



Micronutrient nutrition and traditional food systems of indigenous peoples

Within both developed and developing countries, indigenous peoples are often the most marginalized and disadvantaged groups in terms of receiving the resources needed for well-being, including food and health care, along with other amenities considered important for a good quality of life. Extreme poverty often characterizes these groups, but indigenous peoples themselves may consider resources other than money as important, such as an intact environment, land for harvesting their traditional food and medicines and a peaceful existence. Because government health services in areas inhabited by indigenous peoples are often either of low quality or missing, most governments designate their indigenous peoples as those most in need of public health attention.

Indigenous peoples are well aware of their food-security risks. An international meeting held in Atitlán, Guatemala, described the difficulties and frustrations of indigenous peoples in protecting their food environments and livelihoods

(Kuhnlein *et al.*, 2002b). As this is one of the most pressing of the problems identified by indigenous peoples, the recently created United Nations Permanent Forum on Indigenous Issues will ensure that all possible avenues within the United Nations agencies are explored in order to protect the rights of indigenous peoples with respect to their traditional food resources.

The development, health and scientific communities do not usually understand the food resources that indigenous people know and use. Scientific identifications and laboratory data for nutrients and other phytochemicals for a food system may be unknown for many species. This means that the usual processes for nutrition assessment must be modified, and that the recognition and promotion of local food for alleviating micronutrient malnutrition will require preliminary studies. Investigations on this issue were recently carried out by FAO collaborators in five case studies of indigenous peoples in rural areas of Asia. It was found that, of 716 species of traditional food reported by the five community areas, 93 still

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Definitions

For the purposes of this article, indigenous people are “a cultural group in an ecological area that developed a successful subsistence base from the natural resources available in that environment. Indigenous People identify themselves. The plural form (Indigenous Peoples) refers to more than one cultural group” (Kuhnlein and Receveur, 1996). Further discussion of the term is provided by the United Nations Permanent Forum on Indigenous Issues¹ and by the Minority Rights Group (1997). Estimates of numbers of indigenous people in the world today vary, depending on the use of the definition or estimates. Numbers range from 266 million to 660 million, and one summary places 380 different groups of indigenous peoples in Asia alone (World Bank, 1991; Goering, 1993; Durning, 1992; Minorities Work Group, 1997).

A traditional food system can be defined as “all food from a particular culture available from local resources and culturally accepted. It includes sociocultural meanings, acquisition/processing techniques, use, composition, and nutritional consequences for people using the food” (Kuhnlein and Receveur, 1996).

¹ United Nations Human Rights Commission, Permanent Forum on Indigenous Issues (available at <http://www.unhcr.ch/indigenous/forum.htm> ; accessed May 2003).

required original scientific identification, and for approximately 147 species there was not even the most basic nutrient data on file (Kuhnlein, 2001).

Arguments that attempt to justify the scientific neglect of these food resources often claim the need to give more priority to food species that are commonly used nationally and that are available through commercial distribution. Certainly, work on commercial food needs to be carried out; however, it is equally important to pay attention to the traditional food resources of indigenous peoples. Arguments in favour of scientific work on traditional food systems species are that the traditional knowledge of indigenous peoples about the diversity of world food resources must be preserved, and that this knowledge should be combined with basic scientific data. If, in fact, indigenous peoples risk micro-nutrient problems, local traditional food resources should be investigated for items with which to build food-based strategies to alleviate these peoples' malnutrition. Protection of rural environments where indigenous peoples live and harvest their unique food species is a logical prerequisite for health-promotion activities.

As residents in rural developing areas, indigenous peoples may be subject to the consequences of the “lifestyle and

nutrition transition” resulting in increasing obesity and chronic disease (Popkin, 2001). A shift away from natural traditional food resources generally means a decrease in the consumption of fish, domestic animals, locally grown agricultural crops and uncultivated (wild) vegetable and plant foods with a simultaneous increased consumption of industrially processed food. Poor micronutrient intake is a likely consequence, in addition to obesity and other conditions associated with increasing dietary energy, carbohydrate and fat. Understanding the micronutrient contents of species in traditional food systems would be an essential and positive step towards the goal of building health-promotion activities that could incorporate these foods.

