

TOXINS AND TRADITION: THE IMPACT OF FOOD-CHAIN CONTAMINATION ON THE INUIT OF NORTHERN QUEBEC

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Abstract • Résumé

The dependence of Quebec Inuit on their traditional diet, known as "country food," is complicated by the presence of toxins in the northern food chain. Dr. Éric Dewailly's unexpected finding of high levels of polychlorinated biphenyls (PCBs) in Inuit women's breast milk prompted years of research into this troubling public health issue. In his recent study of heavy-metal contaminants Dewailly found that mercury and organic chlorine compounds such as PCBs were the major toxins in Inuit blood samples. Although not present at levels high enough to endanger adults, these contaminants may have adverse developmental effects on fetuses and breast-fed infants. Although country food is a major source of contaminants, it contains important nutrients that counter some of the toxic effects. Dewailly's research indicates that the nutritional, economic and cultural benefits of country food far outweigh the risks.

La dépendance des Inuit du Québec à l'égard de leur alimentation traditionnelle est compliquée par la présence de toxines dans la chaîne alimentaire dans le Nord. Le Dr Éric Dewailly a découvert un taux élevé inattendu de biphényles polychlorés (BPC) dans le lait maternel de femmes inuit, ce qui a déclenché des années de recherche sur cette question troublante de santé publique. Dans son étude récente sur les contaminants à métaux lourds, Dewailly a constaté que le mercure et les composés organochlorés comme les BPC sont les principaux contaminants de spécimens de sang d'Inuit. Même si leurs taux ne sont pas assez élevés pour mettre des adultes en danger, ces contaminants peuvent avoir des effets défavorables sur le développement de fœtus et de nouveau-nés allaités. Même si l'alimentation traditionnelle est une source de contaminants, elle contient par ailleurs d'importants éléments nutritifs qui viennent contrer certains des effets toxiques de ces contaminants. La recherche de Dewailly indique que les avantages nutritifs, économiques et culturels de l'alimentation traditionnelle l'emportent de loin sur les risques qu'elle présente.

Dr. Éric Dewailly was conducting a study of contaminants in the breast milk of Quebec women when a midwife friend offered to provide him with samples from Inuit women. Dewailly, who is director of the Environmental Health Service at Quebec's Community Health Department in Sainte-Foy, recalls how he welcomed this as "a good opportunity to have pure milk, with no contaminants." Six months later, when he received 24 milk samples, he was "very surprised to see the concentration of contaminants." The levels of polychlorinated biphenyls (PCBs) he found were five times greater than those among Caucasian women living in southern Quebec.

This startling finding gave rise to a profusion of questions that Dewailly, a public health specialist with graduate degrees in epidemiology and toxicology, was to spend the next 6 years trying to answer. Through this work Dewailly has put Canada at the forefront of research on northern food-chain contaminants.

Contrary to the common perception, the Arctic is not a pristine environment free of the pollution problems that plague the industrial South. The Arctic's frigid climate makes it a sink for contaminants from Asia, Africa and Eastern Europe that arrive via prevailing winds and ocean currents and deposit organic chlorine compounds and heavy metals across Canada's North.

Background levels of pollution in the Arctic are generally much lower than in industrialized areas at the globe's midlatitudes. On their own these levels might be no great cause for concern. However, it is the way that toxins accumulate over an organism's life-span and magnify in quantity as they move up through each level of the Arctic food chain that causes concern. This bioaccumulation and biomagnification ultimately touch the lives of Inuit, who rely heavily on local game.

"They're at the top of the food chain and . . . accumulate the highest levels of these contaminants," says Dr. Russel Shearer, an environmental physical scientist with the federal Department of Indian Affairs and Northern

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Dr. Éric Dewailly: The nutritional benefits of "country food" clearly outweigh the risks posed by contaminants.

Development. The traditional Inuit diet, often called "country food," includes caribou, wildfowl and their eggs, fish, plants and marine mammals, namely beluga whales, walrus and seals. Unfortunately, the Inuit's heavy reliance on the blubber of long-lived marine mammals is a major source of toxin exposure, because PCBs and other organic chlorine compounds break down extremely slowly and are stored in proportion to fat content.

