NUTRITION,FOOD SAFTEY IMMUNITY AND PREGNANCY

Presented by

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Toxins

مقدمه

- **امنیت غذایی**: دسترسی همه مردم درتـــمام اوقـــات به غذای کافی و*سالم* به منظورزندگی سالم و فعال

تعریف

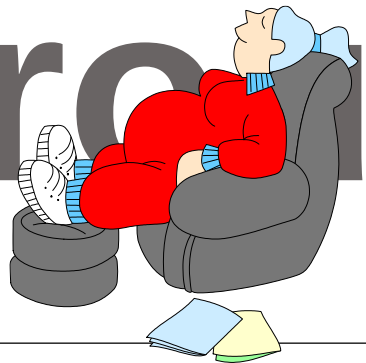
- ایمنی مواد غذایی رویکردی چندگانه برای ارتقائ ایمنی و پیشگیری از بیماریهای غذازاد است .
- به عنوان مثال، یکی از جنبه های ایمنی غذا ایجاد شرایطی است که از رشد توکسین ها (سموم) و آلودگی مواد غذایی با سموم، یا آلودگی غذا و آب سالم با غذا و آب آلوده، جلوگیری کند.

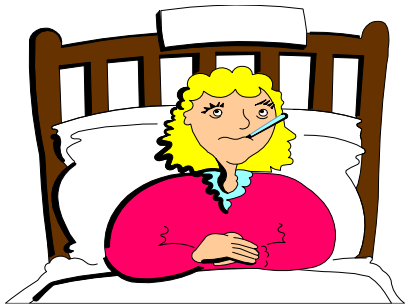
- به سخن دیگر، ایمنی غذا تضمین محصول غذایی در برابر خطرهای فیزیکی، شیمیایی و بیولوژیکی است که ممکن است برای مصرف کننده ایجاد شود.

Who's Most Susceptible?

- Pregnant women
- Newborns or young children
- Elderly
- Immune-comprised individuals
- patients

Are you in the YOPI group?





- **مهمتر ين علل ايجاد بيماريهاي غذ ازا (ناشي از غذا) عبارتند از :**

- ـ فرآيند طولاني مدت آماده سازي غذا
- 2-ذخيره سازي در دماي نامناسب
- 3-سرد كردن غذا بطور خيلي آهسته پيش از قرار دادن آن در يخچال
- 4-عدم گرم كردن مجدد غذا تا دمايي كه در آن باكتريهاي مولد مسموميت غذايي از بين مي روند.
- 5-استفاده از غذاي آلوده
- 6 -عدم پخت كافي گوشت ، محصولات گوشتي و طيور
- 7-عدم تخصيص مدت زمان كافي براي خروج ازحالت انجماد گوشت و مرغ يخ زده
- 8-نگهداري غذا در دماي كمتر از 63° c
- 9- عدم نگهداري غذاي پخته دريخچال در ظروف در بسته يا نگهداري آنها بصورت باز در مجاورت با غذاي خام
- 10- پخت گوشت ، محصولات گوشتي و طيور بيش از مقدار مورد نياز
- 11-وجود بيماري مسري در دست اندركاران تهيه و توزيع غذا
- 12-عدم رعايت بهداشت توسط دست اندركاران تهيه و توزيع غذا
- 13- ا ستفاده از وسايل و تجهيزات آلوده
- .

بیماریهای غذازاد (با منشأ غذا)
(Food-born Diseases)

- **بیماری های غذازاد:**

بیماری هایی به علت مصرف غذای آلوده به عوامل بیماری زای زیستی (باکتری، انگل...) و یا ترکیبات سمی حاصل از آنها ایجاد می شوند.

- **این بیماریها به دو دسته تقسیم می شوند :**

1. عفونت های با منشأ غذایی

(Food-born infections)

2. مسمومیت های با منشأ غذایی

(Food-born intoxications)

Toxins

- Screening women for alcohol, tobacco (including e-cigarettes, vapors), and recreational drug use is critical and also may be important for occupational toxin exposure.
- Marijuana (Cannabis sativa) use is now legalized in some states. It does not appear to affect semen parameters but the prevalence of infertility increases among women reporting marijuana use (Practice Committee, 2017).
- Animal models have demonstrated an increase in birth defects (Hennessy, 2018) but human studies are confounded with polysubstance abuse and often ignore the timing of exposure (American College of Obstetricians and Gynecologists [ACOG], 2017a). In addition, the potency has increased over time.