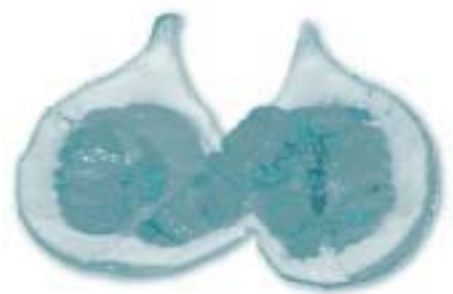
Background work needed

When it has been recognized that indigenous peoples require health-promotion activities to improve their micronutrient status, there are several steps that need to be carried out in the assessment process before programme activities can be implemented. Background work requires first determining what the local traditional food system resources and their

micronutrient contents are, and any other micronutrients. Carotenoids and preformed vitamin A, iron, zinc, vitamin B₁₂, ascorbate, folate, and iodine are key micronutrients, but physiological response to them depends on adequate amounts of total energy, protein and fat in the diet (Institute of Medicine, 1998, 2001).

Focus groups and individual interviews with community members can be conducted to furnish the spectrum of local species used as food. Market surveys and focus groups can then be used to provide understanding of the kinds of food that can be purchased. Once the list of local food items used by a group of indigenous peoples is known, local or regional scientists can then search for identifications and any existing nutrient data. When no data exist, samples of the food can be collected when in season and submitted for analysis.

Additional qualitative data are also required to understand the potential of each food resource for the community. A certain number of questions should be asked: what is the agricultural potential, and what land is available for cultivation? How is the food harvested, stored and prepared? What is the general acceptability pattern within the community? Is this a reasonable food for the population groups especially vulnerable to dietary deficits in micro-



nutrients, such as pregnant and lactating women and young children? If not, how might it possibly be adapted for consumption by these vulnerable groups?

Methods for gathering this information in communities of developing countries are available

(Kuhnlein and Pelto, 1997; Blum *et al.*, 1997). However, procedures that remain sensitive to the local issues of indigenous peoples must also be employed. In addition to extensive scientific attention to wild and uncultivated food, these methods include the need for local collaboration, respect for and inclusion of the local culture and circumstances, the possible need to work in a local language

been used extensively in the Family Food Production and Nutrition programme sponsored by UNICEF (Engelberger, 1999).

In western British Columbia, the Nuxalk food and nutrition programme was conducted in an isolated rural area of the coast among the Nuxalk Nation. The programme demonstrated how traditional food can improve micronutrient

health-promotion activities must be considered. For example, all food-based strategies for improving nutritional status simply take longer, because they treat the root of the problem of insufficient nutrient-rich food and involve attitude and food behaviour change instead of trying to “patch up” a problem for the short term. However, “taking longer” also means that there are greater possibilities

The traditional knowledge of indigenous peoples about the diversity of world food resources must be preserved, and this knowledge should be combined with basic scientific data

and the requirement for local capacity-building to assist the project. These very practical requirements may exceed the resources regularly allocated by public health agencies for the population within a given country.

Several health-promotion programmes for micronutrients that use indigenous peoples’ traditional foods have already been documented. In Viet Nam, the *gac* fruit [Spiny gourd] (*Momordica cochinchinensis* Spreng.) was used in a controlled food-supplementation trial among preschool children and was shown to significantly increase plasma beta-carotene. In addition, *gac* improved haemoglobin concentrations of individuals with low or borderline haemoglobin levels (Vuong *et al.*, 2002). Several micronutrient-rich local fruits and vegetables in northern Viet Nam have been identified for health-promotion potential, and *gac* contains the highest levels of beta-carotene, at approximately 45 mg or 45 000 µg/100g fruit (Vuong, 2000).

In Micronesia, the Karat banana (*Musa troglodytarum*) is another local food with excellent potential to provide protection against micronutrient deficiencies. Containing 160 RE (retinol equivalent)/100 g of fruit, this banana has

health status. After a health-promotion programme emphasized that good-quality local foods (both wild and purchased) should be included in the diet, the levels of retinol, carotene, ferritin and folate improved in adults and teens (Kuhnlein and Burgess, 1997).

In studying the local natural food resources of indigenous peoples, it is also important to investigate the levels of potential environmental contaminants. Generally speaking, fish and sea mammal species are known to contain both organochlorine and heavy metal contaminants at much higher levels than land mammals or plant food resources. Attention should be given to both local and non-local sources of environmental pollution (Kuhnlein and Chan, 2000). Anxieties about potential contaminants and destruction of land and water resources are key issues and challenges for indigenous peoples’ food-security and health status. It is hoped that the greater attention given to the traditional knowledge of indigenous peoples in the domain of food-system biodiversity will drive policy-makers to recognize the pressing need to protect these peoples’ environments.

