Probabilistic Assessment Factors in the Ecological Risk Assessment of Chemical Mixtures

Yohei Onishi*, Yoshihito Takeda

[1] *Graduate School of Environment and Information Sciences, Yokohama National University*
79-7, Tokiwadai, Hodogaya-ku, Yokohama, Japan 240-8501

Abstract

The ecological risks of chemicals have been assessed in many countries and regions. However, most of the targets for these assessments are individual chemicals. Since different chemicals mix together in the environment, risk assessments of complex chemicals are required. For this reason, we have developed an ecological screening risk assessment method for mixtures of industrial chemicals. Since there is less information about hazardous industrial chemicals than about chemicals such as pesticides, the uncertainty surrounding industrial chemicals is great. Thus, it would be effective to use assessment factors in order to deal with that uncertainty. In the risk assessment of chemical mixtures, the number of assessment factors applied will be greater than in the risk assessment of individual chemicals. In conventional risk assessments of individual chemicals, fixed values have been used as assessment factors. Since each of the fixed values is conservative, the risk is overestimated in cases with multiple assessment factors. For example, assessment factors for "acute to chronic toxicity ratio" and "interspecies extrapolation" are used at the same time. Therefore, assessment factors using probabilities have been proposed. However, there have been no studies of probabilistic assessment factors in the ecological risk assessment of mixtures. Therefore, in this study, we developed assessment factors using probabilities for the ecological risk assessment of mixtures. The subjects are the assessment factors of "acute to chronic toxicity ratio" and "interspecies extrapolation". The ecotoxicity values of algae, water fleas and fish were used. The reliability of the data has been confirmed under the Chemical Substances Control Law in Japan. In accordance with the probability distribution of “acute to chronic toxicity ratio” and “interspecies extrapolation”, the probability distribution for the predicted no-effect concentration (PNEC) of the whole mixture was simulated by using the Monte Carlo method. As a result, the 90th percentile of PNEC for the whole mixture tended to be bigger than the PNEC calculated using fixed assessment factors.

Keyword: 1) Assessment factor, 2) Uncertainty factor, 3) Mixture, 4) Risk assessment, 5) Probabilistic, 6) Extrapolation