The Inuit of Broughton Island in the Davis Strait were the first to hear the bad news. In 1988 they learned that a considerable proportion of the community — 63% of islanders under the age of 15 and 23% of those 15 years and older — were exposed to PCBs at levels higher than deemed tolerable by the Department of National Health and Welfare. However, it was the way the villagers learned about the research, not the toxins themselves, that had the most damaging effect. "It wasn't handled very well," says Shearer. "They read about it in the paper before any official scientist had a chance to get up there and talk to them about it." Fears fanned by bleak reports in the media turned to confusion when health officials urged the islanders to continue eating the food they had just learned was packed with toxins. Moreover, Broughton Islanders were labelled the "PCB people" and shunned by those from other communities who feared the problem was contagious.

Dewailly has worked hard to avoid such pitfalls. He plans to continue his record of good communications

when he informs Quebec Inuit about his most recent results, completed in October 1994, as part of the Santé Québec's report, *A Health Profile of the Inuit*. Dewailly's study completes the report's chapter on the risks and benefits of country food for Quebec Inuit.

Dewailly's group analysed blood samples of 499 Inuit from 14 communities on the east coast of Hudson Bay and along the Ungava Bay shore. This was the first study to examine blood levels of lead, mercury and cadmium among Quebec Inuit; levels of organic chlorine compounds, namely PCBs and pesticides, were also measured. Samples were further analysed for selenium and polyunsaturated fatty acids, important nutrients derived from country food. In addition, attitudes toward contamination of country food were surveyed.

THE MERCURY PROBLEM

Mercury proved to be a major contaminant of the food chain: the average blood concentration among the Inuit in Dewailly's study — 104 nmol/L — was very high in comparison with that found in a Quebec City sample, in which 78% of subjects had a concentration lower than 10 nmol/L. Although the levels found among the Inuit are too low to endanger adults, the neurotoxic effects of mercury could be of concern for fetal development. Fewer than 5% of pregnant women in a population should have a blood level of mercury higher than 400 nmol/L, according to the World Health Organization (WHO). In Dewailly's study the highest level found in a woman of childbearing age was 397 nmol/L, and the mean level was 85 nmol/L. However, WHO warns that subtle neurotoxic effects could exist for the fetus even if the maternal level is below 400 nmol/L.

Dewailly plans to manage the risk of mercury among the most seriously exposed women by counselling them to alter their diets. This will not rule out country food. "We don't want to say 'Don't eat that,'" says Dewailly. "We would probably say 'Eat more fish or more Arctic char [during pregnancy],' for example." Fish is lower on the food chain and contains less mercury than seal meat. "This could reduce the intake of mercury during the first trimester . . . and this could work," says Dewailly. Studies of Inuit diet and nutrition and of the best dietary options for pregnant women are under way.

Mercury might concern Dewailly more were it not for *maktak*, the skin of beluga whale. "It tastes of nuts. It's very good," says Dewailly. More important, he says, it is rich in selenium, an anticarcinogen also thought to counter the neurotoxic effects of mercury.

Dewailly uses the case of an Inuit man from northern Greenland to illustrate his point. Admitted to hospital for a health problem unrelated to toxins, the man stopped eating his traditional diet and in a few days be-

gan to show symptoms of mercury poisoning. Mercury, with a half-life of 2 to 3 months, outlasts selenium, which is excreted in about 24 hours. "They bought some *maktak* on the market and gave him some," says Dewailly. "In 2 or 3 days the symptoms disappeared. So they are prescribing *maktak* instead of pills — it is very nice!"

Dewailly's study, the first to report on selenium levels among Canadian Inuit, found mean concentrations of selenium in this group to be considerably higher than those among southern Canadians. Critically, blood levels of selenium and mercury were highly correlated.