Toxins

- The chemicals cross the placenta and fetal cannabinoid receptors are active as early as 14 weeks. Marijuana use affects the central nervous system and animal models show it negatively affects fetal brain development.
- The prevalence of SGA babies and stillbirths both increase among those using marijuana and, if associated with cigarette smoking, may increase the risk of preterm birth (ACOG, 2017a; ACOG, 2018d).
- In vitro studies, using first trimester placental villous cells from terminated pregnancies transplanted to a nutrient medium, demonstrate poor placental growth and function, including lower taurine transport to the fetus, when the fetus is exposed to high amounts of alcohol in early pregnancy (Lui et al, 2014).

Toxins

- **Women may be at risk for entering pregnancy with toxic levels of mercury, and the types of fish eaten should be discussed (see Focus On: Omega-3 Fatty Acids in Pregnancy and Lactation).**
- **The effect of maternal caffeine intake on infertility is often debated. No increased risk of miscarriage has been seen with caffeine consumption less than 200 mg/day, but consumption of more than 500 mg/day is associated with decreased fertility (Practice Committee, 2017).**
- **Caffeine is not a teratogen (a substance that causes malformation in an embryo or fetus), and does not affect semen parameters.**

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Pesticides
- **Chemicals Exposure Sources and Pathways**
  - Pesticides are applied in large quantities in agricultural, community, and household settings. In 2001 more than 1.2 billion pounds of pesticides were used in the United States. Pesticides can be ingested, inhaled, and absorbed by the skin. The pathways of pesticide exposure include food, water, air, dust, and soil.
- **Reproductive or Developmental Health Effects**
  - Impaired cognitive development
  - Impaired neurodevelopment
  - Impaired fetal growth
  - Increased susceptibility to testicular cancer
  - Childhood cancer

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Solvents
- **Chemicals Exposure Sources and Pathways**
  - Examples include benzene, toluene, xylene, styrene, 1-bromopropane, 2-bromopropane, perchloroethylene, and trichloroethylene. Solvents include some of the highest production volume chemicals in the United States.
  - They are used in plastics, resins, nylon, synthetic fibers, rubber, lubricants, dyes, detergents, drugs, pesticides, glues, paints, paint thinners, fingernail polish, lacquers, detergents, printing and leather tanning processes, insulation, fiberglass, food containers, carpet backing, and cleaning products. Solvents are a component of cigarette smoke. Exposure is primarily through breathing contaminated air.
- **Reproductive or Developmental Health Effects**
  - Fetal loss
  - Miscarriage

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Toluene
- **Chemicals Exposure Sources and Pathways**
  - Exposure occurs from breathing contaminated air at the workplace, in automobile exhaust, and in some consumer products, paints, paint thinners, fingernail polish, lacquers, and adhesives.
- **Reproductive or Developmental Health Effects**
  - Decreased fetal and birth weight
  - Congenital malformations

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Phthalates
- **Chemicals Exposure Sources and Pathways**
  - Phthalates are synthetically derived. They are used in a variety of consumer goods, such as medical devices, cleaning and building materials, personal care products, cosmetics, pharmaceuticals, food processing, and toys. Exposure occurs through ingestion, inhalation, and dermal absorption.
- **Reproductive or Developmental Health Effects**
  - Reduced masculine play in boys
  - Reduced anogenital distance
  - Shortened gestational age
  - Impaired neurodevelopment in girls

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Lead
- **Chemicals Exposure Sources and Pathways**
  - Occupational exposure occurs in battery manufacturing and recycling, smelting, car repair, welding, soldering, firearm cleaning and shooting, and stained glass ornament and jewelry production. Nonoccupational exposure occurs in older homes where lead-based paints were used, water pipes, imported ceramics and pottery, herbal remedies, traditional cosmetics, hair dyes, contaminated soil, toys, and costume jewelry.
- **Reproductive or Developmental Health Effects**
  - Alterations in genomic methylation
  - Intellectual impairment
  - Increased likelihood of allergies

