ART: ADVANCED REACH TOOL (WWW.ADVANCEDREACHTOOL.COM)

Erik Tielemans[1*], Nick Warren[2], Thomas Schneider[3], Martie van Tongeren[4], Martin Tischer[5], Peter Ritchie[4], Wouter Fransman[1], Hans Kromhout[6], Jody Schinkel[1], Joop van Hemmen[1], John Cherrie[4]

TNO innovation for life

The development of ART is funded by HSE, the Dutch Government, the AFSSET, the CEFIC LRI, Shell, Eurometaux, the BOHS and GSK

Chemical Safety Assessment under REACH can be complex and time consuming. Assessing occupational risks requires a clear knowledge of exposure to chemicals. While Tier I models are available to estimate exposure, they are sometimes inadequate to indicate safe use. Refinement with more data or better assumptions is then a way forward. TNO developed a second tier Advanced REACH Tool or ART to facilitate the CSA process

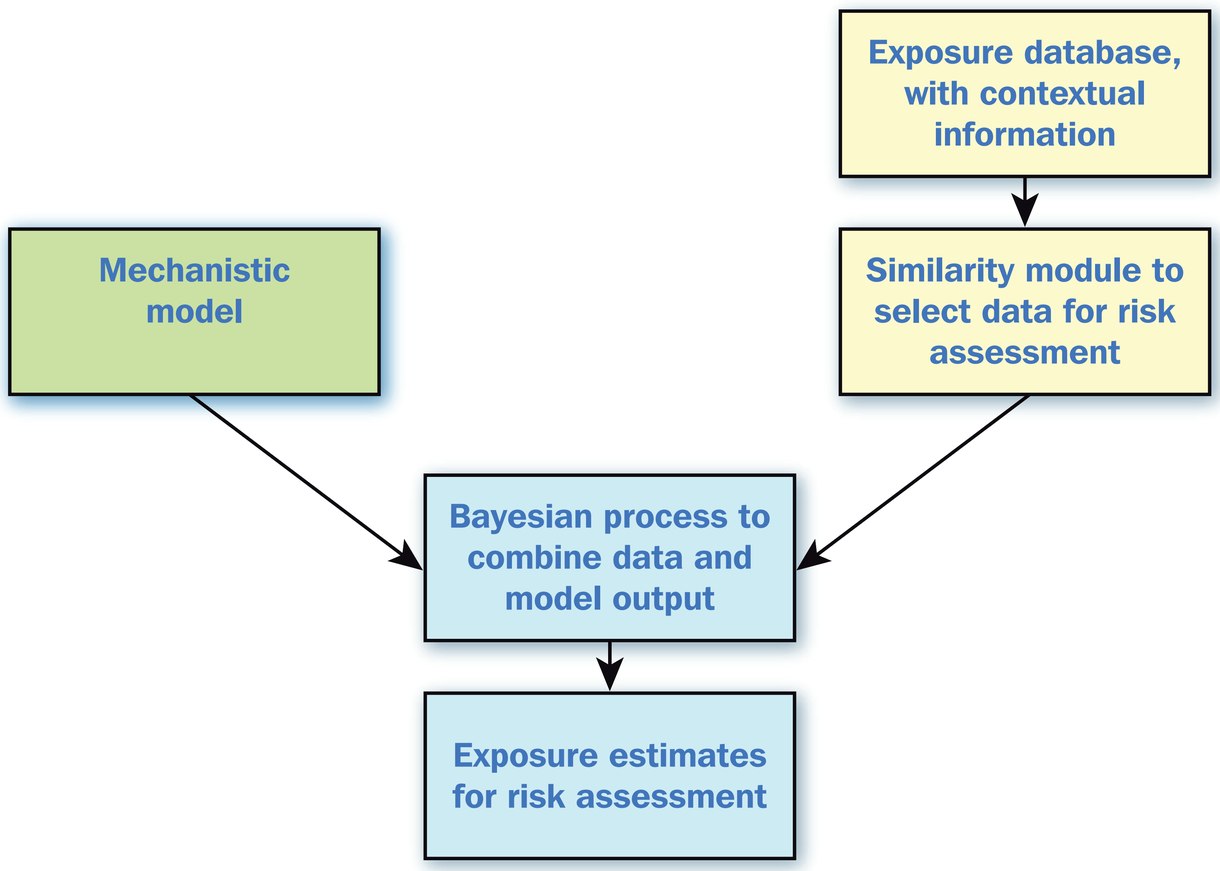
TIERED EXPOSURE ASSESSMENT UNDER REACH

REACH follows a two-tier exposure assessment approach in which the first tier provides a conservative estimate to discriminate between substances in scenarios of some concern and those of no concern. For this first tier, various easy to use tools are proposed in the REACH guidance. Chemicals for which risks cannot be ruled out move on to a second tier where more reliable and realistic exposure assessments are required. A case-by-case assessment using measurements for each individual chemical of concern would be an extremely expensive and slow process. A more efficient higher tier alternative was not yet available. A large collaborative project was therefore initiated by TNO, bringing together leading scientists across Europe from major research organizations in the field of occupational health (TNO, IOM, HSL, IRAS, BAUA and NRCWE) with the aim to develop an Advanced REACH Tool. The ART provides a cost-effective higher tier exposure assessment approach without diminishing the protection of workers in Europe.

NEW EXPOSURE ASSESSMENT PARADIGM

The ART incorporates a mechanistic model of inhalation exposure and a database of empirical exposure information from a wide variety of exposure scenarios and substances. Information from the model and the exposure database is combined using sophisticated statistical techniques to produce more refined estimates of exposure and related uncertainty (Figure). Assessors may also include their own data to update and refine estimates. The mechanistic model is calibrated using a range of data sources so that even if there are no relevant data available the ART provides useful exposure estimates.

