



Nutritional Needs during Pregnancy

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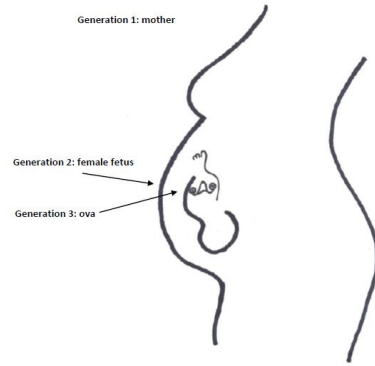
Learning objectives

To meet competencies for nutrition and weight management advising during pregnancy, following this presentation a student should be able to:

- ▶ Identify at least two socio-cultural influences on general nutrition
- ▶ State caloric needs during pregnancy
 - ▶ Adjust for maternal age
 - ▶ Adjust for multiple gestation
- ▶ Identify the following prenatal macronutrients, their physiologic use and the approximate target daily intake:
 - ▶ Carbohydrates
 - ▶ Fats
 - ▶ Proteins
- ▶ Identify the following prenatal micronutrients, their physiologic use and approximate RDA:
 - ▶ Vitamin A
 - ▶ Vitamin D
 - ▶ Vitamin B12
 - ▶ Vitamin C
 - ▶ Folate/folic acid
 - ▶ Iron
 - ▶ Calcium
 - ▶ Iodine
- ▶ Give general counseling about special dietary needs: lactose free, glute free, vegetarian/vegan, My Plate Diet, pica

PERINATAL MORBIDITY & MORTALITY

EPIGENETIC CHANGES:
*fetal
*ova in female fetus

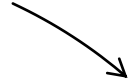
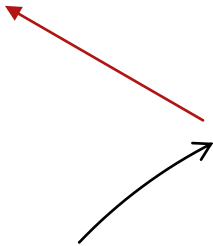


OBESITY:
^ white adipose tissue cytokines & hormones
v satiety signaling from gut microbiome

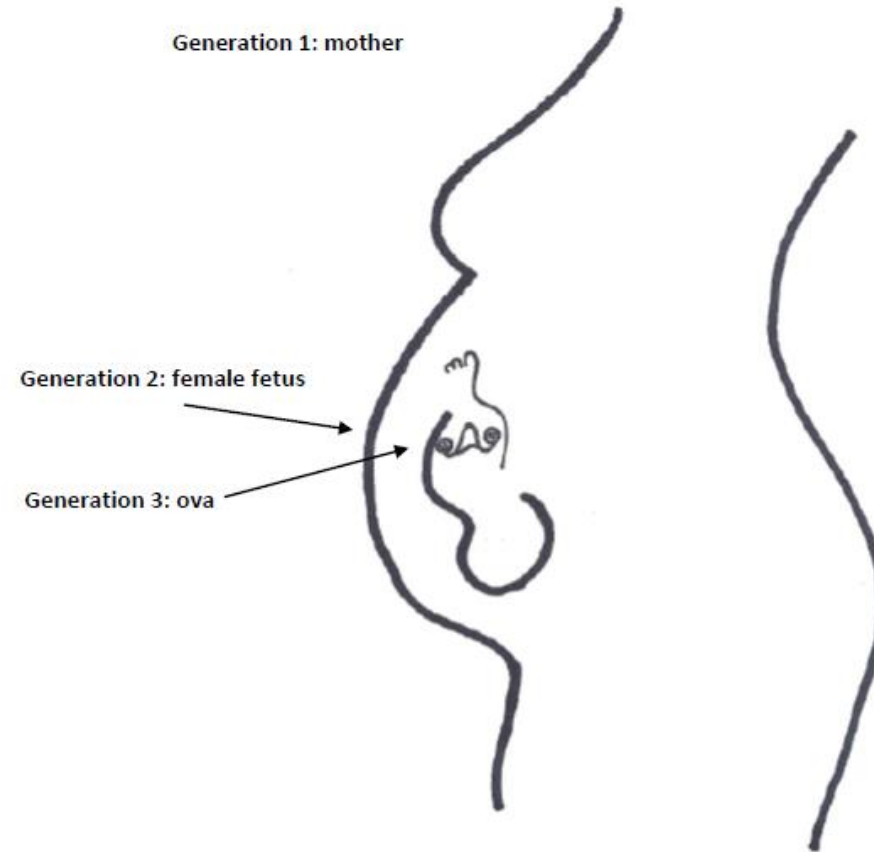
ECONOMIC & EDUCATIONAL DISPARITIES:
v access to quality education
v access to living wage
v access to health care
v access to health information

