

Title of Research:23-6-01

Development of risk assessment method based on the concept of the bioavailability with a model predicting the toxicities for difficult-to-test substances.

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Summary of Research:

Chemical risk assessments in Japan are conducted under the Chemical Substances Control Law (CSCL), yet progress remains limited for substances categorized as difficult-to-evaluate chemicals. This study developed an ecological risk assessment approach using monoalkyl cation C16 (HTAC), a cationic surfactant designated as a CSCL Priority Assessment Chemical. HTAC toxicity is known to decrease with increasing dissolved organic carbon (DOC), and discrepancies frequently arise between nominal and measured concentrations, hindering reliable exposure assessment. Algal growth inhibition tests were conducted at DOC concentrations of 0, 0.5, 2.5, and 5 mg/L. The resulting no-observed-effect concentrations (NOECs) based on nominal concentrations were 5, 55, 63, and 130 µg/L, respectively, confirming reduced toxicity with higher DOC. Time-course measurements revealed that the decline in measured concentration occurred predominantly within the first hour, reaching near-equilibrium far more rapidly than previously assumed. Additional decreases commonly observed at test termination were attributed to centrifugation during algal removal rather than to adsorption losses. These findings suggest that the 72-hour concentration measured without centrifugation is the most appropriate indicator of exposure. Using these data, we constructed a mathematical model to predict toxicity across varying DOC levels. A preliminary risk assessment combining the model with AIST-SHANEL exposure estimates indicated that ecological risk of HTAC is likely low. The applicability of this method to other difficult-to-evaluate substances is also discussed.

Timeline:

March 2025 – February 2026

Topics:

Presented at the LRI annual research meeting of JCIA. August 29, 2025.

Publications:

Masashi Kamo, Hiroyuki Mano, Tetsuro Okamura, Jun Yamamoto, Kasumi Yamaguchi, Akifumi Ogawa, Atsushi Sawai. "Toxicity of Cationic Surfactants Varies with Water Quality: Its Verification and Predictive Modeling". 4th Joint Conference on Environmental Chemicals. July 15th, 2025, Yamagata