

Invited Commentary

Vitamin D intake by Indigenous Peoples in the Canadian Arctic

Vitamin D is an especially fascinating nutrient to study in people living in northern latitudes, where sun exposure is limited from nearly all day in summer to virtually no direct sun exposure in winter. This essential nutrient is naturally available from synthesis in the skin through the action of UVB solar rays or from a few natural sources such as fish fats. Vitamin D is responsible for enhancing many physiological processes related to maintaining Ca and P homeostasis, as well as for diverse hormone functions that are not completely understood⁽¹⁾.

Indigenous populations residing for thousands of years in the Arctic are of special interest for vitamin D status. This is particularly so for pregnant and lactating women and breast-fed infants, who have greater relative needs for bone formation. A research paper in this issue of *Public Health Nutrition* related to this topic, by El Hayek Fares and Weiler⁽²⁾, describes the current vitamin D status and dietary intakes of vitamin D and Ca of lactating Canadian Inuit women. It finds that only 8.8% of these women had serum 25-hydroxyvitamin D at optimal levels (>75 nmol/l) and 50% of women were at risk of inadequacy (<40 nmol/l), despite the season of evaluation being at the maximum of sun exposure (4 h/d) and traditional food use (August–October). Intakes of vitamin D were far below the estimated average requirement of Canada and the USA for vitamin D (10 µg/d or 400 IU/d)⁽²⁾.

About 10 years ago and in the same Inuit communities, as well as Arctic First Nations, Berti *et al.*⁽³⁾ noted largely adequate dietary levels of vitamin D (9–20 µg/d) for lactating women. At that time, adult Inuit consumed a mean level of 28% of daily energy from traditional foods. In reviewing Inuit Polar Year studies of lactating women's intakes, El Hayek Fares and Weiler found a median of only 397 kJ/d (95 kcal/d; of a total of 7845 kJ/d (1875 kcal/d)) was derived from traditional foods – about 5% of dietary energy. Possible explanations point to ongoing nutrition transition, with its decreasing intake of many essential nutrients derived from traditional foods, including vitamin D-rich fish and sea mammals.

How were vitamin D needs met in a wholly traditional diet with several months of restricted or absent direct sunlight, when it is known that this nutrient is found in few foods? Alternatively, do Arctic Indigenous Peoples have unique metabolic needs for vitamin D? To date, there have been no metabolic studies on long-resident Arctic cultural phenotypic populations that point to altered physiology reducing the need for dietary or sunlight provisioning of vitamin D. Until these questions can be satisfactorily answered, it was logical and appropriate to

seek information on food sources in traditional Arctic diets and to question the availability and use of these foods to support vitamin D status⁽⁴⁾. At that time, Inuit adults were found to be likely adequate for vitamin D.

Assessment research and addressing dietary inadequacies

Assessment research to understand intake and availability of nutrients from unique dietary patterns is needed for all Indigenous Peoples. However, it is essential for responsible public health professionals to go beyond assessment and address serious dietary inadequacies in partnership with the population under study. Most Indigenous Peoples prefer their dietary needs met with local foods rather than medical aids. This requires careful consideration of resources, including the judicious use of supplements (especially those providing single nutrients) when there are multiple dietary inadequacies.

Looking closely at Indigenous Peoples' food systems

Traditional food systems of Indigenous Peoples throughout the globe are threatened by climate change, social change and many aspects of ecosystem degradation, all of which contribute to restricted availability, access and use of traditional foods^(5,6). Indigenous Peoples' traditional foods and dietary practices are largely understudied for health benefits, and warrant closer exploration for their unique biodiversity, nutrient composition and other health benefits, as well as potential risks from environmental contaminants. The FAO, the International Union of Nutritional Sciences and Bioversity International have all called for more research to document Indigenous Peoples' food systems while there is still living knowledge about these resources as well as their availability for food security and health promotion.

Investigations on environmental risks and health benefits of traditional foods of Canadian Arctic Indigenous Peoples began in the mid-1980s, stimulated by new knowledge about organochlorine and heavy metal contaminants that migrate through ocean and atmospheric currents from industrial southern areas into northern ecosystems and foods. Research began by forming partnerships with Indigenous communities and documenting the diversity of species in the First Nations and Inuit traditional food systems. This was followed by research on traditional food sampling and analysis for

nutrients and contaminants that could then be applied to dietary evaluations tracked through the different seasons of the year^(7,8). The Inuit Polar Year studies, including the paper in this issue⁽²⁾, are important in the research progression to understand ongoing dietary change for Inuit.

There is an international imperative to seek the wisdom of Indigenous Peoples as they have applied traditional knowledge to maintaining their populations and cultures over countless generations in diverse ecosystems with sustainable healthy food systems and diets. Only within the last two decades has there been documentation of the impact of nutrition transition away from traditional diets, including reduced nutrient density and the related increase in chronic disease.

Recent issues of *Public Health Nutrition* have documented the serious impact of ultra-processing on nutrient quality of global food supplies and the extensive use of non-renewable resources and fuels for food processing and distribution that contribute to climate change^(9,10). Action by public health professionals and other policy makers is long overdue. We must curb this trend and support human well-being by insisting on whole or minimally processed foods (including traditional local foods) in dietary recommendations and commercial food supplies – not only for Indigenous Peoples, but for all of us on the planet.

Focus on vitamin D nutrition provides a salient expression of the phenomena of nutrition transition, dietary change and resulting nutrient inadequacy. It is possible to show with existing research how Inuit enjoyed optimal status of vitamin D (and other nutrients), while using local resources and giving attention to their cultural heritage and ecosystem conservation in their food system, until very recently. Dietary change away from traditional foods must be approached and appreciated with caution, because Indigenous Peoples are losing not only nutrition and the health that traditional cultural foods provide, but also the essential social, mental and spiritual elements accompanying them⁽¹¹⁾.

Public health professionals can support healthy dietary change by stimulating marketing of whole and minimally processed affordable foods in the commercial sector. However, Indigenous Peoples and their health-care providers must protect their traditional foods, and their availability and access, for nutrition and the other important aspects of health derived from their foods and diets. The best food resources of vitamin D in the world are found in the cultural territories and dietary traditions of the Inuit.

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