Expressing uncertainty in hazard characterization and exposure assessment of substances: Principles and practice using APROBA-Plus

In 2017, WHO/IPCS published a guidance document[1] on evaluating uncertainties in hazard characterization. Instead of relying on (conservative) point estimates, it was proposed to (better) quantify the level of conservatism in the final hazard characterization outcome (i.e. a health-based guidance value such as an RfD or ADI) by quantitatively evaluating the uncertainties involved in a so-called probabilistic assessment. Here, the single values are replaced by uncertainty distributions resulting in an overall uncertainty distribution of the final hazard characterization outcome.

This presentation will introduce the principles described in the WHO/IPCS guidance document to arrive at a probabilistic health-based guidance value. In addition, the user-friendly Excel tool APROBA-Plus is presented, which facilitates probabilistic hazard characterization and risk assessment. The tool is developed as an addition to the WHO/IPCS tool APROBA, which can do probabilistic calculations in an approximate but quick and easy way by applying lognormal uncertainty distributions to the different aspects of the hazard characterization (such as Point of Departure, inter-, and intraspecies extrapolation). This results in a probabilistic health-based guidance value rather than the usual deterministic point estimate. In the extended APROBA-Plus tool, exposure estimates with an uncertainty range can be included to create a single plot, which visualizes the uncertainties in exposure and hazard.

APROBA-Plus can be used as a quick tool for risk assessment while making the (approximate) uncertainties in both the hazard and the exposure visible. By making the uncertainties visible, the outcome from a risk assessment becomes more transparent and informative than the more usual deterministic approaches, so that risk managers can make better-informed decisions, e.g. directly taking measures or asking for refinement of the risk assessment. If the latter, APROBA-Plus can help in showing which aspects in the risk assessment contributed most to the overall uncertainty, as an indication what type of refinement would be most effective.

Several exercises will be provided to familiarize the participants with the details of APROBA-Plus and to illustrate the various conclusions which can be drawn from an APROBA-Plus assessment. **Participants are asked to bring their own laptops.** APROBA-Plus requires Microsoft Excel 2010 (version 14) or higher. The APROBA-Plus tool can be downloaded from: https://www.researchgate.net/publication/326422432_APROBA_PLUS-V100_v012_TEMPLATE .

[1] https://www.who.int/ipcs/methods/harmonization/areas/hazard_assessment/en/