

Occupational exposure models: a systematic translation into each other

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Occupational exposure models are frequently used for exposure assessment in the context of the European Union regulation on the Regulation, Evaluation, Authorization and Restriction of CHemicals (REACH). Two different models will usually produce different estimates with large uncertainties for the same exposure conditions. Generating a reliable risk profile for a chemical and interpreting the exposure estimate adequately is therefore somewhat a challenge. The selection of the modeling tool and entry parameters is therefore of essence.

Here, a translation of three models commonly used within the REACH framework is presented: ECETOC TRA v3, Stoffenmanager 5.0 and Advanced REACH Tool (ART) 1.5.

The translation is implemented in the mathematical modeling language Coloured Petri Nets (CPN Tools, University of Aarhus). Each exposure model was rebuilt in CPN Tools and then the translation was built into the program, connecting the models with each other. The workflow is as follows: First, one of the three models is chosen to assess an exposure estimate. Each decision or input parameter in the model is also translated to the corresponding decision in the other two models. The translation has been validated with measured exposure data. Occupational exposure data were obtained from Schweizerische Unvallversicherungsanstalt (SUVA). Only personal inhalation exposures related to either single or multiple activities were considered. In total, 700 measurements were available.

The new tool has several advantages: i) the ECETOC TRA, Stoffenmanager and ART occupational exposure models can be used in a single software, ii) the exposure estimate for all three models is given with a single set of exposure determinants, iii) the tool allows a systematic comparison of the exposure estimates. With the validated translation more confidence in the exposure estimate is gained and a weighting of model results may be advised. Examples will be given.