

A Single Cell Multimedia Fate Model for Endocrine Disrupting Chemicals

Kyunghee Choi¹, Junheon Youn¹, Daeil Kang¹, Choong Lee¹, Dongsoo Lee², Jaeryoung Oh³,
Sunghwan Jeon¹ and Jingyun Na¹

1. National Institute of Environmental Research¹, Republic of Korea

2. Seoul National University

3. Korea Ocean Research & Development Institute

To understand environmental paths of the transport and accumulation of endocrine disrupting chemicals (EDCs), a single cell multimedia fate model has been constructed and evaluated. The EDCs of concern were PAHs, Organochlorine Pesticides (OCPs), PCBs, Alkyl phenols, and phthalates. An evaluation model was designed for the multimedia distribution, including air, water, soil, sediment and vegetation. This model was verified using reported values and via monitoring data. Based on collected data, the distribution trends of EDCs with respect to environmental media were analyzed. Those results have applied to the model for the prediction of the spatial and temporal distribution of EDCs in Seoul. Especially, phenol compound, phthalates, PAHs, PCBs and organochlorine pesticides were estimated and the model was verified. This model was successfully conducted to environmental media, such as air (vapor and suspended particles), soils (forest soil, bare soil, and cement-concrete covered soil), water (dissolved and suspended solids), sediment, trees (deciduous and coniferous). The discrepancies between the model prediction and the measured data are approximately within or near a factor of 10 for the PAHs of three rings through that of six rings, implying that multimedia distribution of the PAHs could be predicted with a factor of 10. Concerning about the air equilibrium may be assumed, a fugacity at steady state is similar in all environmental media. Considering the uncertainties of this model, the use of equilibrium models may be sufficient for assessing chemical fates. In this study, a suggestion was made that modeling and estimation of chemicals in environmental multimedia be rigorously evaluated using the measured flux data. In addition, these data should be obtained, for example, from the precise and standardized inventory of the target chemicals. The model (EDC Seoul) will be refined in an ongoing research effort and will be used to support decision-making concerning the management of EDCs.