

RECENT FINDINGS IN RINGED SEALS

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Metabolomics could help better understand impact of contaminants and climate change in ringed seals



Reason for the study

Arctic ringed seals are exposed to contaminants including mercury (Hg) and persistent organic pollutants, such as polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs), as a result of the contamination of food webs from long-range atmospheric transport and some local sources. These contaminants can alter their hormonal levels, interfere with their reproduction, and disrupt mechanisms that allow them to store their energy properly.

Climate change also represents an additional layer of stress, particularly due to declining sea ice conditions. Ringed seals are vulnerable to such changes, as they depend on ice for foraging, breeding, resting, molting and protection against predators.

In this research, we used metabolites as a tool to assess the potential impacts of contaminants and climate change in adult ringed seals from Lake Melville, Labrador. Metabolites are small molecules that are generated by the body to regulate the proper functioning and health of an organism. Metabolite profiles were investigated in four different ringed seal tissues (i.e., liver, plasma, inner and outer blubber) to identify which tissue could be the most optimal for use in assessing the impacts of contaminant and climate related stressors.

HIGHLIGHTS

TISSUE SPECIFICITY

Blubber was mainly characterized by a greater proportion of lipids, and liver and plasma by amino acids, sugar and biogenic amines.

CONTAMINANT IMPACT?

The flame retardant HBB correlated with several blubber metabolites which could be either associated with nutritional status changes or a toxicity inducing the disruption of lipid metabolism.

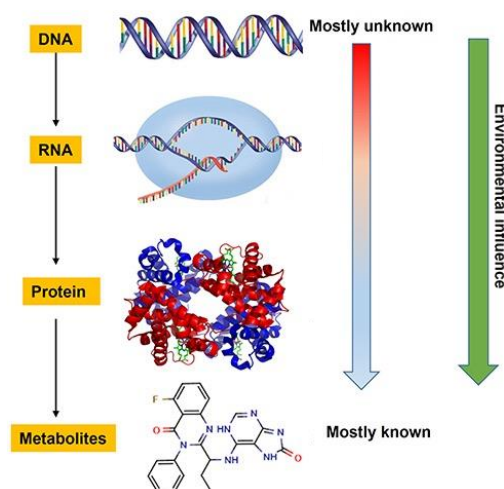
WHICH TISSUE TO USE?

Plasma and liver are more suitable for studying changes in diet, and liver and blubber for studying the impacts of contaminants.

A little more detail

- This study was made possible thanks to the sharing of liver, plasma and blubber samples from 10 adult male ringed seals harvested from the Lake Melville in 2019.
- A total of 235 metabolites were measured in liver, plasma and blubber, 206 PCB and 65 PBDE congeners were analyzed in blubber, and total Hg was measured in muscle.
- Total Hg and PBDE concentrations in ringed seals from Lake Melville were greater than those reported in populations from Northern Labrador and elsewhere in the Arctic, while PCBs were within the same range of concentrations reported in males from Northern Labrador.
- This study shed some light on the factors affecting marine mammal health and may offer guidance for at-risk species studies where samples are limited to skin/blubber biopsies.

What is metabolomics?



Metabolomics is the comprehensive, qualitative, and quantitative study of all the small molecules in an organism.

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Metabolomics can be used to determine differences between the levels of thousands of molecules between a healthy and diseased animal.

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Metabolomics represents the interface between the influence of inherited traits and the environment.



Do you want to know more?

The content of this newsletter comes from the following article:

Simond et al., 2022. A Multi-Matrix Metabolomic Approach in Ringed Seals and Beluga Whales to Evaluate Contaminant and Climate-Related Stressors. *Metabolites*, 12, 813, doi:10.3390/metabo12090813.

This open-source scientific paper can be downloaded here: <https://www.mdpi.com/2218-1989/12/9/813>

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