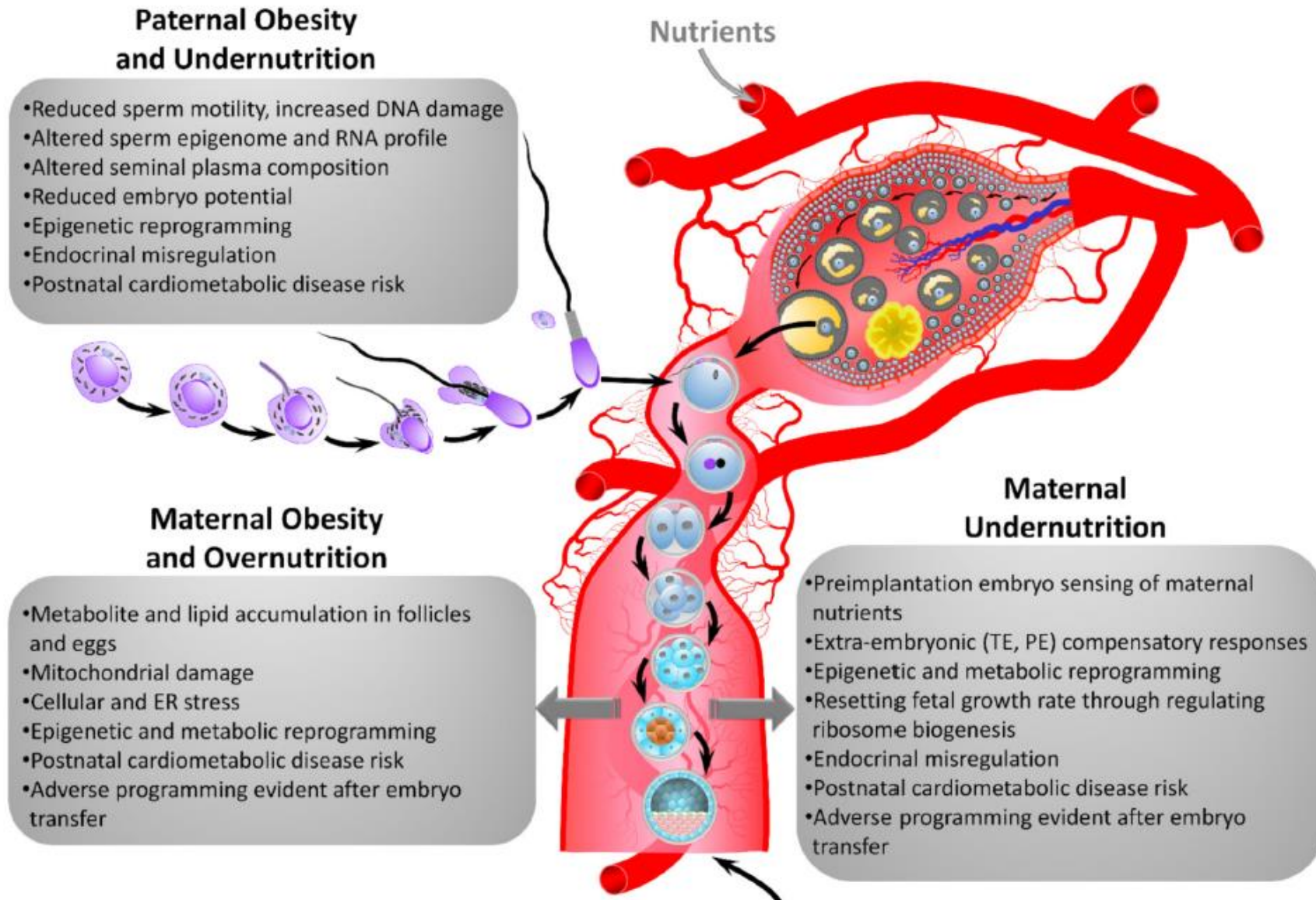
ENVIRONMENTAL DISPARITIES:
^ exposure to endocrine disrupting chemicals
^ increased tobacco product exposure
v safety of physical activity

NUTRITIONAL DISPARITIES:
v incidence & duration of breastfeeding
v income for quality nutrition
v availability of nutritious foods
^ exposure to calorie dense, high glycemic index foods



Obesity has less to do with personal choice than with socioeconomic limits on choices & epigenetics





From Fleming, et al., *The Lancet*

Basis of 2009 US Institute of Medicine Weight Gain Recommendations

- ▶ Optimal weight for newborn health is 3500 to 4500 g (*Lederman SA 2001*)
- ▶ Positive correlation between maternal prenatal weight gain and infant birth weight (*Thorsdottir et al. 2002*)
- ▶ Stable correlation between BMI & percent body fat during pregnancy in non-obese women (*Lindsay 1997*)
- ▶ Women of normal prepregnancy weights have better perinatal outcomes with weight gains in the 23-35 pound (11.5 – 16 kg) range (*Bracero & Byrne 1998, Thorsdottir 2002*)
- ▶ WHO: BMI is a predictor of specific maternal & neonatal outcomes

Perinatal Nutrition Needs

~ 300 additional calories per day after 16 weeks gestation-per fetus

Women may be eating 300 excess calories daily before pregnancy begins (10 lb/year gain or 22 kg). They don't need an increase.

