Using GUTS to explain dynamic mortality patterns for a marine copepod exposed to dimethylnaphthalene

Tjalling Jager[1], Ida Beathe Øverjordet[2], Bjørn Henrik Hansen[2]

[1] DEBtox Research, De Bilt, The Netherlands (www.debtox.nl), e-mail contact: tjalling@debtox.nl
[2] SINTEF Materials and Chemistry, Marine Environmental Technology, Trondheim, Norway

Track and session:
4. Ecological risk assessment and human health risk assessment of chemicals and other stressors and mixtures. Environmental consequences of oil and gas extraction and transport

The marine ecosystem is exposed to stressors such as pollution resulting from oil and gas exploration. Mechanistic models are needed to interpret the effects of such stressors, and to predict the impact on the life histories of selected species under realistic environmental conditions. Toxicokinetic-toxicodynamic (TKTD) models are well-suited for this task as they provide a mechanistic link between external concentrations and effects on life-history traits. For the endpoint survival, almost all existing TKTD models can be seen as special cases of the GUTS framework; the General Unified Threshold model for Survival. Here, we apply GUTS to the effects of a single oil component, 1,3-dimethylnaphthalene, on the copepod *Calanus finmarchicus*. Calanoid copepods form an important part of the marine zooplankton, and *C. finmarchicus* is a common species in the Northern Atlantic Ocean and expanding up into the Arctic. Rather than a single TKTD model, GUTS is a framework from which specific models can be derived. However, selecting the 'most appropriate' GUTS model can be challenging. Our data set includes effects on survival as well as body residues over time, and is therefore well suited to compare different model cases. In this contribution, we present the different death mechanisms included in GUTS, and demonstrate how they explain the patterns in the current data set. Further, we discuss the consequences of using a specific model case for extrapolations.

Keywords: Survival modelling, oil pollution, copepods, GUTS, TKTD modelling