

Title of Research:

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Probabilistic Exposure Evaluation Model for Relatively Small-scale Occupational Workplace

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Summary of Research:

The purpose of this study is to develop an exposure assessment model that assists voluntary chemicals management by Japanese downstream industries for occupational exposure which seems to have relatively higher risk in the industrial supply chain. We have developed a probabilistic assessment tool for the occupational exposure in Japan based on the framework of Advanced REACH Tool (ART) constructed in European ART consortium. We named this tool as SWEES (integrated Score-based Workplace Exposure system) and validated the exposure estimating algorithm by using limited amount of some available data of the organic solvent in Japanese industries. What we have done were model validation and building pathway of practical application by industrial sectors.

First, for a validation of SWEES, we collected the observed exposure data of the organic solvent measured in some workplaces related to the automobile manufacturing industry in Japan. The result indicated that the exposure estimate by SWEES was the 0.1-873 times larger than the measured data as a whole. When looking at each task, the 93% of estimated exposure estimate on the paint production were within the factor of 3. These suggest that continuous effort to collect relevant information on workplace exposure are strongly required. This also needs cooperative actions from stakeholders.

Second, to prioritize the required collected data for SWEES, we tried to estimate probabilistically estimated the exposure concentration stochastically by assuming providing the probability distribution to each of mechanistic model parameters used in of ART and performed sensitive analysis with the case of workers exposed to toluene in gravure printing industry in Japan. As the result of this analysis, the average of estimated concentration of toluene in the painting industry was 30.8 ppm, the 0.66 times of observed concentration (46.7ppm). In addition, modified factors such as related to local control measurement and action of workers in workplace were identified as a key parameters that contributed largely to the estimated concentration by this sensitive analysis. In parallel with this modeling study, we continue to improve model framework applicable under limited data availability condition, up to now we have examined introduction of the model for multi chemical behavior in the workplace, validation through data rich case studies. We also continuously do socio-economic needs assessment of risk and exposure assessment of industry sectors. Through integrating these tasks, final goal will be the participatory evolving systems of voluntary risk management system in industrial sectors in Japan.

Timeline: 2014.4 – 2015.6

Topics: N/A

Publications:

Yamaguchi, Haruko; Hamada, Hayato; Ito, Asato; Tokai, Akihiro. Development of probabilistic occupational exposure assessment tool assisting voluntary chemical risk management of industrial sector in Japan, 2014 annual meeting of Society for Risk Analysis-Europe