Figure. *General structure of ART*



ART VERSION 1.5.

Several industry- and sector-specific features have been built into the ART resulting in a version 1.0 that combines the mechanistic model with a facility for statistical updates with the user's own data. Version 1.0 was released in March 2010 and is freely available at www.advancedreachtool.com.

Examples convincingly show that updating the mechanistic model estimates with available exposure data results in a substantial reduction in model uncertainty. While in version 1.0 it was only possible to update the mechanistic model estimates with own data, in version 1.5 an exposure database is integrated in the tool. This database contains approximately 2,000 exposure measurements from over 100 exposure scenarios. With ART 1.5.it is possible to revise your mechanistic model estimate with your own data, data from the exposure database or a combination of the two. ART version 1.5 is scheduled for release end of 2011

MAIN FEATURES OF THE ART:

- The ART makes full use of mechanistically modeled estimates of exposure and any relevant measurements of exposure.
- The ART facilitates the inclusion of any new data that become available in the future or during the risk assessment process.
- The ART does not automatically require scenario specific exposure data and allows the use of analogous data from relatively comparable scenarios (read across).
- The ART integrates an exposure database that can be used to select data to upgrade the mechanistic model estimates.
- The ART produces a variety of realistic and reasonable worst case (RWC) exposure estimates dependent upon the requirements of the particular risk assessment.

LRI The Long-range Research initiative

cefic

Health & Safety Laboratory — An Agency of the Health & Safety Executive

baua: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin

Forskningscenter for Arbejdsmiljø

IOM

[1] TNO Quality of Life, P.O. Box 360, 3700 AJ Zeist, The Netherlands • [2] HSL, United Kingdom • [3] NRCWE, Denmark
[4] IOM, United Kingdom • [5] BAuA, Germany • [6] IRAS, Utrecht University, The Netherlands

* P +31 30 694 49 90 F +31 30 694 40 70 ✉ Erik.Tielemans@tno.nl