Pregnancy Diet Secrets

TRAINING GUIDE

Discover The Secrets To

Maintain Proper Nutrition For

A Happy And Healthy Pregnancy!

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Introduction

During and after pregnancy, sustenance assumes a significant job in kids' wellbeing and advancement. Nourishment training can assist moms with settling on better decisions and know "what to eat," empowering them to improve their dietary patterns and those of their kid.

Pregnancy, early stages, and youth are the most critical times of development and advancement in the human life cycle. Poor sustenance during these periods can prompt a scope of medical issues.

Poor nourishment while the infant is in the belly and soon after birth can prompt:

- Development hindrance
- Deferred psychosocial improvement
- Subjective, training and conduct issues
- The expanded danger of a later mental issue

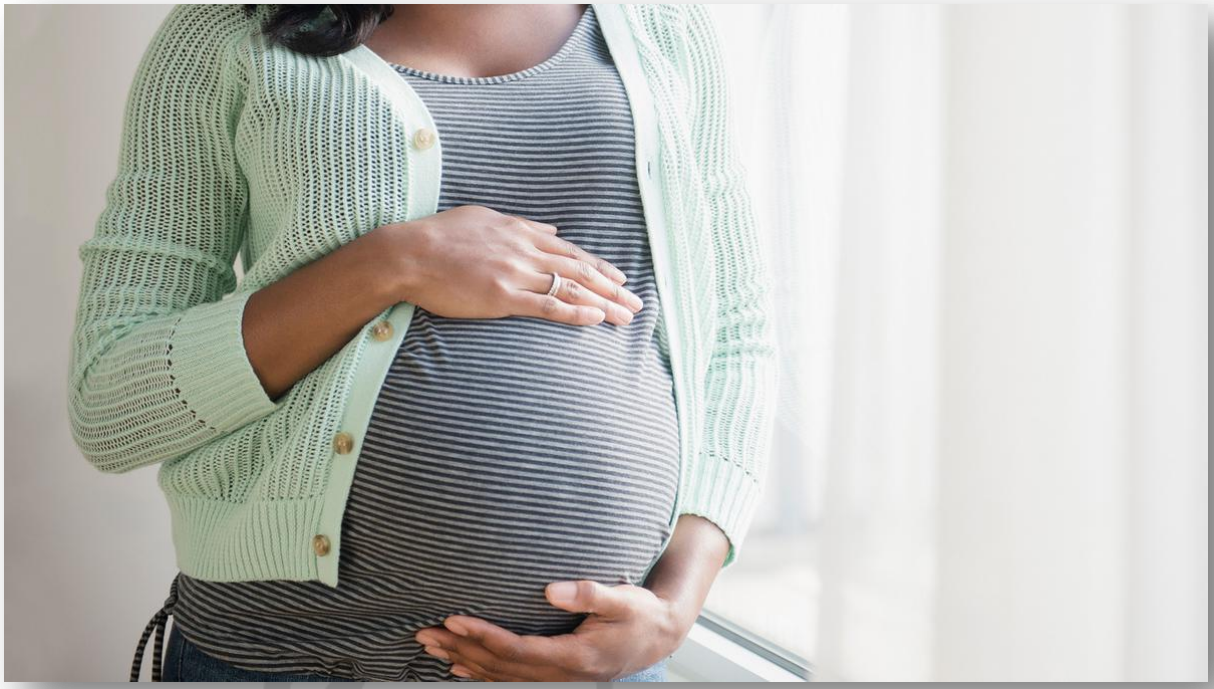
Basically, moms and infants get adequate quality supplements. This ought to be a need before pregnancy, during pregnancy, breastfeeding, youth, and all phases of the existence cycle.

In this guide, we will cover all these points in detail. So let's get started!

Pregnancy
Diet Secrets

Chapter 1

Pregnancy Overview



Pregnancy occurs when a sperm fertilizes an egg after it's released from the ovary during ovulation. The fertilized egg then travels down into the uterus, where implantation occurs. A successful implantation results in pregnancy.

On average, a full-term pregnancy lasts 40 weeks. Many factors can affect a pregnancy. Women who receive an early pregnancy diagnosis and prenatal care are more likely to experience a healthy pregnancy and give birth to a healthy baby.

Knowing what to expect during the full pregnancy term is important for monitoring both your health and the health of the baby. If you'd like to prevent pregnancy, there are also effective forms of birth control you should keep in mind.

Symptoms of pregnancy

You may notice some signs and symptoms before you even take a pregnancy test. Others will appear weeks later, as your hormone levels change.

Missed period

A missed period is one of the earliest symptoms of pregnancy (and maybe the most classic one). However, a missed period doesn't necessarily mean you're pregnant, especially if your cycle tends to be irregular.

There are many health conditions other than pregnancy that can cause a late or missed period.

Headache

Headaches are common in early pregnancy. They're usually caused by altered hormone levels and increased blood volume. Contact your doctor if your headaches don't go away or are especially painful.

Spotting

Some women may experience light bleeding and spotting in early pregnancy. This bleeding is most often the result of implantation. Implantation usually occurs one to two weeks after fertilization.

Early pregnancy bleeding can also result from relatively minor conditions such as an infection or irritation. The latter often affects the surface of the cervix (which is very sensitive during pregnancy).

Bleeding can also sometimes signal a serious pregnancy complication, such as miscarriage, ectopic pregnancy, or placenta previa. Always contact your doctor if you're concerned.

Weight gain

You can expect to gain between 1 and 4 pounds in your first few months of pregnancy. Weight gain becomes more noticeable toward the beginning of your second trimester.

Pregnancy-induced hypertension

High blood pressure, or hypertension, sometimes develops during pregnancy. Several factors can increase your risk, including:

- being overweight or obese
- smoking
- having a prior history or a family history of pregnancy-induced hypertension

Heartburn

Hormones released during pregnancy can sometimes relax the valve between your stomach and esophagus. When stomach acid leaks out, this can result in heartburn.

Constipation

Hormone changes during early pregnancy can slow down your digestive system. As a result, you may become constipated.

Cramps

As the muscles in your uterus begin to stretch and expand, you may feel a pulling sensation that resembles menstrual cramps. If spotting or bleeding occurs alongside your cramps, it could signal a miscarriage or an ectopic pregnancy.

Back pain

Hormones and stress on the muscles are the biggest causes of back pain in early pregnancy. Later on, your increased weight and shifted center of gravity may add to your back pain. Around half of all pregnant women report back pain during their pregnancy.

Anemia

Pregnant women have an increased risk of anemia, which causes symptoms such as lightheadedness and dizziness.

The condition can lead to premature birth and low birth weight. Prenatal care usually involves screening for anemia.

Depression

Between 14 and 23 percent of all pregnant women develop depression during their pregnancy. The many biological and emotional changes you experience can be contributing causes.

Be sure to tell your doctor if you don't feel like your usual self.

Insomnia

Insomnia is another common symptom of early pregnancy. Stress, physical discomfort, and hormonal changes can be contributing causes. A balanced diet, good sleep habits, and yoga stretches can all help you get a good night's sleep.

Breast changes

Breast changes are one of the first noticeable signs of pregnancy. Even before you're far enough along for a positive test, your breasts may begin to feel tender, swollen, and generally heavy or full. Your nipples may also become larger and more sensitive, and the areolae may darken.

Acne

Because of increased androgen hormones, many women experience acne in early pregnancy. These hormones can make your skin oilier, which can clog pores. Pregnancy acne is usually temporary and clears up after the baby is born.

Vomiting

Vomiting is a component of "morning sickness," a common symptom that usually appears within the first four months. Morning sickness is often the first sign that you're pregnant. Increased hormones during early pregnancy are the main cause.

Hip pain

Hip pain is common during pregnancy and tends to increase in late pregnancy. It can have a variety of causes, including:

- pressure on your ligaments
- sciatica
- changes in your posture
- a heavier uterus

Diarrhea

Diarrhea and other digestive difficulties occur frequently during pregnancy. Hormone changes, a different diet, and added stress are all possible explanations. If diarrhea lasts more than a few days, contact your doctor to make sure you don't become dehydrated.

Stress and pregnancy

While pregnancy is usually a happy time, it can also be a source of stress. A new baby means big changes to your body, your personal relationships, and even your finances. Don't hesitate to ask your doctor for help if you begin to feel overwhelmed.

