

Webinar Highlights

Organic Contaminants in Tire Crumb Rubber

Research on the production, use, and disposal of artificial turf has brought to light concerns over human health and environmental hazards.

In the webinar *Environmental Health Impacts of Synthetic Turf and Safer Alternatives*, Dr. Rachel Massey and Lindsey Pollard discussed research conducted at the Toxics Use Reduction Institute (TURI) on health and environmental implications of artificial turf and safer alternatives. Dr. Zhenyu Tian summarized the identification in crumb rubber of 6PPD-quinone as a lethal toxicant for coho salmon. He discussed knowledge gaps and ongoing research about crumb rubber infill materials. To conclude, Dr. Sarah Evans spoke from a pediatric environmental health perspective, touching on routes of exposure and concerns specific to children, with an emphasis on what families and communities can do to use safer alternatives.

Featured Speaker: Dr. Zhenyu Tian, Assistant Professor at Northeastern University, speaking January 27, 2022.

This fact sheet has been created by CHE based on information presented in a CHE webinar. This fact sheet focuses on Dr. Tian's portion of the webinar. Selected quotes in bold are from the webinar speaker(s). For the full set of resources provided by the webinar presenters, see the [webinar page](#), where you'll also find associated Slides & Resources.

The Problem

In the Pacific Northwest, the salmon return every fall to lay their eggs. In urban creeks in Washington state, coho salmon are dying before they can spawn. They have been observed losing their equilibrium, swimming in circles, and gaping for air. Within hours, they die. Dr. Tian warned that if they continue to die at current rates, coho salmon in these areas could go extinct within decades. This particular effect is not found in all species of salmon; chum salmon do not show these symptoms.

A study found that this coho mortality syndrome is linked to urbanization and traffic intensity. The amount of urbanization in an area predicts the risk of coho mortality. This correlation suggests that something toxic in the road runoff was killing the coho.

Researchers sampled the water where coho were killed. They identified tire rubber leachate as a possible cause. To verify this, researchers exposed coho and chum salmon to water with tire rubber leachate. The coho died while the chum survived.

Tire leachate contains thousands of chemicals. Further studies identified one specific chemical in the leachate that has the same effect on coho. The molecular formula of the chemical is $C_{18}H_{22}N_2O_2$. This chemical was not previously known to be in tires. A similar chemical, $C_{18}H_{24}N_2$. ("6PPD"), is commonly used in tires.

Key finding: The researchers determined that the chemical killing coho is a transformation product from 6PPD. They identified the new chemical as 6PPD-quinone. This chemical is leaching out of tire rubber and killing salmon.

Further research confirmed that wherever you have traffic and tire dust, 6PPD-quinone is present. Researchers also confirmed that 6PPD-quinone is toxic to coho in very low concentrations. More research is being done now to determine the effects of 6PPD-quinone on other species.

Tire crumb is used in most artificial turf infills. Samples taken of artificial turf contained both 6PPD and 6PPD-quinone. The samples also contained other chemicals of concern, including known and potential endocrine disruptors. As Dr. Tian explains, many of these chemicals are "emerging" or unknown. The toxicology has not been assessed; we don't know how toxic they are.

Recommendations

Products such as artificial turf cannot be considered safe. The tire crumb used in artificial turf contains known and, likely, unknown toxicants. Whole mixture toxic assessment is needed.

"Without a comprehensive risk assessment, we cannot say 'those things are safe'."

To Find Out More

- Watch the January 27, 2022 webinar:
<https://www.healthandenvironment.org/webinars/96595>
- Read the webinar slides:
 - Massey and Pollard: [Artificial Turf and Safer Alternatives](#)

- Zhenyu Tian: [Organic Contaminants in Tire and Crumb Rubber: 6PPD-Quinone and Beyond](#)
- Sarah Evans: [Artificial Turf and Children's Health](#)
- Read the [Webinar Q&A](#).
- Read the study that identified the coho-killing chemical: <https://www.science.org/doi/abs/10.1126/science.abd6951>
- Read more about the sudden death of migrating coho salmon and 6PPD-quinone: <https://www.science.org/content/article/common-tire-chemical-implicated-mysterious-deaths-risk-salmon>

About the Speaker



Dr. Zhenyu Tian is an Assistant Professor at Northeastern University. He received his Ph.D. from UNC-Chapel Hill, and worked as a postdoc research scientist at the University of Washington Tacoma. His research uses cutting-edge methods in analytical chemistry, toxicology, and data analysis to identify emerging organic contaminants in the environment. He is curious about the contaminants that are most relevant to human's health and the ecosystem.