

NRP Endocrine Disruptors

Final Summary

Original project title Brominated flame retardants and other endocrine disrupting chemicals in the ecosystem of Thunersee - environmental fate and correlation to biological effects (FLEET)
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Endocrine disrupting chemicals in Thunersee - fate and effects

Concentrations and temporal trends of brominated flame retardants and other endocrine disrupting chemicals in the Thunersee ecosystem were measured and modeled in air, water, fish, and sediments. Our results do not support the hypothesis that the gonad malformations observed in whitefish from Thunersee are linked to these chemicals.

Research questions

Brominated flame retardants are chemicals that are added to materials such as plastics and textiles to prevent fires. Certain brominated flame retardants exhibit endocrine activity and some of them show the characteristic properties of persistent organic pollutants (slow degradation, bioaccumulation and long range transport). Concentrations and temporal trends of these chemicals in the Thunersee ecosystem were measured and modeled in air, water, fish and sediments. In order to explore if gonad malformations occurring in whitefish from Thunersee are linked to the presence of persistent endocrine disrupting compounds, concentrations of a selection of chemicals in fish samples were compared according to ecotype, sex, sampling site and morphology.

Results

The required analytical techniques to detect less than 0.000'000'000'1 g of these compounds in 1 liter of lake water were successfully developed. In ambient air, we found that concentrations of some brominated flame retardants have now exceeded the levels of polychlorinated biphenyls (PCB), a notorious persistent technical chemical that has been banned more than 25 years ago. Sediment analysis revealed that environmental concentrations of brominated flame retardants

have rapidly increased since the mid 1970/1980s. In addition, we found evidence for the formation of potentially endocrine active transformation products, originating from decabromodiphenyl ether (DecaBDE), a brominated flame retardant that is currently produced in quantities exceeding 70,000 t/y. Regarding the investigation of whitefish from Thunersee, our results do not support the hypothesis that the gonad malformations observed are linked to these chemicals.

Perspectives

The data and knowledge obtained on brominated flame retardants including decabromodiphenyl ether and hexabromocyclododecane (HBCD) proved to be an excellent asset to the on-going EU risk assessments for these two chemicals and to the NRP50 Consensus Platform on brominated flame retardants. The multimedia box model that was developed by our colleagues at ETHZ shows promising first results and will be further refined, using an updated data set that will be available by next summer.