



Unmasking the Environmental Impacts of Artificial Turf with Rubber Infill

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Rubber Infill and Its Advantages

Plastic is a utility material that can become a source of contamination in the environment, disrupting endocrine and metabolic functions in humans and animals¹.

Rubber infill, and its composition²

Microplastic with a size of about 2 mm

- Polycyclic aromatic hydrocarbons
- Heavy metals
- Phthalates
- Phenols
- Volatile organic hydrocarbon

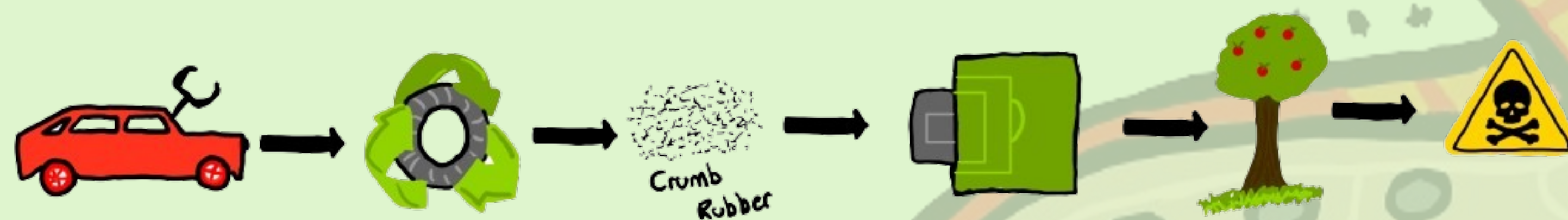


Fig 1. Pathway of tire particles and leachates desperation to the environment.

Benefits of Using Rubber Infill³

- Cheaper
- Reduces water content
- Easy access
- High lifespan
- Mimics soil substrate
- Good for damping

References

- ¹Stevens et al., 2024. *Environmental Science & Technology*. 58(11), 4859–4871.
²Massey et al., 2020. *A Journal of Environmental and Occupational Health Policy*, 30(1), 10–26.
³Evans, 2021. *Tire Waste and Recycling*. 483–497.
⁴Murphy, M., & Warner, G. R, 2022. *Environmental Pollution* (Barking, Essex : 1987), 310, 119841.
⁵Chibwe et al., 2022. *Environmental Toxicology and Chemistry*, 41(5), 1144–1153.
⁶Tian et al., 2021. *Science*. 371(6525), 185–189.