The bottom line

If you think you may be pregnant, you shouldn't rely solely on these signs and symptoms for confirmation. Taking a home pregnancy test or seeing your doctor for lab testing can confirm a possible pregnancy.

Many of these signs and symptoms can also be caused by other health conditions, such as premenstrual syndrome (PMS). Learn more about the early symptoms of pregnancy — such as how soon they'll appear after you miss your period.

Pregnancy week by week

Pregnancy weeks are grouped into three trimesters, each one with medical milestones for both you and the baby.

First trimester

A baby grows rapidly during the first trimester (weeks 1 to 12). The fetus begins developing their brain, spinal cord, and organs. The baby's heart will also begin to beat.

During the first trimester, the probability of a miscarriage is relatively high. According to the American College of Obstetricians and Gynecologists (ACOG), it's estimated that about 1 in 10 pregnancies end in miscarriage and that about 85 percent of these occur in the first trimester.

Seek immediate help if you experience the symptoms of miscarriage.

Second trimester

During the second trimester of pregnancy (weeks 13 to 27), your healthcare provider will likely perform an anatomy scan ultrasound.

This test checks the fetus's body for any developmental abnormalities. The test results can also reveal the sex of your baby if you wish to find out before the baby is born.

You'll probably begin to feel your baby move, kick, and punch inside of your uterus.

After 23 weeks, a baby in utero is considered "viable." This means that it could survive living outside of your womb. Babies born this early often have serious medical issues. Your baby has a much better chance of being born healthy the longer you are able to carry the pregnancy.

Third trimester

During the third trimester (weeks 28 to 40), your weight gain will accelerate, and you may feel more tired.

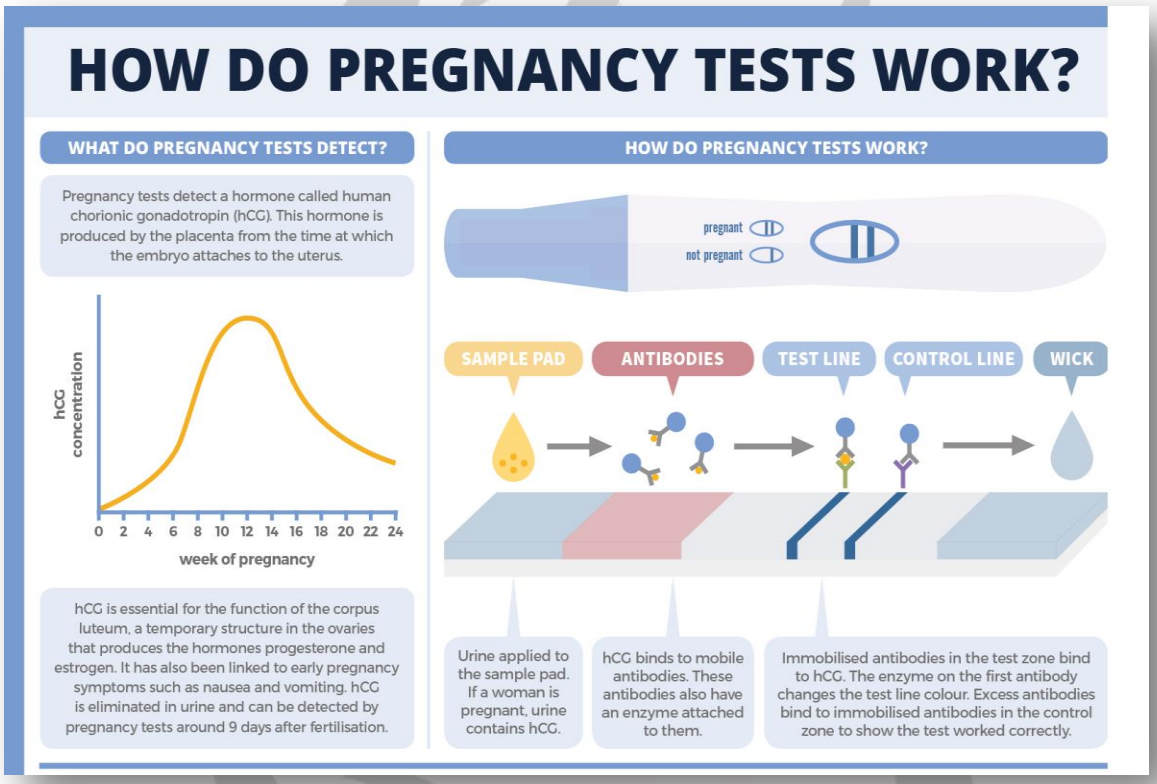
Your baby can now sense light as well as open and close their eyes. Their bones are also formed.

As labor approaches, you may feel pelvic discomfort, and your feet may swell. Contractions that don't lead to labor, known as Braxton-Hicks contractions, may start to occur in the weeks before you deliver.

The bottom line

Every pregnancy is different, but developments will most likely occur within this general time frame. Find out more about the changes you and your baby will undergo throughout the trimesters.

Pregnancy tests



Home pregnancy tests are very accurate after the first day of your missed period. If you get a positive result on a home pregnancy test, you should schedule an appointment with your doctor right away. An ultrasound will be used to confirm and date your pregnancy.

Pregnancy is diagnosed by measuring the body's levels of human chorionic gonadotropin (hCG). Also referred to as the pregnancy hormone, hCG is

produced upon implantation. However, it may not be detected until after you miss a period.

After you miss a period, hCG levels increase rapidly. hCG is detected through either a urine or a blood test.

Urine tests may be provided at a doctor's office, and they're the same as the tests you can take at home.

Blood tests can be performed in a laboratory. hCG blood tests are about as accurate as home pregnancy tests. The difference is that blood tests may be ordered as soon as six days after ovulation.

The sooner you can confirm you're pregnant, the better. An early diagnosis will allow you to take better care of your baby's health. Get more information on pregnancy tests, such as tips for avoiding a "false negative" result.

Pregnancy and vaginal discharge

An increase in vaginal discharge is one of the earliest signs of pregnancy. Your production of discharge may increase as early as one to two weeks after conception before you've even missed a period.

As your pregnancy progresses, you'll continue to produce increasing amounts of discharge. The discharge will also tend to become thicker and occur more frequently. It's usually heaviest at the end of your pregnancy.

During the final weeks of your pregnancy, your discharge may contain streaks of thick mucus and blood. This is called "the bloody show." It can be an early sign of labor. You should let your doctor know if you have any bleeding.

Normal vaginal discharge, or leukorrhea, is thin and either clear or milky white. It's also mild-smelling.

If your discharge is yellow, green, or gray with a strong, unpleasant odor, it's considered abnormal. Abnormal discharge can be a sign of an infection or a problem with your pregnancy, especially if there's redness, itching, or vulvar swelling.

If you think you have abnormal vaginal discharge, let your healthcare provider know immediately. Learn more about vaginal discharge during pregnancy.

Pregnancy and urinary tract infections (UTIs)

Urinary tract infections (UTIs) are one of the most common complications women experience during pregnancy. Bacteria can get inside a woman's urethra, or urinary tract, and can move up into the bladder. The fetus puts added pressure on the bladder, which can cause the bacteria to be trapped, causing an infection.

Symptoms of a UTI usually include pain and burning or frequent urination. You may also experience:

- cloudy or blood-tinged urine
- pelvic pain
- lower back pain
- fever
- nausea and vomiting

Nearly 18 percent of pregnant women develop UTI. You can help prevent these infections by emptying your bladder frequently, especially before and after sex. Drink plenty of water to stay hydrated. Avoid using douches and harsh soaps in the genital area.

Contact your healthcare provider if you have symptoms of a UTI. Infections during pregnancy can be dangerous because they increase the risk of premature labor.

When caught early, most UTIs can be treated with antibiotics that are effective against bacteria but still safe for use during pregnancy.

Pregnancy prevention

Women who have male sexual partners should consider birth control if they're not interested in becoming pregnant.