- ▶ Target is 2100 calories per day
 - ▶ Teens may need more for growth
 - ▶ Ages 35-40 may only need 1500 calorie baseline

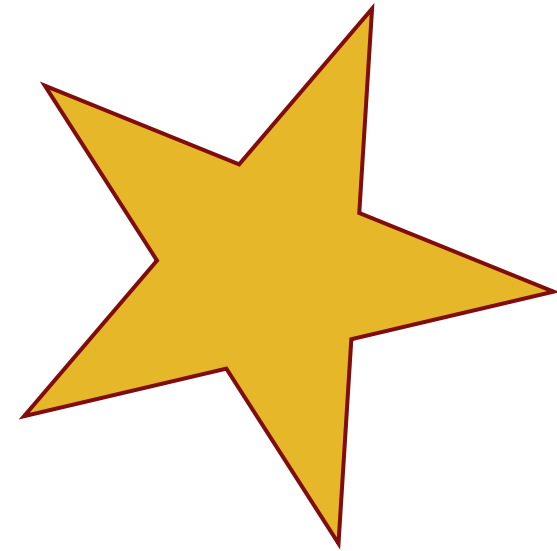
Sufficient

- ▶ Folic acid
- ▶ Calcium
- ▶ Iron



AMDR = Acceptable Macronutrient Distribution Ranges)

- ▶ Protein 10-35%
- ▶ Fat 20-35%
- ▶ Carbohydrate 45-65%



RDA = Recommended Daily Allowance

- ▶ Target
- ▶ Many ways to meet RDAs
- ▶ Some populations easily meet RDAs
- ▶ Some populations have special needs: Vitamin D in Canada

Abbreviations & Definitions

- ▶ UL=Tolerable upper limit (example: fat soluble vitamins)
- ▶ AI=Adequate intake

Macronutrients in Pregnancy: Carbohydrates

- Function:** primary energy source for the brain, least expensive nutrient to produce

- Dietary sources:**

- starch** (corn, potatoes, rice, grains)
- sugars** (fruits and juices)
- added sugars**

- RDA:** 175grams/day (vs. 130g/d)

- AMDR:** 45-65% (25% or less from added sugars)

- Inadequate intake:** bone mineral loss, hypercholesterolemia, impaired development and function of the central nervous system

- Excess intake:** dental caries, behavioral changes, cancer, risk of obesity, risk of hyperlipidemia

- Key messages:**

Make at least half of your grains whole grains

Drink water instead of sugary drinks

Choose foods and drinks with little or no added sugars



Macronutrients in Pregnancy: Protein

- **Function:** major structural component of cells, functions as enzymes, transport carriers, hormones, in membranes, etc.
- **Dietary sources:**
 - **complete proteins** (provide all 9 essential amino acids) meat, poultry, fish, eggs, milk, soy milk, cheese, yogurt, tofu
 - **incomplete proteins** (deficient in one or more amino acids) legumes, grains, nuts, seeds, vegetables
- **RDA** (only for the second half of pregnancy): 71grams/day (vs. 46g/d)
- **AMDR:** 10-35%
- **Inadequate intake:** protein deficiency affects all of the body's organs and many systems



Macronutrients in Pregnancy: Protein

- Excess intake:** high-protein diets may produce gastrointestinal effects, changes in nitrogen balance, and chronic disease (conflicting data)

- Key messages**

Vary protein food choices.

Choose beans, peas, or soy products as a main dish or part of a meal often

Choose seafood at least once a week as the main protein food. (See next slides)

Processed meats such as ham, sausage, frankfurters, and deli meats have added sodium (no need for sodium restriction during pregnancy)

Meats need to be cooked thoroughly.



Canadian Seafood Guidelines

Have at least 150 grams (5 ounces) of cooked fish each week, as recommended in Canada's Food Guide*. Fish contains omega-3 fats and other important nutrients for a healthy pregnancy.

*Vary the types of fish you eat and follow advice from Health Canada to limit your exposure to environmental contaminants such as mercury. The recommended intake for some predatory fish is less than 150 grams (5 ounces) per month. Refer to Health Canada's website. Consult local, provincial or territorial governments for information about eating locally caught fish. [Environment Canada's](#) website provides useful links.

Generally low in contaminants:

salmon, trout, herring, haddock, canned light tuna, pollock (Boston bluefish), sole, flounder, anchovy, char, hake, mullet, smelt, Atlantic mackerel and lake white fish.

CANADIAN SEAFOOD GUIDELINES

TUNAFISH

Limit the amount of canned 'albacore' or 'white' tuna. Eat no more than 300 grams (10 ounces) per week. This is equal to about two 170-g cans of albacore tuna per week. Health Canada has not established a maximum limit on eating light tuna such as 'skipjack', 'yellowfin' and 'tongol'; these types of tuna are low in mercury.

