Focus on: Finding Solutions to 6PPD

Figure 1. The Washington Department of Fish and Wildlife and the Puyallup Tribe of Indians monitor toxic contaminants, including 6PPD-quinone, in seaward migrating juvenile Chinook salmon from the Puyallup/White River watershed. Photo: Andrew Berger, Puyallup Tribe of Indians.

6PPD in Washington State

6PPD is an antioxidant and antiozonant used in motor vehicle tires to prevent tire cracking and promote tire longevity. In 2020, Washington State University and University of Washington researchers discovered that 6PPD ozonation leads to the harmful breakdown product 6PPD-quinone (6PPD-q). This chemical has been identified as the second most toxic aquatic chemical ever measured and causes rapid mortality to species of cultural and environmental significance like the coho salmon.

Washington State's work focuses on three objectives:

1. Reducing sources of 6PPD in the environment, including identifying a safer alternative;
2. Minimizing and mitigating the impact of 6PPD in the environment; and
3. Furthering research to better understand 6PPD's effect on human health and key aquatic species.

Statewide Projects

6PPD Action Plan

Washington State is leading development of a statewide 6PPD Action Plan.[1] We are responding to emerging science by producing the plan in phases. Currently, we are developing recommendations that respond to priority and near-term research needs and data gaps. In future phases, we will develop long-term recommendations that reduce the impact of 6PPD and 6PPD-q on people and the environment.

State, Tribal, and Federal Puget Sound Stormwater and Transportation Charter Group

Washington State is partnering with the U.S. Environmental Protection Agency and Tribes in Washington to remove toxics from stormwater before they reach salmonid-bearing surface waters. We've identified 16 demonstration projects based on coho stream crossings along a gradient of traffic conditions.

Interstate Technology & Regulatory Council's Tire Anti-Degradant (6PPD) Team

Ecology and Health collaborate with Federal, State, and Tribal governments, municipalities, and community members to develop 6PPD and 6PPD-q guidance documents and tools, including this fact sheet.[2] These resources are intended to broaden and deepen technical knowledge and expedite quality regulatory decision-making at the state and local level.

Department of Ecology

Alternatives Assessment

Ecology's alternatives assessment will identify, compare, and select safer alternatives to 6PPD in tires. In November 2021, Ecology published the 6PPD Hazard Assessment.[3] The assessment reviewed existing anti-degradants that could potentially replace 6PPD in tires. The 6PPD Hazard Criteria,[4] developed October 2023, describe specific data requirements and standards to assess chemical safety of alternatives to 6PPD. Ecology will use these hazard criteria when comparing the safety of possible replacement chemicals during the alternatives assessment.

Safer Products for Washington

Ecology has listed 6PPD as a priority chemical[5] and motorized tires as a priority consumer product under the Safer Products for Washington program. The Safer Products for Washington program provides a state framework for regulating chemicals in consumer products. If a safer alternative is feasible and available, Ecology could restrict the sale of tires containing 6PPD through this program.

Water Quality

Figure 2. We want to better understand the concentrations of chemicals in stormwater when it rains, including 6PPD-q. Field staff for King County Environmental Lab collect a stormwater runoff sample from the highway above. Photo credit: KCEL.

Ecology has proposed adding requirements to address 6PPD in multiple general permits. The updated municipal stormwater permits[6] will be finalized by end of June 2024 and the industrial stormwater general permit[7] will be finalized by December 2024. Section 1.5[8] and the Emerging Guidance Section[9] of the stormwater management manuals already contain guidance for effective 6PPD-q best management practices (BMPs). In February 2024, Ecology proposed a freshwater acute criterion for 6PPD-q in our draft aquatic life toxics criteria rulemaking.[10] In June 2022, Ecology, university researchers, and industry experts issued a stormwater BMP effectiveness report[11] providing best professional judgement on existing BMP options and their likelihood to manage 6PPD and 6PPD-q. Ecology continues to fund BMP effectiveness projects.[12]

Sampling and Monitoring

Statewide partners supported Ecology's development of the 6PPD in Road Runoff[13] report. This report discusses the complexity of finding 6PPD-q in the environment and identifying the most vulnerable areas. Ecology's Manchester Environmental Laboratory was the first in the nation to produce an accredited 6PPD-q standard operating procedure[14] for analyzing 6PPD-q in water samples.

Mapping

Ecology developed a tire contaminant story map[15] that details traffic, salmon distribution, and watershed characteristics. The story map identifies locations of coho salmon, brook trout, rainbow trout, and steelhead that are at risk of 6PPD-q exposure.

Department of Fish and Wildlife

The Department of Fish and Wildlife is partnering with chemists at the National Oceanic and Atmospheric Administration's Northwest Fisheries Science Center laboratory. They are developing analytical methods to test for 6PPD, 6PPD-q, and other tire-related compounds in juvenile Chinook salmon and bay mussels whole-body tissue and English sole bile and plasma. 6PPD-q was detected in a subset of all tissue samples. The potential impacts for each species at the measured concentrations are currently unknown. Learn more about how the Department of Fish and Wildlife's Toxics Biological Observation System (TBiOS) monitors toxic contaminants in fish[16] and other organisms living in Puget Sound.

Figure 3. A mussel cage anchored at Duwamish Head in Elliott Bay during a 2020 TBiOS study. Photo credit: Puget Soundkeeper.

Department of Health

Department of Health toxicology staff are tracking and compiling research on human exposure and health effects of 6PPD, 6PPD-quinone, and other transformation products. They are preparing an assessment of available human health data and information gaps on 6PPD and its transformation products for the 6PPD Action Plan.

Department of Transportation

Figure 4. Stormwater retrofits help reduce 6PPD-q pollution. This pilot project tests the effectiveness of bioretention planter boxes to treat 6PPD-q. Photo credit: WSDOT.

The Move Ahead Washington transportation funding package includes $500 million over 16 years for stormwater retrofits to enhance stormwater treatment from existing roads and infrastructure, with an emphasis on green infrastructure retrofits. This includes $6 million to establish a new stormwater treatment facility and treat 6PPD-q at the Interstate 5 Ship Canal Bridge in Seattle. The Washington State Department of Transportation (WSDOT) is developing a prioritization plan to invest funds in cost-effective projects that accomplish the following goals:

- Provide benefits to salmon recovery and ecosystem health.
- Reduce pollution, including 6PPD-q.
- Address health disparities.

Learn more about stormwater retrofits on WSDOT's Move Ahead Washington folio.[17]

Related Information

- 6PPD webpage: Tire anti-degradant (6PPD) and 6PPD-quinone[18]
- The Connection Between Tires, Fish, and Us[19]
- Focus on: Best Management Practices for 6PPD-q[20]
- Focus on: Reducing Sources of 6PPD[21]
- Focus on: Monitoring 6PPD-q in the environment[22]
- 6PPD resources[23]
- Join our 6PPD email list to stay up to date on Ecology's 6PPD work[24]

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[1] www.ezview.wa.gov/site/alias__1962/37915/6ppd_action_plan.aspx
[2] 6ppd.itrcweb.org/wp-content/uploads/2023/09/6PPD-Focus-Sheet-Web-Layout-9.pdf
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