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Mercury
- **Chemicals Exposure Sources and Pathways**
  - Mercury from coal-fired power plants is the largest man-made source of mercury pollution in the United States. Primary human exposure is by consumption of contaminated seafood.
- **Reproductive or Developmental Health Effects**
  - Reduced cognitive performance
  - Impaired neurodevelopment

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Polychlorinated biphenyls
- **Chemicals Exposure Sources and Pathways**
  - Polychlorinated biphenyls were used as industrial insulators and lubricants. They were banned in the 1970s but are persistent in the aquatic and terrestrial food chains, resulting in exposure by ingestion.
- **Reproductive or Developmental Health Effects**
  - Development of attention deficit/hyperactivity disorder-associated behavior
  - Increased body mass index
  - Reduced IQ

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Air pollutants
- **Chemicals Exposure Sources and Pathways**
  - Common air pollutants include carbon monoxide, lead, ground-level ozone, particulate matter, nitrogen dioxide, and sulfur dioxide. Air pollution arises from a variety of sources, including motor vehicles, industrial production, energy (coal) production, wood burning, and small local sources such as dry cleaners.
- **Reproductive or Developmental Health Effects**
  - Low birth weight
  - Birth defects

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Cigarette smoke
- **Chemicals Exposure Sources and Pathways**
  - Cigarette smoke exposure includes active smoking, passive smoking, or both.
- **Reproductive or Developmental Health Effects**
  - Miscarriage
  - Intrauterine growth restriction
  - Low birth weight
  - Preterm delivery
  - Decreased semen quality

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Perchlorate
- **Chemicals Exposure Sources and Pathways**
  - Perchlorate is used to produce rocket fuel, fireworks, flares, and explosives and also can be present in bleach and some fertilizers. Sources of exposure are contaminated drinking water, food, and other non-water beverages. Infants also may be exposed through breastmilk.
- **Reproductive or Developmental Health Effects**
  - Altered thyroid function

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Perfluorochemicals
- **Chemicals Exposure Sources and Pathways**
  - Perfluorochemicals are widely used man-made organofluorine compounds with many diverse industrial and consumer product applications. Examples are perfluorooctane sulfonate and perfluorooctanate, which are used in cookware products with nonstick surfaces and in packaging to provide grease, oil, and water resistance to plates, food containers, bags, and wraps that come into contact with food. They persist in the environment. Occupational exposure and general population exposure occur by inhalation, ingestion, and dermal contact.
- **Reproductive or Developmental Health Effects**
  - Reduced birth weight

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Polybrominated diphenyl ethers
- **Chemicals Exposure Sources and Pathways**
  - These include flame retardant materials that persist and bioaccumulate in the environment. They are found in furniture, textiles, carpeting, electronics, and plastics that are mixed into but not bound to foam or plastic.
- **Reproductive or Developmental Health Effects**
  - Impaired neurodevelopment
  - Premature delivery
  - Low birth weight
  - Stillbirth

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Formaldehyde
- **Chemicals Exposure Sources and Pathways**
  - Formaldehyde is used in the production of wood adhesives, abrasive materials, and other industrial products and in clinical laboratories and embalming. It is found in some germicides, fungicides, insecticides, and personal care products. Routes of exposure are oral, dermal, and inhaled.
- **Reproductive or Developmental Health Effects**
  - Spontaneous abortion
  - Low birth weight

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Antineoplastic drugs
- **Chemicals Exposure Sources and Pathways**
  - This class of chemotherapy drugs presents an occupational exposure for nurses and other health care professionals.
- **Reproductive or Developmental Health Effects**
  - Spontaneous abortion
  - Low birth weight

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Bisphenol-A
- **Chemicals Exposure Sources and Pathways**
  - Bisphenol-A is a chemical intermediate for polycarbonate plastic and resins. It is found in food, consumer products, and packaging. Exposure occurs through inhalation, ingestion, and dermal absorption.
- **Reproductive or Developmental Health Effects**
  - Recurrent miscarriage
  - Aggression and hyperactivity in female children

