.3 [4.0 - 4.7]	
Hairdressers, barbers, beauticians, wigmakers	4.8 [2.8 - 7.7]	6.1 [5.8 - 6.5]	
Building, vehicle, street cleaner	4.2 [2.3 - 7.0]	4.8 [4.5 - 5.1]	
Engineers, technicians and scientists	3.3 [1.7 - 5.8]	2.4 [2.2 - 2.6]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	2.4 [1.0 - 4.7]	3.9 [3.6 - 4.2]	
Machinery mechanics and fitters	2.1 [0.8 - 4.3]	2.4 [2.2 - 2.6]	
Missing information	1.8 [0.7 - 3.9]	1.2 [1.1 - 1.4]	
Medical doctors	1.8 [0.7 - 3.9]	1.1 [0.9 - 1.3]	
Laboratory assistants (health associate professionals)	1.8 [0.7 - 3.9]	1.2 [1.0 - 1.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to formaldehyde (CAS: 50-00-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to formaldehyde (CAS: 50-00-0)	Significance
Personal care and related workers	1.5 [0.5 - 3.5]	1.6 [1.4 - 1.8]	
Housewife/-man, domestic helper	1.2 [0.3 - 3.0]	1.5 [1.3 - 1.7]	
Plastic-products machine operators	1.2 [0.3 - 3.0]	0.8 [0.7 - 1.0]	
Precision workers in metal and related materials	1.2 [0.3 - 3.0]	0.6 [0.5 - 0.8]	
Storekeeper, transport labour and freight handlers	1.2 [0.3 - 3.0]	1.4 [1.2 - 1.6]	
Office clerks	1.2 [0.3 - 3.0]	2.5 [2.3 - 2.8]	
Social and health associate professionals, teachers	1.2 [0.3 - 3.0]	1.1 [0.9 - 1.2]	
Wine grower, vine refiner, vintage helper	0.9 [0.2 - 2.6]	0.7 [0.6 - 0.9]	
Gardeners, salespersons (fruit, flowers, vegetables)	0.9 [0.2 - 2.6]	1.9 [1.7 - 2.1]	
Textile, garment and related trades workers	0.9 [0.2 - 2.6]	0.3 [0.3 - 0.4]	
Construction workers, Manufacturers of building materials	0.9 [0.2 - 2.6]	2.7 [2.5 - 3.0]	
Carpenter, cabinet maker, model maker	0.9 [0.2 - 2.6]	1.2 [1.1 - 1.4]	
Painters, lacquerers and related workers	0.9 [0.2 - 2.6]	2.2 [2.0 - 2.4]	
Protective services workers	0.9 [0.2 - 2.6]	0.5 [0.4 - 0.6]	
Dentists	0.9 [0.2 - 2.6]	1.8 [1.6 - 2.0]	
Mining- and mineral-processing plant operators	0.6 [0.1 - 2.2]	0.2 [0.1 - 0.3]	
Dental technicians	0.6 [0.1 - 2.2]	0.8 [0.6 - 0.9]	
Electrical and electronic equipment mechanics and fitters	0.6 [0.1 - 2.2]	1.7 [1.5 - 1.9]	
Bakers, pastry-cooks and confectionery makers	0.6 [0.1 - 2.2]	2.1 [1.8 - 2.3]	
Food and related products machine operators	0.6 [0.1 - 2.2]	0.4 [0.3 - 0.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to formaldehyde (CAS: 50-00-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to formaldehyde (CAS: 50-00-0)	Significance
Drivers and mobile plant operators	0.6 [0.1 - 2.2]	0.7 [0.6 - 0.9]	
Communication professions	0.6 [0.1 - 2.2]	0.2 [0.1 - 0.3]	
Chemist, Lab assistant, Chemical-products machine operators	0.3 [0.0 - 1.7]	1.5 [1.3 - 1.7]	
Rubber-products machine operators, vulcanizers	0.3 [0.0 - 1.7]	0.1 [0.1 - 0.2]	
Printing-machine operators	0.3 [0.0 - 1.7]	0.6 [0.5 - 0.7]	
Metal processing plant operators, rolling mill operators	0.3 [0.0 - 1.7]	0.4 [0.3 - 0.5]	
Welders and flame cutters	0.3 [0.0 - 1.7]	0.5 [0.4 - 0.7]	
Labour, unknown, or not classifiable other occupation	0.3 [0.0 - 1.7]	0.4 [0.3 - 0.5]	
Petrol pump attendant	0.3 [0.0 - 1.7]	0.1 [0.0 - 0.1]	
Cashiers, tellers and related clerks	0.3 [0.0 - 1.7]	0.3 [0.2 - 0.4]	
Pharmacists	0.3 [0.0 - 1.7]	0.1 [0.1 - 0.1]	
Waiters and bartenders, guest attendants	0.3 [0.0 - 1.7]	1.0 [0.9 - 1.2]	
Domestic and related helpers, cleaners and launderers	0.3 [0.0 - 1.7]	0.2 [0.1 - 0.3]	

**Tab. 3.2.3.21** IVDK, 2007-2016, OD patients with positive and negative reaction to 1,3-diphenylguanidine (CAS: 102-06-7), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 321

Number of patients not sensitized to the allergen (negative reaction): 11,160

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to 1,3-diphenylguanidine (CAS: 102-06-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to 1,3-diphenylguanidine (CAS: 102-06-7)	Significance to
Health care professionals	14.6 [11.0 - 19.0]	13.6 [13.0 - 14.3]	
Mechanics, Metal, machinery and related trades workers	10.6 [7.4 - 14.5]	11.7 [11.1 - 12.3]	
Occupations with undetermined exposure	8.7 [5.9 - 12.4]	7.2 [6.7 - 7.7]	
Medical doctors	6.2 [3.8 - 9.5]	1.0 [0.8 - 1.2]	*
Cooks, Cannery workers, Fruit, vegetable and related preservers	4.7 [2.6 - 7.6]	4.1 [3.7 - 4.5]	
Building, vehicle, street cleaner	4.4 [2.4 - 7.2]	5.0 [4.6 - 5.4]	
Construction workers, Manufacturers of building materials	3.7 [1.9 - 6.4]	2.8 [2.5 - 3.2]	
Geriatric nurse, social work associate professionals	3.4 [1.7 - 6.0]	5.5 [5.1 - 6.0]	
Engineers, technicians and scientists	3.1 [1.5 - 5.7]	2.0 [1.8 - 2.3]	
Missing information	2.8 [1.3 - 5.3]	1.1 [0.9 - 1.3]	
Carpenter, cabinet maker, model maker	2.5 [1.1 - 4.9]	0.9 [0.8 - 1.1]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to 1,3-diphenylguanidine (CAS: 102-06-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to 1,3-diphenylguanidine (CAS: 102-06-7)	Significance
Machinery mechanics and fitters	2.2 [0.9 - 4.4]	2.6 [2.3 - 2.9]	
Painters, Varnishers and related workers	2.2 [0.9 - 4.4]	1.9 [1.6 - 2.2]	
Housewife/-man, domestic helper	1.9 [0.7 - 4.0]	1.5 [1.3 - 1.7]	
Gardeners, salespersons (fruit, flowers, vegetables)	1.9 [0.7 - 4.0]	1.9 [1.6 - 2.2]	
Metal worker (cutting)	1.9 [0.7 - 4.0]	3.8 [3.4 - 4.1]	
Hairdressers, barbers, beauticians, wigmakers	1.9 [0.7 - 4.0]	6.0 [5.6 - 6.5]	#
Food and related products machine operators	1.6 [0.5 - 3.6]	0.3 [0.2 - 0.5]	*
Chemist, Lab assistant, Chemical-products machine operators	1.2 [0.3 - 3.2]	1.3 [1.1 - 1.5]	
Plastic-products machine operators	1.2 [0.3 - 3.2]	0.8 [0.6 - 1.0]	
Metal finishing-, plating- and coating-machine operators	1.2 [0.3 - 3.2]	0.3 [0.2 - 0.5]	
Construction & maintenance labour: roads, dams & similar	1.2 [0.3 - 3.2]	0.4 [0.3 - 0.6]	
Drivers and mobile plant operators	1.2 [0.3 - 3.2]	0.9 [0.7 - 1.0]	
Storekeeper, transport labour and freight handlers	1.2 [0.3 - 3.2]	1.5 [1.2 - 1.7]	
Wine grower, vine refiner, vintage helper	0.9 [0.2 - 2.7]	0.7 [0.6 - 0.9]	
Printing-machine operators	0.9 [0.2 - 2.7]	0.6 [0.4 - 0.7]	
Electrical and electronic equipment mechanics and fitters	0.9 [0.2 - 2.7]	1.9 [1.6 - 2.2]	
Bakers, pastry-cooks and confectionery makers	0.9 [0.2 - 2.7]	1.8 [1.5 - 2.0]	
Butchers, fishmongers and related food preparers	0.9 [0.2 - 2.7]	0.9 [0.7 - 1.1]	
Building finishers and related trades workers	0.9 [0.2 - 2.7]	0.4 [0.3 - 0.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to 1,3-diphenylguanidine (CAS: 102-06-7)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to 1,3-diphenylguanidine (CAS: 102-06-7)	Significance
Salespersons and demonstrators	0.9 [0.2 - 2.7]	1.1 [0.9 - 1.3]	
Laboratory assistants (health associate professionals)	0.9 [0.2 - 2.7]	1.2 [1.0 - 1.5]	
Forestry and related workers	0.6 [0.1 - 2.2]	0.0 [0.0 - 0.1]	
Potters, glass-makers and related trades workers	0.6 [0.1 - 2.2]	0.2 [0.1 - 0.3]	
Welders and flame cutters	0.6 [0.1 - 2.2]	0.6 [0.5 - 0.8]	
Precision workers in metal and related materials	0.6 [0.1 - 2.2]	0.5 [0.4 - 0.7]	
Textile, garment and related trades workers	0.6 [0.1 - 2.2]	0.3 [0.2 - 0.5]	
Office clerks	0.6 [0.1 - 2.2]	1.8 [1.5 - 2.0]	
Dentists	0.6 [0.1 - 2.2]	1.9 [1.6 - 2.1]	
Mixed-animal producers (dairy, poultry etc), fishery labour	0.3 [0.0 - 1.7]	0.3 [0.2 - 0.4]	
Mining- and mineral-processing plant operators	0.3 [0.0 - 1.7]	0.2 [0.2 - 0.4]	
Metal processing plant operators, rolling mill operators	0.3 [0.0 - 1.7]	0.4 [0.3 - 0.5]	
Metal worker (non-cutting)	0.3 [0.0 - 1.7]	0.2 [0.1 - 0.3]	
Manufacturers or processors of fur and leather	0.3 [0.0 - 1.7]	0.2 [0.2 - 0.4]	
Protective services workers	0.3 [0.0 - 1.7]	0.4 [0.3 - 0.6]	
Personal care and related workers	0.3 [0.0 - 1.7]	1.5 [1.3 - 1.8]	
Waiters and bartenders, guest attendants	0.3 [0.0 - 1.7]	0.8 [0.6 - 1.0]	

**Tab. 3.2.3.22** IVDK, 2007-2016, OD patients with positive and negative reaction to lanolin alcohols (CAS: 8027-33-6), respectively: Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 318

Number of patients not sensitized to the allergen (negative reaction): 16,227

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;  
# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to lanolin alcohols (CAS: 8027-33-6)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to lanolin alcohols (CAS: 8027-33-6)	Significance
Health care professionals	15.7 [11.9 - 20.2]	12.2 [11.7 - 12.7]	
Occupations with undetermined exposure	9.1 [6.2 - 12.8]	8.3 [7.9 - 8.8]	
Mechanics, Metal, machinery and related trades workers	7.9 [5.2 - 11.4]	11.0 [10.5 - 11.5]	
Building, vehicle, street cleaner	6.0 [3.6 - 9.2]	4.7 [4.4 - 5.0]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	5.7 [3.4 - 8.8]	3.8 [3.5 - 4.1]	
Geriatric nurse, social work associate professionals	4.4 [2.4 - 7.3]	4.3 [4.0 - 4.6]	
Office clerks	3.8 [2.0 - 6.5]	2.5 [2.3 - 2.8]	
Salespersons and demonstrators	3.1 [1.5 - 5.7]	1.1 [1.0 - 1.3]	*
Social and health associate professionals, teachers	3.1 [1.5 - 5.7]	1.0 [0.9 - 1.2]	*
Hairdressers, barbers, beauticians, wigmakers	3.1 [1.5 - 5.7]	6.3 [5.9 - 6.7]	#
Waiters and bartenders, guest attendants	2.8 [1.3 - 5.3]	1.0 [0.8 - 1.1]	*
Engineers, technicians and scientists	2.5 [1.1 - 4.9]	2.4 [2.2 - 2.7]	
Bakers, pastry-cooks and confectionery makers	2.2 [0.9 - 4.5]	2.0 [1.8 - 2.3]	
Dentists	2.2 [0.9 - 4.5]	1.7 [1.5 - 1.9]	
Wine grower, vine refiner, vintage helper	1.9 [0.7 - 4.1]	0.7 [0.6 - 0.8]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to lanolin alcohols (CAS: 8027-33-6)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to lanolin alcohols (CAS: 8027-33-6)	Significance
Gardeners, salespersons (fruit, flowers, vegetables)	1.9 [0.7 - 4.1]	2.0 [1.8 - 2.2]	
Storekeeper, transport labour and freight handlers	1.9 [0.7 - 4.1]	1.4 [1.3 - 1.6]	
Medical doctors	1.9 [0.7 - 4.1]	1.0 [0.9 - 1.2]	
Metal worker (cutting)	1.6 [0.5 - 3.6]	3.8 [3.5 - 4.1]	
Construction workers, Manufacturers of building materials	1.6 [0.5 - 3.6]	2.7 [2.5 - 3.0]	
Painters, lacquerers and related workers	1.6 [0.5 - 3.6]	2.2 [2.0 - 2.5]	
Missing information	1.3 [0.3 - 3.2]	1.2 [1.1 - 1.4]	
Housewife/-man, domestic helper	1.3 [0.3 - 3.2]	1.5 [1.3 - 1.7]	
Personal care and related workers	1.3 [0.3 - 3.2]	1.6 [1.4 - 1.8]	
Machinery mechanics and fitters	0.9 [0.2 - 2.7]	2.4 [2.2 - 2.7]	
Textile, garment and related trades workers	0.9 [0.2 - 2.7]	0.3 [0.3 - 0.4]	
Carpenter, cabinet maker, model maker	0.9 [0.2 - 2.7]	1.2 [1.0 - 1.4]	
Laboratory assistants (health associate professionals)	0.9 [0.2 - 2.7]	1.2 [1.0 - 1.3]	
Electrical and electronic equipment mechanics and fitters	0.6 [0.1 - 2.3]	1.7 [1.5 - 1.9]	
Butchers, fishmongers and related food preparers	0.6 [0.1 - 2.3]	0.8 [0.6 - 0.9]	
Construction & maintenance labour: roads, dams & similar	0.6 [0.1 - 2.3]	0.4 [0.3 - 0.5]	
Protective services workers	0.6 [0.1 - 2.3]	0.5 [0.4 - 0.6]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.3 [0.0 - 1.7]	0.3 [0.2 - 0.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to lanolin alcohols (CAS: 8027-33-6)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to lanolin alcohols (CAS: 8027-33-6)	Significance
Chemist, Lab assistant, Chemical-products machine operators	0.3 [0.0 - 1.7]	1.5 [1.3 - 1.7]	
Plastic-products machine operators	0.3 [0.0 - 1.7]	0.9 [0.7 - 1.0]	
Printing-machine operators	0.3 [0.0 - 1.7]	0.6 [0.5 - 0.7]	
Metal processing plant operators, rolling mill operators	0.3 [0.0 - 1.7]	0.4 [0.3 - 0.5]	
Metal finishing-, plating- and coating-machine operators	0.3 [0.0 - 1.7]	0.3 [0.3 - 0.4]	
Welders and flame cutters	0.3 [0.0 - 1.7]	0.6 [0.5 - 0.7]	
Precision workers in metal and related materials	0.3 [0.0 - 1.7]	0.7 [0.5 - 0.8]	
Dental technicians	0.3 [0.0 - 1.7]	0.8 [0.6 - 0.9]	
Optometrists and opticians	0.3 [0.0 - 1.7]	0.0 [0.0 - 0.1]	
Manufacturers or processors of fur and leather	0.3 [0.0 - 1.7]	0.2 [0.1 - 0.3]	
Beverage industry labour	0.3 [0.0 - 1.7]	0.0 [0.0 - 0.1]	
Food and related products machine operators	0.3 [0.0 - 1.7]	0.4 [0.3 - 0.5]	
Building finishers and related trades workers	0.3 [0.0 - 1.7]	0.5 [0.4 - 0.6]	
Drivers and mobile plant operators	0.3 [0.0 - 1.7]	0.8 [0.6 - 0.9]	
Cashiers, tellers and related clerks	0.3 [0.0 - 1.7]	0.3 [0.2 - 0.4]	
Hygiene and health surveillance	0.3 [0.0 - 1.7]	0.1 [0.1 - 0.2]	
Veterinarians	0.3 [0.0 - 1.7]	0.2 [0.1 - 0.2]	
Pharmacists	0.3 [0.0 - 1.7]	0.1 [0.0 - 0.1]	

