

## Plasma omega-3 and psychological distress among Nunavik Inuit (Canada)

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Received 20 October 2006; received in revised form 14 December 2007; accepted 12 April 2008

### Abstract

Marine omega-3 (*n*-3) fatty acid eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids have been associated with beneficial effects in mental health. Cultural and social changes have been related to a decline in mental health of the Inuit, but the role of diet has received scant attention. We examined the relationship between psychological distress (PD) and plasma *n*-3 among 368 Nunavik Inuit aged 18–74 years who took part in a survey in 1992. Participants were categorized as high-level PD if they scored over the 80th percentile of the PD Index Santé-Québec Survey (PDISQS-14), and non-distressed subjects were those who scored less than this cutoff. Compared with the non-distressed group, *n*-3 concentrations in the PD group were significantly lower in women but not in men. Compared with the lowest tertile of EPA+DHA, the odds ratios for high-level PD among women were 0.32 (95% CI: 0.13–0.82) for the second, and 0.30 (95% CI: 0.10–0.90) for the third tertile, after controlling for confounders. In males, there were no significant associations between EPA+DHA and PDISQS-14 scores. Our findings suggest that marine *n*-3 may play a role in PD among Inuit women. The gender difference observed in our analysis must be examined more carefully in future studies.

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**Keywords:** Omega-3 fatty acids; Psychological distress; Inuit; Eicosapentaenoic acid; Docosahexaenoic acid; Plasma phospholipids; Women

### 1. Introduction

Before World War II, the majority of the Inuit populations mainly lived according to a traditional lifestyle, which was based on subsistence activities

such as hunting and fishing (Santé-Québec, 1994; Blanchet et al., 2002; Kirmayer et al., 2000a; McGrath-Hanna et al., 2003). In recent decades, however, changes in lifestyle and dietary patterns have been observed among Inuit populations (Kirmayer et al., 2000a; McGrath-Hanna et al., 2003). Traditional food system use is declining rapidly, though not uniformly across the Arctic, but for most circumpolar regions, dietary intake from market foods exceeds those from traditional foods (Blanchet et al., 2002). In several native populations, this

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shift away from traditional lifestyle and diet was associated with increased health problems (Kirmayer et al., 2000a; McGrath-Hanna et al., 2003). Some aboriginal groups have reported evidence of severe psychological distress (PD) (with high rates of depression, suicide, violence, alcoholism and substance abuse), the most profound impact being seen among the young (Santé-Québec, 1994; Waldram et al., 1995; Chandler and Lalonde, 1998; Boothroyd et al., 2000; Haggarty et al., 2000; Kirmayer et al., 2000a,b).

The Nunavik region, located above the 55th parallel in the province of Quebec (Canada), is inhabited primarily by Inuit. The traditional Inuit diet mainly consists of marine mammals (white whale (beluga) and seal), fish and caribou, which are eaten fresh (raw or cooked) or dried, with the skin, blubber, liver, and fat added in different meals (Santé-Québec, 1994; Blanchet et al., 2000). The consumption of fish and marine mammals, rich in omega-3 ( $n-3$ ) fatty acids, represented a significant part of the Inuit diet in 1992 (Santé-Québec, 1994; Blanchet et al., 2000; Dewailly et al., 2001). Data from 24-h dietary recalls revealed that mean traditional food consumption of marine origin was 131.2 g/day (95% confidence interval (CI): 110.8–152.1) (Dewailly et al., 2001, 2003). Existing evidence points to a decrease in the traditional diet of the Inuit, especially among young adults and youth for whom market foods (which generally have a higher content of *trans*-fatty acids, lower omega-3, higher omega-6/omega-3 ratio, etc.) appear to be more attractive. We reported earlier that young adults (18–34 years) had one-half the eicosapentaenoic acid (EPA)+docosahexaenoic acid (DHA) concentrations in plasma phospholipids compared with Inuit aged 50 years and over (6.5% vs. 11.5%,  $P < 0.0001$ ) (Dewailly et al., 2003).

Several studies have identified EPA and DHA concentrations in blood as indicators of past individual dietary intake of marine  $n-3$  fatty acids (Hjartaker et al., 1997; Kobayashi et al., 2001; Kuriki et al., 2002, 2003; Kobayashi et al., 2003). It has been suggested that dietary changes occurring in our societies, mainly a decrease in marine  $n-3$  and an increase in omega-6 ( $n-6$ ), could be contributing to the increasing incidence of depression (Hibbeln and Salem, 1995). Epidemiological studies have shown that the prevalence of major depression (Hibbeln, 1998), bipolar depression (Noaghiul and Hibbeln, 2003), post-partum depression (De Vriese et al., 2003; Hibbeln, 2002), hostility (Iribarren et al., 2004) and suicidal ideation (De Vriese et al., 2004) is associated with lower dietary intake and/or blood concentrations of marine  $n-3$ . The Omega-3 Fatty Acids Subcommittee, assembled by the Committee on Research of Psychiatric Treatment of the American Psychiatric Association, has concluded that

studies support a protective effect of marine omega-3 in mood disorders (Freeman et al., 2006). Human (Hamazaki et al., 2000; Maes et al., 2000; Delarue et al., 2003) and animal (Takeuchi et al., 2003) investigations suggest that marine  $n-3$  may have an anti-stress function.

Specific diagnostic measures concerning mental health among the Inuit of Nunavik are lacking (Santé-Québec, 1994). This population and the representatives of various sectors of activity recognize that psychological and social problems are growing. The modernization of Inuit society has been associated with cultural and social changes, increased chronic diseases (obesity, cardiovascular disorders and diabetes) as well as a decline in mental health (Kirmayer et al., 2000a; McGrath-Hanna et al., 2003). However, the role of their traditional diet has received scant attention in regard to mental health. A generalized measure of PD was used in a cross-sectional survey undertaken by the Government of Quebec among the Inuit of Nunavik in 1992 (Santé-Québec, 1994). We considered it important to examine the potential role of marine  $n-3$  fatty acids in PD among the Nunavik Inuit.

## 2. Methods

### 2.1. Study design and population

The Santé-Québec Health Survey among the Inuit of Nunavik in 1992 has been described in detail elsewhere (Santé-Québec, 1994; Dewailly et al., 2001). Briefly, Santé-Québec, an organization of the Quebec Health and Social Services Ministry, undertook a health survey among the Inuit population of Nunavik in 1992. The primary objective of the survey was to collect relevant information on the physical, social and psychosocial health of the Inuit population (Santé-Québec, 1994). These data were gathered in several stages. Face-to-face interviews were conducted in English and/or Inuktitut (the Inuit language) at each participant's home to fill out a lifestyle questionnaire along with a confidential and a self-administered socio-demographic questionnaire. A clinical session was organized for the same participants, in the village health clinic to obtain physiological and anthropometric measurements. Information on demographic characteristics was collected from the Santé-Québec data files. Our team was responsible for analyzing the fatty acids in blood samples.

The target population of the survey comprised all permanent residents of Nunavik aged 18–74 years, excluding households consisting of only non-Inuit persons, individuals not related to an Inuit, and institutionalized subjects (Santé-Québec, 1994). Of the household respondents, 560 participants submitted to clinical

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