

Research and Professional Briefs

Low Docosahexaenoic Acid in the Diet and Milk of American Indian Women in New Mexico

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ABSTRACT

A recent finding of low levels of docosahexaenoic acid (DHA) in the milk of lactating Hispanic and non-Hispanic white women in New Mexico prompted a study of the DHA content of the breast milk and diets of American Indian women in the state. Nineteen urban American Indian women (18 to 40 years) who had been lactating for 1 to 6 months and who were attending clinics at the University of New Mexico Hospital were enrolled in a cross-sectional study that was conducted between June 2005 and February 2009. Descriptive statistics and correlations were performed. The mean fat content of the breast milk was 4.67 ± 1.9 g/dL and the mean DHA proportion of the milk fat was $0.097\% \pm 0.035\%$, which is a low value relative to international norms. The low DHA content of the milk could be accounted for by the women's low dietary intake of DHA (median=30 mg). The DHA percentage in the women's milk fat was positively correlated with dietary intake of DHA ($r=0.67$; $P<0.001$). This

study shows that the DHA content of the breast milk of urban American Indian women attending clinics at a university hospital in New Mexico is well below levels widely acknowledged as being healthful for infants who rely mainly on breast milk for their supply of DHA. *J Am Diet Assoc.* 2011;111:744-748.

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Breast milk is the preferred form of nourishment for infants during the first 6 months of life, and a mother's docosahexaenoic acid (DHA) status plays an important role in determining the DHA status of her offspring (1) and the growth and neurocognitive development of infants through the first 12 months of life (2-9). Although newborns can synthesize DHA from α -linolenic acid, this capacity is insufficient to meet the demands of growth and development (10,11).

The proportion of DHA in human milk fat is highly variable both within and among cultures (12-15), ranging from 0.05% to 0.10% in women whose diets do not habitually include foods or supplements that provide relatively large amounts of DHA (16), to proportions $>1.0\%$ in women who consume salmon or other ocean fish at least once a week (7,17,18).

The DHA content of the serum or red-cell phospholipids of a lactating woman and the breast-milk triglycerides she produces are positively correlated with the amount of DHA she consumes (19-21). Bergmann and colleagues (20) estimate that intake of 200 mg per day of DHA from mid-pregnancy through lactation is sufficient to support normal neurodevelopment. In a recent study of the diets and milk fat of breastfeeding Hispanic and non-Hispanic white women in New Mexico (22), it was found that their mean DHA intake was only 47 mg and DHA accounted for just 0.11% of the fatty acids in their milk fat.

In light of the previous finding that the milk fat of women representing the two other major ethnic groups in New Mexico—namely Hispanics and non-Hispanic whites—contained low amounts of DHA (22), and that diets of indigenous people in the US Southwest tend to contain little in the way of seafood or other DHA-rich foods, it was expected that DHA would be an inadequate fatty acid in the diets and milk fat of lactating American Indian women in New Mexico. The main aim of the present study was to determine the DHA content of the diets and breast milk of American Indians inhabiting New Mexico.

METHODS

Participants

Women between 18 and 40 years of age who had been lactating for 1 to 6 months were recruited into a cross-

sectional study while they were visiting clinics at the University of New Mexico Hospital. From June 2005 to February 2009, of the 789 mothers who were screened for eligibility, 304 were American Indian. Two hundred nineteen American Indian women who were determined to be eligible were invited to participate in the study. Of these, 199 were no longer breastfeeding, could not be reached, or were not interested in participating. Nineteen of the remaining 20 women enrolled in and completed the study. The socioeconomic status (SES) of the subjects was assessed by financial class based on Medicaid eligibility.

Exclusion criteria were maternal use of tobacco, use of immunosuppressive drugs, pregnancy, or diabetes. Informed consent was obtained from each subject and the study was approved by the Human Research Review Committee of the University of New Mexico Health Sciences Center.

Breast Milk

Milk was collected and processed as described elsewhere (23-25), between 8:30 and 10:30 AM after an overnight fast.

Diet Records and Dietary Supplements

Collection of information about diet and dietary supplements is described elsewhere (22). Participants completed a single written diet record of food and drinks consumed in the 3 days immediately preceding the clinic visit when blood and breast-milk samples were obtained. A registered dietitian probed for any additional consumption of foods, drinks, or dietary supplements. The 3-day diet records were coded, analyzed, and reviewed by registered dietitians using the Food Intake Analysis System (version Millennium 1.0, 2005, The University of Texas School of Public Health, Houston). The software database included American Indian foods.

Participant Education

After data collection, a registered dietitian counseled each participant about increasing fish consumption in accordance with US Environmental Protection Agency Guidelines (26).

Body Composition Analysis

Two measurements of each participant's height and weight were obtained using methods described elsewhere (27). Body composition was assessed in the fasted state according to the method of Heyward (28) using a Quantum II Bioelectrical Impedance Analyzer (RJL Systems, Clinton Township, MI). Duplicate measurements of resistance and reactance were used to determine percentage body fat using validated formulas for American Indian women (29).

Fatty Acid Analysis

Breast milk lipids were extracted as described elsewhere (22). The extracted lipid residue was weighed after drying at 40°C under a stream of nitrogen to calculate milk fat content. Fatty acid methyl esters were prepared, sepa-

Table 1. Summary of the anthropometric characteristics of lactating American Indian women in New Mexico (n=19)

Parameter	← mean ± standard deviation →
Age (y)	23.9 ± 4.4
Height (cm)	160 ± 6
Weight (kg)	76.5 ± 15.0
Triceps skin fold (mm)	26 ± 6
Mid-upper arm circumference (cm)	32.5 ± 4.3
Body fat (%)	46.4 ± 4.3

rated, and quantified using methods described elsewhere (23). Fatty acid methyl esters were identified using pure methyl ester standards (Nu-Chek Prep, Elysian, MN).

Statistical Analyses

Descriptive statistics and correlations were made using Number Cruncher Statistical Software (NCSS, version 6, 2004, Kaysville, UT). Data are presented as mean ± 1 standard deviation. Relations between parameters were tested using the Pearson correlation coefficient. A *P* value ≤ 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Participants ranged in age from 19 to 34 years (mean = 23.9 years) (Table 1). Average time of lactation when milk was obtained was 2.3 ± 1.8 months. Seventeen women were assessed to be low SES. Sixteen women resided in the Albuquerque area and three in small towns; none resided on an American Indian reservation. The mean percent body fat of the subjects was 46.4% ± 4.3%. Three low SES participants reported consuming seafood (tuna, salmon, shrimp, catfish). Nine women reported taking dietary supplements. Seven participants took a prenatal vitamin/mineral supplement daily. One low-SES participant reported taking a DHA supplement three times weekly.

The main finding of this study was that the DHA intake of a sample of urban American Indian women in the US Southwest is suboptimal and might not be sufficient to support the level of DHA in their milk that is required for the optimum health and development of their infants, especially during the first year of life. The mean percentage of DHA in the milk of the American Indian women in the present study was only 0.097%, a value that is well below the recommended proportion of 0.20% to 0.40% (28,29) (Table 2). Brenna and colleagues (13) performed a meta-analysis of human milk fat from numerous countries worldwide and found the mean DHA percentage to be 0.32%. The average DHA percentage in the milk of the American Indian participants in this study is slightly lower than the value of 0.11% reported recently for both Hispanic and non-Hispanic white women in New Mexico (22) and 0.20% for women elsewhere in the United States (30).

The low level of DHA in the breast milk of most of the participants in the present study can be attributed to

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