**Tab. 3.2.3.23** IVDK, 2007-2016, OD patients with positive and negative reaction to 1,6-hexanediol diglycidylether (CAS: 16096-31-4), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 302

Number of patients not sensitized to the allergen (negative reaction): 3,964

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;  
# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to 1,6-hexanediol diglycidylether (CAS: 16096-31-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to 1,6-hexanediol diglycidylether (CAS: 16096-31-4)	Significance
Construction workers, Manufacturers of building materials	18.5 [14.3 - 23.4]	8.5 [7.7 - 9.4]	*
Occupations with undetermined exposure	14.2 [10.5 - 18.7]	10.0 [9.1 - 11.0]	
Painters, Varnishers and related workers	12.9 [9.3 - 17.2]	7.1 [6.4 - 8.0]	*
Mechanics, Metal, machinery and related trades workers	12.3 [8.8 - 16.5]	17.2 [16.1 - 18.4]	
Plastic-products machine operators	9.9 [6.8 - 13.9]	2.3 [1.9 - 2.9]	*
Engineers, technicians and scientists	4.3 [2.3 - 7.2]	3.8 [3.2 - 4.4]	
Carpenter, cabinet maker, model maker	3.0 [1.4 - 5.6]	3.5 [3.0 - 4.2]	
Missing information	2.3 [0.9 - 4.7]	1.5 [1.2 - 2.0]	
Construction & maintenance labour: roads, dams & similar	2.3 [0.9 - 4.7]	1.1 [0.8 - 1.5]	
Mining- and mineral-processing plant operators	2.0 [0.7 - 4.3]	0.5 [0.3 - 0.7]	
Chemist, Lab assistant, Chemical-products machine operators	2.0 [0.7 - 4.3]	2.1 [1.7 - 2.6]	
Drivers and mobile plant operators	1.7 [0.5 - 3.8]	0.9 [0.7 - 1.3]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to 1,6-hexanediol diglycidylether (CAS: 16096-31-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to 1,6-hexanediol diglycidylether (CAS: 16096-31-4)	Significance
Printing-machine operators	1.3 [0.4 - 3.4]	1.4 [1.1 - 1.9]	
Metal finishing-, plating- and coating-machine operators	1.3 [0.4 - 3.4]	0.4 [0.2 - 0.6]	
Electrical and electronic equipment mechanics and fitters	1.3 [0.4 - 3.4]	3.3 [2.8 - 3.9]	
Building finishers and related trades workers	1.3 [0.4 - 3.4]	1.3 [1.0 - 1.7]	
Machinery mechanics and fitters	1.0 [0.2 - 2.9]	4.1 [3.5 - 4.8]	#
Office clerks	1.0 [0.2 - 2.9]	2.1 [1.6 - 2.6]	
Building, vehicle, street cleaner	1.0 [0.2 - 2.9]	0.8 [0.6 - 1.1]	
Metal worker (cutting)	0.7 [0.1 - 2.4]	3.8 [3.3 - 4.5]	#
Storekeeper, transport labour and freight handlers	0.7 [0.1 - 2.4]	1.9 [1.5 - 2.4]	
Health care professionals	0.7 [0.1 - 2.4]	1.7 [1.3 - 2.2]	
Housewife/-man, domestic helper	0.3 [0.0 - 1.8]	0.5 [0.3 - 0.8]	
Mixed-animal producers (dairy, poultry etc), fishery labour	0.3 [0.0 - 1.8]	0.0 [0.0 - 0.1]	
Potters, glass-makers and related trades workers	0.3 [0.0 - 1.8]	0.3 [0.2 - 0.6]	
papermaking-plant operators, bookbinders	0.3 [0.0 - 1.8]	0.7 [0.4 - 1.0]	
Metal processing plant operators, rolling mill operators	0.3 [0.0 - 1.8]	0.6 [0.4 - 0.9]	
Welders and flame cutters	0.3 [0.0 - 1.8]	0.9 [0.6 - 1.2]	
Precision workers in metal and related materials	0.3 [0.0 - 1.8]	1.1 [0.8 - 1.5]	
Textile, garment and related trades workers	0.3 [0.0 - 1.8]	0.5 [0.3 - 0.7]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to 1,6-hexanediol diglycidylether (CAS: 16096-31-4)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to 1,6-hexanediol diglycidylether (CAS: 16096-31-4)	Significance
Cooks, Cannery workers, Fruit, vegetable and related preservers	0.3 [0.0 - 1.8]	0.4 [0.2 - 0.6]	
Labour, unknown, or not classifiable other occupation	0.3 [0.0 - 1.8]	0.5 [0.3 - 0.7]	
Protective services workers	0.3 [0.0 - 1.8]	0.5 [0.3 - 0.7]	
Artists, musicians, professional sportsmen	0.3 [0.0 - 1.8]	0.2 [0.1 - 0.4]	
Waiters and bartenders, guest attendants	0.3 [0.0 - 1.8]	0.3 [0.1 - 0.5]	

**Tab. 3.2.3.24** IVDK, 2007-2016, OD patients with positive and negative reaction to iodopropynylbutyl carbamate (CAS: 55406-53-6), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 296

Number of patients not sensitized to the allergen (negative reaction): 14,654

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to iodopropynylbutyl carbamate (CAS: 55406-53-6)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to iodopropynylbutyl carbamate (CAS: 55406-53-6)	Significance
Mechanics, Metal, machinery and related trades workers	13.5 [9.8 - 17.9]	11.9 [11.3 - 12.4]	
Metal worker (cutting)	11.1 [7.8 - 15.3]	4.1 [3.8 - 4.4]	*
Health care professionals	10.1 [6.9 - 14.2]	12.7 [12.2 - 13.3]	
Occupations with undetermined exposure	7.1 [4.4 - 10.6]	8.0 [7.6 - 8.5]	
Hairdressers, barbers, beauticians, wigmakers	6.8 [4.2 - 10.2]	6.3 [5.9 - 6.7]	
Geriatric nurse, social work associate professionals	6.4 [3.9 - 9.8]	4.5 [4.1 - 4.8]	
Building, vehicle, street cleaner	4.7 [2.6 - 7.8]	4.6 [4.2 - 4.9]	
Machinery mechanics and fitters	2.7 [1.2 - 5.3]	2.5 [2.3 - 2.8]	
Engineers, technicians and scientists	2.7 [1.2 - 5.3]	2.4 [2.2 - 2.7]	
Office clerks	2.7 [1.2 - 5.3]	2.2 [2.0 - 2.5]	
Storekeeper, transport labour and freight handlers	2.4 [1.0 - 4.8]	1.4 [1.2 - 1.6]	
Personal care and related workers	2.4 [1.0 - 4.8]	1.6 [1.4 - 1.8]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to iodopropynylbutyl carbamate (CAS: 55406-53-6)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to iodopropynylbutyl carbamate (CAS: 55406-53-6)	Significance
Housewife/-man, domestic helper	2.0 [0.7 - 4.4]	1.4 [1.2 - 1.6]	
Construction workers, Manufacturers of building materials	1.7 [0.6 - 3.9]	2.6 [2.4 - 2.9]	
Painters, Varnishers and related workers	1.7 [0.6 - 3.9]	2.2 [2.0 - 2.5]	
Dentists	1.7 [0.6 - 3.9]	1.6 [1.4 - 1.8]	
Laboratory assistants (health associate professionals)	1.7 [0.6 - 3.9]	1.2 [1.0 - 1.4]	
Chemist, Lab assistant, Chemical-products machine operators	1.4 [0.4 - 3.4]	1.3 [1.2 - 1.5]	
Bakers, pastry-cooks and confectionery makers	1.4 [0.4 - 3.4]	2.0 [1.8 - 2.2]	
Gardeners, salespersons (fruit, flowers, vegetables)	1.0 [0.2 - 2.9]	1.9 [1.6 - 2.1]	
Butchers, fishmongers and related food preparers	1.0 [0.2 - 2.9]	0.7 [0.6 - 0.9]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	1.0 [0.2 - 2.9]	3.7 [3.4 - 4.1]	#
Carpenter, cabinet maker, model maker	1.0 [0.2 - 2.9]	1.1 [1.0 - 1.3]	
Drivers and mobile plant operators	1.0 [0.2 - 2.9]	0.7 [0.6 - 0.9]	
Social and health associate professionals, teachers	1.0 [0.2 - 2.9]	1.0 [0.9 - 1.2]	
Wine grower, vine refiner, vintage helper	0.7 [0.1 - 2.4]	0.7 [0.5 - 0.8]	
Mixed-animal producers (dairy, poultry etc), fishery labour	0.7 [0.1 - 2.4]	0.3 [0.2 - 0.4]	
Metal worker (non-cutting)	0.7 [0.1 - 2.4]	0.2 [0.2 - 0.3]	
Precision workers in metal and related materials	0.7 [0.1 - 2.4]	0.7 [0.5 - 0.8]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to iodopropynylbutyl carbamate (CAS: 55406-53-6)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to iodopropynylbutyl carbamate (CAS: 55406-53-6)	Significance
Dental technicians	0.7 [0.1 - 2.4]	0.7 [0.6 - 0.9]	
Textile, garment and related trades workers	0.7 [0.1 - 2.4]	0.3 [0.2 - 0.4]	
Medical doctors	0.7 [0.1 - 2.4]	1.0 [0.9 - 1.2]	
Waiters and bartenders, guest attendants	0.7 [0.1 - 2.4]	0.9 [0.7 - 1.0]	
Missing information	0.3 [0.0 - 1.9]	1.2 [1.1 - 1.4]	
Mining- and mineral-processing plant operators	0.3 [0.0 - 1.9]	0.2 [0.1 - 0.3]	
Potters, glass-makers and related trades workers	0.3 [0.0 - 1.9]	0.2 [0.1 - 0.3]	
Musical-instrument makers and tuners, model makers, taxidermists	0.3 [0.0 - 1.9]	0.0 [0.0 - 0.0]	
Electrical and electronic equipment mechanics and fitters	0.3 [0.0 - 1.9]	1.8 [1.6 - 2.0]	
Construction & maintenance labour: roads, dams & similar	0.3 [0.0 - 1.9]	0.4 [0.3 - 0.5]	
Salespersons and demonstrators	0.3 [0.0 - 1.9]	1.2 [1.0 - 1.4]	
Communication professions	0.3 [0.0 - 1.9]	0.1 [0.1 - 0.2]	
Cashiers, tellers and related clerks	0.3 [0.0 - 1.9]	0.3 [0.2 - 0.4]	
Protective services workers	0.3 [0.0 - 1.9]	0.4 [0.3 - 0.6]	
Artists, musicians, professional sportsmen	0.3 [0.0 - 1.9]	0.1 [0.1 - 0.2]	
Pharmacists	0.3 [0.0 - 1.9]	0.1 [0.0 - 0.2]	
Domestic and related helpers, cleaners and launderers	0.3 [0.0 - 1.9]	0.2 [0.1 - 0.3]	

**Tab. 3.2.3.25** IVDK, 2007-2016, OD patients with positive and negative reaction to oil of turpentine (CAS: 8006-64-2), respectively: Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 294

Number of patients not sensitized to the allergen (negative reaction): 16,275

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;  
# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to oil of turpentine (CAS: 8006-64-2)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to oil of turpentine (CAS: 8006-64-2)	Significance
Health care professionals	13.9 [10.2 - 18.4]	12.1 [11.6 - 12.6]	
Mechanics, Metal, machinery and related trades workers	9.2 [6.1 - 13.1]	10.9 [10.5 - 11.4]	
Occupations with undetermined exposure	7.8 [5.0 - 11.5]	8.3 [7.9 - 8.8]	
Geriatric nurse, social work associate professionals	6.8 [4.2 - 10.3]	4.2 [3.9 - 4.5]	
Metal worker (cutting)	5.1 [2.9 - 8.3]	3.7 [3.4 - 4.0]	
Hairdressers, barbers, beauticians, wigmakers	4.4 [2.4 - 7.4]	6.2 [5.8 - 6.6]	
Building, vehicle, street cleaner	3.7 [1.9 - 6.6]	4.8 [4.5 - 5.1]	
Engineers, technicians and scientists	3.4 [1.6 - 6.2]	2.4 [2.2 - 2.7]	
Personal care and related workers	3.4 [1.6 - 6.2]	1.6 [1.4 - 1.8]	
Machinery mechanics and fitters	3.1 [1.4 - 5.7]	2.4 [2.1 - 2.6]	
Construction workers, Manufacturers of building materials	3.1 [1.4 - 5.7]	2.7 [2.5 - 3.0]	
Gardeners, salespersons (fruit, flowers, vegetables)	2.4 [1.0 - 4.8]	1.9 [1.7 - 2.1]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to oil of turpentine (CAS: 8006-64-2)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to oil of turpentine (CAS: 8006-64-2)	Significance
Cooks, Cannery workers, Fruit, vegetable and related preservers	2.0 [0.8 - 4.4]	3.9 [3.6 - 4.2]	
Painters, Varnishers and related workers	1.7 [0.6 - 3.9]	2.2 [2.0 - 2.5]	
Salespersons and demonstrators	1.7 [0.6 - 3.9]	1.2 [1.0 - 1.4]	
Social and health associate professionals, teachers	1.7 [0.6 - 3.9]	1.0 [0.9 - 1.2]	
Precision workers in metal and related materials	1.4 [0.4 - 3.4]	0.6 [0.5 - 0.8]	
Dental technicians	1.4 [0.4 - 3.4]	0.7 [0.6 - 0.9]	
Electrical and electronic equipment mechanics and fitters	1.4 [0.4 - 3.4]	1.7 [1.5 - 1.9]	
Carpenter, cabinet maker, model maker	1.4 [0.4 - 3.4]	1.2 [1.1 - 1.4]	
Artists, musicians, professional sportsmen	1.4 [0.4 - 3.4]	0.1 [0.1 - 0.2]	*
Housewife/-man, domestic helper	1.0 [0.2 - 3.0]	1.5 [1.3 - 1.7]	
Wine grower, vine refiner, vintage helper	1.0 [0.2 - 3.0]	0.7 [0.6 - 0.8]	
Bakers, pastry-cooks and confectionery makers	1.0 [0.2 - 3.0]	2.1 [1.8 - 2.3]	
Food and related products machine operators	1.0 [0.2 - 3.0]	0.4 [0.3 - 0.5]	
Labour, unknown, or not classifiable other occupation	1.0 [0.2 - 3.0]	0.4 [0.3 - 0.5]	
Storekeeper, transport labour and freight handlers	1.0 [0.2 - 3.0]	1.5 [1.3 - 1.7]	
Office clerks	1.0 [0.2 - 3.0]	2.6 [2.3 - 2.8]	
Dentists	1.0 [0.2 - 3.0]	1.7 [1.5 - 1.9]	
Laboratory assistants (health associate professionals)	1.0 [0.2 - 3.0]	1.2 [1.0 - 1.4]	
Chemist, Lab assistant, Chemical-products machine operators	0.7 [0.1 - 2.4]	1.5 [1.3 - 1.7]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to oil of turpentine (CAS: 8006-64-2)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to oil of turpentine (CAS: 8006-64-2)	Significance
Plastic-products machine operators	0.7 [0.1 - 2.4]	0.8 [0.7 - 1.0]	
papermaking-plant operators, bookbinders	0.7 [0.1 - 2.4]	0.3 [0.2 - 0.3]	
Welders and flame cutters	0.7 [0.1 - 2.4]	0.5 [0.4 - 0.7]	
Butchers, fishmongers and related food preparers	0.7 [0.1 - 2.4]	0.8 [0.6 - 0.9]	
Construction & maintenance labour: roads, dams & similar	0.7 [0.1 - 2.4]	0.4 [0.3 - 0.5]	
Protective services workers	0.7 [0.1 - 2.4]	0.5 [0.4 - 0.6]	
Waiters and bartenders, guest attendants	0.7 [0.1 - 2.4]	1.0 [0.9 - 1.2]	
Missing information	0.3 [0.0 - 1.9]	1.3 [1.1 - 1.4]	
Mixed-animal producers (dairy, poultry etc), fishery labour	0.3 [0.0 - 1.9]	0.3 [0.2 - 0.4]	
Mining- and mineral-processing plant operators	0.3 [0.0 - 1.9]	0.2 [0.2 - 0.3]	
Printing-machine operators	0.3 [0.0 - 1.9]	0.6 [0.5 - 0.7]	
Metal processing plant operators, rolling mill operators	0.3 [0.0 - 1.9]	0.4 [0.3 - 0.5]	
Metal finishing-, plating- and coating-machine operators	0.3 [0.0 - 1.9]	0.3 [0.3 - 0.4]	
Optometrists and opticians	0.3 [0.0 - 1.9]	0.0 [0.0 - 0.1]	
Textile, garment and related trades workers	0.3 [0.0 - 1.9]	0.4 [0.3 - 0.5]	
Manufacturers or processors of fur and leather	0.3 [0.0 - 1.9]	0.2 [0.1 - 0.3]	
Interior decorators, upholsterers	0.3 [0.0 - 1.9]	0.1 [0.1 - 0.2]	
Petrol pump attendant	0.3 [0.0 - 1.9]	0.0 [0.0 - 0.1]	
Drivers and mobile plant operators	0.3 [0.0 - 1.9]	0.8 [0.6 - 0.9]	
Communication professions	0.3 [0.0 - 1.9]	0.2 [0.1 - 0.2]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to oil of turpentine (CAS: 8006-64-2)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to oil of turpentine (CAS: 8006-64-2)	Significance
Cashiers, tellers and related clerks	0.3 [0.0 - 1.9]	0.3 [0.2 - 0.4]	
Medical doctors	0.3 [0.0 - 1.9]	1.1 [0.9 - 1.3]	