Toxicological Effects of Rubber Infill

In humans¹

- Carcinogen
- Neurotoxic
- Endocrine disruptor

In rodents⁴

- Decreased thymus and ovary weights
- Increased liver weight

In fish⁵

- Enhanced liver enzyme activity
- Malformations
- Hatching delay
- Mortality

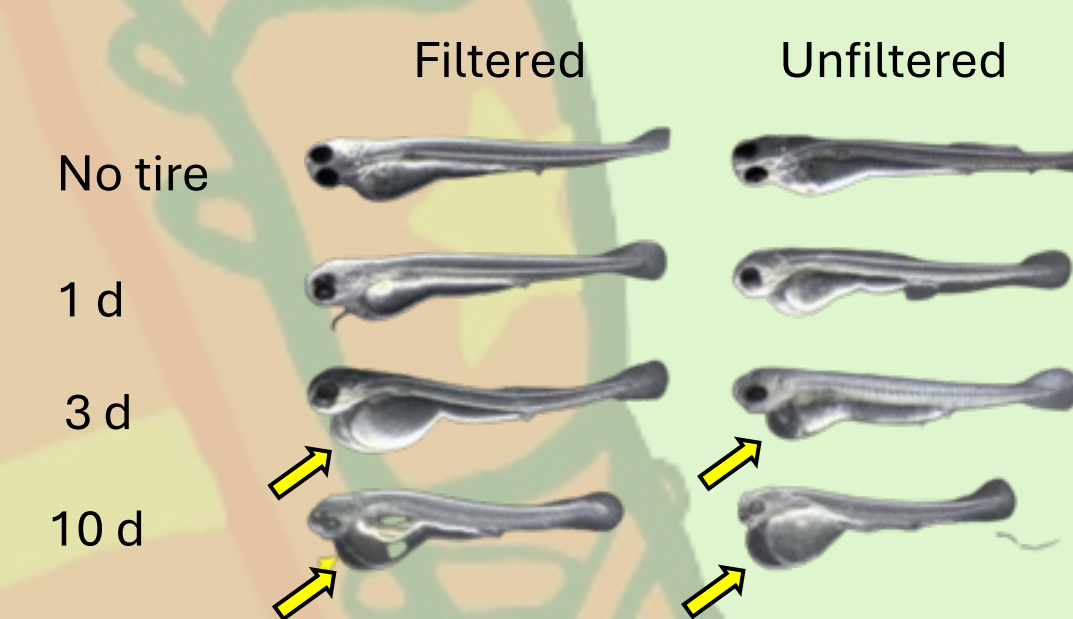


Fig 2. Effects on fathead minnow fry after exposure to filtered and unfiltered tire particle leaches⁵. Decreased eye and body pigmentation, reduced lengths and cardiac edemas (yellow arrows) are observed by increasing leaching day (d).

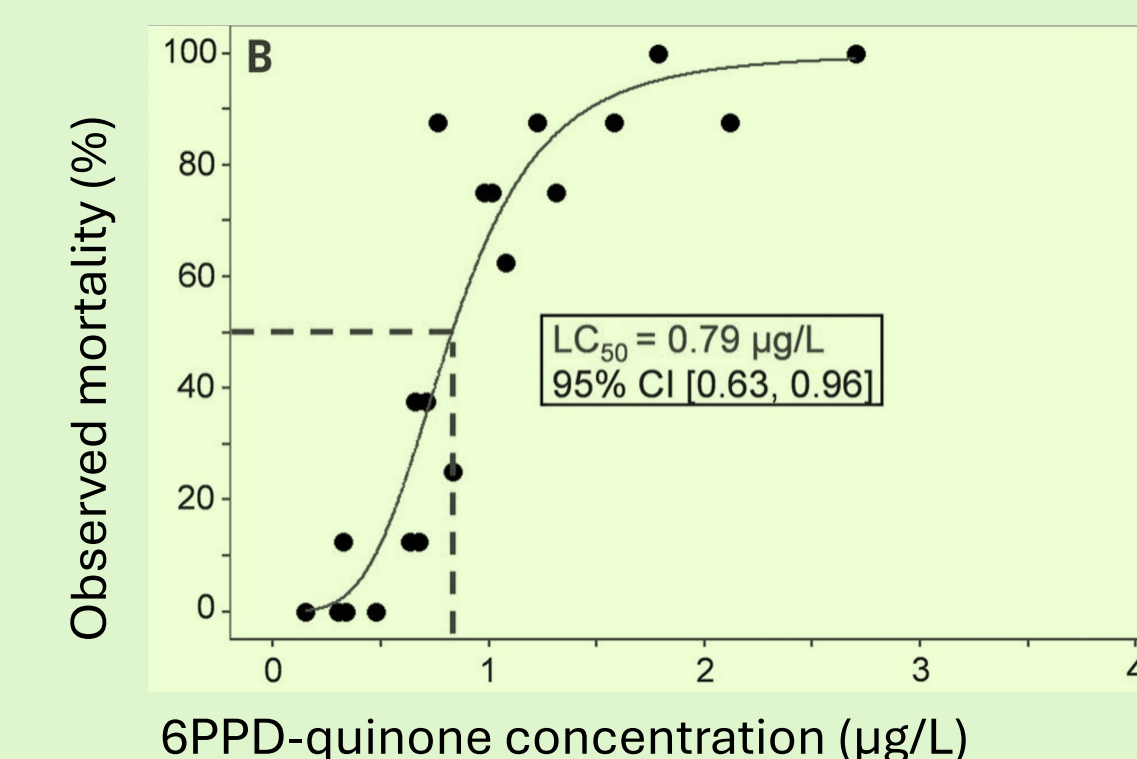


Fig 3. Juvenile coho were exposed to ozone-synthesized 6PPD-quinone⁶. Time of exposure was 24 h across ten concentrations with two replicates, in total 160 fish.

6Phenylphenylenediamine (6-PPD)-quinone⁶

- An oxidized form of an additive designed to safeguard tire rubber against ozone-induced damage.
- Concentration in tire particles is sufficient to cause acute toxicity incidents in coho salmon (Fig 3).

Alternatives

Due to the environmental concerns regarding Rubber infill, some alternatives with non-toxic effects are suggested:

- Acrylic polymer-coated sand: A durable infill with anti-microbial properties
- Organic infill: Made of from cork, processed nutshells, or coconut fibers