Project information

Project title
Evaluating the significance of spatial variability and body mass index (BMI) for human concentrations of persistent organic pollutants (POPs) in northern areas

Year
2019

Project leader
Therese Haugdahl Nøst

Geographical localization of the research project in decimal degrees (max 5 per project, ex. 70,662°N and 23,707°E)
The project focus area for human blood samples is in Tromsø county (69,649°N and 18,955°E) but the aspect regarding spatial variability has in 2018 included available PCB results in fish samples from any location along the Norwegian coast line.

Participants

Therese Haugdahl Nøst, NILU/UiT; thn@nilu.no / therese.h.nost@uit.no

Torkjel Sandanger, UiT; torkjel.sandanger@uit.no (TSA)

Charlotta Rylander, UiT; charlotta.rylander@uit.no (CR)

Knut Breivik, NILU; knut.breivik@nilu.no (KBR)

Ingjerd Sunde Krogseth, NILU; isk@nilu.no (ISK)

Linda Hanssen, NILU; linda.hanssen@nilu.no (LHA)

Sylvia Frantzen, IMR; sylvia.frantzen@hi.no (SF)

Flagship
Hazardous Substances

Summary of Results

This three year project aims to explore how (i) human lipid dynamics (represented by body mass index; BMI) and (ii) spatial variability may influence human exposure to POPs in Norway. Past modelling of human PCB concentrations had indicated that these two factors could be improved in the model parameterization to improve coherence with measurements. Also, recent developments of the model framework include parameterizations of the spatial resolution of the physical environment along with expansion of dietary sources relevant for Arctic regions. The activities during the initial year focused on (i) preparing empirical data for time trends of PCBs for BMI groups; and (ii) initial compilation of geographical variation along the Norwegian coast line for PCBs in fish. During the second year the activities were focused on i) continue the data compilation and evaluate geographical variation in PCBs in fish. This work was prepared as a master thesis during the spring of 2019; and ii) continuing on the compilation of human PCB concentrations related to BMI and prepare the code for mechanistic modelling of PCBs accounting for BMI.

i) Aspects related to BMI

The competence and code for modelling time trends while regarding lipid dynamics (i.e. accounting for body weight) has been developed at a research group at the University of Toronto. This research group and the modelling competence at NILU has long-term collaborations. To reach out for this collaboration, a project description where empirical results for time trends of POPs according to BMI categories was compiled during the initial year. The project description also served as a start for the publication that is planned and includes description of time trends in measurements in blood samples from two sample sets in the Tromsø Study that have been analyzed for a suite of polychlorinated biphenyls (PCBs). The project description including the initial description of the aims of the study was sent to the leader of the research group, Professor Frank Wania, and he was positive to this initiative and we got the information sufficient to start writing our own code during the late Summer of 2019. We have implemented a test code that is being evaluated and improved and will be finalized before Christmas 2019.

ii) Spatial variability

For the spatial variability part of the project, the collection of information and data regarding fish concentrations progressed ahead of planned progress in the initial year. The efforts during 2019 have focused on finalizing the compilation of geographical variation along the Norwegian coastline for PCBs in fish (wild-caught salmon, cod and herring) from reports found online and from data received late 2018 from the Institute of Marine Research (IMR). The data compilation included information on location, individual or pooled samples, sum or individual congeners. From IMR, we obtained comprehensive measurement data throughout the Norwegian coastline for PCBs in cod, herring and salmon (muscle and liver). Our contact person was included as a project partner in 2019 and has contributed with knowledge regarding these data and will be more involved in the final year of the project. All compiled data on PCBs and dioxins in cod, herring and salmon was used to compare to safety thresholds for safe human consumption and this work formed the basis of a master thesis in Public Health at UiT that was submitted in May 2019.

Master and PhD-students involved in the project

1 Master's thesis in Public Health, UiT, May 2019, Sia Gerard:

Geographic variation of human dietary intake of PCBs from Norwegian coastal fish species and potential health risks of consumption

For the Management

This project will contribute to its field of research but as it is in its second year, results are not yet finalized. The proposed project has a planned duration of three years (2018-2020). WP1 was the planned focus in the first period and WP2 the main focus of the second. The start of WP1 was delayed during 2018 due to other ongoing projects, but during August 2018 a master student started on work related to WP2 so this part of the project started earlier than planned. The project progress overall as of October 2019 is according to the scheduled end in 2020.

Published Results/Planned Publications

Published results:

1 Master's thesis in Public Health, UiT, May 2019, Sia Gerard:

Geographic variation of human dietary intake of PCBs from Norwegian coastal fish species and potential health risks of consumption

Planned publications:

Repeated measurements of POPs, BMI and lipids in Norwegians from 1979-2007 in concert with mechanistic modeling: evaluating time trends and the importance of concurrent time trends in body lipid mass

Communicated Results

Krogseth, I.S. Air pollution. Guest lecture in the course "HEL-3030: International and environmental health", UiT – The Arctic University of Norway, January 10th 2019, Tromsø, Norway.

Krogseth, I.S.; Nøst, T.H.; Breivik, K.; Modellering som verktøy til å forstå utslipp, eksponering og bioakkumulering. Fram Centre Dialogmøte for the flagship "Hazardous Substances", 11. Oct 2019, Tromsø, Norway.

Nøst, T.H.; Rylander, C.; Berg, V.; Breivik, K.; Sandanger, T.M. Evaluating exposure to environmental contaminants across past decades in the context of effect studies today. The 26th Norwegian Epidemiology Conference. 13.-14. Nov 2019, Oslo, Norway.

The UiT master student Sia Gerard presented her thesis work with the title 'Are we eating to much fish?' at NILU, Framsenteret, Tromsø, Norway May 2th 2019.

Interdisciplinary Cooperation

The project involves partners within the fields of analytical and environmental chemistry, emission-based mechanistic environmental modelling, and epidemiology. This project benefited from the different competences and could not have been carried out without the close cooperation of the partners. Expanding the understanding of human exposure and the modelling competence requires many disciplines and is inherently interdisciplinary. In the application for the second year of funding, another valuable additional partner was included, namely the Marine Research Institute that has a large database for PCB concentrations in various species of fish.

Budget in accordance to results

This project was an extension of previous projects and the activities could not have been carried out without the funding from the Fram Centre. The budget was spent according to the estimations in the application. According to the updated plan, finalization of the results and publication will be expected in 2020 conditional on funding for this project from the Flag Centre flagship Hazardous substances.

Could results from the project be subject for any commercial utilization
No
Conclusions

The project is in its second year and results have not yet been finalized, so no conclusions are made at this stage although the work is approximately according to the overall schedule.