Some of the practical implications of using traditional food resources for

for long-term sustainability of food resources in the community. This is especially true when traditional knowledge and the sociocultural values inherent in the group are revived and the community embraces the targeted behaviour change. In the case of rural-dwelling indigenous peoples, this is a welcome strategy, and it is also the most practical solution where coverage of pharmaceutical nutrient supplements or availability of fortified market food may be limited.

Using traditional food resources for indigenous peoples in health promotion is most reasonably applied in rural areas where such food is most likely to be recognized by the group and readily available. Transporting unique food resources from rural areas to indigenous peoples in urban settings is case specific. Some groups are quite proactive in seeing that their city-dwelling relatives gain access to these foods, as has been documented for developing a market for *quelites* (boiled green herb) in Mexico City. In the case of traditional varieties of agricultural species, it is possible that urban agriculture and home gardens can be promoted to assist indigenous urban migrants. Transporting favoured cultural food items from rural to urban areas may



Gac fruit (*Momordica cochinchinensis* Spreng.) in Viet Nam

not always be possible, depending on the extent of food availability, distance, fragility of the food items, and whether or not a market for the food has been developed – indeed, if such development is even wanted by the rural community. It is well known that indigenous peoples often live according to value systems that may conflict with a more dominant global value system based on economic returns. An investigation of the factors affecting indigenous urban migrant access to traditional foods would be well worth pursuing.

Micronutrients in traditional cultural foods

In addition to the examples noted above, it has been demonstrated that many unique foods used by indigenous peoples are good sources of micronutrients. The *Journal of Food Composition and Analysis* regularly reports findings on the nutrient composition of non-cultivated, non-commercial foods from different areas of the world (Burlingame, 2002).

Four green plants used by indigenous peoples are ivy gourd (*Coccinia grandis* Voigt.), roselle, sweet potato leaves and wild betel leaves (*Piper sarmentosum* Roxb.). Ivy gourd and wild betel leaves, used by the Karen People in Thailand, are among the best local sources of beta-carotene (3 095 µg/100g and 4 036 µg/100g). As shown in Table 1, they also contain a large amount of vitamin C (13–17 mg/100 g; Puwastien *et al.*, 1999). The table also shows two additional varieties of green leaves that are significant for improving beta-carotene content, used by the Aetas of the Philippines and the Hausas of Niger (Kuhnlein, 2000).

Narwhal *mattak* is a favourite food of the Greenland and Arctic Canadian Inuit. This food, consisting of both skin and fat (blubber), is a rich source of retinol, vitamin C, vitamin E as alpha-tocopherol and omega-3 fatty acids. Narwhal meat is also an excellent source of iron (Kuhnlein and Soueida, 1992; Fediuk *et al.*, 2002; Kuhnlein *et al.*, 2002a). Another rich nutrient source that is a legacy of Canada's indigenous peoples in British Columbia is the fat from the small fish

called *ooligan* (*Thaleichthys pacificus*), prepared by several groups of First Nations. Ooligan grease contains 2 500 ± 1 200 µg of retinol/100 g, 14 mg of alpha-tocopherol, and 19 ± 5.2 g of omega-3 fats/100 g – a truly remarkable source of these micronutrients (Kuhnlein *et al.*, 1996).

Conclusions

The traditional food systems of indigenous peoples contain a wealth of micronutrients that have been poorly described and reported in scientific literature. This lack of scientific coverage prevents the information from being included in health training programmes and public-health promotion programmes. While indigenous peoples are often the most marginalized and disadvantaged subgroups of a population, their traditional knowledge and diverse food resources may be substantial enough to be used to improve their own micronutrient status.

People working in the health sector who wish to incorporate traditional knowledge about locally available food should first enlist the collaboration of

TABLE 1
Examples of micronutrient-rich sources in the traditional cultural foods of indigenous peoples

