

ENVIRONMENTAL MEDICINE IN AN ARCTIC PERSPECTIVE: “THE ARCTIC DILEMMA” REVISITED

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When, on June 16 2006, at the 13th International Congress on Circumpolar Health in Novosibirsk, I received the Hildes Award, it was with gratitude and with a humble mind. Humble, because so many others would have been just as qualified as I, and grateful, because some people, by nominating me, have found that what I have done during my career was worth this prestigious award.

My special interest in Arctic medicine has been studies of human exposure to environmental contaminants and the potential health effects of this exposure. As contaminant exposure is closely related to the traditional part of the diet, the contaminant-food interaction soon became a natural part of the studies. The fact that, on the one hand, traditional marine food has health-promoting effects, while, on the other hand, their contaminants possess potential negative effects, led to the coining the term of “The Arctic Dilemma”.

My first experience with Arctic medicine dates back to 1978. At this time, biologists had found high concentrations of mercury, lead and cadmium in birds and marine mammals in Greenland; as these species are important for the traditional Inuit diet, there was concern for the human exposure, and I was asked to design a study to investigate if this could be a health problem. The programme started in 1978 by blood sampling in West Greenland. The results showed a high exposure level, in many cases



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in excess of international guidelines for safe intakes, and a close relationship to the amount of local marine food that was eaten.

As a consequence, the programme continued during the 1980s to cover all of Greenland and, as both mercury and lead pass the placental barrier, thereby presenting potential risk factors for foetal development, sampling from pregnant women and cord-blood at birth were also included.

In order to make the Arctic studies more visible, I founded the “Centre for Arctic Environmental Medicine” (CAM) at the University

of Aarhus, Denmark, in 1992. In 2001, the Centre was officially recognised as a research centre within the Institute of Public Health, Faculty of Health Science, with a regional office in Nuuk, Greenland.

In the early 1990s, the Arctic Monitoring and Assessment Program (AMAP) was started, and Denmark offered to take the lead for the human health sub-programme. The group was formally established in January 1992, when I, as representative for the lead country, became the group-chair. In October of the same year, there was a call for a meeting in Nuuk, Greenland, with the task to develop an implementation plan for the programme in the eight Arctic countries. The mandate was to monitor human exposure levels to persistent organic pollutants (POPs), including dioxins, PCBs, pesticides and heavy metals (mercury, lead and cadmium). Only Canada and Denmark participated in this initial meeting, but, during the next two years, the group was established with representatives from all eight countries. The first regular group meeting took place in the autumn 1994 in Copenhagen. Since then, the group has met twice a year and has developed into a productive and successful group under the AMAP; the main reasons for this have been continuity and personal engagement and enthusiasm from all the group members. In 1997, Canada offered to take responsibility together with Denmark, and the group has since been co-chaired by the two countries.

During the first phase of the AMAP (1994-1996), the mandate of the human health group was limited to monitoring the human exposure levels in the Arctic. Even if only relatively few samples were collected in the eight countries, it became remarkable in that the sampling procedure followed the same protocol in all

countries, and all samples were analysed at one certified laboratory. This created the very first possibility to compare contaminant exposure levels on a circumpolar basis. The main result from this study confirmed that human exposure to contaminants in the Arctic is primarily connected to the consumption of traditional food, and that the highest exposure levels were found among those populations relying mainly on marine mammals. This fact created an advisory problem now known as "The Arctic Dilemma" whereby the traditional, nutritious and health-promoting food, with its content of essential n-3 fatty acids, micronutrients, and high quality protein, is also the vehicle of health-threatening contaminants; so far this problem has not been solved.

In phase 2 (1998-2001), the mandate was extended from continued monitoring, to include the influence of "multiple environmental stressors", which, in practice, meant undertaking effect studies. During phase 2, the monitoring was extended geographically, and provided further confirmation of the conclusions from phase 1. According to the extended mandate, an effect programme was developed with emphasis on the hormone-mimicking effect of some POPs. However, this seems to be only one of the potential effects of the contaminants, as there is increasing evidence for other effects, such as being cofactors in the development of metabolic syndrome, diabetes type 2 and cardiovascular diseases. These aspects will be the main issues in the ongoing phase 3 and will, together with needs for interventions and communication strategies, comprise the main issues for the coming update report from the group, which is scheduled to be published in 2008 in connection with the International Polar Year (IPY).