FISH TO AVOID (high food chain predators)

Limit the amount of fresh/frozen tuna, shark, swordfish, escolar, marlin, and orange roughy to no more than 150 g (5 ounces) per month

Macronutrients in Pregnancy: Fats

- **Total Fat** (energy source, increases absorption of fat soluble vitamins)
 - butter, margarine, vegetable oils, whole milk, visible fat on meat, invisible fat in fish, seeds, nuts
- DRI:** not determined
- AMDR:** 20-35%
- **Inadequate intake:** impaired growth, increased risk of chronic disease, rough scaly skin and dermatitis
- **Excess intake:** obesity, increased risk of CHD, cancer, and insulin resistance
- **Key messages**
 - Choose plant based oils for cooking
 - Choose plant sources that are a source of protein and healthy fats (nuts, avocados)
 - Choose lean or low-fat meat and poultry
 - Choose fat-free or low-fat milk, yogurt, and cheese
 - Select some seafood that is rich in omega-3 fatty acids



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Foods High in Fat



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Unsaturated fats



•**OMEGA-6 POLYUNSATURATED FATTY ACIDS** (COMPONENT OF MEMBRANE LIPIDS, INVOLVED WITH CELL SIGNALING, SKIN FUNCTIONING)

-NUTS, SEEDS, VEGETABLE OILS

-**AI:** 13G/D (VS. 11-12G/D)

-**AMDR:** 5-10%

•**OMEGA-3 POLYUNSATURATED FATTY ACIDS** (NEUROLOGICAL DEVELOPMENT)

-VEGETABLE OILS, SOYBEANS, FLAX, FISH OIL, FATTY FISH, MEATS, EGGS

-**AI:** 1.4G/D (VS. 1.1G/D)

-**AMDR:** 0.6-1.2%



Saturated Fats

SATURATED AND TRANS FATTY ACIDS
(NO HEALTH BENEFITS AND NOT
REQUIRED)

DRI AND AMDR: NOT DETERMINED
(MINIMIZE INTAKE TO REDUCE RISK OF
CHD)

Foods High in Trans Fats



French fries



Cheeseburger



Pies



Chicken nuggets



Vanaspati ghee



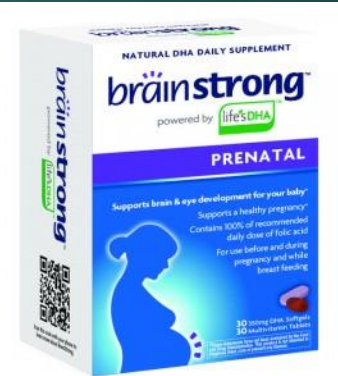
Donuts

Omega-3 Fatty Acids

Three types of omega-3 polyunsaturated fatty acids:

ALA found in plant oils (flax seed, walnuts, soybeans, hemp seed, etc.)

EPA and **DHA** fatty fish--salmon, tuna, trout, sardines, and mackerel; DHA eggs or fortified foods



-EPA and DHA may protect against heart disease, metabolic syndrome, type 2 diabetes, and depression by lowering inflammation

-DHA is the most abundant fatty acid in the brain, where it accumulates rapidly in the third trimester and neonatal period--maternal nutrition may affect the amount of DHA deposited in the growing brain

-observational (population) studies have linked fish, fish oil, and/or DHA/EPA supplementation with improved cognitive and visual function in offspring and lower rates of postpartum depression; randomized trials do not support this

-because the benefits of DHA during pregnancy have not been proven, not enough evidence to recommend supplementation

-many expert groups suggest 200mg of DHA intake daily (2 meals of fish per week)

Macronutrients in Pregnancy: Fiber

- Function:** improves laxation, reduces risk of CAD, maintains normal blood glucose levels

- Dietary sources:**

- dietary fiber** (fruits, vegetables, nuts, legumes, grains)

- functional fiber** (isolated, extracted, or synthetic fiber, such as pectin, chitin, polydextrose)

- AI:** 28g/d (vs. 25g/d)

