ABSTRACT

This paper describes and analyses changes in food composition and nutritional preferences among the Chukchi and Yupik of coastal Chukotka in the last 15 years.

The economic collapse of the infrastructure of Chukotka region has resulted in many indigenous northerners reverting to the traditional subsistence economy. Relatively expensive market foods are being replaced by cheaper ones, and by more readily available local foods. Percent contribution of proteins, lipids and carbohydrates to total caloric intake has not changed substantially, but sources of the major nutrients have become different. In 1985, local marine mammals accounted for about half of the consumed meat (55 %), while in 2000 the share of it increased to 89 %. Market fats and oils are also being substituted by the fat of marine mammals.

However, the contemporary diet of the natives of coastal Chukotka differs significantly from the traditional one. The meat of seals and gray whales (small sized and less dangerous to harvest) remains seasonally accessible, but can not be stored for long times. There is an insufficient amount of walrus and bowhead whale meat, which can be prepared in traditional style by fermentation, and stored for a long time. This probably also provides a specific protection against Helicobacter pylori.

The young people today are more oriented towards local food-stuff: 76 % Coastal Chukchee and Yupik under the age of 30 indicated a preference for native foods over European ("Russian") ones, while this share is lower (66 %) among people older than 30 years.

Overall, 86 % of natives consider that whale hunting, as the main source of food, should be increased (in 1985, only 45% suggested so).

(Key words: Chukchi, Yupik, nutrition, traditional food, market food, nutritional preferences, food composition, demography, economic changes)
INTRODUCTION

The Chukchi Autonomous District of the Russian Federation is located at the north-easternmost extreme of the Asian continent. It is a sparsely populated Arctic region with a substantial minority of indigenous peoples, including Chukchi, Yupik, Evens and others. Since the dissolution of the Soviet Union in 1991, the region has undergone substantial social, economic and political changes.

This paper describes and analyses changes in food composition and nutritional preferences among the Chukchi and Siberian Yupik of coastal Chukotka in the last 15 years, based on preliminary data obtained in the first stages of the Project "Nutrition and Health of Indigenous People of the North" (NUHIP) conducted in Chukotka since 2002. The project was approved by the International Arctic Science Committee (IASC).

METHODS

Data were obtained from the following sources:

1) Official statistics published by the Department of Agriculture, Food and Trade of the Chukchi Autonomous District, including the number of marine mammals harvested, consumption of marine mammals, and purchases of food-stuff (1).

2) A population-based food interview survey conducted by the same Department in 2000, involving a total sample of 1461 individuals (2).

3) Interviews of 78 male native marine hunters conducted in 2 villages (Lorino and Lavrentija) and in Anadyr town (administrative center of Chukotka) in November 2002 (3). Each group consisted of 16 to 38 participants. The survey instrument was derived from the one developed and used in Greenland (4).

4) The Russian Statistical Yearbook for 2002 (5) provided official economic and demographic statistics from the Chukchi Autonomous District.
RESULTS

Demographic and economic changes

The population of Chukotka reached its peak in 1989 (163,000). During the 1990s, a massive outmigration occurred. By 2000, the population had been reduced by 55% to 72,000. The migration involved almost exclusively the non-indigenous people (Figure 1). As a result, indigenous people accounted for almost 22% of the total population in 2000, compared to 9.55% in 1989. In particular, the Chukchee and Siberian Yupik made up 8.16% of the district population, although the absolute size of the population has not changed significantly.

Figure 1. Decline in the population of Chukotka, 1989-2000.

Between 1994 and 2000, the average monthly income in the District had increased from 600 to 1,700 Russian Rubles, but, when converted to US dollars, there had in fact been a substantial decline from $169.4 to $64.8. Throughout the 1990s, wages were constantly cut and the level in 1999 was only 25% of that reported in 1993.

