Filling information gaps with QSAR predictions for 600,000 chemical substances for Reduction, Replacement, Prioritization and Substitution

The DTU Food QSAR (Quantitative Structure-Activity Relationships) team has developed and applied *in silico* toxicity models for more than 15 years. Activities include advising the Danish EPA on regulatory use e.g. for OECD and EU REACH chemical assessments and performing large scale screenings. For example, QSAR-predictions underlie the Danish EPA advisory classifications for danger to the aquatic environment, acute oral toxicity, skin irritation, skin sensitization, cancer, mutagenicity and developmental toxicity for 33,835 substances.

Besides direct replacement of experimental tests in some cases, QSARs can be used to support assessments and thereby avoid unnecessary testing for example in development of read-across cases, by improving evaluation of existing test data, in the design of testing strategies, in priority setting, and in weight of evidence approaches. In cases where animal testing is still needed, predictions of mechanistic properties of the substance can contribute to optimize the experimental design to enhance the amount of knowledge that can be extracted from an experiment without the use of more animals. Furthermore, QSARs can be applied in the design of safer substitution chemicals and to provide information beyond the regulatory standard information requirements. In some cases QSARs can be made on human *in vivo* data, eliminating the interspecies difference.

The DTU QSAR Database (http://qsar.food.dtu.dk) includes estimates from more than 200 QSARs covering a wide range of hazardous properties relevant for human health and the environment such as acute toxicity to rat, mouse, fish, daphnia and algae, as well as many physical-chemical and environmental fate properties, skin irritation, sensitization, mutagenicity, cancer, and reproductive toxicity including endocrine activity. QSAR predictions for 600,000 substances are included in the database, which is one of the most comprehensive freely available QSAR tools for substance evaluations and large-scale screenings.