
Sensitivity of sea urchin larvae to car tire leachates

Sinja Rist^{*1}, Jessy Ledu-Carrée², Kevin Ugwu², and Rodrigo Almeda²

¹Technical University of Denmark – Kemitorvet 2800 Kgs. Lyngby, Denmark

²University of Las Palmas de Gran Canaria – Juan de Quesada, 30 35001 Las Palmas de Gran Canaria, Spain

Abstract

Abrasion of car tires is recognized as a major source of microplastics in the environment. The composition of these particles is highly complex, including rubber, a diverse array of chemical additives and heavy metals. Various of these compounds can leach from the particles into the marine environment presenting a cocktail of chemicals to marine biota. Still, little is known about the effects of car tire leachates on marine species. The aim of this study was to test the effects of car tire leachates on the early development of the three dominant species of sea urchins in Gran Canaria: *Paracentrotus lividus*, *Arbacia lixula*, and *Diadema africanum*. We prepared leachates of micronized car tires ($< 250 \mu\text{m}$) at a concentration of 1 g/L for 72h on rollers in darkness. The car tires as well as their leachates were analyzed for polycyclic aromatic hydrocarbons, selected additives and heavy metals. Embryos of each species were exposed to a range of leachate dilutions (100%, 75%, 50%, 25%, 12.5%, 6.25%) at static conditions for 72h. At the end of exposure, we analyzed the level of mortality, the occurrence of abnormal development, and the size of the larvae. We found concentration-dependent mortality as well as abnormal development in all three species. Concurrently, there was a concentration-dependent decrease in larval growth. However, sensitivity differed greatly between species: the EC50 values for *P. lividus* and *A. lixula* were 15.8% and 34.5%, respectively. *D. africanum* showed high levels of mortality with a LC50 of 45.6%. For *P. lividus* we additionally tested effects on enzymatic activity to investigate their applicability as sensitive biomarkers in invertebrate larvae. Overall, the results show that chemicals from car tires can be hazardous to marine invertebrates and a better understanding of their concentration, fate, and impact in the natural environment is needed.

Keywords: tire wear particles, early development, mortality, growth, enzymatic activity, microplastics

^{*}Speaker