MOST IMPORTANT NUTRIENTS FOR PREGNANCY

During pregnancy, the basic principles of healthy eating remain the same. Balance is key. Half of every meal should be comprised of vegetables. The other half should be comprised of protein (beans, legumes, nuts, fish, meat, eggs) and carbohydrates (bread, rice, pasta, potatoes). Processed foods should be avoided, and intakes of salt, sugar and animal fats should be minimized. Beyond these basic principles, certain nutrients are of particular importance during pregnancy, notably…

1) Omega-3 Fatty Acids

During pregnancy, the requirement for omega-3 fatty acids increases because omega-3s play a critical role in fetal vision and brain development.[1] Furthermore, adequate omega-3 intakes can help prevent preterm birth.[2-4] The two types of omega-3 fatty acids needed in pregnancy [eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)] and are only found in fish. Some prenatal supplements contain omega-3s, but many do not. Furthermore, prenatal supplements that do contain omega-3s deliver a wide range of doses, that may or may not be consistent with recommended intake levels.

Omega-3 Fatty Acid Recommendation During Pregnancy[2]	
Women with adequate Ω3 intakes	Women with inadequate Ω3 intakes
NOTE: Adequate intakes can be loosely defined as a longstanding (at least one year) history of consuming two servings (3 oz) of fatty fish per week (salmon, mackerel, herring, sardines, anchovies)	NOTE: Research suggests, more than 95% of North American women have insufficient intakes of omega-3 fatty acids [5,6]
• >350 mg EPA+DHA	• >600 mg EPA+DHA
-A 3-oz [palm sized] serving of fatty fish (salmon, mackerel, herring, sardines or anchovies) eaten TWO times per week can provide the recommended 350 mg of EPA+DHA -NOTE: none of these fatty fish are high in mercury and are therefore considered safe in pregnancy	-This dose of omega-3s is typically only achievable with supplements SUPPLEMENT BRANDS TESTED IN RANDOMIZED CONTROLLED TRIALS: -*DHA Life* (200 mg DHA) OTHER REPUTABLE SUPPLEMENT BRANDS: -*NutraSea*

2) Folate

Folate deficiency at day twenty-eight post-conception increases risk for neural tube defects. Therefore, all pregnant women should take folic-acid starting three months prior to conception and until the end of the first trimester. Furthermore, a diet rich in folate should be consumed throughout pregnancy.

Folate Recommendation During Pregnancy[7,8]	
• 0.4 mg (400 ug) supplemental folic acid* + a diet high in folate for a total of 0.6 mg per day *women with a personal history of neural tube defects, a previous pregnancy affected by an NTD, or who have a male partner at high risk for an NTD, may need 4 mg of folic acid	SOURCE: Dietary Reference Intakes, Institute of Medicine
<u>FOODS HIGH IN FOLATE:</u> Lentils (½ cup) - 179 ug Garbanzo beans (½ cup) - 141 ug Cooked spinach (½ cup) - 131 ug Black-eyed peas (½ cup) - 105 ug Fortified breakfast cereals (1 cup) - 100 ug Green Peas (1 cup) - 94 ug Rice (½ cup) - 90 ug Asparagus (4 spears) - 89 ug Brussels sprouts (½ cup) - 78 ug Enriched pasta (½ cup) - 74 ug Romaine lettuce (1 cup) - 64 ug Avocado (½ cup) - 59 ug Raw Spinach (1 cup) - 58 ug Broccoli (½ cup) - 52 ug	

3) Iron

Iron requirements increase in pregnancy to meet the body's requirement for 40% more red blood cells.[9] Furthermore, insufficient iron intakes increase risk for low birth weight, small for gestational age, preterm birth, need for blood transfusion in the mother, postpartum hemorrhage, and long-term neurocognitive effects in childhood.[10]

Iron Recommendation During Pregnancy	
Pregnant women without anemia[11]	Pregnant women with anemia[12] (Hemoglobin <11, Ferritin <30)
• 16 to 20 mg of elemental iron from supplements along with iron-rich foods to total 27 mg per day	• 40 to 80 mg of elemental iron from supplements
SOURCE: Cockell KA, Miller DC, Lowell H. Application of the Dietary Reference Intakes in developing a recommendation for pregnancy iron supplements in Canada. The American journal of clinical nutrition 2009;90:1023-8.	SOURCE: Pavord S, Daru J, Prasannan N, Robinson S, Stanworth S, Girling J. UK guidelines on the management of iron deficiency in pregnancy. British journal of haematology 2020;188:819-30.
<u>FOODS HIGH IN IRON:</u> Fortified breakfast cereals (1 cup) - 18 mg White beans (1 cup) - 8 mg Lentils (½ cup) - 3 mg Spinach (½ cup) - 3 mg Tofu (½ cup) - 3 mg Kidney beans (½ cup) - 2 mg Chickpeas (½ cup) - 2 mg Sardines (3 oz) - 2 mg Beef (3 oz) - 2 mg Pork (3 oz) - 1 mg Chicken (3 oz) - 0.5 mg	