- Key messages**

- Make half your plate fruits and vegetables

- Make at least half of your grains whole grains

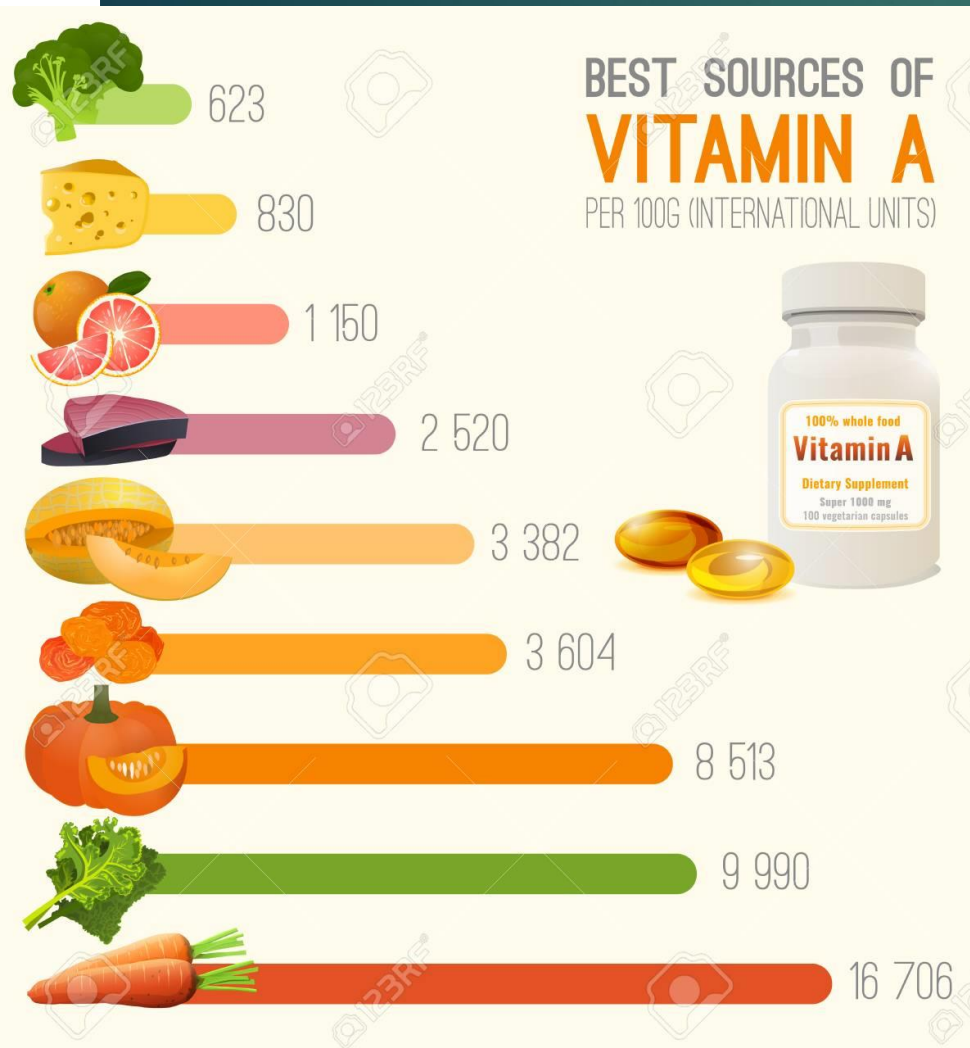
Soluble fiber can be found in foods such as oatbran, barley, nuts, seeds, beans, lentils, fruits (citrus, apples), strawberries and many vegetables



Insoluble fiber is found in foods such as whole wheat and whole grain products, vegetables, and wheat bran



Vitamins and Minerals in Pregnancy-Micronutrients: Vitamin A



•**Function:** a fat-soluble vitamin that is important for normal vision, gene expression, reproduction, embryonic development, growth, and immune function

•**Dietary sources:**

- Preformed Vitamin A (Retinol): animal-based foods (liver, dairy products, and fish)
- Dietary carotenoids (converted to vitamin A in the body): oils, fruits, and vegetables (b-carotene found in carrots, broccoli, squash, peas, spinach, and cantaloupe)

•**RDA:** 750-770mcg/day (vs. 700mcg/day)

•**UL:** 2,800-3,000mcg/day

•**Inadequate intake:** dietary intake appears to be adequate in the US and routine supplementation during pregnancy is not recommended; xerophthalmia (an irreversible drying of the conjunctiva and cornea that can lead to night blindness, etc.), decreased immune function, increased risk of infectious morbidity and mortality

•**Excess intake:** Vitamin A toxicity can only be produced by preformed Vitamin A (nausea, vomiting, headache, vertigo, blurred vision, muscular incoordination, bulging fontanel in infants, liver abnormalities, reduced bone mineral density, disorders of the central nervous system, teratogenic effects (doses >7,800mcg/day), such as craniofacial malformations and abnormalities of the CNS, thymus, and heart)

Vitamin B12

- Function:** involved in normal blood formation and neurological function
- Dietary Sources:** foods of animal origin (meat, dairy); fortified cereal
- RDA:** 2.6mcg/day (vs. 2.4mcg/day)
- UL:** not determined d/t insufficient data

•**Inadequate intake:** major cause of vitamin B12 deficiency is pernicious anemia, a condition in which the gastric mucosa of the stomach does not produce intrinsic factor; other people at risk, who need supplementation, include individuals with malabsorption syndrome, Crohn's disease, atrophic gastritis, or gastric bypass surgery, people who are HIV-positive with chronic Diarrhea, vegans, and infants of vegan mothers; hematological effects (weakness, fatigue, shortness of breath, and palpitations), neurological effects (tingling and numbness in the extremities, gait disturbances, cognitive changes such as loss of concentration, memory loss, disorientation, and dementia, with or without mood changes, visual disturbances, insomnia, impotency, and impaired bowel and bladder control), and GI effects (sore tongue, loss of appetite, flatulence, constipation)

•**Excess intake:** no adverse effects have been associated with excess vitamin B12 intake from food or supplements in healthy individuals



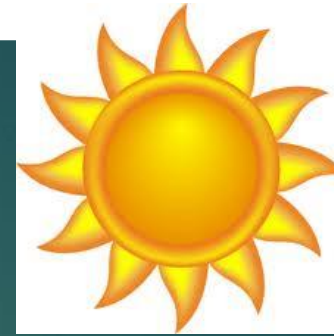
Post-gastric resection-follow B12 monthly