**Tab. 3.2.3.26** IVDK, 2007-2016, OD patients with positive and negative reaction to Ylang Ylang oil (CAS: 8006-81-3), respectively: Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 284

Number of patients not sensitized to the allergen (negative reaction): 12,391

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;  
# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Ylang Ylang oil (CAS: 8006-81-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Ylang Ylang oil (CAS: 8006-81-3)	Significance
Health care professionals	25.0 [20.1 - 30.5]	13.2 [12.6 - 13.8]	*
Mechanics, Metal, machinery and related trades workers	7.7 [4.9 - 11.5]	10.8 [10.2 - 11.3]	
Geriatric nurse, social work associate professionals	7.0 [4.4 - 10.7]	4.9 [4.5 - 5.3]	
Occupations with undetermined exposure	7.0 [4.4 - 10.7]	7.9 [7.4 - 8.4]	
Building, vehicle, street cleaner	6.0 [3.5 - 9.4]	4.6 [4.2 - 5.0]	
Hairdressers, barbers, beauticians, wigmakers	5.6 [3.3 - 9.0]	6.3 [5.9 - 6.8]	
Gardeners, salespersons (fruit, flowers, vegetables)	2.8 [1.2 - 5.5]	2.1 [1.8 - 2.3]	
Personal care and related workers	2.8 [1.2 - 5.5]	1.6 [1.4 - 1.9]	
Machinery mechanics and fitters	2.5 [1.0 - 5.0]	2.2 [2.0 - 2.5]	
Metal worker (cutting)	2.1 [0.8 - 4.5]	3.9 [3.6 - 4.3]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	2.1 [0.8 - 4.5]	3.7 [3.4 - 4.0]	
Engineers, technicians and scientists	2.1 [0.8 - 4.5]	2.4 [2.1 - 2.7]	
Office clerks	2.1 [0.8 - 4.5]	2.3 [2.1 - 2.6]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Ylang Ylang oil (CAS: 8006-81-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Ylang Ylang oil (CAS: 8006-81-3)	Significance
Bakers, pastry-cooks and confectionery makers	1.8 [0.6 - 4.1]	2.1 [1.9 - 2.4]	
Protective services workers	1.8 [0.6 - 4.1]	0.4 [0.3 - 0.6]	
Butchers, fishmongers and related food preparers	1.4 [0.4 - 3.6]	0.7 [0.6 - 0.9]	
Construction workers, Manufacturers of building materials	1.4 [0.4 - 3.6]	2.6 [2.4 - 2.9]	
Social and health associate professionals, teachers	1.4 [0.4 - 3.6]	1.1 [0.9 - 1.3]	
Wine grower, vine refiner, vintage helper	1.1 [0.2 - 3.1]	0.6 [0.5 - 0.8]	
Chemist, Lab assistant, Chemical-products machine operators	1.1 [0.2 - 3.1]	1.5 [1.3 - 1.7]	
Dental technicians	1.1 [0.2 - 3.1]	0.7 [0.6 - 0.9]	
Storekeeper, transport labour and freight handlers	1.1 [0.2 - 3.1]	1.4 [1.2 - 1.7]	
Dentists	1.1 [0.2 - 3.1]	1.6 [1.4 - 1.9]	
Waiters and bartenders, guest attendants	1.1 [0.2 - 3.1]	0.9 [0.7 - 1.1]	
Missing information	0.7 [0.1 - 2.5]	1.3 [1.1 - 1.5]	
Housewife/-man, domestic helper	0.7 [0.1 - 2.5]	1.4 [1.2 - 1.7]	
Plastic-products machine operators	0.7 [0.1 - 2.5]	0.8 [0.6 - 0.9]	
Welders and flame cutters	0.7 [0.1 - 2.5]	0.5 [0.4 - 0.6]	
Electrical and electronic equipment mechanics and fitters	0.7 [0.1 - 2.5]	1.7 [1.4 - 1.9]	
Food and related products machine operators	0.7 [0.1 - 2.5]	0.4 [0.3 - 0.5]	
Painters, lacquerers and related workers	0.7 [0.1 - 2.5]	2.3 [2.0 - 2.6]	
Labour, unknown or not classifiable, „other occupation“	0.7 [0.1 - 2.5]	0.4 [0.3 - 0.5]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to Ylang Ylang oil (CAS: 8006-81-3)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to Ylang Ylang oil (CAS: 8006-81-3)	Significance
Salespersons and demonstrators	0.7 [0.1 - 2.5]	1.2 [1.0 - 1.4]	
Printing-machine operators	0.4 [0.0 - 1.9]	0.5 [0.4 - 0.6]	
Metal processing plant operators, rolling mill operators	0.4 [0.0 - 1.9]	0.3 [0.2 - 0.4]	
Musical-instrument makers and tuners, model makers, taxidermists	0.4 [0.0 - 1.9]	0.0 [0.0 - 0.1]	
Textile, garment and related trades workers	0.4 [0.0 - 1.9]	0.3 [0.2 - 0.4]	
Manufacturers or processors of fur and leather	0.4 [0.0 - 1.9]	0.2 [0.1 - 0.3]	
Construction & maintenance labour: roads, dams & similar	0.4 [0.0 - 1.9]	0.5 [0.3 - 0.6]	
Carpenter, cabinet maker, model maker	0.4 [0.0 - 1.9]	1.2 [1.0 - 1.4]	
Communication professions	0.4 [0.0 - 1.9]	0.1 [0.1 - 0.2]	
Cashiers, tellers and related clerks	0.4 [0.0 - 1.9]	0.3 [0.2 - 0.4]	
Medical doctors	0.4 [0.0 - 1.9]	1.1 [0.9 - 1.3]	
Laboratory assistants (health associate professionals)	0.4 [0.0 - 1.9]	1.3 [1.1 - 1.5]	
Scientists	0.4 [0.0 - 1.9]	0.0 [0.0 - 0.1]	
Domestic and related helpers, cleaners and launderers	0.4 [0.0 - 1.9]	0.2 [0.1 - 0.3]	

**Tab. 3.2.3.27** IVDK, 2007-2016, OD patients with positive and negative reaction to benzoyl peroxide (CAS: 94-36-0), respectively: Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 281

Number of patients not sensitized to the allergen (negative reaction): 3,865

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to benzoyl peroxide (CAS: 94-36-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to benzoyl peroxide (CAS: 94-36-0)	Significance to
Occupations with undetermined exposure	11.7 [8.2 - 16.1]	10.6 [9.7 - 11.6]	
Mechanics, Metal, machinery and related trades workers	9.3 [6.1 - 13.3]	14.8 [13.7 - 16.0]	#
Dentists	8.5 [5.5 - 12.4]	4.0 [3.4 - 4.7]	*
Painters, lacquerers and related workers	5.3 [3.0 - 8.7]	7.2 [6.4 - 8.0]	
Construction workers, Manufacturers of building materials	4.3 [2.2 - 7.3]	7.3 [6.5 - 8.2]	
Dental technicians	3.9 [2.0 - 6.9]	2.9 [2.4 - 3.5]	
Carpenter, cabinet maker, model maker	3.9 [2.0 - 6.9]	3.2 [2.6 - 3.8]	
Engineers, technicians and scientists	3.9 [2.0 - 6.9]	3.3 [2.7 - 3.9]	
Personal care and related workers	3.9 [2.0 - 6.9]	2.7 [2.2 - 3.3]	
Plastic-products machine operators	3.6 [1.7 - 6.4]	2.7 [2.2 - 3.2]	
Health care professionals	3.6 [1.7 - 6.4]	2.2 [1.8 - 2.7]	
Missing information	3.2 [1.5 - 6.0]	1.5 [1.1 - 1.9]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to benzoyl peroxide (CAS: 94-36-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to benzoyl peroxide (CAS: 94-36-0)	Significance
Electrical and electronic equipment mechanics and fitters	3.2 [1.5 - 6.0]	2.8 [2.3 - 3.4]	
Hairdressers, barbers, beauticians, wigmakers	3.2 [1.5 - 6.0]	2.6 [2.1 - 3.2]	
Office clerks	2.8 [1.2 - 5.5]	1.9 [1.5 - 2.3]	
Metal worker (cutting)	2.5 [1.0 - 5.1]	2.7 [2.2 - 3.3]	
Potters, glass-makers and related trades workers	2.1 [0.8 - 4.6]	0.2 [0.1 - 0.4]	*
Chemist, Lab assistant, Chemical-products machine operators	1.8 [0.6 - 4.1]	2.0 [1.6 - 2.5]	
Precision workers in metal and related materials	1.8 [0.6 - 4.1]	0.9 [0.6 - 1.2]	
Building, vehicle, street cleaner	1.4 [0.4 - 3.6]	0.8 [0.5 - 1.1]	
Printing-machine operators	1.1 [0.2 - 3.1]	1.4 [1.1 - 1.8]	
Machinery mechanics and fitters	1.1 [0.2 - 3.1]	3.6 [3.0 - 4.2]	
Bakers, pastry-cooks and confectionery makers	1.1 [0.2 - 3.1]	2.0 [1.6 - 2.5]	
Construction & maintenance labour: roads, dams & similar	1.1 [0.2 - 3.1]	0.8 [0.5 - 1.1]	
Storekeeper, transport labour and freight handlers	1.1 [0.2 - 3.1]	1.7 [1.3 - 2.2]	
Geriatric nurse, social work associate professionals	1.1 [0.2 - 3.1]	0.4 [0.3 - 0.7]	
Gardeners, salespersons (fruit, flowers, vegetables)	0.7 [0.1 - 2.5]	0.9 [0.6 - 1.2]	
Metal processing plant operators, rolling mill operators	0.7 [0.1 - 2.5]	0.5 [0.3 - 0.8]	
Building finishers and related trades workers	0.7 [0.1 - 2.5]	1.2 [0.9 - 1.6]	
Salespersons and demonstrators	0.7 [0.1 - 2.5]	0.6 [0.4 - 1.0]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to benzoyl peroxide (CAS: 94-36-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to benzoyl peroxide (CAS: 94-36-0)	Significance
Artists, musicians, professional sportsmen	0.7 [0.1 - 2.5]	0.2 [0.1 - 0.4]	
Medical doctors	0.7 [0.1 - 2.5]	0.3 [0.1 - 0.5]	
Social and health associate professionals, teachers	0.7 [0.1 - 2.5]	0.7 [0.4 - 1.0]	
Housewife/-man, domestic helper	0.4 [0.0 - 2.0]	0.6 [0.4 - 0.9]	
Mixed-animal producers (dairy, poultry etc.), fishery labour	0.4 [0.0 - 2.0]	0.0 [0.0 - 0.1]	
Mining- and mineral-processing plant operators	0.4 [0.0 - 2.0]	0.4 [0.2 - 0.6]	
papermaking-plant operators, bookbinders	0.4 [0.0 - 2.0]	0.7 [0.5 - 1.0]	
Metal worker (non-cutting)	0.4 [0.0 - 2.0]	0.3 [0.1 - 0.5]	
Welders and flame cutters	0.4 [0.0 - 2.0]	0.8 [0.5 - 1.1]	
Textile, garment and related trades workers	0.4 [0.0 - 2.0]	0.5 [0.3 - 0.7]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	0.4 [0.0 - 2.0]	0.8 [0.5 - 1.1]	
Labour, unknown, or not classifiable other occupation	0.4 [0.0 - 2.0]	0.5 [0.3 - 0.7]	
Petrol pump attendant	0.4 [0.0 - 2.0]	0.0 [0.0 - 0.1]	
Laboratory assistants (health associate professionals)	0.4 [0.0 - 2.0]	0.6 [0.4 - 0.9]	
Scientists	0.4 [0.0 - 2.0]	0.0 [0.0 - 0.1]	
Waiters and bartenders, guest attendants	0.4 [0.0 - 2.0]	0.4 [0.3 - 0.7]	

**Tab. 3.2.3.28** IVDK, 2007-2016, OD patients with positive and negative reaction to cocamidopropyl betaine (CAS: 61789-40-0), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 279

