## Adapting standardised toxicity tests for anthropogenic particles using a copepod model organism

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## Abstract

To evaluate the risks posed by anthropogenic particles requires toxicity tests that can be used to determine thresholds for lethal and sub-lethal effects in representative biota. A plethora of toxicity tests are available for waterborne chemicals, but these protocols are often inappropriate for testing anthropogenic particulates such as microplastics. Here we adapt, optimise and trial the use of adapted partial life-cycle and 72 h lethal toxicity tests for anthropogenic particles using the globally-distributed, coastal and estuarine copepod Acartia tonsa. Trial exposures used 0-1  $\mu$ g/mL of a tripolymer microplastic blend comprising cryoground polyethylene, polypropylene and nylon particles (5-100  $\mu$ m). Adult female copepods were incubated with microplastics for 5 days and subsequently used in a 24-hour feeding and egg production experiment, allowing for determination of adult mortality, feeding rate, egg production rate and egg size. Copepod eggs were then incubated until > 50% of progeny had moulted into copepodite stage; preserved samples were subsequently used to calculate hatching success, juvenile mortality, larval development ratio and copepodite size. Here we discuss how existing protocols can be adapted for particle toxicity testing, and present lethal and sub-lethal (feeding, fecundity, development, growth) dose concentrations for microplastics. The test provides a method for comparing the toxicity of anthropogenic particles, with the focus on apical endpoints (survival, growth, reproduction) which are of high relevance to ecosystem health.

Keywords: Copepod, toxicity, survival

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