Some methods of pregnancy prevention work better for certain individuals. Talk to your doctor about birth control that's right for you. A few of the most common birth control methods are discussed below:

Birth control method	**Effectiveness rate**
Intrauterine devices (IUDs)	Over 99 percent
The pill	99 percent with perfect use; around 91 percent with typical use
Male condom	98 percent with perfect use; around 82 percent trusted Source with typical use
Female condom (or internal condom)	95 percent effective with perfect use; around 79 percent with typical use
Morning-after pill	Up to 95 percent (taken within one day of sexual contact); 75 to 89 percent (taken within three days)
Natural family planning (NFP)	75 percent when used on its own

Intrauterine devices (IUDs)

Intrauterine devices (IUDs) work mostly by stopping fertilization. They're currently the most effective form of birth control. The downside is that they don't prevent sexually transmitted diseases (STDs).

The pill and other hormonal birth control methods

Birth control pills, patches, and vaginal ring work by controlling the hormone levels in a woman's body. They're available by prescription.

Actions that can reduce the effectiveness of these methods include forgetting to use them as prescribed. Effectiveness rates that mention "typical use" account for these types of human errors.

Other forms of hormonal birth control include the patch and the vaginal ring. They're also available by prescription, and their effectiveness rates are similar to those of the pill.

Condoms and other barrier methods

Condoms, diaphragms, and sponges are convenient and inexpensive forms of birth control that can be bought without a prescription.

They're most effective when used correctly every time you have sexual intercourse. If you're relying on these barrier methods to avoid getting pregnant, also consider using an additional method of contraception such as spermicide or a birth control pill.

Other barrier methods include diaphragms and sponges. They can be bought without a prescription.

Emergency contraception

Several morning-after pills are available, both over the counter and by prescription. These pills aren't intended as regular forms of birth control. Instead, they can act as a backup if you have unprotected sex or forget to use your regular form of birth control.

They must be used within 120 hours (five days) of sexual contact to be effective. Some pills are most effective when taken within 72 hours (three days).

Natural family planning (NFP)

Natural family planning (NFP), or fertility awareness, is the birth control method with the highest failure rate. With NFP, a woman tracks her menstrual cycle so that she can predict when she'll ovulate. She'll then avoid intercourse during her fertile window.

Accidental pregnancies can occur because there are many variables affecting a woman's cycle from month to month.

The bottom line

Condoms are the only birth control method that both prevent pregnancy and protect against STDs. Discover the safest condoms on the market here.

Pregnancy or PMS

The symptoms of early pregnancy can often mimic those of premenstrual syndrome (PMS). It may be difficult for a woman to know if she's pregnant or simply experiencing the onset of another menstrual period.

A woman needs to know as soon as possible if she's pregnant so that she can get proper prenatal care. She may also want to make certain lifestyle changes, such as abstaining from alcohol, taking prenatal vitamins, and optimizing her diet.

Taking a pregnancy test is the best, and easiest, way to determine if it's PMS or early pregnancy. You can take a home test or visit your healthcare provider.

Some common symptoms of both PMS and early pregnancy include:

- breast pain
- bleeding
- mood changes
- fatigue
- food sensitivities
- cramping

Early pregnancy and PMS are often difficult to tell apart. Learn to distinguish between the two with the help of this Venn diagram.

Pregnancy diet

A healthy pregnancy diet should be much the same as your typical healthy diet, only with 340 to 450 additional calories per day. Aim for a healthy mix of foods, including:

- complex carbohydrates
- protein
- vegetables and fruits
- grains and legumes
- healthy fats

If you already eat a healthy diet, you'll only need to make slight changes. Fluids, fiber, and iron-rich foods are especially important during pregnancy.

Vitamins and minerals

Pregnant women require larger amounts of some vitamins and minerals than women who aren't pregnant. Folic acid and zinc are just two examples.

Once you find out you're pregnant, you may wish to increase your vitamin and mineral intake with the help of supplements. Be sure to read nutrition labels and seek your doctor's advice before using any supplements or over-the-counter (OTC) medications.

Although rare, taking supplements could result in vitamin toxicity or overdose. However, a complete prenatal vitamin will probably contain a good mix of the nutrients that you need for a healthy pregnancy.

Try it: Shop for complete prenatal vitamins.

The bottom line

Taking care of yourself is one of the best ways to take care of your growing baby. Discover the 18 vitamins and minerals that lay the foundation for an optimal pregnancy diet.

Pregnancy and exercise

Exercise is essential to keeping you fit, relaxed, and ready for labor. Yoga stretches, in particular, will help you stay limber. It's important not to overdo your stretches, however, as you could risk injury.

Other good exercises for pregnancy are gentle Pilates, walking, and swimming.

You may need to modify your current fitness routine to accommodate your changing body and lower energy levels. Work with your healthcare provider or a personal trainer to ensure that you aren't overexerting yourself. Get more ideas for staying fit in your first trimester.

Pregnancy massage

Practicing relaxation techniques can help relieve some of the stress and anxiety you may feel throughout your pregnancy.

If you're searching for ways to stay calm, consider trying a prenatal massage. A prenatal massage is good for relieving mild tension. It may also help ease your body and muscle aches.

Massages are generally safe at any time during your pregnancy. Some facilities avoid performing them in the first trimester because the risk of miscarriage is highest during this period.

Getting your doctor's approval before you get a massage is a good idea, especially if you've had pain in your calves or other parts of your legs.

Essential oils

Using essential oils during pregnancy is controversial. Some healthcare professionals say that certain oils can be safe and helpful for relaxing and alleviating pain during pregnancy and labor. However, they also warn against using the oils in the first trimester.

According to the nonprofit National Association for Holistic Aromatherapy, the main point of contention is whether oils used during pregnancy can harm the growing baby if they cross over into the placenta.

More research is needed about using essential oils during pregnancy and labor. If you plan to use them, seek guidance from your healthcare provider.

The bottom line

Prenatal massage can be a soothing and tranquil part of your pregnancy routine, with or without the essential oils. See how it compares to other types of massage here.

When to seek medical care

Most women in their 20s or early 30s have a good chance of a problem-free pregnancy. Teens and women over the age of 35 are at a higher risk for health complications.

Underlying conditions

Underlying health conditions such as high blood pressure, diabetes, or cardiovascular disease will increase your risk of pregnancy complications. Other examples include:

- cancer
- kidney disease
- epilepsy

If you have one of these conditions, ensure that it's properly monitored and treated throughout your pregnancy. Otherwise, it can lead to miscarriage, poor fetal growth, and birth defects.

Other risk factors

Other factors that can affect an otherwise healthy pregnancy include:

- multiple-birth pregnancies, such as twins or triplets
- infections, including STDs
- being overweight or obese
- anemia

Pregnancy complications

Pregnancy complications can involve the baby's health, the mother's health, or both. They can occur during pregnancy or delivery.

Common pregnancy complications include:

- high blood pressure
- gestational diabetes
- preeclampsia
- preterm labor
- miscarriage

Addressing them early can minimize the harm done to the mother or the baby. Know your options when it comes to treating pregnancy complications.

Pregnancy and labor

Sometime after your fourth month of pregnancy, you may begin to experience Braxton-Hicks contractions or false labor. They're completely normal and serve to prepare your uterus for the job ahead of real labor.

Braxton-Hicks contractions don't occur at regular intervals, and they don't increase in intensity. If you experience regular contractions before week 37, it could be preterm labor. If this occurs, call your healthcare provider for help.

Early labor

Labor contractions are generally classified as early labor contractions and active labor contractions. Early labor contractions last between 30 and 45 seconds. They may be far apart at first, but by the end of early labor, contractions will be about five minutes apart.

Your water might break early during labor, or your doctor may break it for you later on during your labor. When the cervix begins to open, you'll see a blood-tinged discharge coating your mucous plug.

Active labor

Inactive labor, the cervix dilates, and the contractions get closer together and become more intense.

If you're in active labor, you should call your healthcare provider and head to your birth setting. If you're unsure whether it's active labor, it's still a good idea to call and check-in.

Labor pain

Pain will be at its height during active labor. Have a discussion with your doctor about your preferred method of dealing with pain.

You may choose drug-free measures such as meditation, yoga, or listening to music.

If you choose to manage your pain with drugs, your doctor will need to know whether to use analgesics or anesthetics.

Analgesics, such as meperidine (Demerol), dull the pain but allow you to retain some feeling. Anesthetics, such as an epidural, prevent certain muscle movements and completely block the pain.

