DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES

Reducing pesticide runoff into Puget Sound may increase orca survival

Our research has found that marine mammals, including orcas, lack a key protein that provides protection from certain pesticides. Reducing contamination in local waters could help.

Orcas, like other marine mammals, lack a key protein that provides protection from certain pesticides. Their bodies do not produce active paraoxonase 1 (PON1), a protein that can protect against pesticides.

Organophosphate pesticides are used primarily to kill insect pests on crops, and many of these toxic pesticides end up in Puget Sound as agricultural runoff.

The result: Orcas are being exposed to toxins against which they have no protection.

Orcas in Puget Sound.

Orcas exposed to toxins directly and indirectly

Most land mammals have functional PON1 genes that protect them from organophosphate pesticides, which can inhibit the central nervous system, causing paralysis and brain damage.

Recently, researchers from Nathan Clark and Wynn Meyer's team at the University of Pittsburgh teamed up with Clement Furlong and Judit Marsillach of the UW Superfund Research Program, to demonstrate that mutations in the PON1 gene in marine mammals eliminated PON1 activity.

In lab experiments, mice with a deleted PON1 gene die from levels of pesticide exposure that have no effect on normal mice. Without PON1, mammals are more vulnerable to certain insecticides, including diazinon and chlorpyrifos.

These pesticides can also stunt the growth, swimming ability and reproductive systems of salmon. Orcas eating these contaminated salmon are exposed to a concentrated dose of harmful pesticides.

Reducing organophosphate contamination in Puget Sound could help increase orca survival by reducing their direct exposure and the exposure of their salmon prey.

About the UW Superfund Research Program

The University of Washington Superfund Research Program is an interdisciplinary program that conducts and communicates about research on the impacts of metal neurotoxicity on human and ecological health. Our research focuses on metals that commonly occur at Superfund hazardous waste sites. The program is housed at the UW Department of Environmental & Occupational Health Sciences.

LEARN MORE

- ☐ The Furlong lab: http://www.gs.washington.edu/faculty/furlong.htm
- ☐ UW Superfund Research Program: http://deohs.washington.edu/srp/
- ☐ News stories about recent PON1 finding:
  National Geographic: https://on.natgeo.com/2MwSjhL
  The Atlantic: https://bit.ly/2Bh8PRM
- ☐ A biological opinion by the National Oceanic and Atmospheric Administration outlining the harmful effects of chlorpyrifos, diazinon, and malathion on endangered species, including orcas and salmon: https://bit.ly/2SAepDq

CONNECT

address 4225 Roosevelt Way NE, Box 354695, Seattle, Wa 98195-4695
phone 206.685.8244 **twitter** @uw_srp
email sfund@u.washington.edu

November 2018 Photos: Courtesy of Robert Pittman and Frank Busch.