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Formaldehyde
- **Chemicals Exposure Sources and Pathways**
  - Formaldehyde is used in the production of wood adhesives, abrasive materials, and other industrial products and in clinical laboratories and embalming. It is found in some germicides, fungicides, insecticides, and personal care products. Routes of exposure are oral, dermal, and inhaled.
- **Reproductive or Developmental Health Effects**
  - Spontaneous abortion
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Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Antineoplastic drugs
- **Chemicals Exposure Sources and Pathways**
  - This class of chemotherapy drugs presents an occupational exposure for nurses and other health care professionals.
- **Reproductive or Developmental Health Effects**
  - Spontaneous abortion
  - Low birth weight

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Anesthetic gases
- **Chemicals Exposure Sources and Pathways**
  - Anesthetic gases are administered by inhalation in health care settings and veterinary care. Occupational exposure is a risk for nurses, physicians, dentists, veterinarians, and other health care professionals who work in settings where anesthetic gases are used.
- **Reproductive or Developmental Health Effects**
  - Congenital anomalies
  - Spontaneous abortion

Examples of Reproductive Health Effects of Prenatal Exposure to Environmental Contaminants

- **Chemicals**
  - Ethylene oxide
- **Chemicals Exposure Sources and Pathways**
  - Ethylene oxide is used to sterilize heat-sensitive medical items, surgical instruments, and other objects that come into contact with biologic tissues. Occupational exposure is a risk in some health care settings, particularly sterilization units. Exposure is through inhalation.
- **Reproductive or Developmental Health Effects**
  - Spontaneous abortion and pregnancy loss
  - Preterm and post-term birth

Herbal and Dietary Supplements

Herbal and Dietary Supplements

- Some herbal and dietary supplements are promoted for PCOS and/or metabolic syndrome treatment. However, for many, the supporting evidence is insufficiently reliable to rate their effectiveness. For others, there is concern even if the herbal supplements are thought to be effective, because of the potential negative effect on a pregnancy. Specifically, berberine is likely unsafe in pregnancy because it crosses the placenta and may harm the fetus.
- It may also stimulate uterine contractions. N-acetyl cysteine is also mentioned as useful in treating PCOS.
- However, it also crosses the placenta. Melatonin may inhibit ovulation but the critical dose is unknown and it is not recommended. Inositol (myo-inositol, D-chiro-inositol) appears to be safe for use in pregnancy.

Herbal and Dietary Supplements

- Its use with folic acid appears to lower triglycerides and/or testosterone and improve ovarian function, including ovulation rates in overweight women with PCOS, working as well as metformin (Jellin and Gregory, 2018).
- A combination of the two forms of inositol may be more effective than a single form. However, a Cochrane systematic review found no differences between inositol and placebo on BMI, waist-hip ratio, the number of people who ovulated, serum testosterone, triglycerides, cholesterol, fasting glucose, or fasting insulin (Monash University2018).
- Data is still limited and inositol use should be considered experimental. Dosage appears critical and there are potential adverse effects among nonobese women, so caution is advised (Noventa et al, 2016).

Herbal and Dietary Supplements

- As in the general population, the use of herbal and dietary supplements for many conditions is common during pregnancy.
- For many herbs, the supporting evidence is insufficiently reliable to rate their effectiveness or safety, especially in the first trimester.
- Common local herbs should be investigated carefully for their safety during pregnancy. Even those with the same names can have different effects.
- For example, German chamomile appears to be of little concern during pregnancy, while Roman chamomile appears to increase the risk for preterm delivery and LBW (Trabace et al, 2015) and may be an abortifacient (Jellin and Gregory, 2018).

Herbal and Dietary Supplements

- **Many herbs may cause uterine contractions and/or bleeding and are contraindicated in pregnancy, including ingested aloe vera latex, cat's claw, cinnamon volatile oil, oregano tea, avocado leaf tea, rue, sage tea, damiana, and large amounts of parsley or celery seeds (Kennedy et al, 2016; Rivera et al, 2006).**
- **Some herbal and dietary supplements are promoted for PCOS and/or metabolic syndrome treatment. However, for many, the supporting evidence is insufficiently reliable to rate their effectiveness.**
- **For others, there is concern even if the herbal supplements are thought to be effective, because of the potential negative effect on a pregnancy.**
- **Specifically, berberine is likely unsafe in pregnancy because it crosses the placenta and may harm the fetus. It may also stimulate uterine contractions.**

