Predictive models in ecotoxicology: bridging the gap between scientific progress and regulatory applicability

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Modelling approaches have been an intensive topic for research in academic and industry research in the last years, because mathematical or computer models provide the means to gain a deeper mechanistic understanding of environmentally-related processes like fate and effects of organic contaminants in the environment and they enable predictions of effects or of processes like toxicity, biodegradation, uptake and bioaccumulation. Mathematical and computer models have in that respect unbeatable advantages: once established and tested, they allow predictions of expected behaviour and effects of contaminants for really large numbers of environmental conditions, while reducing animal testing at the same time, which means that the number of tested environmental situations and so the environmental safety can be increased at low monetary and ethical costs. While researchers suggest model applications in many cases, on the regulatory side the criteria for the acceptance of modelling are not the same for the different approaches. While distribution and fate models are generally accepted since a long time for exposure estimation in predictive risk assessment, the acceptance of QSARs and ecological modelling is still controversial and problematic. This session will show examples for QSAR (quantitative structure-activity relationship) models for the estimation of toxicity, biodegradation and bioaccumulation of organic contaminants. Other types of mathematical models are the toxicokinetic-toxicodynamic (TKTD) models, which relate the external exposure to expected effects on survival or other endpoints. For these models, we will see presentations about regulatory aspects, acceptability criteria and an application for a concrete risk assessment question. The presentations will be finished by a model based analysis of the impact of an endocrine disruptive compound on the population dynamics of a fish, and by exciting news from attempts to link adverse outcome pathways to dynamic energy budget modelling.