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Maternal Intake of Seafood Omega-3 Fatty Acids and Infant Health: A Review of the Evidence

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BACKGROUND

Pregnant and lactating women should plan their diets to meet the nutrient needs of the developing fetus and growing infant, including consuming foods that contain the omega-3 fatty acids docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). Seafood is the primary source of DHA and EPA in the food supply, and current evidence indicates there are benefits to seafood consumption for pregnant and lactating women when women consume seafood that is lower in contaminants.

The potential risks associated with seafood consumption are the presence of contaminants such as methyl mercury (MeHg) and persistent organic pollutants (POPS). These toxins can impair neurologic development and are especially problematic for pregnant or lactating women, infants, and women who may become pregnant. However, there are large differences in the amount of contaminants in various seafood species and there is a risk-benefit balance that needs to be considered when incorporating seafood in the diet. To maximize benefits, seafood species should be selected that are higher in omega-3 fatty acids (increased benefit) and lower in contaminants (decreased risk).

This *Nutrition Insight* provides a summary of two evidence-based systematic reviews on (1) maternal omega-3 fatty acid intake from seafood and selected infant health outcomes and (2) the benefits in relationship to the risks for seafood consumption (Dietary Guidelines Advisory Committee, 2010). These reviews were conducted by the 2010 Dietary Guidelines Advisory Committee (DGAC) and the USDA Nutrition Evidence Library (NEL) in support of the *Dietary Guidelines for Americans, 2010*.

REVIEW OF THE EVIDENCE

The NEL evidence-based systematic reviews followed a rigorous, transparent, and reproducible methodology. The full 2010 DGAC report that was informed by these reviews can be accessed at www.dietaryguidelines.gov. The full NEL evidence portfolios, as well as information on the literature search, evidence abstraction and analysis, and criteria for study quality, can be accessed at www.NEL.gov.

Infant health and breast milk composition. For this systematic review, nine articles published since 2000 met the inclusion

USDA NUTRITION EVIDENCE LIBRARY

The USDA Nutrition Evidence Library (NEL) specializes in conducting systematic reviews to inform Federal nutrition policy and programs. The Library is a key resource for making food and nutrition research accessible to all Americans.

www.NEL.gov

criteria. There were seven positive-quality prospective cohort studies with low-risk pregnant women, healthy mother-infant pairs, or children. These studies were conducted in the United States, Europe, and Canada with cohort sizes from 211 to 50,276 individuals. One randomized controlled trial of 350 mother-infant pairs from the United States and a meta-analysis of 65 studies worldwide, both positive quality, were also included. These studies assessed heterogeneous outcomes such as cognitive function, visual acuity, duration of pregnancy, and birth weight. Studies on omega-3 supplements were not included.

Seafood consumption during pregnancy was assessed in three cohort studies that showed higher prenatal seafood intake was associated with improved infant cognition scores. One large cohort study found low prenatal seafood intake was associated with risk of low verbal IQ in 8-year-old children. And, lastly, a clinical trial tested prenatal DHA consumption and showed that those infants had improved vision and attention span.

Maternal seafood consumption was also associated with improved pregnancy outcomes. One cohort study showed that gestation time was longer and risk of preterm delivery was less in women who consumed seafood at least once per week. A second study found that in overweight women, high seafood intake was associated with increased fetal growth.

Regarding lactation, a large quantitative analysis assessed breast milk DHA levels in women worldwide and found that DHA content was closely linked to seafood intake. The association with infant outcomes was examined, and one study found that increased DHA biomarkers in breastfed infants were associated with improved visual acuity.