Herbal and Dietary Supplements

- N-acetyl cysteine is also mentioned as useful in treating PCOS. However, it also crosses the placenta. Melatonin may inhibit ovulation but the critical dose is unknown and it is not recommended.
- Inositol (myo-inositol, D-chiro-inositol) appears to be safe for use in pregnancy. Its use with folic acid appears to lower triglycerides and/or testosterone and improve ovarian function, including ovulation rates in overweight women with PCOS, working as well as metformin (Jellin and Gregory, 2018).
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Herbal and Dietary Supplements

- **Data is still limited and inositol use should be considered experimental. Dosage appears critical and there are potential adverse effects among nonobese women, so caution is advised (Noventa et al, 2016).**
- **Caution is advised with the use of all herbal and dietary supplements because safety, purity, and effectiveness cannot always be guaranteed due to the way they are regulated by the Food and Drug Administration (FDA). Interactions with prescribed medications can occur, affecting treatment decisions (Kennedy et al, 2016).**

Herbal and Dietary Supplements

- **Even some herbs considered helpful during pregnancy can have unexpected consequences. For example, raspberry leaf and blackberry leaf tea can cause hypoglycemia in patients with gestational diabetes (Cheang et al, 2016).**
- **Women should advise their health care provider about any medication use, including dietary and herbal supplements, and the risk vs. benefit should be carefully considered. See Natural Medicines Comprehensive Database for specific detailed information.**

Herbal and Dietary Supplements

- A healthy diet and exercise program helps parents prepare for an optimal pregnancy outcome, with the goal of achieving normal weight before conception.
- However, although preconceptual intervention is recommended, it is seldom achieved because half of pregnancies in the United States are unplanned. In addition, advances in assisted reproductive technology (ART) mean that "parents" may be egg or sperm donors or surrogate mothers.
- The preconceptual health of these "parents" is likely also important but the impact is unknown.

Consumption of Human Placenta

- In many areas, women are now being offered their placentas after delivery. While some people want to save it for cultural reasons, many are now choosing to eat their placentas for many selfreported benefits.
- Placentophagy is promoted as a potential way to lower the risk of postpartum depression and improve infant bonding, as well as replace the iron and other nutrients lost during pregnancy and delivery.
- It is also promoted as a source of energy, a lactation promoter, an immune system booster, and as a way to decrease pain and bleeding after delivery (Farr et al, 2018).

Consumption of Human Placenta

- **Placentas do contain hormones that may be beneficial but the therapeutic effect has not been demonstrated (Young et al, 2016b; Young et al, 2018a; Young et al, 2018b).**
- **The placenta is a significant source of iron but normal consumption amounts are unlikely to make a significant difference in the postpartum iron status (Gryder et al, 2017). The placenta is a source of other nutrients as well, including selenium, protein, and cholesterol (Chang et al, 2017). However, there is wide variability between women (Young et al, 2016a).**

Consumption of Human Placenta

- **The placenta is also a potential source of pathogens, toxins, and heavy metals, depending on prenatal exposure. Theoretically, maternal consumption could trigger alloimmunization, exposing her to genetically different cells or tissues, triggering an immune response and, therefore, harming future pregnancies (Farr et al, 2018). A recent case report cited maternal ingestion of dried placenta as a likely source of Group B strep infection in a newborn, possibly increasing maternal intestinal and skin colonization, facilitating transfer to the infant.**
- **Dried placenta powder is not sterile and when stored over 6 months, has been a source of Paenibacillus macerans, bacteria that produce histamine in preserved foods, potentially causing foodborne chemical intoxication (Johnson et al, 2018).**

Consumption of Human Placenta

- The processing is not regulated by the Food and Drug Administration (FDA) and is not standardized.
- The placenta must be handled carefully, including being refrigerated soon after delivery.
- The consumption of placenta should be discouraged if the mother or baby has a viral infection (Johnson et al, 2018) or if the mother was exposed to heavy metals during pregnancy.
- It should not be eaten raw, including in a smoothie. If dried and encapsulated, it should be steamed first to lower the risk of pathogen transmission.