Vitamin C

- Function:** antioxidant and cofactor in enzymatic and hormonal processes, modulates the absorption, transport, and storage of iron
- Dietary Sources:** fruits and vegetables (citrus fruits, tomatoes, potatoes, strawberries, spinach, and cruciferous vegetables)
- RDA:** 80-85mg/day (vs. 65-75mg/day)
- UL:** 1,800-2,000mg/day
- Inadequate intake:** dietary intake appears to be adequate in the US; scurvy (inflamed and bleeding gums, impaired wound healing dyspnea, edema, dry eyes and mouth, weakness, fatigue, depression); pregnant women who smoke or abuse drugs or alcohol may have increased requirements for vitamin C
- Excess intake:** Vitamin C is not teratogenic and the risk of adverse effects from excess intake of Vitamin C appears to be low; diarrhea and GI disturbances



Vitamin D – a Canada MUST HAVE



- **Function:** involved in bone health, aids in the absorption of calcium and phosphorus
- **Dietary Sources:** synthesized in the skin through exposure to sunlight, found in fish, fish-liver oils, eggs from hens fed vitamin D, fortified milk products, and breakfast cereals
- **RDA:** 15mcg/day or 600IU/day
- **UL:** 100mcg/day or 4,000IU/day

• **Inadequate intake:** At risk individuals include older adults, especially those who live in far-northern latitudes, people with liver failure or Crohn's disease, people taking glucocorticoids or anti-seizure medications, breastfed infants who live in far-northern latitudes or whose sunlight exposure is restricted, and people with darker skin or heavy sunscreen use; inadequate bone mineralization or demineralization of the skeleton (rickets/osteomalacia, elevated serum parathyroid hormone, decreased serum phosphorus, osteoporosis)

• **Excess intake:** Vitamin D toxicity cannot occur from excess sun exposure; polyuria, polydipsia, hypercalciuria, calcification of soft tissues (including the kidneys, blood vessels, heart, and lungs), anorexia, nausea, vomiting, reduced renal function



Calcium



- Function:** plays a key role in bone health, involved in vascular, neuromuscular, and glandular functions
- Dietary Sources:** milk, yogurt, cheese, calcium-set tofu, calcium-fortified orange juice or soy/rice milk, Chinese cabbage, kale, broccoli
- AI:** 1,000-1,300mg/day
- UL:** 2,500mg/day
- Inadequate intake:** osteopenia, osteoporosis, and an increased risk of bone fractures; the following women are at increased risk for calcium deficiency and may need supplementation: menopausal, lactose intolerant, vegan, breastfeeding multiple infants
- Excess intake:** kidney stones, hypercalcemia with renal insufficiency, and a decreased absorption of certain minerals

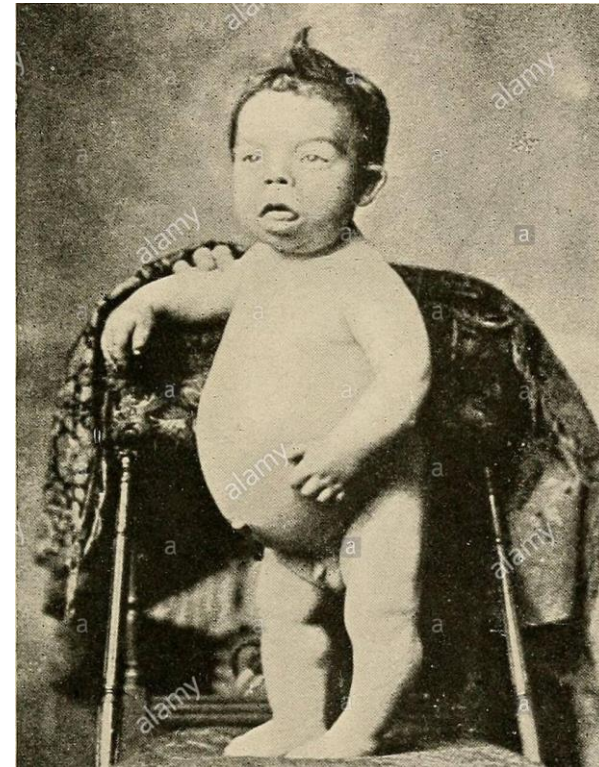
Folate/folic acid-the miracle medicine of the 1990s

- Function:** B vitamin that functions as a coenzyme in the metabolism of nucleic and amino acids (folate is the natural form found in foods and folic acid is found in fortified foods/supplements)
- Dietary Sources:** fortified grain products, dark green vegetables, beans and legumes
- RDA:** 600mcg/day (vs. 400-500mcg/day as 1st trimester supplements, 4-5mg/day if there is diabetes, anticonvulsant medication use, or family history of neural tube defects)
- UL:** 800-1,000mcg/day
- Inadequate intake:** macrocytic anemia (weakness, fatigue, difficulty in concentrating, irritability, headache, palpitations, shortness of breath), neural tube defects; intakes of folate higher than the RDA may be needed by women with multiple gestations, mothers nursing more than one infant, chronic alcoholic use, and individuals on chronic anticonvulsant or methotrexate therapy; coexisting Vitamin B12 deficiency may interfere with the diagnosis of folate deficiency
- Excess intake:** no adverse effects have been associated with the excess consumption of the amounts of folate normally found in fortified foods; excess intake of folate in people with Vitamin B12 deficiency may exacerbate neurological complications (folate may mask Vitamin B12 deficiency and delay diagnosis)



