eteam Project: Results of External Validation Exercise

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Introduction

Tier 1 tools are used under REACH to estimate exposure during the registration process. These generic tools are designed to provide conservative exposure estimate for a wide range of exposure scenarios, using only a limited number of model parameters. This study aimed to validate the Tier 1 tools using exposure measurement data from a variety of sources.

Methods

Results from personal exposure measurements were obtained from several providers cross Europe and the US. In addition, descriptions of the exposure situations were obtained. A team of exposure scientists at the Institute of Occupational Medicine coded the situations for all the tools. Tool exposure estimates were generated and compared with individual measurement results where available. We also received sets of aggregated measurement results from a number of providers. These were usually described by arithmetic mean, geometric mean and geometric standard deviation, and were used for further comparisons with the tool estimates.

Results

The comparison with the individual measurement suggested that across all the exposure categories, the tools appear to be conservative, but this varied between exposure categories. These results could not provide any evidence that the tools were conservative for estimating exposure arising from handling non-volatile liquids, exposure from metal abrasion and hot metal processes. Estimates from ECETOC TRAv2 were generally more conservative than ECETOC TRAv3. The EMKG-EXPO-tool appeared to be less conservative for powders than the other tools. Correlations between the measurement results and tool predictions were generally poor. The exception was for exposure to powders, where the correlation coefficient between measurement results and tool prediction was ~0.8 for the ECETOC TRA (v2 and v3) and Stoffenmanager, but lower for MEASE and the EMKG-EXPO-Tool.

Conclusions

Despite a large effort to develop a comprehensive exposure measurement database for the comparison exercise, there remain important gaps. Relatively few measurement results were available for non-volatile liquids and exposure to metals following abrasion and hot processes. The limited data did not provide evidence that the tools were conservative for these exposure categories and hence should be used with care for these exposures. More data were available for powders and volatile liquids. The tools appeared to be better in predicting exposure from powders, but the EMKG-EXPO-TOOL and ECETOC TRAv3 may not be sufficiently conservative for powders. For volatile liquids, the correlation was lower, but tools appeared to be more conservative. These results provide important information for model developers, regarding areas that may require further development, as well as tool users, in terms of applications where tools should be used with extra caution.