Number of patients not sensitized to the allergen (negative reaction): 13,141

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to cocamidopropyl betaine (CAS: 61789-40-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to cocamidopropyl betaine (CAS: 61789-40-0)	Significance
Health care professionals	12.5 [8.9 - 17.0]	13.2 [12.6 - 13.7]	
Hairdressers, barbers, beauticians, wigmakers	9.7 [6.5 - 13.8]	7.6 [7.2 - 8.1]	
Occupations with undetermined exposure	7.9 [5.0 - 11.7]	8.0 [7.5 - 8.4]	
Mechanics, Metal, machinery and related trades workers	7.2 [4.4 - 10.9]	11.2 [10.6 - 11.7]	
Building, vehicle, street cleaner	5.7 [3.3 - 9.1]	4.7 [4.3 - 5.1]	
Cooks, Cannery workers, Fruit, vegetable and related preservers	4.3 [2.2 - 7.4]	3.9 [3.6 - 4.2]	
Metal worker (cutting)	3.9 [2.0 - 6.9]	3.9 [3.6 - 4.3]	
Office clerks	3.9 [2.0 - 6.9]	2.1 [1.9 - 2.4]	
Geriatric nurse, social work associate professionals	3.9 [2.0 - 6.9]	5.0 [4.6 - 5.3]	
Construction workers, Manufacturers of building materials	3.2 [1.5 - 6.0]	2.4 [2.1 - 2.7]	
Engineers, technicians and scientists	3.2 [1.5 - 6.0]	2.2 [1.9 - 2.4]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to cocamidopropyl betaine (CAS: 61789-40-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to cocamidopropyl betaine (CAS: 61789-40-0)	Significance
Machinery mechanics and fitters	2.5 [1.0 - 5.1]	2.5 [2.2 - 2.8]	
Gardeners, salespersons (fruit, flowers, vegetables)	2.2 [0.8 - 4.6]	1.8 [1.6 - 2.1]	
Electrical and electronic equipment mechanics and fitters	2.2 [0.8 - 4.6]	1.8 [1.5 - 2.0]	
Painters, lacquerers and related workers	1.8 [0.6 - 4.1]	1.8 [1.6 - 2.1]	
Laboratory assistants (health associate professionals)	1.8 [0.6 - 4.1]	1.1 [0.9 - 1.3]	
Missing information	1.4 [0.4 - 3.6]	1.3 [1.1 - 1.5]	
Housewife/-man, domestic helper	1.4 [0.4 - 3.6]	1.6 [1.4 - 1.8]	
Precision workers in metal and related materials	1.4 [0.4 - 3.6]	0.5 [0.4 - 0.7]	
Storekeeper, transport labour and freight handlers	1.4 [0.4 - 3.6]	1.4 [1.2 - 1.6]	
Textile, garment and related trades workers	1.1 [0.2 - 3.1]	0.3 [0.2 - 0.4]	
Bakers, pastry-cooks and confectionery makers	1.1 [0.2 - 3.1]	2.0 [1.7 - 2.2]	
Construction & maintenance labour: roads, dams & similar	1.1 [0.2 - 3.1]	0.4 [0.3 - 0.5]	
Carpenter, cabinet maker, model maker	1.1 [0.2 - 3.1]	1.0 [0.8 - 1.2]	
Salespersons and demonstrators	1.1 [0.2 - 3.1]	1.2 [1.0 - 1.4]	
Drivers and mobile plant operators	1.1 [0.2 - 3.1]	0.7 [0.6 - 0.9]	
Medical doctors	1.1 [0.2 - 3.1]	1.0 [0.8 - 1.2]	
Dentists	1.1 [0.2 - 3.1]	1.6 [1.4 - 1.9]	
Personal care and related workers	1.1 [0.2 - 3.1]	1.7 [1.5 - 1.9]	
Waiters and bartenders, guest attendants	1.1 [0.2 - 3.1]	1.0 [0.8 - 1.1]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to cocamidopropyl betaine (CAS: 61789-40-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to cocamidopropyl betaine (CAS: 61789-40-0)	Significance
Chemist, Lab assistant, Chemical-products machine operators	0.7 [0.1 - 2.6]	1.1 [0.9 - 1.3]	
Plastic-products machine operators	0.7 [0.1 - 2.6]	0.6 [0.5 - 0.8]	
Food and related products machine operators	0.7 [0.1 - 2.6]	0.4 [0.3 - 0.5]	
Communication professions	0.7 [0.1 - 2.6]	0.2 [0.1 - 0.2]	
Social and health associate professionals, teachers	0.7 [0.1 - 2.6]	1.1 [0.9 - 1.2]	
Mining- and mineral-processing plant operators	0.4 [0.0 - 2.0]	0.2 [0.1 - 0.3]	
papermaking-plant operators, bookbinders	0.4 [0.0 - 2.0]	0.3 [0.2 - 0.4]	
Printing-machine operators	0.4 [0.0 - 2.0]	0.5 [0.4 - 0.6]	
Metal finishing-, plating- and coating-machine operators	0.4 [0.0 - 2.0]	0.3 [0.2 - 0.4]	
Dental technicians	0.4 [0.0 - 2.0]	0.7 [0.5 - 0.8]	
Butchers, fishmongers and related food preparers	0.4 [0.0 - 2.0]	0.9 [0.7 - 1.0]	
Building finishers and related trades workers	0.4 [0.0 - 2.0]	0.4 [0.3 - 0.6]	
Labour, unknown or not classifiable, „other occupation“	0.4 [0.0 - 2.0]	0.4 [0.3 - 0.5]	
Protective services workers	0.4 [0.0 - 2.0]	0.5 [0.3 - 0.6]	
Artists, musicians, professional sportsmen	0.4 [0.0 - 2.0]	0.1 [0.0 - 0.2]	
Scientists	0.4 [0.0 - 2.0]	0.0 [0.0 - 0.1]	

**Tab. 3.2.3.29** IVDK, 2007-2016, OD patients with positive and negative reaction to monoethanolamine (CAS: 141-43-5), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 278

Number of patients not sensitized to the allergen (negative reaction): 4,332

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to monoethanolamine (CAS: 141-43-5)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to monoethanolamine (CAS: 141-43-5)	Significance
Metal worker (cutting)	34.9 [29.3 - 40.8]	11.7 [10.8 - 12.7]	*
Mechanics, Metal, machinery and related trades workers	29.1 [23.9 - 34.9]	25.8 [24.5 - 27.1]	
Occupations with undetermined exposure	7.9 [5.0 - 11.7]	7.6 [6.8 - 8.4]	
Hairdressers, barbers, beauticians, wigmakers	7.2 [4.4 - 10.9]	22.8 [21.5 - 24.1]	#
Machinery mechanics and fitters	3.6 [1.7 - 6.5]	5.4 [4.7 - 6.1]	
Engineers, technicians and scientists	3.6 [1.7 - 6.5]	3.6 [3.0 - 4.2]	
Missing information	2.2 [0.8 - 4.6]	1.5 [1.1 - 1.9]	
Precision workers in metal and related materials	1.8 [0.6 - 4.1]	1.3 [1.0 - 1.6]	
Storekeeper, transport labour and freight handlers	1.4 [0.4 - 3.6]	1.3 [1.0 - 1.7]	
Plastic-products machine operators	0.7 [0.1 - 2.6]	0.3 [0.1 - 0.5]	
Metal worker (non-cutting)	0.7 [0.1 - 2.6]	0.6 [0.4 - 0.8]	
Electrical and electronic equipment mechanics and fitters	0.7 [0.1 - 2.6]	2.5 [2.1 - 3.1]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to monoethanolamine (CAS: 141-43-5)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to monoethanolamine (CAS: 141-43-5)	Significance
Salespersons and demonstrators	0.7 [0.1 - 2.6]	0.6 [0.4 - 0.9]	
Drivers and mobile plant operators	0.7 [0.1 - 2.6]	0.4 [0.2 - 0.7]	
Building, vehicle, street cleaner	0.7 [0.1 - 2.6]	0.8 [0.6 - 1.1]	
Housewife/-man, domestic helper	0.4 [0.0 - 2.0]	0.4 [0.2 - 0.7]	
Wine grower, vine refiner, vintage helper	0.4 [0.0 - 2.0]	0.2 [0.1 - 0.4]	
Gardeners, salespersons (fruit, flowers, vegetables)	0.4 [0.0 - 2.0]	0.4 [0.2 - 0.6]	
Potters, glass-makers and related trades workers	0.4 [0.0 - 2.0]	0.3 [0.1 - 0.5]	
Chemist, Lab assistant, Chemical-products machine operators	0.4 [0.0 - 2.0]	0.4 [0.3 - 0.7]	
Metal processing plant operators, rolling mill operators	0.4 [0.0 - 2.0]	0.6 [0.4 - 0.9]	
Bakers, pastry-cooks and confectionery makers	0.4 [0.0 - 2.0]	0.2 [0.1 - 0.3]	
Painters, Varnishers and related workers	0.4 [0.0 - 2.0]	0.9 [0.7 - 1.3]	
Labour, unknown, or not classifiable other occupation	0.4 [0.0 - 2.0]	0.4 [0.2 - 0.7]	
Personal care and related workers	0.4 [0.0 - 2.0]	1.0 [0.7 - 1.3]	
Domestic and related helpers, cleaners and launderers	0.4 [0.0 - 2.0]	0.0 [0.0 - 0.1]	

**Tab. 3.2.3.30** IVDK, 2007-2016, OD patients with positive and negative reaction to ammonium persulfate (CAS: 7727-54-0), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 255

Number of patients not sensitized to the allergen (negative reaction): 1,241

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;  
# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to ammonium persulfate (CAS: 7727-54-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to ammonium persulfate (CAS: 7727-54-0)	Significance
Hairdressers, barbers, beauticians, wigmakers	86.3 [81.4 - 90.2]	61.7 [59.0 - 64.4]	*
Occupations with undetermined exposure	3.5 [1.6 - 6.6]	7.2 [5.8 - 8.8]	
Office clerks	2.0 [0.6 - 4.5]	3.1 [2.2 - 4.2]	
Building, vehicle, street cleaner	2.0 [0.6 - 4.5]	1.1 [0.6 - 1.9]	
Housewife/-man, domestic helper	1.2 [0.2 - 3.4]	1.2 [0.7 - 2.0]	
Personal care and related workers	1.2 [0.2 - 3.4]	3.5 [2.5 - 4.6]	
Waiters and bartenders, guest attendants	0.8 [0.1 - 2.8]	0.6 [0.2 - 1.2]	
Missing information	0.4 [0.0 - 2.2]	0.9 [0.4 - 1.6]	
Gardeners, salespersons (fruit, flowers, vegetables)	0.4 [0.0 - 2.2]	0.9 [0.4 - 1.6]	
Metal worker (non-cutting)	0.4 [0.0 - 2.2]	0.0 [0.0 - 0.2]	
Labour, unknown, or not classifiable other occupation	0.4 [0.0 - 2.2]	0.2 [0.0 - 0.7]	
Salespersons and demonstrators	0.4 [0.0 - 2.2]	1.8 [1.1 - 2.7]	
Communication professions	0.4 [0.0 - 2.2]	0.2 [0.0 - 0.7]	
Laboratory assistants (health associate professionals)	0.4 [0.0 - 2.2]	0.3 [0.1 - 0.8]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to ammonium persulfate (CAS: 7727-54-0)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to ammonium persulfate (CAS: 7727-54-0)	Significance
Social and health associate professionals, teachers	0.4 [0.0 - 2.2]	0.4 [0.1 - 0.9]	

**Tab. 3.2.3.31** IVDK, 2007-2016, OD patients with positive and negative reaction to 4,4'-diaminodiphenylmethane (CAS: 101-77-9), respectively:

Percentages of occupational groups with 95%- confidence intervals (95%-CI).

Number of patients sensitized to the allergen (positive reaction): 246

Number of patients not sensitized to the allergen (negative reaction): 5,364

Coding of significance: \* = significantly higher percentage of this occupational group among patients with positive reaction;

# = significantly higher percentage of this occupational group among patients with negative reaction.

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to 4,4'-diamino-diphenylmethane (CAS: 101-77-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to 4,4'-diamino-diphenylmethane (CAS: 101-77-9)	Significance
Construction workers, Manufacturers of building materials	15.9 [11.5 - 21.0]	6.9 [6.3 - 7.6]	*
Occupations with undetermined exposure	11.4 [7.7 - 16.0]	9.8 [9.0 - 10.6]	
Painters, Varnishers and related workers	10.2 [6.7 - 14.6]	5.7 [5.1 - 6.4]	*
Mechanics, Metal, machinery and related trades workers	9.8 [6.4 - 14.2]	16.4 [15.5 - 17.5]	#
Hairdressers, barbers, beauticians, wigmakers	6.1 [3.5 - 9.9]	3.6 [3.2 - 4.2]	
Carpenter, cabinet maker, model maker	5.3 [2.8 - 8.9]	2.8 [2.4 - 3.3]	
Office clerks	2.4 [0.9 - 5.2]	2.0 [1.6 - 2.4]	
Missing information	2.0 [0.7 - 4.7]	1.6 [1.3 - 1.9]	
Engineers, technicians and scientists	2.0 [0.7 - 4.7]	3.7 [3.2 - 4.2]	
Storekeeper, transport labour and freight handlers	2.0 [0.7 - 4.7]	2.2 [1.8 - 2.6]	
Dentists	2.0 [0.7 - 4.7]	0.9 [0.6 - 1.2]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to 4,4'-diamino-diphenylmethane (CAS: 101-77-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to 4,4'-diamino-diphenylmethane (CAS: 101-77-9)	Significance
Personal care and related workers	2.0 [0.7 - 4.7]	2.1 [1.8 - 2.5]	
Building, vehicle, street cleaner	2.0 [0.7 - 4.7]	1.7 [1.3 - 2.0]	
Mining- and mineral-processing plant operators	1.6 [0.4 - 4.1]	0.5 [0.3 - 0.7]	
Machinery mechanics and fitters	1.6 [0.4 - 4.1]	4.3 [3.8 - 4.9]	
Electrical and electronic equipment mechanics and fitters	1.6 [0.4 - 4.1]	3.1 [2.7 - 3.6]	
Manufacturers or processors of fur and leather	1.6 [0.4 - 4.1]	0.5 [0.3 - 0.7]	
Drivers and mobile plant operators	1.6 [0.4 - 4.1]	1.3 [1.1 - 1.7]	
Geriatric nurse, social work associate professionals	1.6 [0.4 - 4.1]	0.7 [0.5 - 1.0]	
Plastic-products machine operators	1.2 [0.3 - 3.5]	2.3 [1.9 - 2.8]	
Metal worker (cutting)	1.2 [0.3 - 3.5]	3.7 [3.2 - 4.2]	
Welders and flame cutters	1.2 [0.3 - 3.5]	1.2 [0.9 - 1.5]	
Precision workers in metal and related materials	1.2 [0.3 - 3.5]	1.0 [0.7 - 1.3]	
Dental technicians	1.2 [0.3 - 3.5]	1.1 [0.9 - 1.4]	
Building finishers and related trades workers	1.2 [0.3 - 3.5]	1.2 [0.9 - 1.5]	
Health care professionals	1.2 [0.3 - 3.5]	2.4 [2.0 - 2.8]	
Chemist, Lab assistant, Chemical-products machine operators	0.8 [0.1 - 2.9]	1.9 [1.5 - 2.3]	
Construction & maintenance labour: roads, dams & similar	0.8 [0.1 - 2.9]	1.1 [0.8 - 1.4]	
Salespersons and demonstrators	0.8 [0.1 - 2.9]	1.0 [0.7 - 1.2]	

Occupational group	Percentage of patients with this occupational group among those with <u>positive</u> reaction to 4,4'-diamino-diphenylmethane (CAS: 101-77-9)	Percentage of patients with this occupational group among those with <u>negative</u> reaction to 4,4'-diamino-diphenylmethane (CAS: 101-77-9)	Significance
Waiters and bartenders, guest attendants	0.8 [0.1 - 2.9]	0.3 [0.2 - 0.5]	
Wine grower, vine refiner, vintage helper	0.4 [0.0 - 2.2]	0.6 [0.4 - 0.9]	
Potters, glass-makers and related trades workers	0.4 [0.0 - 2.2]	0.3 [0.2 - 0.5]	
papermaking-plant operators, bookbinders	0.4 [0.0 - 2.2]	0.5 [0.3 - 0.8]	
Printing-machine operators	0.4 [0.0 - 2.2]	1.2 [1.0 - 1.6]	
Bakers, pastry-cooks and confectionery makers	0.4 [0.0 - 2.2]	0.4 [0.3 - 0.6]	
Butchers, fishmongers and related food preparers	0.4 [0.0 - 2.2]	0.4 [0.3 - 0.6]	
Food and related products machine operators	0.4 [0.0 - 2.2]	0.1 [0.0 - 0.2]	
Interior decorators, upholsterers	0.4 [0.0 - 2.2]	0.3 [0.1 - 0.4]	
Labour, unknown, or not classifiable other occupation	0.4 [0.0 - 2.2]	0.5 [0.3 - 0.7]	
Protective services workers	0.4 [0.0 - 2.2]	0.7 [0.5 - 0.9]	
Artists, musicians, professional sportsmen	0.4 [0.0 - 2.2]	0.1 [0.1 - 0.3]	
Laboratory assistants (health associate professionals)	0.4 [0.0 - 2.2]	0.4 [0.3 - 0.7]	
Social and health associate professionals, teachers	0.4 [0.0 - 2.2]	0.6 [0.4 - 0.8]	

