**Exploring the exposure and hazard potential of ionogenic organic chemicals released to the environment**

Todd Gouin1

Jon A. Arnot1,2\*, James M. Armitage2, Todd Gouin3, Liisa Toose-Reid1, Frank Wania2, Mark Bonnell4, Marisa Romano5, Dianne Hughes5, Don Mackay6

1ARC Arnot Research and Consulting, 36 Sproat Avenue, Toronto, ON, Canada, M4M 1W4

2Department of Physical and Environmental Sciences, University of Toronto Scarborough, 1265 Military Trail, Toronto, ON, Canada M1C 1A4

3Unilever, Safety and Environmental Assurance Centre, Unilever, Colworth Science Park, Sharnbrook, Bedfordshire, UK, MK44 1LQ

4Environment Canada…

5Health Canada, New Substances Assessment and Control Bureau, Healthy Environments and Consumer Safety Branch, Safe Environments Directorate, Ottawa, ON, Canada, K1A 0K9

6Environmental Studies, Trent University, Peterborough, ON, Canada, K9J 7B8

A common approach used in regulatory programs to evaluate chemicals for their potential effects on the environment is to categorize chemicals using various criteria for Persistence, Bioaccumulation and Toxicity (PBT). Alternative methods screen and prioritize chemicals based on estimates of exposure and potential risk. Many are ionogenic organic chemicals (IOCs); however, because of substantial data gaps, uncertainty in the assessment of IOCs is significant. We have revised the RAIDAR model to simulate the fate, bioaccumulation, exposure and risk of IOCs to a range of representative ecological receptors (autotrophs, invertebrates, fish and a variety of wildlife species). The model allows the user to include chemical partitioning information of IOCs if such data are available, and uses simplifying assumptions based on current screening-level knowledge when such data are not measured. RAIDAR calculates an Exposure Assessment Factor (EAF) to quantify the relationship between the chemical concentration in an organism and an assumed consistent chemical emission rate (unit emission rate) for all chemicals. Hence, the EAF allows chemicals to be compared and ranked based on exposure potential. RAIDAR also calculates a Hazard Assessment Factor (HAF) that quantifies the relationship between the unit emission rate based chemical concentration in an organism to a user-selected effect threshold concentration (a consistent assessment endpoint). The HAF effectively “combines” PBT information into a holistic hazard indicator for comparative assessments. We applied the model to approximately 1,000 IOCs including pharmaceuticals, personal care products and industrial and household chemicals. We assume 100% chemical release to surface water and no waste water treatment or transfer to amended soils. The calculated EAFs span approximately 10 orders of magnitude and the HAFs span approximately 11.5 orders of magnitude highlighting the prioritization capacity of the approach. The greatest overall source of uncertainty in the HAF is the toxicity information. The greatest overall source of uncertainty in the EAF is the degradation half-life in water. Few of these IOCs bioaccumulate in food webs because of their relatively low hydrophobicity, high dissociation and short biotransformation half-lives. We show how these results can also be used for risk-based screening by including approximate values for emission rates and mode of entry to identify IOCs of high and low concern for risk.