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Mini review

Intermittent exposure to aquatic pollutants: assessment, toxicity and sublethal responses in fish and invertebrates

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Abstract

Aquatic animals are often exposed to intermittent, variable poison concentrations during pollution incidents. However, current understanding of ecotoxicology has evolved primarily from continuous exposure studies. This review summarises the relatively dispersed toxicity literature on intermittent exposures. Methodologies used in existing continuous exposure toxicity tests may be adapted to intermittent regimes provided the exposure profile is known and "poison concentration" is defined to give toxicologically relevant lethality estimate. Such tests rely on assuming that continuous and intermittent exposures of equivalent dose have the same toxicity. This assumption is untrue for some chemicals. The toxicity of intermittent events may be assessed by correlating mortality with poison accumulation, biochemical, haematological or physiological response syndromes. Such bioassays can be performed without knowledge of the exposure profile, and are often sufficiently rapid to record short pollution events. Intermittent and continuous exposures of equivalent dose may not have the same toxicities. Intermittent exposures are less toxic than continuous events, but only when peak concentrations of pollutant are the same in each regime. Exceptionally, sulphuric acid, acid/Al and ammonia are much more toxic to fish when administered intermittently. Variations in intermittent exposure frequency or duration do not produce proportional changes in lethality, since apparently large changes in exposure dose may not significantly alter toxicity. The short-lived nature of intermittent exposures suggests that equilibria in poison concentrations between the external environment and the body compartments of the test species are not achieved. The overall accumulation response depends particularly on the duration of peak concentrations and any "recovery periods" between multiple episodes relative to poison uptake and depuration rates respectively. Transient biochemical and physiological disturbances occur during intermittent exposures. Latent effects include reduced post-exposure growth and reproductive failure in the F₁ generation, or increased deformities in the F₂ generation of fish.

Keywords

Intermittent exposure; Aquatic pollutants; Toxicity; Mortality; Poison accumulation

There are no figures or tables for this document.

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