Apr 4th, 2:00 PM - 2:15 PM

PCB and PBDE levels in southern and northern resident killer whales: update on contaminant levels and related health effects

Marie Noel
Ocean Wise, Canada, marie.noel@ocean.org

Gina Maria Ylitalo
Northwest Fisheries Science Center (U.S.), gina.ylitalo@noaa.gov

Brad Hanson
Northwest Fisheries Science Center (U.S.), brad.hanson@noaa.gov

Jared R. Towers
Canada. Department of Fisheries and Oceans, jared.towers@dfo-mpo.gc.ca

Peter Ross
Ocean Wise, Canada, peter.ross@ocean.org

Follow this and additional works at: https://cedar.wwu.edu/ssec

Part of the Fresh Water Studies Commons, Marine Biology Commons, Natural Resources and Conservation Commons, and the Terrestrial and Aquatic Ecology Commons

Noel, Marie; Ylitalo, Gina Maria; Hanson, Brad; Towers, Jared R.; and Ross, Peter, "PCB and PBDE levels in southern and northern resident killer whales: update on contaminant levels and related health effects" (2018). Salish Sea Ecosystem Conference. 30.
https://cedar.wwu.edu/ssec/2018ssec/allsessions/30

This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Salish Sea Ecosystem Conference by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.
PCBs and PBDEs in resident killer whales: update on contaminant levels and related health effects

Marie Noel*, G. Ylitalo, B. Hanson, F. Gobas, J. Towers and P.S. Ross

*Ocean Wise Conservation Association, Vancouver BC
Introduction

- Resident killer whales face 3 main threats
  - Noise
  - Prey abundance
  - Contaminants

- POPs bio accumulate up the food chain

- Southern resident killer whales are the most PCB-contaminated marine mammals on the planet (Ross et al., 2000)

- Risk of adverse health effects
Methods

- Blubber biopsy were collected in 2016 and 2017
- PCB and PBDE analyses
- Stable isotopes
- Fatty acids
- Gene expression
PCB levels in northern and southern residents

- PCB concentrations (mg/kg lw)

- 1 year old
- 2 year old
- Females
- Males

SR NR
PBDE levels in northern and southern residents

PBDE levels are an order of magnitude lower compared to PCBs
Temporal trends in northern residents
PCBs and PBDEs
What does it mean for their health?

Toxicity Reference Values (TRV) have been derived for marine mammals and provide benchmarks for conservation, mitigation and/or risk management.

- Only 3 NR females had levels below the PCB threshold of 1.5 mg/kg lw
- PBDE levels were above the threshold of 1.3 mg/kg only in the one year old SR
Investigating mRNA levels in killer whales

Increasing sensitivity
Decreasing response time

Ecosystem
Population
Individual
Physiological level
Molecular level

Early warning signal of health effects in killer whales
Hormone receptors

- Estrogens important for cellular differentiation, organ development and reproduction
  - ERα
    - R² = 0.28
    - p = 0.048

- Thyroid hormones important for growth, development and metabolism
  - TRα
    - R² = 0.34
    - p = 0.01
  - TRβ
    - R² = 0.22
    - p = 0.01
Stress-related genes

**GR**
- \( R^2 = 0.58 \)
- \( p = 0.023 \)

**hsp**

Important involvement in the hypothalamic – pituitary – adrenal (HPA) axis

Important to protect cells against stress

Impaired ability to efficiently respond to various stresses
Conclusions

- Concentrations of PCBs and PBDEs are still of concern in resident killer whales despite regulations.

- Our preliminary genomics results suggest that individuals are likely at increased risk of reproductive, immune function and developmental effects.

- Additional analyses on the way including multivariate stats with fatty acid, stable isotope and gene expression data.
Thank you

Acknowledgements
Funding provided by Fisheries and Oceans Canada, National Fish and Wildlife Foundation and SeaWorld and Bush Gardens Conservation Funds.
Thanks to L. Barrett-Lennard, Robyn Pearce
Photo credits: Jared Towers and Lance Barrett-Lennard