Title of Research:

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Exploring roles and simple estimation methods of species sensitivity distribution for deriving PNECs

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Summary of Research:

The aim of the present study is to develop a new methodology to determine a suitable predicted no effect concentrations (PNEC) by using a sensitivity distribution (SSD) in the ecological risk assessment. The study is carried out in two perspectives. One is to develop a statistical method to estimate SSD with limited number of toxicity data [1], and the other is to develop a method to quantify an uncertainty in the risk assessment through a comparison of using SSD and using conventional assessment factors (AF) [2] (termed SSD-method and AF-method, respectively). In [1], toxic data are collected to estimate SSD. Data selection are carried out based on reliability of toxicity tests and number of species tested in SSD. As a result, 28 chemicals were selected for SSD estimation. These SSD will be used as a learning set for the SSD predictions. Descriptors of 28 chemicals such as logKow, boiling (melting) points, toxic values of model species in toxicity tests are collected. At the first step, correlations between these descriptors and mean (μ)/standard deviation (σ) of the SSDs are investigated, respectively. The correlations between the descriptors and μ are relatively high, compared to those between the descriptors and σ. These results suggest that the prediction for σ is a harder task than the prediction for μ. In [2], we quantified the uncertainty which is inevitable for the SSD estimation and then developed the method to determine a magnitude of AF under the uncertainty. Using the AF, the performance abilities of SSD-method and AF-method are compared. Measurement of the performance ability is as follows. For a given toxicity data set, PNEC is determined, and if PNEC is greater than the protection goal, determination of PNEC is counted as failure. These processes are repeated many times and the number of failures is counted at various μ and σ of SSD. The performance ability of AF-method is σ sensitive. In lower σ, conventional AF-method had a lower failure probability compared to SSD-method. On the other hand, in higher σ, SSD-method has a lower failure probability. Our result suggests that it is important to understand the factors affecting the performance ability, and σ of SSD is surely one of them.

Timeline:

June 1, 2018 – February 28, 2019

Topics:

N/A

Publications:

Oral presentation at an annual meeting of the Japanese society of environmental toxicology, titled Comparison of performance ability of various assessment method by Masashi kamo (September 11th 2018 at satellite campus of Gifu university).