The average annual number of individuals participating in the labour force had also fallen: from 70,000 in 1992, to 35,000 in 1998. The number of unemployed in 1997 had reached 4,900, but improved to 2,300 in 1998. Some observers reported that the reduction in unemployment was an artifact of changes in registration, and did not represent real change in employment status.
Changes in food consumption

The economic changes influenced the pattern of food consumption. By the year 2000, relatively expensive market foods had been replaced by cheaper ones (6). Overall, market food consumption was reduced significantly, being substituted by more readily available local foods. The data in Table I demonstrates the differences in consumption of various types of foods in ethnically mixed populations of Providensky and Chukotsky Regions of Chukotka, consisting mainly of indigenous people.

There are also changes in the pattern of consumption of local foods, such as marine mammals. From the end of the 1950s, the authorities organized whale hunting for the native people, outfitting a whaling ship to serve coastal settlements. In 1991, the native communities could not pay the rent for the ship and such centralized and collective whaling was discontinued. Only 3 years later (since 1994), people began to renew traditional hunting, but from wooden whaleboats and skin bay达尔as. Local indigenous hunters had to harvest less dangerous young and small-sized gray whales. Bowhead whales were no longer hunted.

In 2000, the number of harvested gray whales had increased by 67% compared to 1985. However, because of the small size of the animals, the total quantity of meat had actually declined to only 45% of those in 1985. Overall, the annual consumption of whale meat by the natives of coastal Chukotka decreased from 84 kg per person in 1985, to 52 kg in 2000.

By 1998, the harvest of marine mammals had increased and has remained stable since. The increase was mainly accounted for by the intensification of harvest of small pinnipeds (seals, but not walruses), which was conducted by local people, both in teams and individually. While Table 1 shows an overall increase in the consumption of marine mammals of 115 grams per capita per day, this can be broken down into seals (+192), walrus (+9) and whale (-86).

Table 1. Shift in food consumption in Chukotka between 1985 and 2000 (grams per capita per day).

| Decrease                | Change | Increase          | Change |
|-------------------------|--------|-------------------|--------|
| Market meats (incl. tinned) | -193   | Marine mammals meat | +115   |
| Market fats and oils    | -18    | Marine mammals fat | +21    |
| Bread and flour products| -62    | Flour             | +146   |
| Sweets and jam          | -26    | Sugar             | +24    |
Changes in nutrient composition of food
Using official data on food purchases and on the consumption of marine hunting products in the local communities, we calculated the ratio of the major nutrients in the diet of the natives in the years 2000 and 1985. The percentage of proteins, lipids and carbohydrates has not changed substantially (Table II).

Table II. Percent contribution of basic nutrients to total caloric intake, Lorino settlement.

| Year | Proteins | Lipids | Carbohydrates |
|------|----------|--------|---------------|
| 1985 | 22.7     | 41.2   | 36.1          |
| 2000 | 23.1     | 43.7   | 34.2          |

In the 1980s, carbohydrates were provided predominantly by bread and purchased flour items, and less by sugar, sweets and jam. Now, cheap flour and sugar have become the main sources of carbohydrates (consumption has increased 3 and 1.5 times, respectively).

In 1985, local marine mammals accounted for about half of the consumed meat (55%), with the remainder from market beef and pork, and tinned meat. In 2000, the share of marine mammals meat increased to 89%. Market fats and oils are also being substituted by the fat of marine mammals.

Changes in food preferences
At the end of the 1980s, a "European" type of a diet was widely adopted by those under the age of 30 in the indigenous population of coastal Chukotka. The older generation (over the age of 30 years) kept a mainly "traditional" diet, supplemented by some market food (7).

In 2002, 76% of the Coastal Chukchi and Yupik respondents in the under-30 age group declared a preference for native foods over European ("Russian") ones. Among people older than 30 years, who had grown up in the Soviet period and had been accustomed to the European type of diet in boarding schools, the proportion preferring a traditional native diet was lower, at 66%.

