

Project information

Keywords

Human biomonitoring, PCBs, pesticides, PFASs, mechanistic modelling

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

2018

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

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Flagship

Hazardous Substances

Funding Source

Fram Centre flagship for 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 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 phramework include parameterizations of the spatial resolution of the physical environment along with expansion of dietary sources relevant for Arctic regions. The activities during this initial year have focused on (i) preparing empirical data for time trends of PCBs for BMI groups and utilizing that to reach out to the research group with the required modelling competence and code that can be implemented in the human module in our existing model framework.; and (ii) initial compilation of geographical variation along the Norwegian coast line for PCBs in fish.

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. The project description also serves 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 has indicated that he would respond to this request by responding to the document by early November 2018.

Granted that we receive the code, we are prepared to implement the code in our existing model framework by the end of 2018. In 2019, the focus will be to finalize model implementation and perform model evaluation

ii) Spatial variability

For the spatial variability part of the project, the collection of information and data regarding fish concentrations has progressed ahead of planned progress. The efforts during 2018 have focused on initial compilation of geographical variation along the Norwegian coastline for PCBs in fish (wild-caught salmon, cod and herring) from reports found online. The data compilation include information on location, individual or pooled samples, sum or individual congeners. The Marine Research Institute that has a large database for PCB concentrations in various species of fish and was contacted for a possible collaboration during 2018. We obtained comprehensive measurement data throughout the Norwegian coastline for PCBs in cod, herring and salmon (muscle and liver). Our contact person is included as a project partner in the proposal for 2019 and will contribute with knowledge regarding such data. These data will in 2019 be used to compare to safety thresholds for safe human consumption and form the basis of a master thesis in Public Health. In 2019, the focus will be to finish data collection of geographical variation in human dietary items. The assessment of fish consumption in relation to PCB exposure as the master thesis project is to be submitted by May 2019.

Master and PhD-students involved in the project

The aspects related to spatial variability in concentrations of PCBs in fish samples forms the basis for the project of a master student in Masters of Public Health at Department of Community Medicine at UiT that will be submitted May 2019. She has started to compile information and data on this and will perform the calculations necessary for the comparison to human consumption thresholds and assessment of whether there are some dietary habits in some geographical areas that exceed the safe thresholds.

For the Management

This project will contribute to its field of research but as it is in its first year, no results are 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 2018 is according to the scheduled end in 2020.

Published Results/Planned Publications

The results of the assessment of PCB concentrations in fish will comprise a MSc thesis in the Public Health programme. Also, a publication is planned related to human consumption of fish and comparisons of estimated consumption with safe human intake thresholds. A second publication will include the modelling and comparison with time trends of PCBs within different BMI classes. The project partners will be included as co-authors.

Communicated Results

None so far.

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 2019-2020 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 first year and no results have been finalized, so no conclusions are made at this stage although the work is approximately according to the overall schedule.