Due to the lack of evidence for the effects, the recommendations from phase 1 were rather vague, proposing to “Advise Arctic peoples to continue to eat traditional food and to breast-feed their children, and develop dietary advice for girls, women of child-bearing age, and pregnant women, promoting the use of less contaminated food items, while maintaining nutritional benefits” (conf: www.amap.no). At that time, the general feeling was that the beneficial effects of traditional food outweighed the potential negative effects from contaminants. Later, in the report from phase 2, the recommendations were more precise, stating: “At the actual exposure level in some Arctic populations, there are negative health effects related to the contaminants (conf: www.amap.no)”. Since the publication of this report, the evidence for negative health effects of contaminants, including xenohormone effects and contributing risk factors in the development of metabolic syndrome, diabetes type 2 and cardiovascular diseases, has increased considerably. However, it is too early to say what will be the resulting official conclusions of the next AMAP Human Health report. Nevertheless, in the following paragraphs I will give my own personal views on the possibilities for a way out of the “Arctic Dilemma”.

The first important point to realise is that dietary influence on health is the sum-effect of the total diet. Today, even in the most traditional-oriented populations, imported food plays the dominant role (in Greenland, less than 25% of food is traditional, while more than 75% is imported). This shift towards “westernisation”, which has taken place within a few generations, has, together with the increasingly sedentary lifestyle, introduced the so-called “diseases of civilisation”, i.e. obesity,

metabolic syndrome, diabetes and cardiovascular diseases. As there is increasing evidence that the contaminants, originating from the traditional part of the diet, act as aggravating factors, there are two aspects to solving the dilemma:

- Reduction of contaminant exposure in the most exposed populations
- Ensure the availability of nutritious alternative food items in the stores.

Contaminant exposure is primarily related to the consumption of top-of-the-foodchain predatory marine mammals and sea-birds. Advice to refrain from these food items could, if followed, reduce the contaminant exposure to an acceptable level. The most vulnerable age groups are foetuses, children, and young people of reproductive age. The younger people are those with the lowest intake of traditional food and are probably the easiest group to reach with such dietary advice. In contrast, most of the adult population will regard such advice as an interference with their traditional cultural pattern, and will not follow the advice. From a public health point of view this is not the largest problem, because people over the reproductive age have a moderate excess exposure and their food preferences should be left to the individual to decide, as an informed choice.

The other part of the problem concerns the imported food in that the available products are often of poor nutritious quality, especially in small communities. To achieve an improvement in the general health status, it is not enough to advise people to refrain from consuming top-of-the-foodchain predatory marine species; alternative high quality products must be available to replace the otherwise healthy marine food.

Will this be in conflict with a sound development of indigenous cultures? Not necessarily, because, instead of imported pork and beef with high saturated fatty acid contents, the alternative food items in the stores could be frozen meat from local, less contaminated species, such as reindeer, musk-ox, hare, lamb and fish; if the production is organised, these products could be available throughout the year, irrespective of hunting seasons. A shift from local marine, to local terrestrial species will not mean abandoning the traditions, but it would change their focus from contaminated, to less contaminated preference foods, without losing nutritious value.

A tendency in this direction can already be seen in several developed Arctic communities, but the development cannot be left to its own, as there will also be an excessive consumption of fast-food products with negative health consequences. Obesity is epidemic globally and is now also evident among Indigenous Peoples in the Arctic, where the negative effects of an unbalanced western diet are aggravated by the concomitant exposure to contaminants from top-of-the-foodchain predatory marine species.

“The Arctic Dilemma” cannot be solved immediately, but must be seen with a longer perspective, over generations. It is necessary that politicians take responsibility for this public health issue and ensure that health education is started already at the primary school level, that pregnant women are suffi-

ciently informed, and that people with a background in local culture, are educated to a level that makes them qualified to convey scientific data to the communities in their own language; such a person could typically be a Master of Public Health education. Diet is more than food for living; it is an integrated component of a culture. Cultures are not static, but evolve constantly, as will dietary preferences; nobody eats exactly as their forefathers, and nobody has ever done so.

In the Arctic context, there seem to be diverging opinions on “The Arctic Dilemma”. On one side conservationists argue, from both a cultural and a nutritional point of view, for the health benefits of traditional marine food and tend to disregard the contaminant effects. On the other side, others argue for the devastating effects of contaminants and tend to disregard the health-promoting effects of the traditional food. In my opinion, both extremes are wrong; the time has come to look for a new paradigm that shows the way out of the dilemma, defining traditional food in a renewed form and, at the same time, reducing the exposure to contaminants. It is time for responsible scientists to have the courage to say this openly, as it is an urgent matter.

I would like to hope that future Arctic environmental health research will explore the new nutritional paradigm, integrating the relationships between nutrition, lifestyle, contaminant exposure and disease.

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