OTHER HEAVY METALS

Although the lead levels he found are too low to affect adults, Dewailly is concerned about the potential for adverse effects on fetal neurodevelopment. Health Canada recommends that the blood lead level in pregnant women not exceed 0.5 $\mu\text{mol/L}$; 26% of the Inuit women of childbearing age in Dewailly's study exceeded this level. On average, blood lead levels among the Inuit in the study were three times higher than those found among southern Quebecers. Canadians' exposure to lead, however, is among the lowest in the world, says Dewailly, and the levels among Inuit are similar to those among Europeans. Although lead contamination is not a problem peculiar to the Inuit, Dewailly's goal is to eliminate nonfood sources of lead in affected households.

Dewailly was able to dismiss dietary sources of cadmium, a heavy metal with nephrotoxic and possible carcinogenic effects that has been found in caribou kidneys and livers, as having little impact. Dewailly's results indicate that cigarettes are in fact the main source of cadmium for Quebec Inuit.

ORGANIC CHLORINE COMPOUNDS

Dewailly's study showed that PCBs and dichlorodiphenyldichloroethylene (DDE), the primary metabolite of dichlorodiphenyltrichloroethane (DDT), were the major organic chlorine contaminants in the northern food chain. The mean blood level of PCBs of 27 $\mu\text{g/L}$ found among the Inuit in the study was nearly 10 times that found in a Montreal sample. Some older Inuit subjects had organic chlorine levels in the order of 150 $\mu\text{g/L}$ — a level at which chloracne can appear on the face and body of susceptible people. More serious exposure to PCBs can lead to hematologic, immunologic, respiratory and neural disorders and can affect the neurodevelopment of infants.

Describing the PCB situation for adults as "worrisome but not requiring immediate intervention," Dewailly has focused on infants' exposure via breast milk. Because of

its high fat content, breast milk carries PCBs at levels almost 10 times those found in blood.

Concerned that PCBs may cause immunosuppression in infants, Dewailly examined the relation between breast-milk contaminants and the immune status of infants during their first year. Although he plans not to release the results until they have been communicated to Quebec's Inuit, Dewailly did indicate that breast-feeding should continue as usual in all but a few cases. The typical duration of 1½ to 2 years for breast-feeding among the Inuit far exceeds the norm in the South. The most severely affected Inuit women will be counselled to reduce their infant's exposure to PCBs by limiting breast-feeding to about 6 months, Dewailly says.

Ironically, when Inuit take up organic chlorine compounds from sea mammals and fish they also receive a healthy dose of polyunsaturated fatty acids. These include omega-3 fatty acids, which cross the placenta (along with PCBs) and guard against prematurity and low birth weight. Although studies in the United States have tied PCBs to low birth weight, one of Dewailly's studies involving Quebec Inuit showed a tendency for higher PCB concentrations to be associated with higher birth weight, an effect he attributes to omega-3 fatty acids.

These fatty acids also prevent coronary artery disease. "You know in [the hospital at] Povungnituk there is no nitroglycerin, the basic treatment for people with coronary [artery] disease," says Dewailly, "and the physician up there has never seen anybody with this disease." Low cancer rates and the near absence of diabetes among Inuit are also attributable to a diet of country food, says Dewailly.

COUNTRY FOOD: SOCIAL IMPLICATIONS

The nutritional benefits of country food clearly outweigh the risks posed by contaminants, Dewailly has concluded. This is something more Inuit need to know. Unfortunately, one in five of the Inuit surveyed in Dewailly's study believed store-bought food to be superior to contaminated country food. This is a worrisome finding: choices are sorely limited in isolated Inuit communities, where store-bought food, freighted in by air, is triple the price in the South. Although Inuit may learn from health-promotion campaigns that vegetables are nutritious, few can afford \$7 for a bunch of broccoli on a regular basis.

Furthermore, "it's just not in their culture to cook," says Suzanne Bruneau, Dewailly's research associate. "So when they go to the co-op to buy food they'll take ready-to-eat meals, like ready-made hamburgers. They put that in the microwave and just eat it." Adolescents in particular adopt the worst eating habits of southerners.

"The young eat a lot of sugar — candy, chocolate bars, chips and [cola]," says Bruneau.

