

Project information

Keywords

Human biomonitoring, PCBs, pesticides, PFASs, mechanistic modelling

Project title

Human biomonitoring and mechanistic modelling of organic compounds across time (1986-2007) in 30 year olds in Tromsø (HUMOR publications 2017)

Year

2017

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)

69,649°N and 18,955°E (Tromsø county)

Participants

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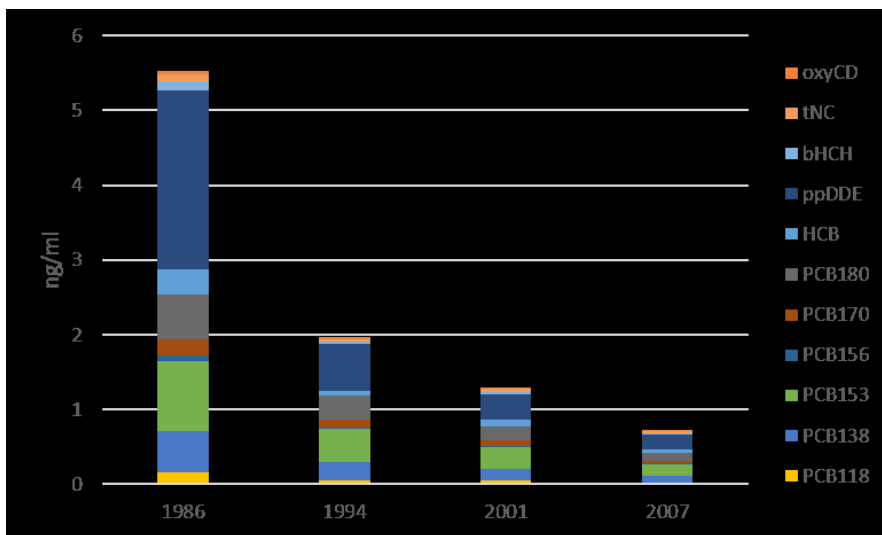
Flagship

Hazardous Substances

Funding Source

Fram Centre flagship for Hazardous Substances

Summary of Results



Samples were analysed for a suite of polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs) and per- and polyfluorinated alkyl substances (PFASs) in the main project HUMOR in 2016. Still, result processing and model comparisons with concentrations predicted by mechanistic exposure modelling for four selected PCBs was performed in 2017 under this project.

Part 1: Time trends of PCB and OCP concentrations in 30-year olds in the Tromsø Study

A summarised descriptive for the time trends of all PCBs and OCPs are displayed in the Figure above. As an example, the time trend for PCB-153 concentrations in thirty-year-old men and women from four different surveys of the Tromsø study (1989, 1994, 2004, and 2007) was clear. The PCB-153 concentrations are presented in the attached figure. The figure shows that the concentrations of PCB 153 for men (blue) and female (orange) decreased across the study period. Median concentrations in 1994, 2001, and 2007 were 45%, 28%, and 16%, respectively, of those in 1986. A decreasing trend was also predicted by the CoZMoMAN model, but the model overestimated the actual concentrations.

Part 2: Time trends of PFAS concentrations in 30-year olds in the Tromsø Study

Median PFAS concentrations in thirty-year-old men and women from four different surveys of the Tromsø study (1989, 1994, 2004, and 2007), as for PCBs, reflect historic production and use of PFASs in the subsequent years. Overall, levels of PFHxS, PFHpS, PFOS, and PFOA increased from 1989-2004 between the group of thirty-year-old followed by a decrease in 2007. This trend was not observed for the longest chained PFASs (C9-11), indicating divergent time trends between the different PFASs.

The concentrations in 30 year olds from northern Norway were generally lower than what was reported for a longitudinal study where the study group consisted of older men (Nøst et al., 2013). The time trend when comparing intra-individual time trends in 30 year olds are more pronounced as compared to the trends observed in older men in the same geographical region. This study have given us valuable data for historic concentrations of PFASs, PCBs, and OCPs in fertile men and women across the past two decades, and shows that when regulations restricts emissions of a compound the concentrations in the population will decrease.

Master and PhD-students involved in the project

The main project in 2016 formed the basis for the project of a medical student that was submitted May 2016.

The extension of the project into 2017 gave two postdoctoral students (THN and VB) the possibility of finalizing two publications from the work.

For the Management

This project used a multidisciplinary approach employing chemical analyses, mechanistic modelling and epidemiological statistics to expand the understanding of human exposure. Further evaluations and development of mechanistic models along with unique biomonitoring data can serve as useful tools for assessing past, present and future exposures in human biomonitoring studies as well as indicate effectiveness of chemical management. This project has contributed to this field of research.

Published Results/Planned Publications

Manuscripts for two publications are being finalized. The project partners are included as co-authors. Their tentative titles are:

Human biomonitoring of polychlorinated biphenyls and organochlorine pesticides in 30-year-olds in Northern Norway in the period 1986-2007. (Lead author THN)

Human biomonitoring of perfluorinated alkyl substances in 30-year-olds in Northern Norway in the period 1986-2007. (Lead author VB)

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 requires many disciplines and is inherently interdisciplinary.

Budget in accordance to results

This project was an extension of the HUMOR project (research project) funded in 2016 and the budget allowed for working hours to process results and draft manuscripts for publications. The budget was spent according to the estimations in the applicaiton.

Could results from the project be subject for any commercial utilization

No

Conclusions

The multidisciplinary approach used in this project (both 2016 and 2017), where chemical analysis, emission-based mechanistic modelling and epidemiological statistics were combined together and expand the understanding of human exposure. Demonstrating decreasing human concentrations of POPs following decreased production and use of the respective chemicals is of importance as the results demonstrate the impact of chemical regulation.