Vitamins and Minerals in Pregnancy: Iodine

- Function:** essential component of thyroid hormones that are involved in the regulation of various enzymes and metabolic processes, including brain development
- Dietary Sources:** seafood has high concentrations, iodized salt
- RDA:** 220mcg/day (vs. 150mcg/day)
- UL:** 900-1,100mcg/day)
- Inadequate intake:** in the US, iodine deficiency is rare because of iodized salt; inadequate thyroid hormone production (goiter, hypothyroidism, mental disability, Cretinism (extreme form of neurological damage from fetal hypothyroidism), growth and developmental abnormalities
- Excess intake:** most people are very tolerant of excess iodine intake from food and supplements; thyroiditis, goiter, hypothyroidism, hyperthyroidism, sensitivity reactions, thyroid papillary cancer



Gourmet alert:
not all salt is iodized.



Iron

•**Function:** component of several proteins, including enzymes, cytochromes, myoglobin, and hemoglobin, which transports oxygen throughout the body; adequate iron intake is important in pregnancy to maintain the increase in red blood cell mass and meet the oxygen requirements of the uteroplacental circulation

•**Dietary Sources:**

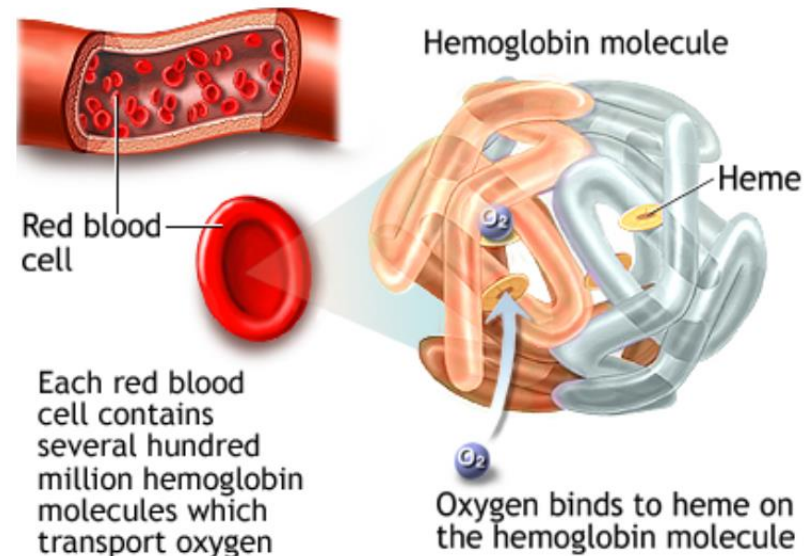
-**Heme iron (readily absorbed):** meat, fish, and poultry

-**Non-heme iron (less bioavailable):** vegetables, fruits, whole-grain breads, whole-grain pasta, fortified breads and cereals, *Vitamin C, meat, poultry, and fish enhance the absorption of iron, calcium inhibits absorption

•**RDA:** 27mg/day (vs. 15-18mg/day) •**UL:** 45mg/day

•**Inadequate intake:** microcytic anemia (reduced physical work capacity, impaired cognitive function, delayed psychomotor development in infants, LBW, preterm delivery, perinatal infant mortality, increased risk for postpartum depression and infection); average American diet does not supply the increased iron requirement of pregnancy, so 30mg daily iron supplementation in pregnancy is recommended (intermittent supplementation may be acceptable)