4) Choline

There is an increased requirement for choline during pregnancy because choline is essential for fetal brain and neurotransmitter development,[13] as well as optimal placental function.[14] Prenatal supplements generally do not contain choline or contain very small amounts. Therefore, all pregnant women need to ensure adequate intakes from diet and/or supplements. While it is preferable to obtain choline from food sources, it is difficult to obtain sufficient choline from food alone. There are multiple different forms of choline supplements (including choline bitartrate, phosphatidyl choline, CDP-choline, choline chloride). Currently, there is insufficient evidence to recommend a specific choline form or dose for pregnancy. However, considering that average choline intakes are approximately 278 mg per day,[15] pregnant women could safely consume an additional ~200 mg of choline from supplements to reach recommended intake levels and would still stay safely below the upper tolerable intake level of 3500 mg. Interestingly, some studies have demonstrated improved infant cognition with even higher supplemental doses of 900 mg of choline chloride.[16,17]

Choline Recommendation During Pregnancy[7]	
• 450 mg per day	SOURCE: Dietary Reference Intakes, Institute of Medicine

DIETARY SOURCES OF CHOLINE:

Egg (1 large) - 151 mg
Beef top round (3 oz) - 117 mg
Soybeans (½ cup) - 107 mg
Scallops, cooked, steamed (3 oz) - 94 mg
Salmon (3 oz) - 75 mg
Ground Beef (3 oz) - 72 mg
Atlantic cod (3 oz) - 71 mg
Shrimp (3 oz) - 69 mg
Brussels sprouts (1 cup) - 63 mg
Broccoli (1 cup) - 62 mg
Chicken breast (3 oz) - 62 mg
Cauliflower (1 cup) - 47 mg
Kidney beans (½ cup) - 45 mg
Quinoa (1 cup) - 43 mg
Milk (1 cup) - 43 mg
Green peas (1 cup) - 41 mg
Lima beans (½ cup) - 34 mg
Peanut butter (2 tbsp) - 20 mg
Avocado (1 whole) - 19 mg

5) Vitamin D

Adequate vitamin D levels in pregnancy improve fetal growth, reduce the risks for small-for-gestational-age, preeclampsia, preterm birth, and gestational diabetes.[18]

Vitamin D Recommendation During Pregnancy[19]	
Women with adequate Vit D intakes	Women with Vit D deficiency
Serum Vitamin D levels <32 ng/ml or <80 nmol/L	Serum Vitamin D levels >32 ng/ml or >80 nmol/L
• 600 IU/day supplemental Vitamin D3	• 1000 IU/day supplemental Vitamin D3

6) Fiber

During pregnancy, recommended fiber intake levels increase. Research trials have shown that increased fiber intakes decrease pregnancy associated weight gain.[20] Furthermore, association-based studies link increased fiber with decreased risk of neurodevelopmental delay.[21]

Fiber Recommendation During Pregnancy[22]		
• 28 g per day		
FOODS HIGH IN FIBER		
VEGETABLES	FRUITS	LEGUMES
-Green peas (1 cup) - 8g -Artichoke (1 whole) - 7 g -Pumpkin (1 cup) - 7 g -Brussels sprouts (1 cup) - 3.5 g -Carrots (1 cup) - 3.5 g	-Avocado (1 whole) - 9 g -Pears (1 whole) - 5.5 g -Mangoes (1 whole) - 5 g -Berries (1/2 cup) - 4 g -Apples (1 whole) - 4 g	-Beans (1 cup) - 17 g -Split peas (1 cup) - 16 g -Lentils (1 cup) - 15.5 g -Chickpeas (1 cup) - 12.5 g
NUTS	SEEDS	GRAINS
-Almonds (1/2 cup) - 7.5 mg -Pistachios (1/2 cup) - 6.5 mg -Peanuts (1/2 cup) - 6 mg -Walnuts (1/2 cup) - 4 mg	-Quinoa (1 cup) - 5 mg -Chia seeds (1 tbsp) - 3.5 mg -Flaxseeds (1 tbsp) - 3 mg	-Oats (1 cup) - 8 mg -Bulgur (1 cup) - 8 mg -Barley (1 cup) - 6 mg -Corn (1 cup) - 5 mg -Brown/Wild rice (1 cup) - 3 mg

7) Lutein

Association-based studies have shown that higher intakes of lutein (an antioxidant that crosses the placenta and accumulates in the fetal brain, is associated with improved verbal intelligence and behavioral regulation in childhood.[23]

Lutein Recommendation During Pregnancy[23]
• ~5 mg per day
DIETARY SOURCES OF LUTEIN: -cooked spinach (1/2 cup) - 10 mg -raw spinach (1 cup) - 3.6 mg -green peas (1 cup) - 3.6 mg -zucchini (1 cup) - 2.6 mg -kale (1 cup) - 1.5 mg -brussels sprouts (1 cup) - 1.4 mg -corn (1 cup) - 1 mg -broccoli (1 cup) - 0.7 mg -romaine lettuce (1 cup) - 0.6 mg -avocado (1 whole) - 0.4 mg -eggs (1 whole) - 0.2 mg