Benefits and risks of seafood consumption. A separate systematic review was conducted on the benefits and risks of seafood. The benefits included supporting infant neurological development through intake of omega-3 fatty acids by pregnant and lactating women. The risks included exposure to MeHg and POPs that may be in seafood. The studies in this review included risk/benefit assessments, a meta-analysis, and a systematic review. The risk/benefit studies conducted in the United States and internationally showed that benefits of omega-3 consumption outweighed the MeHg risks for certain fish species. However, those benefits did not outweigh the risks for consumption of large predatory fish such as shark and swordfish that have high MeHg levels. The systematic review showed that the benefits of modest fish consumption outweigh the risks in women of childbearing age, with the exception of a few fish species. A report from the IOM, *Seafood Choices* (Institute of Medicine, 2007), was used for further context.

CONCLUSIONS

The 2010 DGAC concluded that there is moderate evidence that increased maternal dietary intake of long chain omega-3 fatty acids, “in particular DHA from at least two servings of seafood per week during pregnancy and lactation is associated with increased DHA levels in breast milk and improved infant health outcomes, such as visual acuity and cognitive development.” Two servings per week is the equivalent of approximately 8 ounces per week, which should provide an average 250 milligrams per day of DHA and EPA.

Regarding safety, the 2010 DGAC concluded that “moderate, consistent evidence shows that health benefits derived from the consumption of a variety of cooked seafood in the United States in amounts recommended by the [2010 DGAC] outweigh the risks associated with MeHg and POPs exposure, even among women who may become or who are pregnant, nursing mothers, and children ages 12 and younger.” These groups can safely eat “a variety of cooked seafood in amounts recommended by the [2010 DGAC] while following Federal (U.S. Environmental Protection Agency and U.S. Food and Drug Administration, 2010) and local seafood advisories.” The Federal advisory specifies that these groups should not eat or should limit certain large predatory fish and limit total seafood intake to no more than 12 ounces per week.

FROM RESEARCH TO RECOMMENDATIONS

The *Dietary Guidelines for Americans (DGA), 2010* recommends that women who are pregnant or breastfeeding consume 8–12 ounces of seafood per week from a variety of seafood types (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010).

Additionally, due to MeHg content, women should limit white (Albacore) tuna to 6 ounces per week and should not eat shark, swordfish, king mackerel, or tilefish. Women should also check regional advisories on locally caught seafood. Overall, maternal

benefits are maximized when seafood higher in DHA and EPA, but lower in contaminants, are consumed. Also, consuming a variety of seafood species may decrease exposure to contaminants. Examples of common seafood and estimated DHA and EPA, as well as MeHg levels, are listed in **Table 1**.

Table 1. Estimated DHA and EPA and Mercury Content in 4 Ounces of Selected Seafood Varieties

Common Seafood Varieties	DHA+EPA ¹ mg/4 ounces	Mercury mcg/4 ounces
Salmon [†] : Atlantic*, Chinook*, Coho*	1,200–2,400	2
Anchovies [†] and Herring [†]	2,300–2,400	5–7
Mackerel: Atlantic and Pacific	1,350–2,100	8–13
Oysters: Pacific	1,550	2
Trout: Freshwater	1,000–1,100	11
Tuna: White (Albacore) canned	1,000	40
Salmon [†] : Pink* and Sockeye*	700–900	2
Crab: Blue [†] , King [†] , Snow [†] , Queen*, and Dungeness*	200–550	9
Flounder [†] and Sole [†]	350	7
Clams	200–300	0
Tuna: Light canned	150–300	13
Catfish	100–250	7
Cod [†] : Atlantic* and Pacific*	200	14
Scallops [†] : Bay* and Sea*	200	8
Shrimp	100	0
Seafood varieties that should <i>not</i> be consumed by women who are pregnant or breastfeeding.		
Shark	1,250	151
Tilefish [†] : Gulf of Mexico [†]	1,000	219
Swordfish	1,000	147
Mackerel: King	450	110

¹ DHA (docosahexaenoic acid); EPA (eicosapentaenoic acid).

*Seafood variety is included in DHA + EPA value(s) reported.

[†]Seafood variety is included in mercury value(s) reported.

Adapted from *Dietary Guidelines for Americans, 2010* available at www.cnp.usda.gov/Publications/DietaryGuidelines/2010/PolicyDoc/Appendices

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