Effects and ecological consequences of aquatic exposures to particulate materials from the nano- to macro- scale

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The current paradigm in aquatic environmental assessment, accepted by regulatory authorities globally, is that the dissolved molecule represents the most relevant exposure condition for aquatic toxicity testing and that testing above the solubility limit does not help to inform environmental risk. The increasing focus on nanomaterials, microplastics and other sparingly soluble particulates in the environment over the last decade is challenging this paradigm and has inspired debate regarding the adequacy of existing aquatic testing frameworks for substances, which are now realized to have potential for emission and transmission in the aquatic environment in varied undissolved/particulate states. The majority of published research that has investigated the potential ecotoxicity of nanomaterials and microplastics over the last decade has employed procedures involving exposure to substances above the solubility limit and in the presence of undissolved material. Relatively little attention has been given to addressing the distinction between intrinsic toxicity and physical effects associated with relevant physical states during exposure. The latter is a fundamental requirement for aquatic toxicology studies used in regulatory context. Generally, research focusing on nanomaterials, microplastics, or suspended solids have been considered separately, although they share common physical features as particulates. In this session, we seek to identify and highlight common critical considerations in aquatic exposures and for assessing risk of particulate materials. We invite abstracts which highlight work aimed at: • Distinguishing and characterizing intrinsic toxicity and physical effects of particulates in either lab or field settings from short or long-term exposures. This may include effects of particulate matter on biota, ecosystem processes and functions. • Identifying the key physical properties of particulates which are most relevant to hazard and risk in the aquatic environment (i.e. properties which may promote specific uptake of particulates or may lead to specific physical effects). When should particle size be a decisive factor for environmental risk assessment? • Identifying metrics and models to quantify particulate exposure and physical hazard in the aquatic environment. Are classical toxicological dose models appropriate and sufficient? • Determining the role of particulates in multiple stressor systems, especially considering indirect effects, influence of background particulates or interaction of particulate and dissolved stressors (i.e. adsorption/ desorption or leaching of contaminants, particles as vector for pathogens). • Aquatic environmental risk assessment strategies that consider population relevant impacts of physical (or indirect) effects from particulate matter and particulate anthropogenic contaminants.