**Tab. 3.3.0.1** IVDK, 2013-2015, patients with occupational dermatitis (n=6,019): occupational groups.

Occup. no.	Occupational group	Patient count	Percent of 6,019
1850	Health care professionals	801	13.3
1280	Mechanics, metal, machinery and related trades workers	715	11.9
1990	Occupations with undetermined exposure	452	7.5
1901	Hairdressers, barbers, beauticians, wigmakers	360	6.0
1861	Geriatric nurse, social work associate professionals	304	5.1
1933	Building, vehicle, street cleaners	268	4.5
1220	Metal workers (cutting)	246	4.1
1410	Cooks, cannery workers, fruit, vegetable and related preservers	226	3.8
1600	Engineers, technicians and scientists	160	2.7
1440	Construction workers, manufacturers of building materials	150	2.5
1750	Office clerks	144	2.4
1260	Machinery mechanics and fitters	141	2.3
1390	Bakers, pastry-cooks and confectionery makers	141	2.3
1510	Painters, varnishers and related workers	137	2.3
1050	Gardeners, salespersons (fruit, flowers, vegetables)	109	1.8
1310	Electrical and electronic equipment mechanics and fitters	105	1.7
1140	Chemists, lab assistants, Chemical-products machine operators	100	1.7
1842	Dentists	100	1.7
1902	Personal care and related workers	96	1.6
1007	Housewife/-man, domestic helper	89	1.5
1740	Storekeeper, transport labourers and freight handlers	88	1.5
1500	Carpenter, cabinet maker, model maker	78	1.3
1855	Laboratory assistants (health associate professionals)	76	1.3
1860	Social and health associate professionals, teachers	71	1.2
1841	Medical doctors	62	1.0
1680	Salespersons and demonstrators	60	1.0
1400	Butchers, fishmongers and related food preparers	50	0.8
1303	Dental technicians	49	0.8
1150	Plastic-products machine operators	44	0.7
1910	Waiters and bartenders, guest attendants	44	0.7
1710	Drivers and mobile plant operators	38	0.6
1284	Precision workers in metal and related materials	37	0.6

Occup. no.	Occupational group	Patient count	Percent of 6,019
1010	Wine grower, vine refiner, vintage helper	36	0.6
9999	Missing data	36	0.6
1240	Welders and flame cutters	32	0.5
1170	Printing-machine operators	30	0.5
1790	Protective services workers	26	0.4
1480	Building finishers and related trades workers	25	0.4
1460	Construction & maintenance labourers: roads, dams & similar	24	0.4
1190	Metal processing plant operators, rolling mill operators	23	0.4
1230	Metal finishing-, plating- and coating-machine operators	23	0.4
1430	Food and related products machine operators	22	0.4
1330	Textile, garment and related trades workers	17	0.3
1773	Cashiers, tellers and related clerks	17	0.3
1530	Labour, unknown or not classifiable other occupation	16	0.3
1020	Mixed-animal producers (dairy, poultry etc.), fishery labourers	15	0.2
1370	Manufacturers or processors of fur and leather	14	0.2
1730	Communication professions	12	0.2
1130	Potters, glass-makers and related trades workers	11	0.2
1160	papermaking-plant operators, bookbinders	11	0.2
1805	Hygiene and health surveillance	11	0.2
1070	Mining- and mineral-processing plant operators	10	0.2
1210	Metal worker (non-cutting)	10	0.2
1830	Artists, musicians, professional sportsmen	9	0.1
1843	Veterinarians	9	0.1
1930	Domestic and related helpers, cleaners and launderers	8	0.1
1304	Optometrists and opticians	7	0.1
1490	Interior decorators, upholsterers	6	0.1
1143	Rubber-products machine operators, vulcanizers	4	0.1
1250	Blacksmiths, hammer-smiths and forging-press workers	2	0.0
1420	Beverage industry labourers	2	0.0
1634	Photographic-products machine operators	2	0.0
1804	Chimney sweep	2	0.0
1880	Scientists NEC	2	0.0
1305	Musical-instrument makers and tuners, model makers, taxidermist	1	0.0
1424	Tobacco production machine operators, salesperson	1	0.0

Occup. no.	Occupational group	Patient count	Percent of 6,019
1686	Petrol pump attendant	1	0.0
1844	Pharmacists	1	0.0

**Tab. 3.3.0.2** Distribution of the most frequent occupational groups among OD patients registered in the IVDK (n total = 6,019) and at the DGUV (n total = 61,810), respectively, 2013-2015. Percentages are accompanied by 95% confidence intervals.

Occup. no.	Occupational group	IVDK		DGUV	
		Patient count	Percent of 6,019	Patient count	Percent of 61,810
1850	Health care professionals	801	13.3 [12.5 – 14.2]	9436	15.3 [15.0 – 15.6]
1280	Mechanics, metal, machinery and related trades workers	715	11.9 [11.1 – 12.7]	4353	7.0 [6.8 – 7.2]
1990	Occupations with undetermined exposure	452	7.5 [6.9 – 8.2]	1886	3.1 [2.9 – 3.2]
1901	Hairdressers, barbers, beauticians, wigmakers	360	6.0 [5.4 – 6.6]	2987	4.8 [4.7 – 5.0]
1861	Geriatric nurse, social work associate professionals	304	5.1 [4.5 – 5.6]	4096	6.6 [6.4 – 6.8]
1933	Building, vehicle, street cleaner	268	4.5 [3.9 – 5.0]	1541	2.5 [2.4 – 2.6]
1220	Metal workers (cutting)	246	4.1 [3.6 – 4.6]	2643	4.3 [4.1 – 4.4]
1410	Cooks, cannery workers, fruit, vegetable and related preservers	226	3.8 [3.3 – 4.3]	3291	5.3 [5.1 – 5.5]
1600	Engineers, technicians and scientists	160	2.7 [2.3 – 3.1]	389	0.6 [0.6 – 0.7]
1440	Construction workers, manufacturers of building materials	150	2.5 [2.1 – 2.9]	1079	1.7 [1.6 – 1.9]
1750	Office clerks	144	2.4 [2.0 – 2.8]	1109	1.8 [1.7 – 1.9]
1260	Machinery mechanics and fitters	141	2.3 [2.0 – 2.8]	2069	3.3 [3.2 – 3.5]
1390	Bakers, pastry-cooks and confectionery makers	141	2.3 [2.0 – 2.8]	1131	1.8 [1.7 – 1.9]
1510	Painters, varnishers and related workers	137	2.3 [1.9 – 2.7]	863	1.4 [1.3 – 1.5]

**Tab. 3.3.1.1** Health care professionals (occupational group no. 1850) with OD:

IVDK, 2013-2015, patient count: 801  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 9436  
 BA Arbeit, 2013-2015, worker years: 4225201  
 OD incidence rate, calculated from DGUV and BA Arbeit data 223 [219 - 228] cases of OD per 100,000 worker years  
 [95% confidence intervals in brackets]:

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
10101-97-0	Nickel(II)-sulfate hexahydrate	20.9 [18.0 - 24.1]	1972 [1695 - 2273]	47 [40 - 54]
not applicable	Fragrance mix	13.1 [10.7 - 15.7]	1232 [1008 - 1485]	29 [24 - 35]
not applicable	Fragrance mix II	9.7 [7.6 - 12.0]	911 [718 - 1136]	22 [17 - 27]
25655-41-8	Povidone iodine	9.4 [7.3 - 11.8]	884 [688 - 1114]	21 [16 - 26]
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	8.4 [6.5 - 10.6]	788 [610 - 999]	19 [14 - 24]
2682-20-4	Methylisothiazolinone	7.3 [5.5 - 9.4]	688 [521 - 887]	16 [12 - 21]
8007-00-9	Balsam of Peru ( <i>Myroxolon pereirae</i> )	6.6 [5.0 - 8.7]	627 [468 - 820]	15 [11 - 19]
7791-13-1	Cobalt(II) chloride hexahydrate	6.3 [4.6 - 8.3]	595 [439 - 785]	14 [10 - 19]
not applicable	Thiuram mix	5.0 [3.6 - 6.9]	476 [337 - 649]	11 [8 - 15]
7778-50-9	Potassium dichromate	4.2 [2.9 - 5.9]	398 [272 - 560]	9 [6 - 13]
8050-09-7	Colophony (Rosin)	4.2 [2.9 - 5.9]	396 [271 - 557]	9 [6 - 13]
8006-81-3	Ylang Ylang oil	4.0 [2.7 - 5.6]	373 [253 - 528]	9 [6 - 12]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	3.9 [2.6 - 5.6]	370 [249 - 527]	9 [6 - 12]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	3.4 [2.2 - 5.0]	320 [208 - 468]	8 [5 - 11]
111-30-8	Glutardialdehyde (Glutaral)	2.9 [1.8 - 4.5]	275 [169 - 421]	7 [4 - 10]
50-00-0	Formaldehyde	2.4 [1.4 - 3.8]	228 [136 - 358]	5 [3 - 8]
85665-41-4	Propolis	2.4 [1.5 - 3.8]	230 [137 - 361]	5 [3 - 9]
	Amerchol L-101	2.5 [1.5 - 4.0]	236 [138 - 374]	6 [3 - 9]
84776-64-7	Jasmine absolute	2.2 [1.3 - 3.6]	212 [124 - 337]	5 [3 - 8]
8027-33-6	Lanolin alcohols	2.2 [1.2 - 3.5]	203 [117 - 328]	5 [3 - 8]
51229-78-8	Quaternium 15	1.8 [0.9 - 3.0]	165 [86 - 287]	4 [2 - 7]
1034-01-1	Octyl gallate	1.8 [0.9 - 3.1]	166 [86 - 288]	4 [2 - 7]
63449-41-2	Benzalkonium chloride	1.5 [0.7 - 2.7]	138 [66 - 251]	3 [2 - 6]
1948-33-0	tert-Butylhydroquinone	1.5 [0.7 - 2.7]	138 [67 - 253]	3 [2 - 6]
8006-87-9	Sandalwood Oil	1.3 [0.6 - 2.4]	124 [60 - 227]	3 [1 - 5]
8006-64-2	Oil of turpentine	1.2 [0.6 - 2.3]	115 [53 - 217]	3 [1 - 5]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	1.1 [0.5 - 2.1]	102 [44 - 200]	2 [1 - 5]
61789-40-0	Cocamidopropyl betaine	1.0 [0.4 - 2.1]	97 [39 - 199]	2 [1 - 5]
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	1.0 [0.4 - 2.1]	97 [39 - 199]	2 [1 - 5]
68603-42-9	Coconut diethanolamide (cocamide DEA)	1.0 [0.4 - 2.1]	97 [39 - 199]	2 [1 - 5]
79-07-2	2-Chloroacetamide	0.9 [0.3 - 1.9]	83 [30 - 179]	2 [1 - 4]
52-51-7	Bronopol (2-Bromo-2-nitro-1,3-propanediol)	0.9 [0.3 - 1.8]	81 [30 - 174]	2 [1 - 4]
39236-46-9	Imidazolidinyl urea (Germall 115)	0.7 [0.2 - 1.7]	69 [22 - 160]	2 [1 - 4]
57-55-6	Propylene glycol	0.7 [0.2 - 1.7]	69 [23 - 161]	2 [1 - 4]
not applicable	Mercapto mix (CBS, MBTS, MOR)	0.7 [0.2 - 1.6]	64 [21 - 148]	2 [0 - 4]
not applicable	Compositae Mix II	0.7 [0.2 - 1.6]	65 [21 - 151]	2 [0 - 4]
67762-27-0	Cetearyl alcohol	0.5 [0.1 - 1.4]	51 [14 - 130]	1 [0 - 3]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	0.5 [0.1 - 1.4]	51 [14 - 130]	1 [0 - 3]
not applicable	Paraben mix	0.5 [0.1 - 1.4]	51 [14 - 130]	1 [0 - 3]
6440-58-0	DMDM Hydantoin	0.6 [0.2 - 1.5]	55 [15 - 141]	1 [0 - 3]
78491-02-8	Diazolidinyl urea	0.4 [0.1 - 1.3]	41 [9 - 120]	1 [0 - 3]
149-30-4	Mercaptobenzothiazole	0.4 [0.1 - 1.2]	38 [8 - 111]	1 [0 - 3]
110-44-1	Sorbic acid	0.4 [0.1 - 1.3]	42 [9 - 121]	1 [0 - 3]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	0.4 [0.1 - 1.2]	38 [8 - 111]	1 [0 - 3]
121-00-6	Butylhydroxyanisole (BHA)	0.3 [0.0 - 1.1]	28 [3 - 100]	1 [0 - 2]
18472-51-0	Chlorhexidine digluconate	0.3 [0.0 - 1.0]	25 [3 - 91]	1 [0 - 2]
532-32-1	Sodium benzoate	0.1 [0.0 - 0.8]	14 [0 - 76]	0 [0 - 2]

**Tab. 3.3.2.1** Mechanics, Metal, machinery and related trades workers (occupational group no. 1280) with OD:

IVDK, 2013-2015, patient count: 715  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 4353  
 BA Arbeit, 2013-2015, worker years: 6308760  
 OD incidence rate, calculated from DGUV and BA Arbeit data 69 [67 - 71] cases of OD per 100,000 worker  
 [95% confidence intervals in brackets]: years

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
2682-20-4	Methylisothiazolinone	8.2 [6.2 - 10.6]	358 [271 - 462]	6 [4 - 7]
10101-97-0	Nickel(II)-sulfate hexahydrate	7.1 [5.2 - 9.3]	307 [226 - 406]	5 [4 - 6]
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	6.2 [4.5 - 8.4]	271 [195 - 365]	4 [3 - 6]
8007-00-9	Balsam of Peru (Myroxolon pereirae)	5.8 [4.1 - 7.9]	252 [179 - 343]	4 [3 - 5]
8050-09-7	Colophony (Rosin)	5.4 [3.8 - 7.5]	237 [166 - 326]	4 [3 - 5]
not applicable	Fragrance mix	5.2 [3.6 - 7.3]	227 [158 - 316]	4 [3 - 5]
7791-13-1	Cobalt(II) chloride hexahydrate	4.7 [3.2 - 6.6]	203 [138 - 287]	3 [2 - 5]
7778-50-9	Potassium dichromate	4.5 [3.1 - 6.5]	198 [133 - 281]	3 [2 - 4]
not applicable	Thiuram mix	4.1 [2.7 - 5.9]	178 [117 - 258]	3 [2 - 4]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	3.7 [2.4 - 5.5]	162 [105 - 240]	3 [2 - 4]
not applicable	Fragrance mix II	3.6 [2.3 - 5.4]	157 [100 - 233]	2 [2 - 4]
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	3.5 [2.2 - 5.2]	150 [95 - 226]	2 [2 - 4]
50-00-0	Formaldehyde	3.3 [2.0 - 4.9]	142 [88 - 215]	2 [1 - 3]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	2.3 [1.3 - 3.8]	102 [57 - 166]	2 [1 - 3]
85665-41-4	Propolis	1.7 [0.9 - 3.0]	75 [37 - 133]	1 [1 - 2]
8027-33-6	Lanolin alcohols	1.7 [0.9 - 3.0]	75 [37 - 133]	1 [1 - 2]
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	1.7 [0.9 - 3.0]	74 [37 - 132]	1 [1 - 2]
not applicable	Compositae Mix II	1.7 [0.9 - 3.1]	75 [38 - 133]	1 [1 - 2]
149-30-4	Mercaptobenzothiazole	1.6 [0.8 - 2.9]	68 [33 - 124]	1 [1 - 2]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	1.4 [0.6 - 2.6]	61 [28 - 115]	1 [0 - 2]
8006-81-3	Ylang Ylang oil	1.4 [0.6 - 2.6]	60 [28 - 114]	1 [0 - 2]
not applicable	Mercapto mix (CBS, MBTS, MOR)	1.1 [0.4 - 2.2]	48 [19 - 98]	1 [0 - 2]
102-71-6	Triethanolamine	1.0 [0.4 - 2.1]	42 [15 - 90]	1 [0 - 1]
84776-64-7	Jasmine absolute	0.9 [0.3 - 2.0]	40 [15 - 87]	1 [0 - 1]
not applicable	Paraben mix	0.8 [0.3 - 1.8]	34 [11 - 79]	1 [0 - 1]
8006-64-2	Oil of turpentine	0.8 [0.3 - 1.8]	34 [11 - 79]	1 [0 - 1]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	0.8 [0.3 - 1.8]	34 [11 - 79]	1 [0 - 1]
8006-87-9	Sandalwood Oil	0.6 [0.2 - 1.6]	27 [7 - 68]	0 [0 - 1]
67762-27-0	Cetearyl alcohol	0.3 [0.0 - 1.1]	14 [2 - 49]	0 [0 - 1]