Overall, 86% of natives consider that whale hunting, as the main source of food, should be increased (in 1985, only 45% suggested so). However, there are some differences between representatives of different age groups. Among the under-30s, practically all the females and a half of the males mentioned insuffi-
ciency of marine mammal products today. At the same time, in the 31-60 age group, only 19% (26% of females and 11% of males) pointed out that these products were not sufficiently accessible. For the remainder, their needs for such foods appear to be completely satisfied.

DISCUSSION

The data presented in this paper demonstrate that the consumption of meat and fat of marine mammals has increased in the communities of coastal Chukotka, and young people today are oriented towards local food-stuff. It creates the impression that traditional nutrition has undergone a revival. In the popular and even scientific literature, one can frequently see statements that the Chukchee and Siberian Yupik are historically adapted to such a diet and now they have come back to the optimal one.

A less optimistic interpretation is possible, however, and the situation should be studied carefully.

First, the contemporary diet of the natives of coastal Chukotka differs significantly from the traditional one. Some structural changes in the consumption of the products of marine hunting have occurred. Take, for example, the traditional dishes of "sour meat", like kopalhen. In Chukotka, they are traditionally prepared from fermented walrus and bowhead whale meat. Walrus harvesting has not increased in the last few years, while bowhead whale hunting has completely stopped. The meat of seals and gray whales remains widely accessible, but only seasonally, and it is not suitable for long-term storage.

This substitution may have health-related consequences. It is possible that traditional dishes of "fermented proteins" may develop some specific form of protection against Helicobacter pylori. In the other types of foods H.pylori may exert a much heavier pathogenic effect on the gastro-intestinal tract (8).

The metabolism of lipids, carbohydrates and caffeine (a widely used substance in the modern "northern cuisine") is under the control of many genes (such as APOE, APOA, Lac, NAT, etc). Data are lacking on the frequencies of these genes in modern indigenous populations of Chukotka. However, it is known that significant genetic admixture has taken place over the years.
In 1985, 55% of Siberian Yupik were offspring of interethnic marriages, mainly with Russians (9). If the frequencies of "metabolic genes" in the younger generation of native northerners differ significantly from those among the elders, any adaptive responses that may have existed previously would have been diluted. This matter requires further careful study.

Changing diet is also related to another serious problem, presented by the industrial contamination of the environment and, in particular, the accumulation of persistent pollutants in the meat and fat of marine mammals.

We compared the consumption of local and marketed food-stuffs in native communities of Chukotka and northern Canada. While the Chukotka natives consume about the same quantity of marketed fats as the Canadian Inuit, the diet of the coastal Chukchi and Siberian Yupik comprises about 6 times as much fats of local origin than those of Canadian Inuit (10). According to preliminary results of the AMAP project (11), the polychlorinated biphenyl (PCB) content in the blood samples of the natives of Chukotka is 4.2 times higher than in those of Canadian Inuit (Chaschin, 2003, unpublished data). There needs to be a balance between the nutritional benefits of marine mammal fat and the risk of increasing the intake of contaminants such as PCB.

In recent years, marine hunters of Chukotka frequently report walrus and seals with various developmental defects, as well as an "ill odor and texture" of their meat and fat (12). The cause of the appearance of "stinky whales" (as the Chukchi call them) is poorly understood, but it is most likely connected with industrial contamination (13).

**CONCLUSION**

The economic collapse of the infrastructure of the northern regions of Russia in the past decade has resulted in many indigenous northerners reverting to the traditional subsistence economy.

Over the last 3-4 generations, the indigenous northerners of coastal Chukotka have adopted a "westernized" diet and lost some traditions, knowledge and skills. Many are ill-prepared today to engage in traditional subsistence activities, and a very high rate of fatal accidents has been observed among hunters.
We need to monitor the health impact of the changes in the pattern of food composition, preferences and method of preparation. The balance between the benefits of fatty acids of marine mammal origin and the potential risk of microbiological and chemical contamination requires particular attention.

Much remains unknown about genetic susceptibilities to chronic degenerative and metabolic diseases, and this population offers unique opportunities to investigate gene-environment interactions.

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