The bottom line

Whether you're planning for a vaginal or cesarean delivery, you may feel nervous as your due date approaches. Know what to expect with this guide to the different stages of labor.

Prognosis

You're likely to move through each week of your pregnancy without too much trouble. Pregnancy brings with it many changes to your body, but those changes don't always have a serious impact on your health.

However, certain lifestyle choices can either help or actively harm your baby's development.

Some actions that can keep you and your baby healthy include:

- taking a multivitamin
- getting sufficient sleep
- practicing safe sex
- getting a flu shot
- visiting your dentist

Some things you'll want to avoid include:

- smoking
- drinking alcohol
- eating raw meat, deli meat, or unpasteurized dairy products
- sitting in a hot tub or sauna
- gaining too much weight

Medications

It can be hard to determine which medications you can take during pregnancy and which ones you should avoid. You'll have to weigh the benefits to your health against potential risks to the developing baby.

Ask your healthcare provider about any drugs you may take, even OTC ones for minor ailments such as headaches.

According to the Food and Drug Administration (FDA)Trusted Source, each year 50 percent of pregnant women in the United States report taking at least one medication.

In the 1970s, the FDA created a letter system trusted Source to categorize drugs and their perceived risk to pregnant women. However, they began to phase out this letter system (and use updated drug labeling) in 2015. Their new rules for drug labelling Trusted Source only apply to prescription drugs.

The service MotherToBaby also provides up-to-date information on the safety of specific drugs.

The bottom line

Learning or relearning all the rules of pregnancy can be overwhelming, especially if you're having your first child. Feel more prepared with this handy list of pregnancy do's and don'ts.

The takeaway

Under the Affordable Care Act (ACA), all health insurance plans in the United States are required to offer some level of prenatal care.

Once your pregnancy's been confirmed, call your insurance provider to get an idea of what's covered by your specific plan. If you don't have health insurance when you find out you're pregnant, speak to your doctor about steps you can take to get coverage.

The timing of your first prenatal visit may depend on your overall health. Most women may have their first visit during week 8 of pregnancy. Women whose

pregnancies are considered high-risk, such as those who are over 35 or have chronic conditions, may be asked to see their doctors earlier.

There are many ways to mentally and physically prepare for labor. Many hospitals offer birthing classes before delivery so that women may better understand the signs and stages of labor.

In your third trimester, you may want to prepare a hospital bag of toiletries, sleepwear, and other everyday essentials. This bag would be ready to take with you when labor begins. During the third trimester, you and your doctor should also discuss your labor and delivery plan in detail.

Knowing when to go to the birth setting, who'll be assisting in the birth, and what role your doctor will play in the process can contribute to greater peace of mind as you enter those final weeks.

PREGNANCY

DIET SECRETS

Chapter 2

Effect of maternal diet before and during **pregnancy** on the **life-long health of the child**

A nutrient-rich maternal diet before and during pregnancy is associated with improved fetal health, more appropriate birth weight, and increased rates of maternal and infant survival. Physicians need a better understanding of the role of diet in shaping fetal outcomes. Given this background, we reviewed and summarized articles on maternal nutrition found in MEDLINE since 1981, written in English, and limited to human subjects.

For the Offspring

Maternal diets are high in sugar and fat lead to an increased incidence of metabolic syndrome, diabetes, and cardiovascular disease later in life. Folic acid should be supplemented prior to conception and continued through at least the first 28 days of fetal life to prevent neural tube defects, and vitamin C should be given to women who smoke to lower the incidence of asthma and wheezing in the children. Iodine deficiency is increasing, and iodine should be included in prenatal supplements. If the maternal hemoglobin is 7 g/dL or more, there is no evidence that iron supplementation is needed. Fish intake

during pregnancy is protective against atopic outcomes, whereas high-meat diets contribute to elevated adult blood pressure and hypersecretion of cortisol.

For the Mother

Calcium supplementation lowers the risk of preeclampsia and hypertensive disease in pregnancy.

Given the limits of our current knowledge, a diet rich in whole grains, fruits, vegetables, and selected fish is desirable for the best outcomes. Diets high in sugar and fat lead to higher rates of diabetes, metabolic syndrome, and cardiovascular disease. Folic acid, iodine, and calcium in all pregnant women and vitamin C in smokers are the only supplements so far shown to be of value for routine use. The physician treating a pregnant woman should be ready to advise a healthy diet for the benefit of the fetus.

Maternal nutritional requirements for optimal fetal development are difficult to discern in human pregnancy. The ethical constraints regarding what can reasonably be put to experimental study, coupled with the length of gestation and our different genetic strains, limit what can be stated with confidence for any given woman in any given location. Furthermore, we now know that our diet, our environment, and our responses to each in combination can alter the expression of our genes. This adds another layer of complexity to our findings. The purposes of this article are to summarize what appears to be known at this time about maternal nutritional requirements and to discuss what is not yet established.

Fetal programming, or maternal epigenetic influence, occurs not by changing the genes themselves, but by altering how they are expressed. Methylation of histones, one example of epigenetic change, can influence gene expression. This epigenetic influence is transgenerational and long lasting.1

The risk for the developing fetus of developing the adult-onset disease is determined, at least in part, by maternal nutritional status at conception,

during pregnancy, and in early infancy. The fetal strategy of limiting growth in the absence of adequate nutrition creates an infant with higher insulin response to food and less growth of muscle (including the heart), nephrons, and bone. If the diet improves in infancy or childhood, this infant will gain weight at a higher-than-normal rate and will be at higher risk of type 2 diabetes and the metabolic syndrome.2 As an adult, the lower number of nephrons and cardiac cells will set the stage for hypertension and cardiac failure.

After fertilization, the fertilized ovum and early blastocyst appear to detect and respond to the nutritional quality of the fallopian tube environment, even before implantation. During this time, and throughout the first 10 weeks of gestation, nourishment of the developing fetus seems to be provided solely by the fluid produced by the glands of the endometrium. Studies of mice and other animal species show that there is no maternal bloodstream access to the embryo until 10 weeks of gestation, and the fluid found in the fallopian tubes matches that found in the endometrial glands.3 This is significant as all organ differentiation takes place by 11 weeks of gestation.4 Maternal nutrition must be optimized before conception, so that the preimplantation and early differentiation environment is ready to support early fetal and initial placental development. Maternal nutritional status influences nutrient partitioning to the placenta or fetus, which subsequently affects disease risk.5

Overlying all of this is the current phenomenon of high-calorie malnutrition brought on by the increased reliance on processed foods and the drop in vegetable and fruit consumption around the world. The higher rate of maternal diabetes brought on by a high-calorie diet and the strong effect of diabetes on pregnancy outcome makes this phenomenon particularly important.

There is a growing appreciation of the chemical communication between the mother and the fetus and the competing interests of the mother versus those of the fetus. It appears that the developing fetus, from conception onward,

evaluates the nutritional environment available to it and adjusts its rate of growth accordingly. At the same time, while the goal of the fetus is to maximize its chances of successful development and reproduction, the goal of the mother's body is to maximize her long-term reproductive potential, even if it means sacrificing the current fetus to do so. This means that in the face of limited nutrition the placenta may limit what is available to the fetus, even if the mother receives supplementation.

Pregnancy and lactation are associated with major metabolic and physiologic changes in the mother. Nutritional requirements increase to optimize both maternal adaptation and fetal development. Improving the mother's diet before and during pregnancy reduces the risk of medical problems for her and her infant.

Gestational Weight Gain Recommendations

The Institute of Medicine of the National Academy of Sciences provided gestational weight gain recommendations based on maternal prepregnancy body mass index (BMI). These recommendations, however, specifically excluded women with diabetes, who now make up a significant portion of the US population. For diabetic women, there is evidence that weight gain at the lower edge of the recommended range or even below this range leads to better maternal and fetal outcomes. The additional energy increment needed to support appropriate weight gain during pregnancy is 90 to 125 kcal/d in the first trimester, 286 to 350 kcal/d in the second trimester, and 466 to 500 kcal/d in the third trimester. Thus, the old adage “eating for two” is not mathematically representational of the 10% to 25% increase in caloric intake actually needed to support a healthy pregnancy. Furthermore, given the average caloric intake of many individuals, there is no need to increase caloric intake in pregnancy, but rather to shift low-nutritional calories into more nutrient-dense calories. The protein requirement during pregnancy is not much higher than that needed by a nonpregnant woman, coming to 0.45 g/lb of maternal body weight, or an average of 71 g/d. High protein supplementation or balanced protein supplementation is not helpful and may be harmful to the pregnancy, whereas balanced energy/protein supplementation appears to lead to a lower risk of small-for-gestational-age (SGA) births, as well as a small increase in mean birth weight and maternal weight gain.

