Pulse exposure - delayed responses of Daphnia magna

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Introduction
Intermittent discharges of xenobiotic chemicals to the aquatic environment occur frequently e.g. during spraying of pesticides, industrial discharges, and rain events. These pulse exposures lead to short-term high concentrations which may have significant toxic effects on organisms in the receiving waters. However, the effects of this type of exposure is seldom studied. In the present study we propose and evaluate a method for quantification of the effects of pulse exposure (PulseM) using Daphnia magna as test organism.

Materials and methods
In the PulseM test, new-born daphnids are exposed to high concentrations of chemicals/effluent in pulses ranging from 0.5-6 hours. The test organisms are transferred to clean water and their mobility is observed in a post-exposure period of 48 hours. The method was applied to m-cresol, 3,5 dichlorophenol, potassium dichromate, the pesticides pirimicarb and dimethoate, and two industrial effluents.

Results of ISO-test used for:
- Selection of 3-5 test concentrations for pulse test.
- Selection of pulse duration (0.5-6 h).

Delayed effects - post-exposure:
- Positive - animals regain mobility (example pirimicarb).
- Negative - more immobile animals (example potassium dichromate).

Delayed positive response:
- Pirimicarb.
- Dimethoate.
- 3,5 Dichlorophenol.
- Industrial wastewater.

Delayed negative response:
- Potassium dichromate.
- m-Cresol.
- Industrial stormwater runoff.

Pulse exposure to Dimethoate and Pirimicarb:
- Reduced food uptake.
- Growth of animals affected.
- Time to first offspring increases significantly.

Chronic effects of pulse exposure to Dimethoate and Pirimicarb after 21 d in clean water:
- Number of off-spring significantly lowered.
- Weigh of offspring reduced.
- Size of exposed mother animals reduced.