**Tab. 3.3.3.1** Hairdressers, barbers, beauticians, wigmakers (occupational group no. 1901) with OD:

IVDK, 2013-2015, patient count: 360  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 2987  
 BA Arbeit, 2013-2015, worker years: 428706  
 OD incidence rate, calculated from DGUV and BA Arbeit data 697 [672 - 722] cases of OD per 100,000 worker years  
 [95% confidence intervals in brackets]:

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
95-70-5	Toluene-2,5-diamine	25.1 [20.5 - 30.1]	749 [612 - 899]	175 [143 - 210]
10101-97-0	Nickel(II)-sulfate hexahydrate	23.4 [18.8 - 28.5]	698 [560 - 852]	163 [131 - 199]
106-50-3	p-Phenylenediamine (PPD) (CI 76060)	21.8 [17.5 - 26.7]	653 [522 - 799]	152 [122 - 186]
7727-54-0	Ammonium persulfate	18.5 [14.4 - 23.1]	552 [431 - 690]	129 [101 - 161]
2682-20-4	Methylisothiazolinone	13.1 [9.6 - 17.3]	392 [288 - 517]	91 [67 - 121]
55965-84-9	Methylchlorisothiazolinone/Methylisothiazolinone (MCI/MI)	12.3 [8.9 - 16.4]	368 [267 - 489]	86 [62 - 114]
not applicable	Fragrance mix	6.5 [4.1 - 9.7]	194 [121 - 291]	45 [28 - 68]
123-30-8	p-Aminophenol (CI 76550)	6.4 [4.0 - 9.6]	190 [119 - 286]	44 [28 - 67]
30618-84-9	Glyceryl thioglycolate	3.9 [2.1 - 6.6]	117 [63 - 197]	27 [15 - 46]
7791-13-1	Cobalt(II) chloride hexahydrate	4.0 [2.2 - 6.8]	121 [65 - 204]	28 [15 - 48]
591-27-5	3-Aminophenol	3.6 [1.9 - 6.3]	109 [57 - 187]	25 [13 - 44]
not applicable	Fragrance mix II	3.1 [1.5 - 5.6]	92 [44 - 166]	21 [10 - 39]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	2.8 [1.3 - 5.2]	82 [38 - 155]	19 [9 - 36]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
8007-00-9	Balsam of Peru ( <i>Myroxolon pereirae</i> )	2.8 [1.3 - 5.2]	82 [38 - 155]	19 [9 - 36]
85665-41-4	Propolis	2.8 [1.3 - 5.2]	82 [38 - 155]	19 [9 - 36]
5421-46-5	Ammonium thioglycolate	2.4 [1.0 - 4.6]	71 [31 - 139]	17 [7 - 32]
8050-09-7	Colophony (Rosin)	2.1 [0.9 - 4.4]	64 [26 - 130]	15 [6 - 30]
87-66-1	Pyrogallol	2.1 [0.8 - 4.2]	62 [25 - 126]	14 [6 - 29]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	2.2 [0.9 - 4.5]	66 [27 - 135]	15 [6 - 31]
31906-04-4	Hydroxyisoheptyl 3-cyclohexene carboxaldehyde	2.1 [0.9 - 4.4]	64 [26 - 131]	15 [6 - 31]
61789-40-0	Cocamidopropyl betaine	1.7 [0.6 - 3.7]	52 [19 - 112]	12 [4 - 26]
not applicable	Thiuram mix	1.9 [0.7 - 4.0]	55 [20 - 119]	13 [5 - 28]
8006-81-3	Ylang Ylang oil	1.5 [0.5 - 3.4]	44 [14 - 103]	10 [3 - 24]
84776-64-7	Jasmine absolute	1.5 [0.5 - 3.4]	44 [14 - 103]	10 [3 - 24]
50-00-0	Formaldehyde	1.2 [0.3 - 3.1]	37 [10 - 93]	9 [2 - 22]
7778-50-9	Potassium dichromate	1.2 [0.3 - 3.1]	37 [10 - 93]	9 [2 - 22]
141-43-5	Monoethanolamine (MEA)	1.2 [0.3 - 3.0]	36 [10 - 90]	8 [2 - 21]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	1.2 [0.3 - 3.1]	37 [10 - 94]	9 [2 - 22]
123-31-9	Hydroquinone	0.9 [0.2 - 2.6]	27 [6 - 79]	6 [1 - 18]
8027-33-6	Lanolin alcohols	0.9 [0.2 - 2.7]	27 [6 - 79]	6 [1 - 18]
149-30-4	Mercaptobenzothiazole	0.6 [0.1 - 2.2]	18 [2 - 65]	4 [0 - 15]
not applicable	Paraben mix	0.6 [0.1 - 2.2]	18 [2 - 65]	4 [0 - 15]
52-51-7	Bronopol (2-Bromo-2-nitro-1,3-propanediol)	0.6 [0.1 - 2.2]	19 [2 - 67]	4 [0 - 16]
not applicable	Compositae Mix II	0.6 [0.1 - 2.2]	19 [2 - 66]	4 [0 - 15]
67762-27-0	Cetearyl alcohol	0.3 [0.0 - 1.7]	9 [0 - 51]	2 [0 - 12]
8006-64-2	Oil of turpentine	0.3 [0.0 - 1.7]	9 [0 - 51]	2 [0 - 12]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	0.3 [0.0 - 1.7]	9 [0 - 51]	2 [0 - 12]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
not applicable	Mercapto mix (CBS, MBTS, MOR)	0.3 [0.0 - 1.7]	9 [0 - 51]	2 [0 - 12]
8006-87-9	Sandalwood Oil	0.3 [0.0 - 1.6]	9 [0 - 49]	2 [0 - 11]

**Tab. 3.3.4.1** Geriatric nurse, social work associate professionals (occupational group no. 1861) with OD:

IVDK, 2013-2015, patient count: 304  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 4096  
 BA Arbeit, 2013-2015, worker years: 1480737  
 OD incidence rate, calculated from DGUV and BA Arbeit data 277 [268 - 285] cases of OD per 100,000 worker years  
 [95% confidence intervals in brackets]:

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
not applicable	Fragrance mix	13.6 [9.8 - 18.3]	557 [400 - 748]	38 [27 - 51]
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	10.0 [6.7 - 14.1]	410 [276 - 579]	28 [19 - 39]
2682-20-4	Methylisothiazolinone	9.5 [6.4 - 13.6]	391 [261 - 556]	26 [18 - 38]
8007-00-9	Balsam of Peru ( <i>Myroxolon pereirae</i> )	7.2 [4.4 - 10.9]	294 [182 - 445]	20 [12 - 30]
7791-13-1	Cobalt(II) chloride hexahydrate	7.1 [4.3 - 10.8]	289 [176 - 443]	20 [12 - 30]
not applicable	Fragrance mix II	7.0 [4.3 - 10.7]	286 [174 - 438]	19 [12 - 30]
25655-41-8	Povidone iodine	6.4 [3.8 - 10.1]	263 [155 - 413]	18 [10 - 28]
not applicable	Thiuram mix	5.4 [3.1 - 8.8]	223 [126 - 361]	15 [9 - 24]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	5.0 [2.8 - 8.2]	205 [113 - 338]	14 [8 - 23]
7778-50-9	Potassium dichromate	4.7 [2.5 - 7.8]	191 [103 - 321]	13 [7 - 22]
111-30-8	Glutardialdehyde (Glutaral)	4.6 [2.4 - 7.9]	188 [98 - 322]	13 [7 - 22]
8050-09-7	Colophony (Rosin)	3.2 [1.5 - 6.0]	132 [61 - 247]	9 [4 - 17]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	3.2 [1.5 - 6.0]	131 [60 - 245]	9 [4 - 17]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	3.2 [1.5 - 6.0]	132 [61 - 246]	9 [4 - 17]
50-00-0	Formaldehyde	2.8 [1.2 - 5.5]	117 [51 - 227]	8 [3 - 15]
not applicable	Compositae Mix II	2.8 [1.2 - 5.5]	116 [50 - 226]	8 [3 - 15]
85665-41-4	Propolis	2.5 [1.0 - 5.1]	102 [41 - 208]	7 [3 - 14]
8006-81-3	Ylang Ylang oil	2.0 [0.8 - 4.4]	84 [31 - 180]	6 [2 - 12]
8027-33-6	Lanolin alcohols	1.8 [0.6 - 4.1]	73 [24 - 169]	5 [2 - 11]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	1.8 [0.6 - 4.1]	73 [24 - 169]	5 [2 - 11]
51229-78-8	Quaternium 15	1.4 [0.4 - 3.7]	59 [16 - 150]	4 [1 - 10]
149-30-4	Mercaptobenzothiazole	1.4 [0.4 - 3.6]	59 [16 - 149]	4 [1 - 10]
1034-01-1	Octyl gallate	1.4 [0.4 - 3.6]	59 [16 - 149]	4 [1 - 10]
	Amerchol L-101	1.1 [0.2 - 3.2]	45 [9 - 129]	3 [1 - 9]
61789-40-0	Cocamidopropyl betaine	1.1 [0.2 - 3.1]	44 [9 - 128]	3 [1 - 9]
78491-02-8	Diazolidinyl urea	1.1 [0.2 - 3.1]	44 [9 - 127]	3 [1 - 9]
57-55-6	Propylene glycol	1.1 [0.2 - 3.1]	44 [9 - 128]	3 [1 - 9]
8006-64-2	Oil of turpentine	1.1 [0.2 - 3.1]	44 [9 - 127]	3 [1 - 9]
not applicable	Mercapto mix (CBS, MBTS, MOR)	1.1 [0.2 - 3.1]	44 [9 - 127]	3 [1 - 9]
39236-46-9	Imidazolidinyl urea (Germall 115)	0.7 [0.1 - 2.6]	29 [4 - 105]	2 [0 - 7]
not applicable	Paraben mix	0.7 [0.1 - 2.6]	29 [4 - 105]	2 [0 - 7]
110-44-1	Sorbic acid	0.7 [0.1 - 2.6]	29 [4 - 105]	2 [0 - 7]
3380-34-5	Triclosan	0.7 [0.1 - 2.6]	30 [4 - 106]	2 [0 - 7]
4405-13-4	Glyoxal trimer dihydrate	0.8 [0.1 - 2.7]	31 [4 - 112]	2 [0 - 8]
4065-45-6	Benzophenone-4 (Sulisobenzone)	0.7 [0.1 - 2.6]	30 [4 - 106]	2 [0 - 7]
84776-64-7	Jasmine absolute	0.7 [0.1 - 2.4]	28 [3 - 100]	2 [0 - 7]
79-07-2	2-Chloroacetamide	0.4 [0.0 - 2.0]	15 [0 - 81]	1 [0 - 5]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
18472-51-0	Chlorhexidine digluconate	0.3 [0.0 - 1.9]	14 [0 - 79]	1 [0 - 5]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	0.4 [0.0 - 2.0]	15 [0 - 81]	1 [0 - 5]
1948-33-0	tert-Butylhydroquinone	0.4 [0.0 - 2.0]	15 [0 - 81]	1 [0 - 5]
102-71-6	Triethanolamine	0.4 [0.0 - 2.0]	15 [0 - 82]	1 [0 - 6]
6440-58-0	DMDM Hydantoin	0.4 [0.0 - 2.0]	15 [0 - 81]	1 [0 - 5]
532-32-1	Sodium benzoate	0.4 [0.0 - 2.0]	15 [0 - 81]	1 [0 - 5]
68603-42-9	Coconut diethanolamide (cocamide DEA)	0.4 [0.0 - 2.0]	15 [0 - 82]	1 [0 - 6]

**Tab. 3.3.5.1** Building, vehicle, street cleaner (occupational group no. 1933) with OD:

IVDK, 2013-2015, patient count: 268  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 1541  
 BA Arbeit, 2013-2015, worker years: 2290824  
 OD incidence rate, calculated from DGUV and BA Arbeit data 67 [64 - 71] cases of OD per 100,000 worker years  
 [95% confidence intervals in brackets]:

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group

[95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
10101-97-0	Nickel(II)-sulfate hexahydrate	26.5 [21.0 - 32.6]	408 [323 - 502]	18 [14 - 22]
not applicable	Thiuram mix	9.5 [6.1 - 14.0]	147 [95 - 215]	6 [4 - 9]
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	8.4 [5.3 - 12.6]	130 [82 - 194]	6 [4 - 8]
not applicable	Fragrance mix	8.6 [5.4 - 12.9]	133 [83 - 198]	6 [4 - 9]
2682-20-4	Methylisothiazolinone	8.6 [5.4 - 12.9]	133 [84 - 199]	6 [4 - 9]
7778-50-9	Potassium dichromate	7.7 [4.7 - 11.8]	119 [72 - 181]	5 [3 - 8]
7791-13-1	Cobalt(II) chloride hexahydrate	7.3 [4.4 - 11.3]	113 [68 - 174]	5 [3 - 8]
8007-00-9	Balsam of Peru (Myroxolon pereirae)	6.5 [3.7 - 10.3]	100 [58 - 159]	4 [3 - 7]
not applicable	Fragrance mix II	5.8 [3.2 - 9.5]	89 [49 - 146]	4 [2 - 6]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	4.1 [2.0 - 7.4]	63 [31 - 114]	3 [1 - 5]
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	4.1 [2.0 - 7.4]	63 [30 - 114]	3 [1 - 5]
8050-09-7	Colophony (Rosin)	3.6 [1.7 - 6.8]	56 [26 - 104]	2 [1 - 5]
50-00-0	Formaldehyde	2.4 [0.9 - 5.1]	37 [14 - 79]	2 [1 - 3]
149-30-4	Mercaptobenzothiazole	2.0 [0.7 - 4.7]	31 [10 - 72]	1 [0 - 3]
8027-33-6	Lanolin alcohols	2.0 [0.7 - 4.7]	31 [10 - 72]	1 [0 - 3]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
not applicable	Mercapto mix (CBS, MBTS, MOR)	2.0 [0.7 - 4.7]	31 [10 - 72]	1 [0 - 3]
8006-81-3	Ylang Ylang oil	2.0 [0.7 - 4.6]	31 [10 - 71]	1 [0 - 3]
not applicable	Compositae Mix II	2.1 [0.7 - 4.9]	33 [11 - 75]	1 [0 - 3]
85665-41-4	Propolis	1.6 [0.4 - 4.1]	25 [7 - 63]	1 [0 - 3]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	1.7 [0.5 - 4.2]	26 [7 - 65]	1 [0 - 3]
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	1.3 [0.3 - 3.7]	20 [4 - 57]	1 [0 - 2]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	1.2 [0.3 - 3.6]	19 [4 - 55]	1 [0 - 2]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	1.2 [0.3 - 3.5]	19 [4 - 54]	1 [0 - 2]
52-51-7	Bronopol (2-Bromo-2-nitro-1,3-propanediol)	0.9 [0.1 - 3.0]	13 [2 - 47]	1 [0 - 2]
84776-64-7	Jasmine absolute	0.8 [0.1 - 2.9]	12 [2 - 44]	1 [0 - 2]
8006-87-9	Sandalwood Oil	0.8 [0.1 - 2.9]	12 [2 - 44]	1 [0 - 2]
100-51-6	Benzyl alcohol	0.4 [0.0 - 2.4]	7 [0 - 37]	0 [0 - 2]
not applicable	Paraben mix	0.4 [0.0 - 2.2]	6 [0 - 34]	0 [0 - 1]
8006-64-2	Oil of turpentine	0.4 [0.0 - 2.2]	6 [0 - 35]	0 [0 - 2]