TABLE 1

Recommended Weight Gain in Pregnancy

Weight Classification	Prepregnancy BMI, kg/m^2	Range of Recommended Total Weight Gain, kg		Rate of Weight Gain in Second and Third Trimester, lb/wk
		Singleton Pregnancy	Twin Pregnancy	Singleton Pregnancy
Underweight	<18.5	28–40 lb (12.5–18 kg)	NA	1.0–1.3 lb (0.5 kg)
Normal	18.5–24.9	25–35 lb (11.5–16 kg)	37–54 lb (16.8–24.5 kg)	0.8–1.0 lb (0.4 kg)
Overweight	25–29.9	15–25 lb (7–11.5 kg)	31–50 lb (14.1–22.7 kg)	0.5–0.7 lb (0.3 kg)
Obese	≥30	11–20 lb (5–9 kg)	25–42 lb (11.4–19.1 kg)	0.4–0.6 lb (0.2 kg)

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↓ insulin, glucose synthesis

↑ lipolysis

↑ placental growth

↑ metabolic rate, appetite, breast development, blood volume

↑ uterine growth and uterine blood flow

- 40% of weight gain is associated with the fetus and placenta
- 60% of weight gain is associated with maternal changes

Women with a high prepregnancy BMI have infants with higher birth weights, and heavier babies have a higher body fat mass. Except for the very overweight group, birth weight is strongly correlated to maternal weight gain.

An elevated energy intake is associated with the following:

- increased maternal weight gain
- increased risk of hypertension
- gestational diabetes (GDM)
- cesarean deliveries, macrosomia (birth weight >4500 g)

- childhood obesity in the offspring

An inadequate energy intake is associated with the following:

- SGA or low birth weight (LBW; <2500 g)
- SGA is associated with an increased risk of adult metabolic diseases including type 2 diabetes

The risk ratio for developing impaired glucose tolerance or type 2 diabetes mellitus is 4 times higher among babies with a birth weight of 5.5 lb or less than those with a birth weight of 7.5 to 8.5 lb.15 Intrauterine growth restriction is associated with an increased risk of adult-onset of hypertension and stroke. Large-for-gestational-age infants are at increased risk of infant and adult obesity and other obesity-related comorbidities.

Episodes of famine in otherwise well-nourished populations (the Netherlands in World War II and rural China in the 1950's Great Leap Forward) provide valuable data to evaluate the impact of maternal diet on short- and long-term health outcomes in the offspring. Exposure to famine during gestation resulted in higher rates of adult-onset disease in the offspring including impaired glucose tolerance, obesity, coronary heart disease, atherogenic lipid profiles, hypertension, microalbuminuria, schizophrenia, antisocial personality and affective disorders, and a higher rate of the addictive disorder in men. The offspring also tend to eat a higher fat diet. Women exposed to famine in utero tend to have more offspring, more twin gestations, and younger age at first pregnancy and show a higher incidence of metabolic syndrome. There are also different effects of famine depending on when it occurs during the pregnancy. As organogenesis takes place along a rigid timeline, nutrient deficits early in the pregnancy may lead to compromised organ development, whereas deficits later in pregnancy may lead to an LBW infant with normal organ function.

Carbohydrates

Carbohydrates are the body's, and importantly the brain's, main source of energy. Pregnant women need the energy provided by carbohydrates to grow a healthy baby, as glucose, derived from carbohydrate, is the main fuel used for intrauterine growth. The Daily Recommended Intake (DRI) for carbohydrates during pregnancy is 175 g/d. It is important that pregnant women choose high-quality carbohydrates with a low glycemic index (GI), found naturally in whole foods such as whole grains, nonstarchy vegetables, fruits, beans, peas, lentils, and low-fat dairy. Carbohydrates may also take the form of added sugars such as table sugar, honey, syrup, cane sugar, agave, high-fructose corn syrup, and fruit juice concentrate. All women, including pregnant women, should limit their intake of these sugars, as well as foods that have high amounts of added sugar such as candy, desserts, and sugar-sweetened beverages (soda, juice, lemonade, sweetened teas, and other fruit-flavored drinks). A study showed that increased consumption of fruits and vegetables was associated with an increase in birth weight, birth length, and head circumference, but was not associated with any specific measured micronutrient intake

TABLE 2

Recommended Daily Intake During Pregnancy and Dietary Sources of Macronutrients and Micronutrients

Nutrient	DRI	Dietary Sources
Carbohydrate	175 g/d	Whole grains, nonstarchy vegetables, fruits, beans, peas, lentils, low-fat dairy products
Protein	1.1 g/kg per day (~71 g/d)	Meats, poultry, seafood, eggs, dairy products, beans, lentils, nuts, and seeds
Fat	No DRI. Suggest 25%–35% of total calories	Emphasize n-3 PUFAs, limit animal fat and saturated fat, avoid *trans*-fat
Polyunsaturated fat	200–300 mg DHA/d, 500 mg/d of DHA + EPA	12 oz of seafood/wk; avoid high-mercury fish
Iron	No documented benefit to supplementation in US population	Use of iron cookware, clams, sunflower seeds, nuts, whole grains, dark leafy greens, tofu
Folate	0.6 mg/d in pregnancy 0.5 mg/d during lactation; suggest 4 mg/d better	Beans, peas, orange juice, green leafy vegetables
Iodine	220 µg/d (US) 250 µg/d (World Health Organization)	Iodized salt, seafood, seaweed, kelp, dairy products (1/2 tsp salt = ~74 µg iodine)
Vitamin A	No significant effects of supplementation in US population	Sweet potatoes, carrots, dark leafy greens, winter squashes; must consume with fat.
Vitamin B_6	No clear evidence of effects for supplementation in US population	Fish, beef liver, potatoes, other starchy vegetables, fruit
Vitamin B_{12}	No clear evidence of effects for supplementation in US population	Fish, meat, poultry, eggs, milk, and dairy products; vegetarians and vegans need supplements
Vitamin C	500 mg/d prevents wheezing/asthma in children of smokers	Citrus fruit, cantaloupe, kiwi fruit, mango, papaya, pineapple, strawberries, blueberries
Vitamin D	600 IU/d, may supplement up to 1000–2000 IU/d	Fatty fish, egg yolks, fortified milk, margarine, yogurt, orange juice
Vitamin E	No clear evidence of effects for supplementation in US population	Sunflower seeds, almonds, wheat germ oil, sunflower oil
Calcium	1–2 g/d lowers risk of preeclampsia and hypertensive disease	Milk, yogurt, cheese, fortified juices, tofu, cereals, Chinese cabbage, broccoli, fish with bones
Multivitamin supplements	Folate 0.8–1.0 mg/d. Iodine 200 µg/d	

Protein

Dietary protein provides important building blocks during times of growth, development, or repair and also provides structural components for human cells and for the synthesis of enzymes, which help to ensure proper function of these cells. A diet low in protein during pregnancy decreases insulin secretion in rats, whereas a diet high in protein induces changes in genes associated with energy metabolism in the liver in rats, mice, and pigs.

In some cases, there appear to be important interrelated nutritional effects, such that supplementation with one nutrient has differing effects based on the availability of other nutrients. A good example of this would be providing only protein supplementation to a population that is both protein and energy deficient (dangerous) versus the effect of supplementing both protein and energy in a balanced manner (promotes growth) or by providing folate with or without iron supplementation. While the primary intent here is to discuss each nutrient separately, some discussion of their interactions is necessary. The DRI for protein during pregnancy is 1.1 g/kg per day or approximately 71 g protein per day starting in the second trimester, which is approximately 25 g

more than what is recommended for nonpregnant women. Meats, poultry, seafood, eggs, milk and dairy products, beans, lentils, nuts, and seeds are rich sources of protein. Protein, in smaller amounts, is also found in vegetables and grains.

