# Development of chemical risk assessment and management system as disaster and emergency response

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[Abstract]

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Development of methodologies of non-steady state chemical risk assessment and information system for chemical management under disaster environment were studied. Roles and coverages of the focus area of all sub-projects in S-17 project were characterized in the perspectives of risk governance. Both conceptual and realistic exposure scenario were established based on the survey and analysis of existing incidents of chemical accidents. Web information system, named as “D.Chem-Core” was established that is compiling all S-17 outcomes and other relevant information sources. Systematic retrieval of data enables the rapid extraction of necessary information from the system, through the tag-based data organization under scenario in the system.

Sub-theme 2 evaluated countermeasure options considering the causes, scale, and properties of affected parties, such as air, water, and soil under the emergencies caused by natural disasters. We conducted a literature survey on impacts through the hydrosphere and sorted and categorized countermeasure options by type and affected parties. Based on this accident pattern, we constructed a representative scenario with significant risks and effectiveness of countermeasures. Consequently, we expanded the target to the atmosphere and the soil sphere and conducted case evaluations. Finally, the organizational framework was developed by adding representative scenarios and expanding evaluation methods for countermeasure options.

The purpose of sub-theme 3 is to develop methods to evaluate the health effects of exposure history and exposure dose fluctuation, which are assumed to be non-steady-state exposures to chemicals under disasters. Tris-(1,3-dichloro-2-propyl) phosphate (TDCIPP) or acenaphthene, were administered to male rats to investigate toxic effects. Neonatal TDCIPP exposure history significantly increased toxicity to adrenal weight, serum iron, and UIBC detected in mature exposure but not adolescence or acenaphthene exposure history. The health-effects assessment that considers exposure history is suggested to be useful, but it may be time- and substance-specific.

A passive sampling method that does not require external energy input is useful for measuring the personal exposure of VOCs and SVOCs under disaster environment. Passive sampling method requires the determination of sampling rate (SR) for each substance. Limited data are available on the SRs of passive sampler for VOCs and SVOCs. We developed an estimation method of the SRs based on the diffusion coefficient of each VOC and established a comprehensive database of SRs

for VOCs including PRTR-designated chemicals. We also evaluated the relationships between the concentrations of SVOCs such as PAHs and XPAHs measured by active sampling and their collection amounts by passive sampling using silicone wristbands.

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