ENGLISH NAME/ PART USED	SCIENTIFIC NAME	CULTURE/ LOCATION	NUTRIENT CONTENT PER 100 g
Wild betel /leaves	<i>Piper sarmentosum</i> Roxb.	Karen/ Thailand	3 095 µg beta-carotene 17 mg vitamin C
Sweet potato /leaves	<i>Ipomea batatas</i>	Aetas/Philippines	5 176 µg beta-carotene
Kupta/ leaves	<i>Moringa oleifera</i>	Hausas/Niger	5 880 µg beta-carotene
Roselle/leaves	<i>Hibiscus sabdariffa</i> Linn.	Karen/Thailand	44 mg vitamin C
Ivy gourd/ leaves	<i>Coccinia grandis</i> Voigt.	Karen/Thailand	13 mg vitamin C 4 036 µg beta-carotene
Gac/ seed pulp	<i>Momordica cochinchinensis</i> Spreng.	Viet Nam	45.8 mg beta-carotene
Ooligan fish/ oil	<i>Thaleichthys pacificus</i>	Nuxalk/Canada	2 500 µg retinol 19 mg omega-3 fatty acids 14 mg alpha-tocopherol
Narwhal/ meat blubber mattak	<i>Monodon monoceros</i>	Inuit/Canada	70 mg iron 1 700 µg retinol 8.9 mg vitamin E 3.6 g omega-3 fatty acids 36 mg vitamin C

indigenous communities. Local and regional nutrient data centres will define existing data that can be used in health-promotion strategies, and provide the addresses of the nearest laboratories that can assist with nutrient analyses of any other important and frequently consumed food items.

Agricultural and public-health sector agents who are working with indigenous peoples need to be aware of the potential of the local food resources to provide micronutrients and other basic nutrients required for good health. As indigenous peoples leave their rural homelands for employment opportunities or engage in

other types of economic activities, awareness must be raised so that their traditional food knowledge can be preserved for future generations.

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Micronutrient nutrition and traditional food systems of indigenous peoples

INDIGENOUS PEOPLES LIVING IN RURAL AREAS possess food resources that are usually not completely understood by the development and health sectors that provide services to them. This means that the usual processes of nutrition assessment and identification of food-based strategies for micronutrient health promotion cannot take these resources into full consideration for planning.

Indigenous peoples are often the most marginalized and disadvantaged for health care and other resources for well-being, and extreme poverty is often the result. Thus, most governments designate their indigenous peoples as those most in need of public health attention and food security. For these residents in rural developing areas, the “lifestyle and nutrition transition” experience means decreasing consumption of fish, wildlife, domestic animals and locally grown crops (rich sources of micronutrients) and increased consumption of industrially processed food. Poor micronutrient intake is a likely consequence, coincident with increasing obesity and other chronic diseases associated with increased caloric consumption in the form of simple carbohydrates and fat.

A few micronutrient health promotion strategies using local food resources have demonstrated success and are presented here. These include the use of the gac fruit (*Momordica cochinchinensis*) in Viet Nam, the karat banana (*Musa troglodytarum*) in Micronesia and the Nuxalk food system in British Columbia, Canada.

It is necessary to be aware of special considerations if successful food studies and health-promotion activities are to be carried out with indigenous peoples using their own local food. Tools for the evaluation of traditional food systems of indigenous peoples would be helpful. An FAO collaboration found that for five case studies of indigenous peoples in Asia, 716 types of traditional food were reported, 93 of which required original scientific identification, and for approximately 147 of which there was not even the most basic nutrient data on file in the world literature. Techniques for understanding local food availability and use; scientific data for species; food harvest, storage and preparation practices; acceptability for vulnerable members of the population; and potential for increased food availability and consumption are necessary data.

Apports en micronutriments et systèmes d'alimentation traditionnels des peuples autochtones

LES PEUPLES AUTOCHTONES VIVANT EN MILIEU RURAL possèdent des ressources alimentaires qui ne sont pas toujours bien comprises des secteurs du développement et de la santé qui leur fournissent des services. En conséquence, les processus classiques d'évaluation nutritionnelle et d'élaboration des stratégies fondées sur l'alimentation et axées sur la promotion de la santé par les micronutriments ne peuvent prendre pleinement ces ressources en considération aux fins de planification.

Les peuples autochtones sont souvent les plus marginalisés et les plus mal lotis en matière de soins de santé et d'accès aux ressources indispensables à leur bien-être, et vivent généralement dans le plus total dénuement. C'est pourquoi la plupart des gouvernements considèrent que les communautés autochtones sont celles qui exigent le plus d'attention, tant en matière de santé publique que de sécurité alimentaire. Dans les zones rurales en développement, l'évolution des modes de vie et d'alimentation s'est traduite par une baisse de la consommation de poisson, d'espèces sauvages et domestiques et de plantes cultivées localement (qui sont riches en micronutriments) et par une augmentation de la consommation de produits alimentaires transformés. Il en résulte généralement une baisse des apports en micronutriments qui va de pair avec l'accroissement de la prévalence de l'obésité et autres maladies chroniques liées à l'augmentation de la consommation de calories sous forme d'hydrates de carbone et de graisses.