Fat

Fats are part of a healthy diet during pregnancy. Fat is primarily used as an energy source by the body but is also used to transport the fat-soluble vitamins A, D, E, and K and to provide essential fatty acids that cannot be synthesized by the body.

Although there is no DRI for fat specific to pregnancy, it seems reasonable for pregnant women to follow the current guidelines for Americans, which suggests keeping total dietary fat intake to between 25% and 35% of total calories. The quality of the fat is also an important consideration when looking at overall fat intake. Recent scientific investigation allows for a greater understanding of specific fatty acid functions and is helpful to clarify the fatty acids best for health. Based on recent research and consensus, increased intake of the omega-3 (n-3) polyunsaturated fatty acids (PUFAs) should be emphasized, and intake of saturated fatty acids should be limited to no more than 7% to 10% of total calorie intake; trans-fatty acid intake should be avoided whenever possible.

High-fat diets in pregnancy have been found to increase insulin resistance. High saturated fat intake is associated with the development of glucose abnormalities in pregnancy and an increased risk of GDM. Higher intakes of animal fat and cholesterol before pregnancy are also associated with an increased risk of GDM, as is a higher intake of saturated fat during pregnancy.

Docosahexaenoic acid (DHA) and n-3 fatty acids are needed for a brain and retinal development throughout the third trimester of gestation and the first year of life. The fetus needs 200 to 300 mg/d of DHA and 500 mg of DHA plus eicosapentaenoic acid (EPA) per day. Good sources of n-3 fatty acids include

fatty fish and seafood (recommendation of 12 oz per week), walnuts, and dietary supplements.

Polyunsaturated Fatty Acids

For women who do not eat fish, n-3 PUFA supplementation appears to be associated with a small decrease in preterm birth and LBW infants, and fish consumption is associated with increased birth weight and gestation length. Docosahexaenoic acid and EPA are important in visual and cognitive development. Some studies in women who do eat some fish fail to show effects, however, and other studies both support and refute a correlation between the ratio of n-6:n-3 fatty acids, where a ratio of less than 9 is considered healthful. However, there is also concern about consuming too much fish during pregnancy as some fish contain significant amounts of organic mercury compounds relative to the amount of DHA they provide. Studies done in the Faroe Islands showed an effect of fish consumption on

measures of neurologic function at ages 7 and 14 years that were correlated with cord blood mercury concentrations. The population living on these islands eats both fish and whale blubber, and maternal blood levels of mercury have been shown to peak at 10 times higher levels after eating blubber than after eating fish. Besides, there is a higher intake of polychlorinated biphenylbromine compounds in the Faroe Island diet, although controlling for this contaminant did not affect the relationship with mercury.

A study done in the Seychelles islands, where fish consumption is high (with the offspring now 14 years old), did not show these findings, but a recent study out of Hong Kong confirmed the Faroe Island findings in a population that did not consume whale blubber. These results appear to show that a moderate amount of fish consumption in pregnant women is beneficial, but that fish with a low ratio of DHA to mercury (albacore, halibut, red snapper, for example) should be eaten in limited quantities and that shark, swordfish, king mackerel, and tilefish, fish are known to have higher mercury concentrations, should be avoided. Also of note are several studies showing a decrease in atopic syndrome, eczema, and wheezing in the face of small-particle air pollution in infants born after prenatal supplementation with DHA in the third trimester and studies showing that the incidence of eczema and allergies can be increased by n-6 fatty acid intake in the last trimester and decreased by n-3 fatty acid intake in the same period. A recent report shows that pregnant women have avoided fish consumption altogether as a result of concerns about mercury, while it is clear that moderate consumption (8–12 oz/wk) of fish with low levels of mercury is beneficial for all pregnant women and needs to be reinforced.

Iron

Maternal iron stores at conception are a strong predictor of maternal iron status and risk of iron deficiency and anemia in later pregnancy. Some data show that in populations with a high prevalence of anemia there is an increase in birth weight in infants following in utero iron supplementation (usually

provided along with folate). The incidence of anemia and iron deficiency in the United States is about 12% in nonpregnant women and 18% in pregnant women. These conditions are found in 43% and up to 75% of nonpregnant and pregnant women, respectively, in developing countries. This is due to poor diet, limited consumption of iron-rich foods, intestinal parasites, and chronic blood loss.

There is no doubt that adequate iron stores are crucial for maternal safety. While there is no evidence of fetal growth restriction with a hemoglobin level greater than 6 g/dL, hemorrhage in the presence of anemia is the cause of at least 20% of maternal deaths worldwide. Mild anemia reflected by a hemoglobin concentration of 8 to 10.9 g/dL may be physiologic. There is a normal drop in hemoglobin concentration during pregnancy because of the increase in the circulating blood volume, and this may actually improve blood flow across the placental bed by decreasing viscosity, thus providing more efficient oxygen transfer.

A recent review of current literature by the US Preventive Services Task Force failed to show any benefit to routine iron supplementation in pregnancy for women in the developed world. However, as noted previously, any woman with an existing iron deficiency or a major risk of severe bleeding (placenta previa, abruption, clotting disorder, etc) should, of course, receive treatment.

Folate

Folate, derived from food, and folic acid, the synthetic form of folate found in vitamin supplements, is a water-soluble B vitamin. It is a methyl donor that is required for DNA synthesis and cell division. Folate/folic acid is required for neural tube development occurring within 28 days of conception. The value of folate in the prevention of neural tube defects (NTDs) is well established, and recent studies showing hypomethylation of neural tissue in cases of NTD support this observation.

Folate is needed for the formation of the brain and spinal cord. The neural tube closes by day 28 of gestation. If it does not close completely, an opening

at the lower end of the spine causes spina bifida, whereas a larger defect can lead to anencephaly (complete failure of the brain to develop).

Since 1998, the US Food and Drug Administration mandated increased fortification of cereal grains to 140 µg (0.14 mg) folic acid/100 g grain. Since then, the incidence of NTDs has decreased by approximately 30% to 40% (rates of spina bifida declined ~31%; anencephaly declined 16%) in the United States, but this differs by racial/ethnic group. It has been proposed that only folate in food, rather than more in supplements, will lead to further improvement. Data have shown, however, that the current supplementation policy has only dropped the incidence of NTDs by 20%, and calculations predict that if supplementation were increased to 4 mg/d, the incidence of NTDs would drop by 82%. Observational studies also suggest that folate given in pregnancy may drop the incidence of preterm labor between 20 and 32 weeks, while controlled trials do not. If the rest of the world adopted similar food fortification and folate supplementation policies, the worldwide prevalence of 300,000 NTDs could drop by 150,000 to 210,000 cases per year.

The US recommendations are for women of childbearing age to consume 0.4 mg of folate in vitamin form or fortified foods daily, in addition to a diet high in folate-rich foods, because of the lower bioavailability in foods. This amount should increase to 0.6 mg/d in pregnancy and 0.5 mg/d during lactation. Women with a history of pregnancy affected by a neural tube disorder (eg, spina bifida) should consume 4 mg/d of supplemental folic acid (a 10-fold increase, which requires a prescription), starting at least 1 month before conception. Foods rich in folate include beans, peas, orange juice, and green leafy vegetables. Prenatal vitamins contain folic acid, with up to 0.8 to 1 mg/tablet depending on the brand. Low folate intake (<.15 mg/d) has been associated with an increased risk of cancer, and very high intakes of folic acid (>4 times the normal dose) have been possibly associated with an increased

risk of cancer in animal studies. Unfortunately, while the benefit of folic acid supplementation during pregnancy shows up quickly, cancer risks must be studied over decades, so a small amount of uncertainty concerning high doses of folic acid remains. There is a biological basis for the concern, as folic acid is metabolized by a liver enzyme that may be unable to handle the higher amounts of this vitamin, and circulating folic acid is associated with reduced natural killer cell cytotoxicity.

Hispanic women have higher rates of NTDs than non-Hispanic women: 10.34 versus 7.9 per 10,000 live births; this shifted to 7.92 versus 5.35 after the folic acid fortification program was established. Hispanic women consume less folate from food and less from supplements, 20% versus 37%, and 60% consume corn masa flour, which is not fortified with folic acid. Fortification of corn masa flour in the United States would increase folate intake by approximately 20% among 15- to 44-year-old Mexican American women and possibly lead to fewer NTD-affected pregnancies in this population.