**Tab. 3.3.6.1** Metal workers (cutting) (occupational group no. 1220) with OD:

IVDK, 2013-2015, patient count: 246  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 2643  
 BA Arbeit, 2013-2015, worker years: 1950012  
 OD incidence rate, calculated from DGUV and BA Arbeit data 136 [130 - 141] cases of OD per 100,000 worker  
 [95% confidence intervals in brackets]: years

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
141-43-5	Monoethanolamine (MEA)	13.8 [9.5 - 19.1]	364 [251 - 504]	19 [13 - 26]
8050-09-7	Colophony (Rosin)	10.6 [6.8 - 15.4]	279 [180 - 407]	14 [9 - 21]
66204-44-2	Methylene-bis(methyloxazolidine)	10.0 [6.4 - 14.6]	264 [170 - 387]	14 [9 - 20]
2682-20-4	Methylisothiazolinone	10.2 [6.6 - 14.9]	269 [173 - 393]	14 [9 - 20]
51200-87-4	4,4-Dimethyloxazolidine/.(Bioban CS 1135	9.2 [5.8 - 13.7]	242 [152 - 361]	12 [8 - 19]
514-10-3	Abietic acid	9.2 [5.7 - 13.8]	242 [150 - 365]	12 [8 - 19]
55965-84-9	Methylchlorisothiazolinone/Methylisothiazolinone (MCI/MI)	8.8 [5.4 - 13.3]	231 [142 - 352]	12 [7 - 18]
14548-60-8	Benzyl hemiformal	6.6 [3.7 - 10.6]	174 [99 - 281]	9 [5 - 14]
50-00-0	Formaldehyde	6.8 [3.8 - 10.9]	179 [102 - 289]	9 [5 - 15]
10101-97-0	Nickel(II)-sulfate hexahydrate	6.5 [3.6 - 10.7]	173 [96 - 284]	9 [5 - 15]
7791-13-1	Cobalt(II) chloride hexahydrate	5.1 [2.6 - 9.0]	135 [68 - 237]	7 [3 - 12]
4405-13-4	Glyoxal trimer dihydrate	4.7 [2.3 - 8.4]	124 [60 - 223]	6 [3 - 11]
not applicable	Fragrance mix	4.1 [1.9 - 7.7]	110 [51 - 204]	6 [3 - 10]
not applicable	Fragrance mix II	4.1 [1.9 - 7.7]	109 [50 - 203]	6 [3 - 10]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
111-42-2	Diethanolamine (DEA)	3.7 [1.6 - 7.1]	97 [42 - 188]	5 [2 - 10]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	3.5 [1.5 - 6.9]	94 [41 - 181]	5 [2 - 9]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	3.2 [1.3 - 6.5]	85 [34 - 172]	4 [2 - 9]
7747-35-5	7-Ethylbicyclooxazolidine	3.1 [1.2 - 6.2]	81 [33 - 164]	4 [2 - 8]
not applicable	Thiuram mix	2.8 [1.0 - 5.9]	73 [27 - 156]	4 [1 - 8]
2634-33-5	1,2-Benzisothiazolin-3-one, sodium salt	2.6 [1.0 - 5.6]	70 [26 - 149]	4 [1 - 8]
8007-00-9	Balsam of Peru (Myroxolon pereirae)	2.3 [0.8 - 5.3]	61 [20 - 140]	3 [1 - 7]
102-71-6	Triethanolamine	2.1 [0.7 - 4.8]	55 [18 - 126]	3 [1 - 6]
26530-20-1	Octyl isothiazolinone	2.2 [0.7 - 5.1]	58 [19 - 134]	3 [1 - 7]
929-06-6	2-(2-Aminoethoxy)ethanol (Diglycolamine)	2.3 [0.8 - 5.3]	61 [20 - 141]	3 [1 - 7]
2224-44-4, 1854-23-5	(Nitrobutyl)morpholine/.. (Bioban P 1487)	2.2 [0.7 - 5.1]	58 [19 - 134]	3 [1 - 7]
4719-04-4	1,3,5-Tris(2-hydroxyethyl)-hexahydrotriazine	1.8 [0.5 - 4.6]	48 [13 - 122]	2 [1 - 6]
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	1.9 [0.5 - 4.7]	50 [14 - 125]	3 [1 - 6]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	1.8 [0.5 - 4.7]	49 [13 - 123]	3 [1 - 6]
85665-41-4	Propolis	1.9 [0.5 - 4.7]	49 [13 - 124]	3 [1 - 6]
8006-64-2	Oil of turpentine	1.8 [0.5 - 4.6]	48 [13 - 122]	2 [1 - 6]
7778-50-9	Potassium dichromate	1.4 [0.3 - 4.0]	37 [8 - 106]	2 [0 - 5]
52-51-7	Bronopol (2-Bromo-2-nitro-1,3-propanediol)	1.4 [0.3 - 4.0]	37 [8 - 106]	2 [0 - 5]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	0.9 [0.1 - 3.3]	24 [3 - 87]	1 [0 - 4]
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	0.9 [0.1 - 3.3]	24 [3 - 87]	1 [0 - 4]
3811-73-2	Sodium-2-pyridinethiol-1-oxide	0.9 [0.1 - 3.2]	24 [3 - 84]	1 [0 - 4]
84776-64-7	Jasmine absolute	0.9 [0.1 - 3.3]	24 [3 - 87]	1 [0 - 4]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
122-99-6	2-Phenoxyethanol	0.5 [0.0 - 2.6]	12 [0 - 67]	1 [0 - 3]
not applicable	Paraben mix	0.5 [0.0 - 2.5]	12 [0 - 67]	1 [0 - 3]
8027-33-6	Lanolin alcohols	0.5 [0.0 - 2.5]	12 [0 - 67]	1 [0 - 3]
8006-81-3	Ylang Ylang oil	0.5 [0.0 - 2.5]	12 [0 - 67]	1 [0 - 3]
8006-87-9	Sandalwood Oil	0.5 [0.0 - 2.6]	12 [0 - 67]	1 [0 - 3]
not applicable	Compositae Mix II	0.5 [0.0 - 2.6]	12 [0 - 69]	1 [0 - 4]

**Tab. 3.3.7.1** Cooks, Cannery workers, Fruit, vegetable and related preservers (occupational group no. 1410) with OD:

IVDK, 2013-2015, patient count: 226  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 3291  
 BA Arbeit, 2013-2015, worker years: 1364335  
 OD incidence rate, calculated from DGUV and BA Arbeit data 241 [233 - 250] cases of OD per 100,000 worker years  
 [95% confidence intervals in brackets]:

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
10101-97-0	Nickel(II)-sulfate hexahydrate	15.8 [11.1 - 21.6]	521 [365 - 712]	38 [27 - 52]
not applicable	Thiuram mix	9.2 [5.6 - 14.0]	302 [185 - 460]	22 [14 - 34]
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	5.8 [3.0 - 10.0]	192 [100 - 328]	14 [7 - 24]
not applicable	Fragrance mix	5.8 [3.0 - 9.9]	191 [100 - 326]	14 [7 - 24]
7778-50-9	Potassium dichromate	5.3 [2.7 - 9.3]	175 [88 - 306]	13 [6 - 22]
7791-13-1	Cobalt(II) chloride hexahydrate	4.9 [2.4 - 8.7]	160 [77 - 288]	12 [6 - 21]
8050-09-7	Colophony (Rosin)	3.9 [1.7 - 7.5]	127 [55 - 246]	9 [4 - 18]
8027-33-6	Lanolin alcohols	3.9 [1.7 - 7.5]	127 [55 - 246]	9 [4 - 18]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	2.9 [1.1 - 6.2]	95 [35 - 204]	7 [3 - 15]
8007-00-9	Balsam of Peru (Myroxolon pereirae)	2.4 [0.8 - 5.5]	79 [26 - 183]	6 [2 - 13]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	1.9 [0.5 - 4.9]	64 [17 - 160]	5 [1 - 12]
149-30-4	Mercaptobenzothiazole	1.9 [0.5 - 4.9]	64 [17 - 160]	5 [1 - 12]
85665-41-4	Propolis	1.9 [0.5 - 4.9]	64 [17 - 160]	5 [1 - 12]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
not applicable	Mercapto mix (CBS, MBTS, MOR)	1.9 [0.5 - 4.9]	64 [17 - 160]	5 [1 - 12]
84776-64-7	Jasmine absolute	1.9 [0.5 - 4.8]	63 [17 - 159]	5 [1 - 12]
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	1.4 [0.3 - 4.2]	48 [10 - 137]	4 [1 - 10]
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	1.0 [0.1 - 3.5]	32 [4 - 115]	2 [0 - 8]
50-00-0	Formaldehyde	1.0 [0.1 - 3.4]	32 [4 - 113]	2 [0 - 8]
8006-81-3	Ylang Ylang oil	1.0 [0.1 - 3.4]	31 [4 - 112]	2 [0 - 8]
not applicable	Fragrance mix II	1.0 [0.1 - 3.4]	32 [4 - 113]	2 [0 - 8]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	0.5 [0.0 - 2.7]	16 [0 - 88]	1 [0 - 6]
not applicable	Paraben mix	0.5 [0.0 - 2.7]	16 [0 - 88]	1 [0 - 6]
8006-87-9	Sandalwood Oil	0.5 [0.0 - 2.6]	16 [0 - 87]	1 [0 - 6]
not applicable	Compositae Mix II	0.5 [0.0 - 2.7]	16 [0 - 90]	1 [0 - 7]

**Tab. 3.3.8.1** Engineers, technicians and scientists (occupational group no. 1600) with OD:

IVDK, 2013-2015, patient count: 160  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 389  
 BA Arbeit, 2013-2015, worker years: 5740072  
 OD incidence rate, calculated from DGUV and BA Arbeit data 7 [6 - 7] cases of OD per 100,000 worker years  
 [95% confidence intervals in brackets]:

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	9.8 [5.5 - 15.9]	38 [21 - 62]	1 [0 - 1]
not applicable	Fragrance mix	7.6 [3.8 - 13.2]	30 [15 - 51]	1 [0 - 1]
8050-09-7	Colophony (Rosin)	7.6 [3.8 - 13.2]	30 [15 - 51]	1 [0 - 1]
2682-20-4	Methylisothiazolinone	7.7 [3.9 - 13.3]	30 [15 - 52]	1 [0 - 1]
10101-97-0	Nickel(II)-sulfate hexahydrate	6.8 [3.3 - 12.2]	27 [13 - 48]	0 [0 - 1]
not applicable	Fragrance mix II	5.5 [2.4 - 10.6]	21 [9 - 41]	0 [0 - 1]
7778-50-9	Potassium dichromate	4.8 [1.9 - 9.6]	19 [8 - 37]	0 [0 - 1]
7791-13-1	Cobalt(II) chloride hexahydrate	4.8 [1.9 - 9.6]	19 [8 - 37]	0 [0 - 1]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	4.1 [1.5 - 8.7]	16 [6 - 34]	0 [0 - 1]
85665-41-4	Propolis	4.1 [1.5 - 8.8]	16 [6 - 34]	0 [0 - 1]
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	3.4 [1.1 - 7.8]	13 [4 - 30]	0 [0 - 1]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
not applicable	Thiuram mix	3.4 [1.1 - 7.8]	13 [4 - 30]	0 [0 - 1]
50-00-0	Formaldehyde	2.8 [0.8 - 7.0]	11 [3 - 27]	0 [0 - 0]
8007-00-9	Balsam of Peru (Myroxolon pereirae)	2.8 [0.8 - 6.9]	11 [3 - 27]	0 [0 - 0]
8006-64-2	Oil of turpentine	2.1 [0.4 - 5.9]	8 [2 - 23]	0 [0 - 0]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	2.2 [0.5 - 6.3]	9 [2 - 24]	0 [0 - 0]
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	2.1 [0.4 - 5.9]	8 [2 - 23]	0 [0 - 0]
8006-81-3	Ylang Ylang oil	2.0 [0.4 - 5.8]	8 [2 - 22]	0 [0 - 0]
149-30-4	Mercaptobenzothiazole	1.4 [0.2 - 4.9]	5 [1 - 19]	0 [0 - 0]
not applicable	Paraben mix	1.4 [0.2 - 4.9]	5 [1 - 19]	0 [0 - 0]
8027-33-6	Lanolin alcohols	1.4 [0.2 - 4.9]	5 [1 - 19]	0 [0 - 0]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	1.4 [0.2 - 4.9]	5 [1 - 19]	0 [0 - 0]
84776-64-7	Jasmine absolute	1.3 [0.2 - 4.8]	5 [1 - 19]	0 [0 - 0]
67762-27-0	Cetearyl alcohol	0.7 [0.0 - 3.8]	3 [0 - 15]	0 [0 - 0]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	0.7 [0.0 - 3.8]	3 [0 - 15]	0 [0 - 0]
not applicable	Mercapto mix (CBS, MBTS, MOR)	0.7 [0.0 - 3.8]	3 [0 - 15]	0 [0 - 0]
not applicable	Compositae Mix II	0.7 [0.0 - 3.9]	3 [0 - 15]	0 [0 - 0]

**Tab. 3.3.9.1** Construction workers, Manufacturers of building materials (occupational group no. 1440) with OD:

IVDK, 2013-2015, patient count: 150  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 1079  
 BA Arbeit, 2013-2015, worker years: 1362964  
 OD incidence rate, calculated from DGUV and BA Arbeit data 79 [75 - 84] cases of OD per 100,000 worker  
 [95% confidence intervals in brackets]: years

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	17.8 [11.7 - 25.3]	192 [127 - 273]	14 [9 - 20]
7778-50-9	Potassium dichromate	15.4 [9.7 - 22.8]	166 [104 - 246]	12 [8 - 18]
1477-55-0	m-Xylylenediamine	12.9 [7.7 - 19.8]	139 [83 - 214]	10 [6 - 16]
16096-31-4	1,6-Hexanediol diglycidylether	11.5 [6.6 - 18.2]	124 [71 - 196]	9 [5 - 14]
101-77-9	4,4'-Diaminodiphenylmethane	9.8 [5.3 - 16.1]	105 [57 - 174]	8 [4 - 13]
not applicable	Thiuram mix	9.9 [5.4 - 16.4]	107 [58 - 177]	8 [4 - 13]
7791-13-1	Cobalt(II) chloride hexahydrate	9.2 [4.8 - 15.5]	99 [52 - 167]	7 [4 - 12]
122-60-1	Phenylglycidyl ether	8.3 [4.2 - 14.4]	90 [46 - 156]	7 [3 - 11]
2682-20-4	Methylisothiazolinone	6.9 [3.2 - 12.6]	74 [34 - 136]	5 [2 - 10]
3101-60-8	p-tert-Butylphenyl glycidylether	6.8 [3.2 - 12.5]	74 [34 - 135]	5 [2 - 10]
2855-13-2	Isophorone diamine	6.1 [2.7 - 11.6]	65 [29 - 125]	5 [2 - 9]
8007-00-9	Balsam of Peru (Myroxolon pereirae)	6.1 [2.7 - 11.6]	65 [29 - 125]	5 [2 - 9]
2425-79-8	1,4-Butanediol diglycidylether	6.1 [2.7 - 11.7]	66 [29 - 126]	5 [2 - 9]
10101-97-0	Nickel(II)-sulfate hexahydrate	5.3 [2.2 - 10.6]	57 [23 - 115]	4 [2 - 8]
25620-58-0	Trimethylhexane-1,6-diamine	4.5 [1.7 - 9.6]	49 [18 - 104]	4 [1 - 8]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	3.1 [0.8 - 7.6]	33 [9 - 82]	2 [1 - 6]
67762-27-0	Cetearyl alcohol	3.0 [0.8 - 7.6]	33 [9 - 82]	2 [1 - 6]
111-40-0	Diethylenetriamine	3.0 [0.8 - 7.5]	32 [9 - 81]	2 [1 - 6]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	2.3 [0.5 - 6.5]	25 [5 - 71]	2 [0 - 5]
8050-09-7	Colophony (Rosin)	2.3 [0.5 - 6.5]	25 [5 - 70]	2 [0 - 5]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	2.3 [0.5 - 6.5]	25 [5 - 71]	2 [0 - 5]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	2.3 [0.5 - 6.5]	25 [5 - 70]	2 [0 - 5]
26447-14-3	Cresylglycidyl ether	2.3 [0.5 - 6.5]	25 [5 - 71]	2 [0 - 5]
not applicable	Mercapto mix (CBS, MBTS, MOR)	2.3 [0.5 - 6.5]	25 [5 - 70]	2 [0 - 5]
2426-08-6	Butyl glycidylether	2.3 [0.5 - 6.5]	25 [5 - 71]	2 [0 - 5]
not applicable	Fragrance mix	1.6 [0.2 - 5.5]	17 [2 - 59]	1 [0 - 4]
149-30-4	Mercaptobenzothiazole	1.5 [0.2 - 5.4]	16 [2 - 58]	1 [0 - 4]
85665-41-4	Propolis	1.5 [0.2 - 5.4]	16 [2 - 58]	1 [0 - 4]
8006-64-2	Oil of turpentine	1.5 [0.2 - 5.4]	16 [2 - 58]	1 [0 - 4]
98-29-3	4-tert-Butylcatechol	1.4 [0.2 - 5.1]	15 [2 - 55]	1 [0 - 4]
30499-70-8	Trimethylolpropane triglycidylether	1.5 [0.2 - 5.4]	16 [2 - 58]	1 [0 - 4]
50-00-0	Formaldehyde	0.8 [0.0 - 4.1]	8 [0 - 45]	1 [0 - 3]
9003-35-4	Phenol formaldehyde resin (Novolac)	0.8 [0.0 - 4.1]	8 [0 - 44]	1 [0 - 3]
8027-33-6	Lanolin alcohols	0.8 [0.0 - 4.1]	8 [0 - 45]	1 [0 - 3]
818-61-1	Hydroxyethyl acrylate	0.8 [0.0 - 4.2]	8 [0 - 45]	1 [0 - 3]
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	0.8 [0.0 - 4.1]	8 [0 - 45]	1 [0 - 3]
8006-81-3	Ylang Ylang oil	0.7 [0.0 - 4.0]	8 [0 - 43]	1 [0 - 3]
84776-64-7	Jasmine absolute	0.7 [0.0 - 4.1]	8 [0 - 44]	1 [0 - 3]
not applicable	Compositae Mix II	0.8 [0.0 - 4.2]	8 [0 - 45]	1 [0 - 3]