Country food is not only a nutritional and economic necessity, but a cultural one as well. "We're still a strong hunting group," says Minnie Grey, executive director of the Ungava Tulattavik Health Centre in Kuujuaq, a regional administrative centre of about 2500 people. "If something is not done about [contamination], it could very well affect the whole Inuit way of life," says Grey, who explains that up to 90% of her people's diet consists of country food. Although Grey knows that her people can continue to harvest, she stresses that "it's really upsetting to know that your way of life, the food that is part of you, is contaminated."

Furthermore, although southerners might say that fitness is the key to health, native people would generally say that "food, and country food in particular, is the key to health," says Peter Usher, research director of the Inuit Tapirisat of Canada and an expert on people's perceptions of food contamination. "We now have these outside experts coming in and saying, 'The staple of your diet, which you regard as being the key to your good health, is hazardous.'" Although many Inuit are wage workers or hold office jobs, hunting is the activity they most enjoy. It is also a source of prestige and pride in many communities, says Usher. "If you're telling people not to eat country food you're putting all that in jeopardy."

Since hearing about contamination, about one in seven Inuit have begun to eat marine mammals or fish less often or have stopped eating them altogether, according to Dewailly's survey. A small number of women reported reducing the duration of their breast-feeding slightly. Almost all Inuit surveyed wanted to know more about the issue.

COMMUNICATION PROBLEMS

When Bruneau arrived in Kuujuaq no word for "contaminants" existed in Inuktitut. Usher says mercury poisoning was translated by one native community to mean "fish disease," a label that failed to reflect its impact on humans. The scientific language of probabilities and percentages presents a further barrier. "The information people want," says Usher, "is whether this fish or this caribou or this clam that I got here, at this site, is safe to eat." According to Bruneau, "People just don't really understand what's going on, and it's just a wind of panic blowing around." Fear of PCBs prompted one young Inuit women to stop breast-feeding to protect her baby. Because milk is so costly in the north, she substituted a non-dairy coffee whitener and water. In a sad testament to failed communication, her severely malnourished infant ended up in hospital.

DEWAILLY'S WAY

Communication problems have bred distrust of researchers among native peoples. However, Dewailly and his group gained the confidence of Quebec Inuit by providing strong community involvement and a stable presence. Part of that presence was provided by Bruneau, who lived for 3 years in Kuujuaq. "It gives you a good hand because people see you, they know you. And after 1 year I started to be very comfortable," says Bruneau, who was educated as an anthropologist and epidemiologist. Although the Inuit were not happy to see researchers arrive, confidence in Dewailly's team grew over the years. "If we want to start something new, they follow us," says Bruneau, who adds that the genuine warmth of the Inuit and the marvellous landscape have made her bond with the North a permanent one.

Dewailly says Bruneau's presence in Kuujuaq was vital for their lengthy research projects because the quick turnover of northern medical staff made it necessary to explain the projects to new nurses and midwives every 6 months. By being on hand, Bruneau was able to put the polarized worst case often presented in the media into perspective. "The Inuit have television at home, and they receive information . . . saying that they are on the way to dying from chemicals," says Dewailly.

Dewailly's group will paint a more realistic picture when it communicates the results of its most recent studies to Quebec Inuit during a theme week they plan to hold by June. Radio hotlines and a video produced for television broadcast will be used to promote country food as the healthiest choice.

THE FUTURE

Although Dewailly may restore the Inuit's confidence in country food, he cannot stem the flow of contaminants to the Arctic. Toxins continue to emanate, especially from developing nations, where the prevention of malaria by DDT takes precedence over concerns about the pesticide's long-term toxic effects. Manufacturers in Germany and the United States continue to produce and sell chemicals such as DDT to developing nations, although their use is banned in their own countries, says Shearer.

Canada is pursuing international agreements that may someday prevent the influx of toxins to the Arctic. Canadians can hardly command developing nations to stop using the chemicals that they used not long ago to make their lives more comfortable. What they can do is strive to provide less harmful alternatives. Meanwhile the Inuit, whose austere lifestyle has accrued few of the benefits of industry, must live with the toxic spectre of the "progress" enjoyed elsewhere on the globe. ■