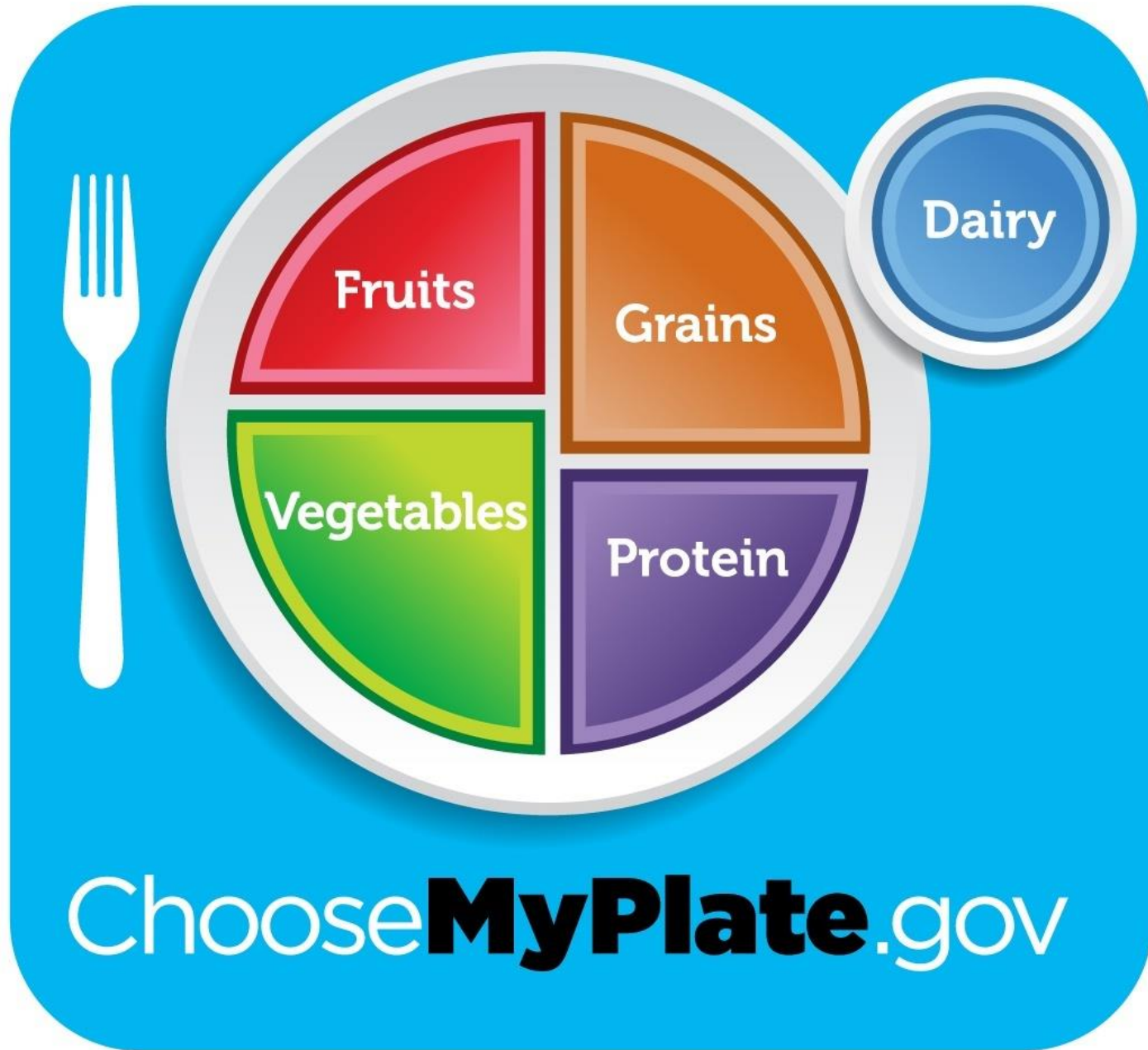
•**Excess intake:** the risk of adverse effects of excessive iron intake from dietary sources appears to be low; GI effects associated with high-dose supplements (constipation, nausea, vomiting, diarrhea); people with chronic alcoholism, liver disease, thalassemias are susceptible to the adverse effects of excess iron intake



Glycosylated hemoglobin-glucose replaces heme molecule

Low Glycemic Index List

- Peanuts 15
- Artichoke 15
- Asparagus 15
- Broccoli 15
- Cauliflower 15
- Celery 15
- Cucumber 15
- Eggplant 15
- Green beans 15
- Lettuce 15
- Low-fat yogurt, artificially sweetened 15
- Peppers 15
- Snow peas 15
- Spinach 15
- Summer squash 15
- Tomatoes 15
- Zucchini 15
- Soybeans, boiled 16
- Cherries 22
- Peas, dried 22
- Pearl barley 25
- Grapefruit 25
- Milk, whole 27
- Spaghetti (protein enriched) 27
- Kidney beans, boiled 29
- Lentils green, boiled 29
- Soy Milk 30
- Apricots (dried) 31
- Milk, Fat-free 32
- Milk ,skimmed 32
- Fettuccine 32
- M&Ms (peanut) 32
- Chickpeas 33
- Rye Bread 34
- Milk, semi-skimmed 34
- Vermicelli 35
- Spaghetti, whole wheat 37
- Apples 38
- Pears 38
- Tomato soup 38
- Green beans 38
- Plums 39
- Ravioli, meat 39



Choose **MyPlate**.gov



GLUTEN-FREE SNACK IDEAS



POPCORN



FRESH FRUIT



SEAWEED SNACKS



OAT GRANOLA



NUTS & SEEDS



KALE CHIPS



TORTILLA CHIPS



VEGGIES & DIP



EDAMAME



ROASTED CHICKPEAS



HARD BOILED EGGS



RICE CAKES



Lactose free



**Assure that prenatal diet
has adequate calcium and
Vitamin D**

PICA

- UNUSUAL CRAVING FOR NON-NUTRITIVE SUBSTANCE
 - **Ice**
 - **Clay**
 - **Cornstarch**
- TRY TO SUBSTITUTE SOMETHING ELSE

1st trimester blahs

- ▶ Small, frequent meals
- ▶ Avoid foods that stimulate gagging
- ▶ Avoid spicy, high fat foods
- ▶ Stop prenatal vitamin until 12-16 weeks or use only most needed micronutrient such as folic acid
- ▶ Food aversions will improve after 12 weeks
- ▶ Try to satisfy cravings with nutritious foods
- ▶ Team for individuals with anorexia or bulimia: counseling, nutritionist