High supplement levels of folic acid after the first trimester have also been associated with an increase in childhood asthma and eczema, whereas low folate levels have been linked to language delay, emotional problems, and schizophrenia in the offspring. An epidemiological study in Pune, India, found that a combination of low blood B12 levels and high folate levels in women (measured in late pregnancy) are associated with small, relatively obese offspring with a high level of insulin resistance. Vitamin B12 deficiency blocks the metabolism of folate and leads to a buildup of 5-methyltetrahydrofolate, which may be the source of the problem. This population differs from a US cohort, as it had almost no women with folate deficiency, and a large number of the pregnant women have prescribed a dose of 5 mg folate daily from 12 weeks' gestation or later until term.

Iodine

Iodine requirements during pregnancy are increased because of a 50% increase in maternal thyroid (T4) hormone production. Fetal thyroid-

stimulating hormone is not synthesized until the 10th to 12th week of gestation, approximately the same time that the fetal thyroid is capable of concentrating iodine and synthesizing iodothyronine. Little fetal hormone synthesis occurs, however, until the 18th to 20th week of gestation. There is also an increased loss of iodine in the urine during pregnancy.

Therefore, through the first half of pregnancy, the fetus relies on the mother for the thyroid hormone. When maternal iodine intake is low, maternal thyroid hormone production is low. Thyroid hormone is required for normal neuronal migration, myelination, and synaptic transmission and plasticity during fetal and early postnatal life. Poor neuronal development in the fetus, due to iodine deficiency during critical time points, causes irreversible brain damage, is the leading cause of preventable mental retardation worldwide, and can result in up to a 20-point drop in IQ. Iodine deficiency during fetal development is also associated with fetal goiter (potentially obstructing delivery), hypothyroidism, and cretinism.

Major sources of iodine include iodized salt, seafood, seaweed, kelp, and dairy products. Iodized salt provides 77 µg iodine/g of salt (~220 µg iodine in ½ teaspoon of salt). The US Recommended Daily Allowance for iodine is 220 µg/d. The World Health Organization/International Council for Control of Iodine Deficiency Disorders recommends 250 µg/d.

Iodine intake was not felt to be a problem in the United States for many decades but is again an issue. The push to limit salt intake, coupled with the rise in popularity of sea salt and kosher salt, a fall in the number of bakeries using iodized dough, the popularity of organic milk (which has approximately 40% less iodine than regular commercial milk), soy and other “nonmilk” milk, and the rapid loss of iodine from iodinated salt in warm humid climates, has led to iodine intake dropping 50% between 1970 and 1990. Soy intake inhibits iodine absorption and interferes with thyroid hormone production, but can be circumvented by adequate iodine intake. Currently, as many as 30% of pregnant women in this country are estimated to have low levels (<100 µg/L), and as recently as 2012, just under 50% of prenatal vitamins contained no iodine. At least 1 study showed that supplementation given after 6 to 8 weeks of gestation was ineffective at preventing a drop in IQ levels (8–12 points) in the offspring. The current recommendation is for all pregnant women to take prenatal vitamins containing 150 to 250 µg daily. Older women and

multiparas should be taking higher doses. The iodine should come from potassium iodide (KI), not from kelp, as kelp has been shown to contain highly variable amounts of iodine, as well as (in some cases) large concentrations of arsenic and other heavy metals.

Also, recently described 3 cases of congenital hypothyroidism caused by excess maternal iodine ingestion (12.5 mg/d from nutritional supplements, Iodoral [Optimox Corp, Torrance, CA]) Infants were identified through the Oregon newborn screening program. Concentrations of whole-blood iodine were 10 times above mean control levels. One infant required chronic levothyroxine treatment. Maternal breast milk iodine content was also significantly elevated in the mother. The other 2 infants were dizygotic twins who were treated with levothyroxine for 3 weeks, which was then discontinued. None of the infants presented with neonatal goiter; the long-term consequences are not known. These cases emphasize the need for health care providers to evaluate prenatal vitamin/mineral use among pregnant women and to recommend appropriate supplements to prevent unintentional toxicity.

Vitamin A

Deficiency as a cause of night blindness is a major problem worldwide, but not a significant one in the United States. Supplementation does prevent and cure this condition. All studies to date fail to show any significant effects of vitamin A supplementation on pregnancy outcomes for mother or fetus. More than 10,000 IU of vitamin A supplementation per day (4 times the Recommended Daily Allowance) increases the risk of cleft lip or palate, hydrocephalus, and heart defects. β-Carotene, found in food, does not pose a risk.

Vitamins B6, B12, and C

A low level of B12 has been associated with high levels of homocysteine, which has been associated with preeclampsia and LBW. Deficiency may occur in vegans who do not take supplements. By serum testing, 17% to 39% of pregnant women are deficient in B12, but this was not shown to correlate with

pregnancy complications or outcomes. Vitamin B6 supplementation has been shown in 3 small studies to give a modest gain in birth weight. Vitamin C supplementation is not of value in improving pregnancy outcomes but has shown value for the prevention of wheezing and asthma in the children of smokers.

Vitamin E

One study correlated to the risk of wheeze inversely to the level of vitamin E as well as a linear relationship between the level and the forced expiratory volume at 1 minute. No other studies appear to support or refute this. Deficiency during pregnancy may cause miscarriage, preterm birth, preeclampsia, and intrauterine growth retardation. There does not seem to be a need for supplements.

Vitamin D

Adequate vitamin D status during pregnancy is necessary to ensure appropriate maternal responses to the calcium demands of the fetus for bone mineral accretion. Approximately 25 to 30 g of calcium are transferred to the fetal skeleton during pregnancy—approximately 250 mg/d in the third trimester. Major dietary sources of vitamin D are fatty fish (salmon), egg yolks, fortified milk, margarine, yogurt, and orange juice.

Vitamin D screening and supplementation during pregnancy is a topic of great interest and controversy. American College of Obstetricians and Gynecologists suggests that current evidence does not support routine screening of all pregnant women for vitamin D deficiency. Serum 25-OH vitamin D concentrations of 20 ng/mL (50 nmol/L) or greater are associated with bone health; values of 32 ng/mL (80 nmol/L) or greater are associated with appropriate biomarker concentrations. The recommended intake of Vitamin D set by the Institute of Medicine in 2010 is 600 IU/d. However, when vitamin D deficiency is identified during pregnancy, supplementation with up to 1000 to 2000 IU/d is considered safe by most experts. Others feel that supplementation in doses up to 4000 IU/d is safe during pregnancy and

lactation. It has been identified as a nutrient of public health concern by the US Department of Health and Human Services.

Numerous studies have shown a prevalence of vitamin D levels of less than 50 nmol/L in 30% to 96% of pregnant women, increasing with latitude and with nonwhite race. A study done using archived samples of cord blood in Denmark showed an increased risk of developing schizophrenia with either elevated or low levels of Vitamin D. It was hypothesized that if all the infants could have been born with normal levels there would have been a reduction of 43% in the incidence of schizophrenia among the adults. There is also an association of vitamin D deficiency and insulin resistance, which was reversed with a single injection of the vitamin (not approved in the United States). Some studies report higher long-bone density in fetuses of women with adequate amounts of vitamin D, but the numbers are small. The general recommendation is 1000 to 2000 mg/d of supplementation, but there are no agreed-upon levels for sufficiency or insufficiency in pregnancy. There are no studies clearly showing

differences in maternal outcomes or fetal survival, birth weight, or gestational length relative to vitamin D, but studies on bone health (and lung function and asthma at age 6 years) support a level of at least 50 nmol/L, which implies a need for some supplementation for all pregnant women.

Calcium

Women lose 3% to 5% of their bone mass while lactating but rapidly regain it within 6 months after weaning. Calcium and/or vitamin D deficiency leads to porous, weak bones, and rickets. A Cochrane Review has concluded that there is sufficient evidence to show that calcium supplementation lowers the risk of preeclampsia and other hypertensive diseases of pregnancy, especially in the face of a low-calcium diet.

Food sources of calcium are milk, yogurt, cheese, fortified juices, tofu, cereals, Chinese cabbage, kale, broccoli, and fish with bones. Multivitamin supplements, including prenatal supplements, contain little calcium.