Consumption of Human Placenta

- **Placental insults compromise the ability to nourish the fetus, regardless of how well-nourished the mother is.**
- **These insults can be the result of poor placentation from early pregnancy or small infarcts associated with pre-eclampsia and other hypertensive disorders.**
- **When the placenta has a reduced functional capacity for whatever reason, the result is often intrauterine growth restriction (IUGR).**

Consumption of Human Placenta

- However, as mentioned before, the placenta also has the ability to respond to a poor environment. For example, women affected by the World War II Dutch famine in their first trimesters had larger placentas, resulting in normal weight infants (Belkacemi et al, 2010).

- A less-than-optimal environment in utero can lead to a mismatch between available nutrients and the genetically determined fetal drive for growth. The goal is to support a healthy environment through a proper balance of nutrients and the avoidance of teratogens (see Clinical Insight: High-Risk Pregnancies with Nutritional Components)

Omega-3 Fatty Acids in Pregnancy and Lactation

Omega-3 Fatty Acids in Pregnancy and Lactation

- Our ancestors likely consumed a diet with equal amounts of omega-3 and omega-6 fatty acids. American diets currently are estimated to contain much higher levels of omega-6 than omega-3 fatty acids.
- This dramatic change in the ratio is thought to affect overall disease prevalence as well as pregnancy outcome. However, there is no evidence that the absolute amounts of essential fatty acids (EFA) provided by any culture are inadequate for the placenta, fetus, or infant growth (Lauritzen and Carlson, 2011).
- Adequacy of EFA intake is highly individual based on dietary intake, food access, and food preferences.
- Linoleic acid (arachidonic acid) and omega-3 (docosahexaenoic acid [DHA]). Arachidonic acid intake is seldom limited.

Omega-3 Fatty Acids in Pregnancy and Lactation

- The omega-3s, primarily eicosapentaenoic acid (EPA) and DHA, are important for fetal neurodevelopment, vasodilation, reduced inflammation, and thrombosis inhibition. Although EPA is thought to be beneficial, the separate effects have not yet been tested because purified EPA supplements are only recently available.
- Fatty acids are found in all cell membranes. The fetal brain contains equal amounts of omega-6 DHA is important for the growth and development of the fetal central nervous system and the retina.
- It may play a beneficial role in the fetal immune function and may help lower the risk of food allergy (Larqué et al, 2012).
- DHA may also be helpful regarding birth weight, as well as maternal depression. There is some evidence that supplementing all pregnant women with DHA may be a cost-effective way to lower the risk of early preterm delivery (Shireman et al, 2016).

Omega-3 Fatty Acids in Pregnancy and Lactation

- **A recent Cochrane review found that increased overall intake of the omega-3 long-chain polyunsaturated fatty acids (LCPUFAs) (from food or supplements) reduced the risk of both preterm (< 37 weeks) and early preterm (< 34 weeks) births (Middleton et al, 2018).**
- **Cochrane also concluded that more research is needed to determine the long-term effects on mother and child; to determine the metabolic and neurodevelopment pathways; and to determine whether, and how, the outcomes vary by the different types of omega-3 fatty acids, as well as the effects of the timing, dosage, and characteristics of women after birth.**

Omega-3 Fatty Acids in Pregnancy and Lactation

- DHA is selectively and preferentially transferred across the placenta (Lauritzen and Carlson, 2011).
- Fetal DHA accretion is highest in the last half of pregnancy, reaching 30 to 45 mg/day in the last trimester (Koletzko et al, 2007), primarily to the brain and adipose tissue, and in the first few months of life.
- DHA must be mobilized from maternal stores or the prenatal diet must include adequate amounts of preformed DHA.
- Transfer rates are highly variable and are lower among women with obesity, preeclampsia, hypertension, and diabetes (type 1, type 2, and gestational diabetes) (Lauritzen and Carlson, 2011).

Omega-3 Fatty Acids in Pregnancy and Lactation

- **Women who smoke and have growth restricted fetuses also have lower transfer rates. It is thought that short interconceptual periods may cause a mother to enter a subsequent pregnancy depleted.**
- **The amount of DHA in the blood that optimizes maternal and infant outcomes, as well as the intake levels to achieve that level, is still unknown**
- **An average daily intake of 200 mg DHA during pregnancy and lactation currently is recommended, but studies are underway testing the benefit of larger amounts (Carlson et al, 2017).**
- **Current intakes are often far lower. Intakes of up to 1 g/day of DHA or 2.7 g/day of total omega-3 PUFAs appear safe (Koletzko et al, 2007).**

Omega-3 Fatty Acids in Pregnancy and Lactation

- The main food source of DHA is fatty, cold water fish, and a couple of meals per week of low-mercury fish during pregnancy provide adequate amounts of DHA.
- Those fish that are low in methylmercury but high in DHA include salmon, sardines, trout, herring, anchovies, and mackerel (not King mackerel). Caviar and brains (do not use where prion contamination is of concern) are also particularly high in DHA.
- Other foods also may be used, depending on local availability and acceptability of safe sources. Check the local food composition tables for options.

