

HOW CAR TIRE LEACHATES AFFECT SEA URCHIN LARVAE

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Abstract:

Abrasion of car tires has been 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 sea urchin *Paracentrotus lividus*. We prepared leachates of micronized car tires (<250 µm) 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 *P. lividus* 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 (4.9-37%) in the 50-100% treatments. However, a diverse set of malformations occurred at lower dilutions, starting at 12.5%. The number of larvae with such abnormal development as well as the severity increased with leachate concentration. Concurrently, there was a concentration-dependent decrease in larval growth. The analysis of leachate composition revealed high levels of naphthalene, zinc and strontium, which may be responsible for some of the observed effects. These 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.

Key words: tire wear particles, *Paracentrotus lividus*, early development, mortality, microplastics

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