Certaines stratégies de promotion de la santé par les micronutriments privilégiant la consommation d'aliments d'origine locale ont fait la preuve de leur efficacité et sont présentées dans cet article. C'est le cas de l'utilisation du gac (*Momordica cochinchinensis*) au Viet Nam, de la banane karat (*Musa*

trogodytarum) en Micronesia y del sistema de alimentación del pueblo Nuxalk en Colombia-Británica (Canadá).

Las investigaciones sobre la alimentación y las actividades de promoción de la salud, llevadas a cabo en comunidades indígenas y basadas en el consumo de alimentos locales, no arrojan resultados concluyentes si ciertos elementos son tomados en cuenta. En este sentido, las herramientas de evaluación de los sistemas de alimentación tradicionales de los pueblos indígenas serían muy útiles. Según un estudio de la FAO realizado en colaboración, cinco estudios de casos realizados con pueblos indígenas de Asia permitieron registrar 716 tipos de alimentos tradicionales, de los cuales 93 aún no habían sido identificados de manera científica. Para 147 de ellos, la literatura especializada no contiene la más mínima información nutricional básica. Es necesario, por lo tanto, desarrollar técnicas que permitan evaluar la disponibilidad de los alimentos locales y definir sus usos; recopilar datos científicos sobre las especies involucradas y los métodos de recolección, almacenamiento y preparación que las involucran; determinar en qué medida estos alimentos se adaptan a las necesidades nutricionales de los grupos de población más vulnerables; y definir los medios para mejorar su disponibilidad y consumo.

Los micronutrientes en la nutrición y los sistemas tradicionales de alimentación de las poblaciones indígenas

LAS POBLACIONES INDÍGENAS DE LAS ZONAS RURALES poseen recursos alimentarios que no siempre son bien conocidos por los sectores del desarrollo y la salud que les suministran servicios. Debido a ello, en los procesos habituales de evaluación de la nutrición e identificación de estrategias basadas en los alimentos para fomentar la salud en relación con los micronutrientes no se toman plenamente en consideración esos recursos a efectos de planificación.

Con frecuencia, las poblaciones indígenas son las más marginadas y desfavorecidas en relación con la atención sanitaria y otros recursos que promueven el bienestar y de ello deriva una situación de extrema pobreza. Así, para la mayoría de los gobiernos, las poblaciones indígenas son las más necesitadas en materia de atención pública de salud y seguridad alimentaria. Para estas personas que residen en zonas rurales en desarrollo, la «transición en materia de estilo de vida y nutrición» significa reducir el consumo de pescado, carne silvestre, animales domésticos y cultivos locales (alimentos ricos en micronutrientes) y aumentar el de alimentos elaborados industrialmente. La consecuencia más probable es una ingesta insuficiente de micronutrientes, que coincide con una obesidad creciente y otras enfermedades crónicas asociadas con el incremento del consumo de calorías en forma de hidratos de carbono simples y de grasas.

Se presentan aquí algunas estrategias de fomento del estado de salud relacionado con los micronutrientes utilizando recursos alimentarios locales que han dado buenos resultados. Entre esos recursos figuran el consumo de momordiga (*Momordica cochinchinensis*) en Viet Nam, el banano *karat* (*Musa troglodytarum*) en Micronesia y el sistema alimentario *Nuxalk* en Columbia Británica (Canadá).

Es necesario tener en cuenta consideraciones especiales para realizar con éxito estudios alimentarios y actividades de promoción de la salud entre poblaciones indígenas que tienen su propio sistema de alimentación. Sería útil disponer de instrumentos para evaluar los sistemas de alimentación tradicionales de las poblaciones indígenas. En un trabajo en colaboración realizado por la FAO, consistente en seis estudios de caso de poblaciones indígenas en Asia, se constató la existencia de 716 tipos de alimentos tradicionales, de los cuales 93 requerían una identificación científica; además, sobre 147 de esos alimentos no existían en la literatura mundial ni siquiera datos sobre los nutrientes más básicos. Es preciso conocer diversos datos, por ejemplo, sobre las técnicas para comprender la disponibilidad y utilización de alimentos locales; datos científicos sobre las especies; las prácticas de recolección, almacenamiento y preparación de los alimentos; la aceptabilidad entre los miembros vulnerables de la población y el potencial para aumentar la disponibilidad y consumo de alimentos.