REFERENCES:

1. Greenberg JA, Bell SJ, Ausdal WV. Omega-3 Fatty Acid supplementation during pregnancy. Reviews in obstetrics & gynecology 2008;1:162-9.
2. Cetin I, Carlson SE, Burden C, et al. Omega-3 fatty acid supply in pregnancy for risk reduction of preterm and early preterm birth. American journal of obstetrics & gynecology MFM 2023;6:101251.
3. Middleton P, Gomersall JC, Gould JF, Shepherd E, Olsen SF, Makrides M. Omega-3 fatty acid addition during pregnancy. The Cochrane database of systematic reviews 2018;11:CD003402.
4. Carlson SE, Gajewski BJ, Valentine CJ, et al. Higher dose docosahexaenoic acid supplementation during pregnancy and early preterm birth: A randomised, double-blind, adaptive-design superiority trial. EClinicalMedicine 2021;36:100905.
5. Zhang Z, Fulgoni VL, Kris-Etherton PM, Mitmesser SH. Dietary Intakes of EPA and DHA Omega-3 Fatty Acids among US Childbearing-Age and Pregnant Women: An Analysis of NHANES 2001-2014. Nutrients 2018;10.
6. Denomme J, Stark KD, Holub BJ. Directly quantitated dietary (n-3) fatty acid intakes of pregnant Canadian women are lower than current dietary recommendations. The Journal of nutrition 2005;135:206-11.
7. Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline. National Academies Press, 1998. at https://www.ncbi.nlm.nih.gov/books/NBK114308/.)

8. O'Connor DL, Blake J, Bell R, et al. Canadian Consensus on Female Nutrition: Adolescence, Reproduction, Menopause, and Beyond. Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC 2016;38:508-54 e18.
9. Sanghavi M, Rutherford JD. Cardiovascular Physiology of Pregnancy. Circulation 2014;130:1003-8.
10. Malinowski AK, Murji A. Iron deficiency and iron deficiency anemia in pregnancy. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 2021;193:E1137-E8.
11. Cockell KA, Miller DC, Lowell H. Application of the Dietary Reference Intakes in developing a recommendation for pregnancy iron supplements in Canada. The American journal of clinical nutrition 2009;90:1023-8.
12. Pavord S, Daru J, Prasannan N, Robinson S, Stanworth S, Girling J. UK guidelines on the management of iron deficiency in pregnancy. British journal of haematology 2020;188:819-30.
13. Jaiswal A, Dewani D, Reddy LS, Patel A. Choline Supplementation in Pregnancy: Current Evidence and Implications. Cureus 2023;15:e48538.
14. Korsmo HW, Jiang X, Caudill MA. Choline: Exploring the Growing Science on Its Benefits for Moms and Babies. Nutrients 2019;11.
15. Choline - Fact Sheet for Health Professionals. 2022. (Accessed 30 May, 2024, at https://ods.od.nih.gov/factsheets/Choline-HealthProfessional/#en16.)
16. Caudill MA, Strupp BJ, Muscalu L, Nevins JEH, Canfield RL. Maternal choline supplementation during the third trimester of pregnancy improves infant information processing speed: a randomized, double-blind, controlled feeding study. FASEB journal : official publication of the Federation of American Societies for Experimental Biology 2018;32:2172-80.
17. Bahnfleth CL, Strupp BJ, Caudill MA, Canfield RL. Prenatal choline supplementation improves child sustained attention: A 7-year follow-up of a randomized controlled feeding trial. FASEB journal : official publication of the Federation of American Societies for Experimental Biology 2022;36:e22054.
18. Pérez-López FR, Pilz S, Chedraui P. Vitamin D supplementation during pregnancy: an overview. Current opinion in obstetrics & gynecology 2020;32:316-21.
19. ACOG Committee Opinion No. 495: Vitamin D: Screening and supplementation during pregnancy. Obstetrics and gynecology 2011;118:197-8.
20. Hull HR, Herman A, Gibbs H, et al. The effect of high dietary fiber intake on gestational weight gain, fat accrual, and postpartum weight retention: a randomized clinical trial. BMC Pregnancy and Childbirth 2020;20:319.
21. Miyake K, Horiuchi S, Shinohara R, et al. Maternal dietary fiber intake during pregnancy and child development: the Japan Environment and Children's Study. Frontiers in nutrition 2023;10.
22. Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids (Macronutrients). Washington, DC: The National Academies Press; 2005.
23. Mahmassani HA, Switkowski KM, Scott TM, et al. Maternal Intake of Lutein and Zeaxanthin during Pregnancy Is Positively Associated with Offspring Verbal Intelligence and Behavior Regulation in Mid-Childhood in the Project Viva Cohort. The Journal of nutrition 2021;151:615-27.