**Tab. 3.3.10.1** Office clerks (occupational group no. 1750) with OD:

IVDK, 2013-2015, patient count: 144  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 1109  
 BA Arbeit, 2013-2015, worker years: 24246084  
 OD incidence rate, calculated from DGUV and BA Arbeit data 5 [4 - 5] cases of OD per 100,000 worker years  
 [95% confidence intervals in brackets]:

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group

[95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
8050-09-7	Colophony (Rosin)	8.0 [3.9 - 14.2]	89 [43 - 158]	0 [0 - 1]
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	5.6 [2.3 - 11.2]	62 [25 - 124]	0 [0 - 1]
not applicable	Fragrance mix II	4.1 [1.3 - 9.2]	45 [15 - 102]	0 [0 - 0]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	3.3 [0.9 - 8.1]	36 [10 - 90]	0 [0 - 0]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	3.3 [0.9 - 8.1]	36 [10 - 90]	0 [0 - 0]
85665-41-4	Propolis	3.2 [0.9 - 8.1]	36 [10 - 89]	0 [0 - 0]
not applicable	Thiuram mix	3.2 [0.9 - 8.1]	36 [10 - 89]	0 [0 - 0]
8006-87-9	Sandalwood Oil	3.2 [0.9 - 7.9]	35 [10 - 88]	0 [0 - 0]
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	2.4 [0.5 - 6.9]	27 [6 - 77]	0 [0 - 0]
7778-50-9	Potassium dichromate	2.4 [0.5 - 7.0]	27 [6 - 77]	0 [0 - 0]
8027-33-6	Lanolin alcohols	1.6 [0.2 - 5.7]	18 [2 - 63]	0 [0 - 0]
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	1.6 [0.2 - 5.6]	18 [2 - 62]	0 [0 - 0]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
not applicable	Compositae Mix II	1.6 [0.2 - 5.7]	18 [2 - 63]	0 [0 - 0]
8006-64-2	Oil of turpentine	0.8 [0.0 - 4.4]	9 [0 - 49]	0 [0 - 0]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	0.8 [0.0 - 4.4]	9 [0 - 49]	0 [0 - 0]
8006-81-3	Ylang Ylang oil	0.8 [0.0 - 4.3]	9 [0 - 48]	0 [0 - 0]
84776-64-7	Jasmine absolute	0.8 [0.0 - 4.4]	9 [0 - 49]	0 [0 - 0]

**Tab. 3.3.11.1** Machinery mechanics and fitters (occupational group no. 1260) with OD:

IVDK, 2013-2015, patient count: 141  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 2069  
 BA Arbeit, 2013-2015, worker years: 1176010  
 OD incidence rate, calculated from DGUV and BA Arbeit data 176 [168 - 184] cases of OD per 100,000 worker  
 [95% confidence intervals in brackets]: years

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	8.3 [4.2 - 14.4]	172 [88 - 298]	15 [7 - 25]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	6.8 [3.1 - 12.5]	140 [65 - 258]	12 [6 - 22]
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	6.8 [3.2 - 12.5]	141 [65 - 260]	12 [6 - 22]
8050-09-7	Colophony (Rosin)	6.1 [2.7 - 11.6]	125 [55 - 240]	11 [5 - 20]
7778-50-9	Potassium dichromate	5.3 [2.1 - 10.5]	109 [44 - 218]	9 [4 - 19]
7791-13-1	Cobalt(II) chloride hexahydrate	5.3 [2.1 - 10.5]	109 [44 - 218]	9 [4 - 19]
85665-41-4	Propolis	5.3 [2.1 - 10.5]	109 [44 - 218]	9 [4 - 19]
2682-20-4	Methylisothiazolinone	4.4 [1.6 - 9.4]	91 [34 - 194]	8 [3 - 16]
10101-97-0	Nickel(II)-sulfate hexahydrate	3.8 [1.2 - 8.6]	78 [25 - 177]	7 [2 - 15]
8007-00-9	Balsam of Peru (Myroxolon pereirae)	3.8 [1.2 - 8.6]	78 [25 - 177]	7 [2 - 15]
not applicable	Fragrance mix II	3.8 [1.2 - 8.6]	78 [25 - 177]	7 [2 - 15]
not applicable	Fragrance mix	3.0 [0.8 - 7.6]	63 [17 - 157]	5 [1 - 13]
not applicable	Thiuram mix	3.0 [0.8 - 7.5]	62 [17 - 156]	5 [1 - 13]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	3.0 [0.8 - 7.5]	62 [17 - 156]	5 [1 - 13]
8006-81-3	Ylang Ylang oil	3.0 [0.8 - 7.4]	61 [17 - 153]	5 [1 - 13]
50-00-0	Formaldehyde	2.2 [0.5 - 6.4]	46 [10 - 132]	4 [1 - 11]
8006-64-2	Oil of turpentine	2.3 [0.5 - 6.5]	47 [10 - 133]	4 [1 - 11]
102-77-2	Morpholinylmercaptobenzothiazole	1.7 [0.2 - 5.8]	34 [4 - 121]	3 [0 - 10]
6440-58-0	DMDM Hydantoin	1.6 [0.2 - 5.8]	34 [4 - 119]	3 [0 - 10]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	1.5 [0.2 - 5.2]	30 [4 - 108]	3 [0 - 9]
8006-87-9	Sandalwood Oil	1.5 [0.2 - 5.3]	31 [4 - 109]	3 [0 - 9]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	0.8 [0.0 - 4.1]	16 [0 - 85]	1 [0 - 7]
not applicable	Paraben mix	0.8 [0.0 - 4.1]	16 [0 - 85]	1 [0 - 7]
2634-33-5	1,2-Benzisothiazolin-3-one, sodium salt	0.8 [0.0 - 4.5]	17 [0 - 93]	1 [0 - 8]
52-51-7	Bronopol (2-Bromo-2-nitro-1,3-propanediol)	0.8 [0.0 - 4.2]	16 [0 - 88]	1 [0 - 7]
84776-64-7	Jasmine absolute	0.7 [0.0 - 4.1]	15 [0 - 84]	1 [0 - 7]
not applicable	Compositae Mix II	0.8 [0.0 - 4.1]	16 [0 - 85]	1 [0 - 7]

**Tab. 3.3.12.1** Bakers, pastry-cooks and confectionery makers (occupational group no. 1390) with OD:

IVDK, 2013-2015, patient count: 141  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 1131  
 BA Arbeit, 2013-2015, worker years: 233744  
 OD incidence rate, calculated from DGUV and BA Arbeit data 484 [456 - 513] cases of OD per 100,000 worker  
 [95% confidence intervals in brackets]: years

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
10101-97-0	Nickel(II)-sulfate hexahydrate	16.7 [10.7 - 24.1]	189 [122 - 273]	81 [52 - 117]
not applicable	Fragrance mix	6.9 [3.2 - 12.6]	78 [36 - 143]	33 [15 - 61]
85665-41-4	Propolis	6.8 [3.2 - 12.5]	77 [36 - 142]	33 [15 - 61]
7791-13-1	Cobalt(II) chloride hexahydrate	6.1 [2.7 - 11.6]	69 [30 - 131]	30 [13 - 56]
8007-00-9	Balsam of Peru (Myroxolon pereirae)	6.1 [2.7 - 11.6]	69 [30 - 131]	30 [13 - 56]
not applicable	Thiuram mix	5.3 [2.2 - 10.6]	60 [24 - 120]	26 [10 - 51]
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	4.6 [1.7 - 9.7]	52 [19 - 110]	22 [8 - 47]
2682-20-4	Methylisothiazolinone	4.9 [1.8 - 10.3]	55 [20 - 117]	24 [9 - 50]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	3.0 [0.8 - 7.6]	34 [9 - 86]	15 [4 - 37]
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	3.1 [0.8 - 7.6]	35 [9 - 86]	15 [4 - 37]
84776-64-7	Jasmine absolute	3.0 [0.8 - 7.4]	34 [9 - 84]	15 [4 - 36]
not applicable	Fragrance mix II	3.1 [0.8 - 7.6]	35 [9 - 86]	15 [4 - 37]
7778-50-9	Potassium dichromate	2.3 [0.5 - 6.5]	26 [5 - 73]	11 [2 - 31]
8050-09-7	Colophony (Rosin)	2.3 [0.5 - 6.5]	26 [5 - 73]	11 [2 - 31]
8027-33-6	Lanolin alcohols	2.3 [0.5 - 6.5]	26 [5 - 73]	11 [2 - 31]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
not applicable	Mercapto mix (CBS, MBTS, MOR)	2.3 [0.5 - 6.5]	26 [5 - 73]	11 [2 - 31]
not applicable	Compositae Mix II	2.3 [0.5 - 6.5]	26 [5 - 74]	11 [2 - 32]
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	1.5 [0.2 - 5.4]	17 [2 - 62]	7 [1 - 27]
149-30-4	Mercaptobenzothiazole	1.5 [0.2 - 5.4]	17 [2 - 61]	7 [1 - 26]
101-72-4	N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	1.5 [0.2 - 5.4]	17 [2 - 61]	7 [1 - 26]
14324-55-1	Zinc diethyldithiocarbamate (ZDEC)	1.5 [0.2 - 5.4]	17 [2 - 61]	7 [1 - 26]
8006-81-3	Ylang Ylang oil	1.5 [0.2 - 5.2]	17 [2 - 59]	7 [1 - 25]
67762-27-0	Cetearyl alcohol	0.8 [0.0 - 4.1]	9 [0 - 47]	4 [0 - 20]
50-00-0	Formaldehyde	0.8 [0.0 - 4.2]	9 [0 - 47]	4 [0 - 20]
8006-64-2	Oil of turpentine	0.8 [0.0 - 4.1]	9 [0 - 47]	4 [0 - 20]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	0.8 [0.0 - 4.5]	9 [0 - 51]	4 [0 - 22]
8006-87-9	Sandalwood Oil	0.7 [0.0 - 4.1]	8 [0 - 46]	3 [0 - 20]

**Tab. 3.3.13.1** Painters, Varnishers and related workers (occupational group no. 1510) with OD:

IVDK, 2013-2015, patient count: 137  
 DGUV, 2013-2015, count of confirmed cases of OD (BK 5101): 863  
 BA Arbeit, 2013-2015, worker years: 703919  
 OD incidence rate, calculated from DGUV and BA Arbeit data 123 [115 - 131] cases of OD per 100,000 worker  
 [95% confidence intervals in brackets]: years

Estimation of annual incidences of contact sensitization (CS) to allergens tested in  $\geq 85\%$  of the IVDK patients of this professional group  
 [95% confidence intervals in brackets]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
2682-20-4	Methylisothiazolinone	21.1 [14.3 - 29.4]	182 [123 - 254]	26 [17 - 36]
55965-84-9	Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)	14.8 [9.2 - 22.2]	128 [79 - 192]	18 [11 - 27]
25068-38-6, 25089-99-8, 1675-54-3	Epoxy resin	12.2 [7.0 - 19.3]	105 [60 - 167]	15 [9 - 24]
not applicable	Fragrance mix	8.0 [3.9 - 14.2]	69 [34 - 123]	10 [5 - 17]
10101-97-0	Nickel(II)-sulfate hexahydrate	8.0 [3.9 - 14.2]	69 [34 - 123]	10 [5 - 17]
8007-00-9	Balsam of Peru (Myroxolon pereirae)	7.8 [3.8 - 13.9]	67 [33 - 120]	10 [5 - 17]
35691-65-7	Methyldibromo glutaronitrile (dibromodicyanobutane)	5.5 [2.2 - 10.9]	47 [19 - 94]	7 [3 - 13]
7791-13-1	Cobalt(II) chloride hexahydrate	5.5 [2.2 - 10.9]	47 [19 - 94]	7 [3 - 13]
not applicable	Thiuram mix	5.6 [2.3 - 11.1]	48 [20 - 96]	7 [3 - 14]
8050-09-7	Colophony (Rosin)	4.0 [1.3 - 9.1]	35 [11 - 78]	5 [2 - 11]
7778-50-9	Potassium dichromate	3.1 [0.9 - 7.8]	27 [7 - 67]	4 [1 - 10]

CAS number	Substance	Percentage of sensitized patients (IVDK)	Cases of CS in this occupational group, Germany, 2013-2015	CS incidence rate, cases per 100,000 worker years
not applicable	Fragrance mix II	3.1 [0.9 - 7.9]	27 [7 - 68]	4 [1 - 10]
149-30-4	Mercaptobenzothiazole	2.3 [0.5 - 6.7]	20 [4 - 58]	3 [1 - 8]
85665-41-4	Propolis	2.3 [0.5 - 6.7]	20 [4 - 58]	3 [1 - 8]
50-00-0	Formaldehyde	1.6 [0.2 - 5.6]	14 [2 - 48]	2 [0 - 7]
8006-64-2	Oil of turpentine	1.6 [0.2 - 5.5]	13 [2 - 48]	2 [0 - 7]
not applicable	Mercapto mix (CBS, MBTS, MOR)	1.6 [0.2 - 5.5]	13 [2 - 48]	2 [0 - 7]
not applicable	Compositae Mix II	1.6 [0.2 - 5.7]	14 [2 - 49]	2 [0 - 7]
not applicable	Paraben mix	0.8 [0.0 - 4.3]	7 [0 - 37]	1 [0 - 5]
98-29-3	4-tert-Butylcatechol	0.8 [0.0 - 4.6]	7 [0 - 40]	1 [0 - 6]
55406-53-6	Iodopropynylbutyl carbamate (IPBC)	0.8 [0.0 - 4.4]	7 [0 - 38]	1 [0 - 5]
31906-04-4	Hydroxyisohexyl 3-cyclohexene carboxaldehyde	0.8 [0.0 - 4.3]	7 [0 - 37]	1 [0 - 5]
8006-81-3	Ylang Ylang oil	0.8 [0.0 - 4.2]	7 [0 - 37]	1 [0 - 5]
8006-87-9	Sandalwood Oil	0.8 [0.0 - 4.2]	7 [0 - 37]	1 [0 - 5]