Executive summary

The previously developed framework for read-across of inhalation exposure data has been further refined and tested with extra case studies. Refinements to the calculation of read-across factors to correct the source exposure levels towards the target situation as well as refinements of the calibration and rule base resulted in more accurate predictions in general. This study demonstrated that the framework can accurately be used to extrapolate exposure data, but that the expertise with regards to exposure assessment needed to work with the framework is high. It is advised to develop a tool in which the framework, its rules and guidance/training materials can be incorporated for increased before it can be used by exposure assessors.

Summary

Over the last two years, efforts were made in a previous project (CEFIC LRI B19) by an international consortium of TNO, HSE and Triskelion to develop a framework, inspired by the read-across approach applied in toxicology (hazard assessment) (where read-across from a substance with more toxicological data to a similar substance with less toxicological data is, in principle, accepted), for supporting exposure assessment in *analogous* exposure scenarios using measurement data collected on a source scenario. This rule-based framework allows users to extrapolate exposure measurement data from a source dataset to a target situation in which exposure determinants can differ to some degree from each other. This framework was tested with use of a wide variety of case studies encompassing different substances, resulting in 22 extrapolations. Based on this work, recommendations for further study are given. Some specific areas that were concluded in the previous work in need of further study were: extrapolations from one (ECETOC TRA) PROC class to another PROC class (within the rule base); adjustments of ventilation (indexed by room volume and air change rate); extrapolations from indoor to outdoor situations; further investigation of single-company/site exposure measurement datasets were required due to uncertainties as to whether such datasets are representative for average exposures.
The current study (Cefic LRI B19.2) was conducted, to investigate these issues further, using new case studies. These new case studies were used to further refine the theoretical framework for read-across and test the accuracy of the approach by comparing the outcomes with measured data. In total, five case studies were selected with each case study providing several read-across opportunities which cover a broad aspect of the framework tested here. This set of case studies consists of high-quality data and contextual information as well as case studies where contextual information with regards to e.g. exposure time, content of the measured analyte in the product or process related information is lacking and assumptions need to be made. The subjects for the case studies are 1) exposure assessment of roofers exposed to silica, 2) task based lead exposure of bridge work, 3) experimental assessment of several staged industrial processes, 4) inhalation exposure to isocyanates of car body repair shop and industrial spray painters and 5) exposure to VOCs from indoor application of water based paints. Out of these 5 case studies, in total 47 individual extrapolations were made. For each extrapolation, a geometric mean (GM) was estimated with a 5% and 95% confidence interval. The ratios of the estimated target GM divided by the reported source GM for each extrapolation were calculated with their respective 5% and 95%

confidence intervals. For some case studies, 2 assumptions were tested (e.g. the exposure time). In total, for 41 of the 47 extrapolations the GM of the source scenario fell within the estimated GM and its confidence intervals. For most of these extrapolations, the upper and lower limit of the confidence interval of the target GM divided by the source GM were either both higher, or lower than 1. Mostly the rules of the framework were broken to see whether the rules were to strict or not. Specifically, this was the case for case study 3, where PROC classes where extrapolated outside the stated boundaries. In some cases, additional rules were developed based on the extrapolations. When comparing target GMs with source GMs for each extrapolation, a Pearson and Spearman correlation of 0.88 and 0.9 respectively can be observed.

Refinements to the framework and its rule base were made on several topics including dispersion (how to extrapolate from indoors to outdoors, from near-field to far-field and vice versa), substance fraction, and over PROC classes. Additional work to investigate the circumstances where source measurement data from a single company/site may be utilised in read-across has also been conducted. . Lastly, the calibrated read-across score was changed based on new results from the old- and new case studies. The framework only uses calibrated read-across score for the substance emission potential, activity, dispersion and control measures are not calibrated.

In conclusion, the framework was observed to perform well based on the results of the case studies. The original framework was refined and the rule base was expanded based on the outcomes of this current study. In the future, it is advised to conduct a reliability test to investigate the inter-assessor agreement. A sensitivity analysis would provide insights on the most- and least sensible parameters in the framework and their effects on the estimates. And lastly, external validation of the framework using datasets not used in the development of the framework will provide more insight in the accuracy of the outcomes and general bias of the framework. Furthermore, it is advised to gather the knowledge generated over these two projects and build a user-friendly IT tool with all the mappings, calculations and rules available.