

## **Validation and reliability of the Advanced REACH Tool (ART)**

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The Advanced REACH Tool (ART) ([www.advancedreachtool.com](http://www.advancedreachtool.com)) is a higher tier exposure assessment model and the mechanistic model of the ART was calibrated with approximately 2000 exposure measurements. Calibrations were performed for different forms of exposure (*i.e.* abrasive dust, dust, vapours and mists). After calibration the mechanistic model of ART was able to estimate with 90% confidence the geometric mean (GM) exposure level for a given scenario to be within a factor of two to six of measured GM exposure levels depending upon the form of exposure. The performance of the ART inhalable dust algorithm was validated using approximately 200 task-based workplace exposure measurements describing 16 different exposure scenarios collated from a multinational pharmaceutical company. 75% of the exposure scenario estimates were within the 90% uncertainty factor of 4.4 found in the calibration of the mechanistic model for inhalable dust. Not only the validity of the ART mechanistic model was studied, also the reliability of the tool was assessed. The results of this study showed significantly more variability between scenarios than within scenarios. However, substantial variability was observed between individual assessors' estimates for an individual scenario. Only 42% of the assessments lay within a factor three of the gold standard estimate, assessed by two of the developers of the ART tool, after training. The reliability appeared to be influenced by several factors; (i) information provided by text and video hampered the hygienists to gain additional information at the workplace, (ii) for some parameters, the guidance documentation implemented in the tool seemed to be insufficient and (iii) in some cases the assessors were not able to implement the

information explicitly provided. Improvements in the guidance documentation, consensus procedures among multiple experts and improving the training methods could improve the reliability of ART.