Omega-3 Fatty Acids in Pregnancy and Lactation

- Vegetable sources of omega-3 fats (alpha-linolenic acid [ALA]) include flaxseeds and nuts, especially walnuts. The conversion rate to DHA is usually very low but improves during pregnancy (Burdge et al, 2017).
- However, biomagnification by the placenta doesn't appear to compensate for the absence of preformed EPA or DHA. DHA fortified eggs can be helpful, but other fortified foods contain very little DHA. Foods labeled as fortified with omega-3s likely contain ALA. In dietary supplements, algae source EPA and DHA is another useful vegetarian option.
- Any pregnant woman allergic to fish should seek an algal source of supplemental DHA. It is currently unknown if EPA or other components (e.g., other fatty acids, vitamin D, iodine, and selenium) are also important (Oken et al, 2013).

Omega-3 Fatty Acids in Pregnancy and Lactation

- **Fish oil supplements contain EPA and DHA, although better long-term outcomes are seen with fish consumption than with supplements. Caution is advised, though, with the fish liver oils (such as cod liver oil) because of high preformed vitamin A levels.**
- **The breastfed infant obtains DHA through maternal milk when the mother eats sufficient quantities of foods containing DHA. If the exclusively breastfeeding mother is not consuming fish or DHA supplements, a DHA supplement can be given to the infant. For women who are unable, or choose not to breastfeed, most infant formulas in the United States are fortified with DHA.**

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- **There is no dietary reference intake (DRI) for either EPA or DHA in the United States. The benefit of maternal supplementation has not been proven as of yet and there are potential epigenetic effects that must also be considered.**
- **Maternal fish consumption is associated with better child neurodevelopment, at least in observational studies subject to confounding. Perhaps supplementation is merited only for those women with very low intakes of LCPUFAs and/or for premature infants who had insufficient time to accumulate enough.**
- **Promoting a variety of safe seafood choices is preferable. Women have consumed less fish since the mercury advisories were issued (McGuire et al, 2016). They must be reassured that fish can be eaten safely as a good protein source as long as care is taken in choosing and preparing the fish (see Box 14.7). If at least some of the high DHA sources are chosen, pregnancy outcomes, as well as infant neurodevelopment and visual acuity, may improve.**

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- In addition, if women eat these fish during pregnancy, they are also likely to continue eating them postpartum, improving the maternal repletion and the child's DHA accretion that continues Exposure of men and women to environmental chemicals, including pesticides, heavy metals, and organic solvents, is associated with an increased time to pregnancy.
- However, most studies are plagued with important confounders (age, smoking, alcohol use, parity, use of contraceptives, underlying disease) and causality cannot be determined. It is also unknown whether men and women have different susceptibility to the effects of environmental toxins. The strongest evidence of adverse effect is with pesticide and lead exposure. Pesticide exposure affects semen quality and increases risk of sterility (ACOG, 2013).

Smoking and alcohol consumption

- A father's regular preconceptual smoking is associated with DNA damage to the sperm, but it is unclear whether male fertility is reduced (Practice Committee, 2017). Smoking also increases the risk that his child will have acute lymphoblastic leukemia, but the absolute risk is still very small, raising it from 27 per million births to 34 per million births (Van der Zee et al, 2013). Maternal smoking is associated with an increased rate of miscarriage (Practice Committee, 2017).
- Habitual alcohol consumption may be associated with reduced semen quality and changes in testosterone and sex hormone-binding globulin levels. Although higher intakes are of more concern, even five drinks per week have been associated with a reduced sperm count and concentration, as well as a reduction in the percentage of spermatozoa with normal morphology (Jensen et al, 2014)

THANKS FOR YOUR ATTENTION