

Reproductive and environmental health in the Arctic

Jon Øyvind Odland

The Norwegian University of Science and Technology, Trondheim, Norway

An increasing number of exposure studies have been performed in the circumpolar Arctic over the past three decades. Exposure in this context means exposure to contaminants in the Arctic Environment (AMAP 2015). The AMAP 2015 report provides an overview of the different ongoing cohorts. These studies are now basis for more comprehensive studies in the context of studies funded by the EU (Palaniswamy et al 2021).

The MISA study of Northern Norway is basis for more detailed dietary assessment of the young and pregnant population (Xu et al 2021). The northern Norway mother-and-child contaminant cohort study – the MISA study – is a cross-sectional study with longitudinal aspects aimed at establishing a new northern Norway mother-and-child contaminant cohort study. The MISA database is considered suitable for exploring associations between contaminant exposure and diet, and enhancing the understanding of the interplay between physiological changes that occur in mothers and contaminant pharmacokinetics, as well as the interaction with dietary items.

The Tromso Study (AMAP 2015) is a population-based health survey initiated in 1974 to investigate the reasons for high mortality due to cardiovascular disease in northern Norway. Six surveys have been undertaken since 1974 and the health research topics included have increased. A total of 40,051 people have participated in at least one survey and 15,157 have participated in three or more surveys. The Tromso Study was also used to explore changes in POP concentrations from 1979 to 2007 on an individual basis with a repeat measurement

design. Serum samples were obtained from the freezer archive for 54 men who participated in all of the survey points: 1979, 1986, 1994, 2001, and 2007. The archived serum samples were analyzed for PCBs, chlorinated pesticides, and per-and polyfluoroalkyl substances (PFASs). This study provides unique information for trends of human exposure from the environment. Other Nordic studies mentioned are the Northern Finland birth cohorts with compatible design (AMAP 2015); The Chukotka dietary exposure study, with later follow up of the children, the Nunavik child development study, the different Greenlandic studies, and the comprehensive environmental and child developmental studies of the Faroe Island are just as important contributions.

The main source of contaminant exposure is the consumption of traditional foods of marine origin, such as whales, seals, polar bears and some fish species. AMAP has generated a vast amount of data on contaminant levels in human tissues, especially in hair and blood, and in some studies even human milk. Exposure levels vary in different regions of the Arctic, which can be largely explained by variation in contaminant levels in the traditional diet. Several studies have been designed as birth cohorts, giving the opportunity for later examination of health effects associated with prenatal or early postnatal exposure. However, conducting human health effects studies in the Arctic can be challenging for several reasons, including issues associated with logistics, the wide range of languages and cultures, and a lack of qualified staff when estimating the function of the central nervous system. To maximize the returns from such studies requires a harmonized study design and harmonized reporting of results. This will make it possible to merge studies and perform strong meta-analysis. AMAP guidance on the design of cohort and dietary studies for assessing the effects of environmental contaminants on population health in the Arctic as well as a protocol for the full reporting of results, including statistical methodology, would be very useful. This will enhance the ability to compare and combine the outcome of such studies from different circumpolar regions and should thus result in a more statistically valid

assessment of effects. The detailed results and update of the different studies will be presented

Key points:

There are many comprehensive and ongoing human health studies in the Arctic, with focus on pregnancy outcome and child development. The levels of human exposure differ significantly between the regions, mainly based on dietary exposure. Compatible design and overall methodology is crucial for creation of evidence to policy makers and stakeholders at public health as well as scientific levels. One important aspect is the harmonization of the laboratory procedures with continuous calibration and quality control (QA/QC) to secure reliable data from all studies.

References:

AMAP Assessment 2015: Human Health in the Arctic. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. vii + 165 pp

[Saranya Palaniswamy](#) , [Khaled Abass](#), [Jaana Rysä](#) , [Jon Øyvind Odland](#) , [Joan O Grimalt](#), [Arja Rautio](#), [Marjo-Riitta Järvelin](#). Non-occupational exposure to pesticides and health markers in general population in Northern Finland: Differences between sexes. *Environ Int* 2021 Nov;156:106766. doi: 10.1016/j.envint.2021.106766. Epub 2021 Jul 13.

[Shanshan Xu](#), [Solrunn Hansen](#), [Arja Rautio](#), [Marjo-Riitta Jarvelin](#), [Khaled Abass](#), [Jaana Rysä](#), [Saranya Palaniswamy](#), [Sandra Huber](#), [Joan O.Grimalt](#), [Pierre Dumas](#), [Jon Øyvind Odland](#). Monitoring temporal trends of dioxins, organochlorine pesticides and chlorinated paraffins in pooled serum samples collected from Northern Norwegian women: The MISA cohort study. *Env Research* 2021, in press.