Multiple Micronutrients (Multivitamins)

When compared with iron and folate alone, multiple micronutrients can significantly lower the incidence of SGA infants, but in 5 studies, they increased the risk of neonatal death when started after the first trimester. Regular consumption of fortified cereal grains appears to be an effective source of all but B vitamins, iron, and folate.

In the United States, prenatal vitamins should all contain 2 essential elements:

- 0.8 to 1.0 mg folate
- 20 to 150 µg iodine

Calcium, in the amount of 1000 to 2000 mg, should be provided as a supplement. It is not clear that any other specific components are necessary at this time. The introduction of a nutrient known to be lacking in an isolated population can highlight the effects of a deficiency over a short time, but the

recognition of epigenetic mechanisms means that patience is required to evaluate the full effect on subsequent generations.

High-Calorie Malnutrition

Lack of adequate protein in a prenatal diet has been shown to cause lifelong damage to the developing fetus in humans and numerous animal studies. The goal should be to have a diet of 20% protein or more throughout the pregnancy. Specific damage has been shown at levels of 7.2% or less, but an extremely high protein intake has also been shown to be damaging. Damage from a low-protein diet includes decreased brain size, altered fat distribution, increased obesity, shorter gestation and decreased birth weight, increased stress sensitivity, decreased sperm quality, altered cardiac energy metabolism, and changes in muscular tone. A diet filled with carbohydrates and fats (soft drinks, chips, etc) can easily lead to satiation before an adequate amount of protein and other nutrients have been consumed. A diet skewed toward a high-meat, low-carbohydrate intake leads to a higher incidence of hypertension in the offspring as well as high cortisol levels.

Dietary Patterns

Evidence from international scientific research has identified various eating patterns that may provide short- and long-term health benefits, including a reduced risk of chronic disease. Analysis of overall food patterns takes into account the complex interactions and cumulative effects of multiple nutrients in the entire diet, therefore offering a more comprehensive and complementary approach to public health.

The “Western” diet is a pattern of eating that is associated with adverse health outcomes. The typical Western diet is one low in fruits, vegetables, whole grains, fish/seafood, and low-fat dairy. It is often called the meat-sweet diet because it is high in refined sugars, refined grains (baked goods, desserts, chips), red meat, and saturated fat. It also typically contains high-sugar drinks, high-fat dairy, and higher intakes of processed meats.

Other traditional eating patterns alternatively can provide health benefits. Their variety demonstrates that people can eat healthfully in several ways, which also likely applies to pregnancy.

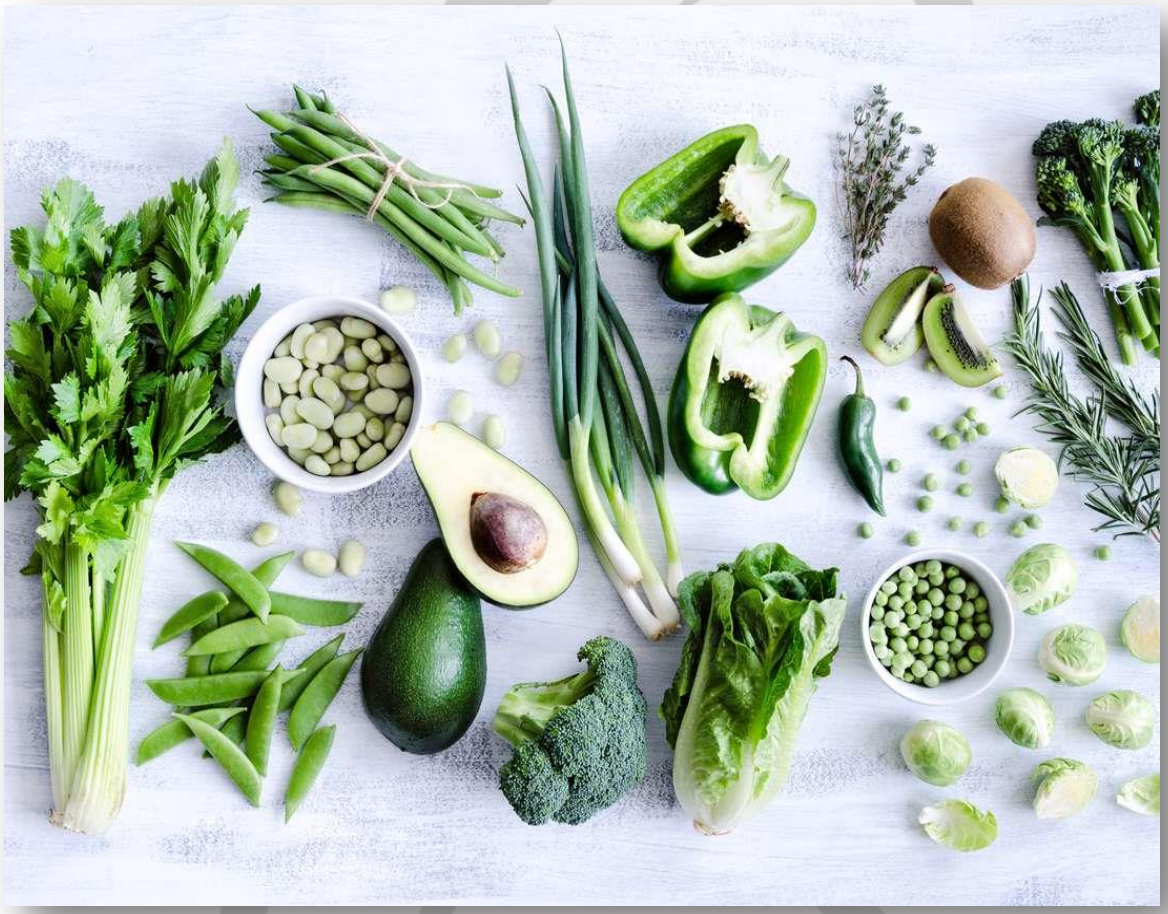
Several healthful dietary patterns have been inversely associated with the risk of type 2 diabetes mellitus, cardiovascular disease, and total mortality Examples of healthy dietary patterns include the aMED (alternative Mediterranean diet), DASH (Dietary Approaches to Stop Hypertension), and aHEI (alternative Healthy Eating Index). These healthy dietary patterns share common components, namely, emphasizing a high intake of vegetables and fruits, high-quality carbohydrates including whole grains, protein from beans and smaller amounts from lean meats, healthy fats from nuts and seeds, fish and seafood and liquid oils, high in fiber, low in added sugar, and low intake of red meat and processed meats.

The types of vegetarian diets consumed in the United States vary widely. Vegans do not consume any animal products, whereas Lacto-ovo vegetarians consume milk and eggs. Vegan diets can be low in B12, riboflavin, vitamin D, calcium, and long-chain n-3 fats if not properly supplemented. Vegetarian diets can also potentially be low in certain nutrients depending on which food groups might be avoided such as dairy, eggs, and/or fish and seafood, so supplement recommendations should be individualized.

Prepregnancy adherence to dietary patterns is now being investigated, with a few studies showing adherence to healthful dietary patterns being significantly associated with a lower risk of GDM, and a recent study showed that adherence to a Mediterranean diet pattern of eating during pregnancy was associated with a lower incidence of GDM and a better degree of glucose tolerance even in women without GDM. It has been speculated that these healthy dietary patterns may minimize the susceptibilities a pregnant woman has to β-cell dysfunction and insulin resistance.

These data suggest that efforts to encourage dietary patterns similar to the aMED, DASH, or aHEI might yield benefits for women of reproductive age

and for pregnant women as well. My Pregnancy Plate is an education tool created using this emerging evidence of healthy eating patterns that can be advocated for in this population



Glycemic Index

The GI has proposed over 30 years ago as a classification of the blood glucose-raising potential of carbohydrate-containing foods, and the concept has stirred up controversy ever since. The GI uses a 100-point scale to measure how rapidly the carbohydrates in food cause blood sugars to rise. Foods with a high-GI value cause a big rise in blood glucose, and foods with a low-GI value cause a smaller rise. A competing measure, the glycemic load, adjusts this

value by taking into account serving sizes and the number of carbohydrates per serving. The glycemic load may be more practical than the GI because it accounts for quantity in addition to carbohydrate quality. There is evidence that low-GI diets improve glycemic control in people with diabetes and reduce the risk of type 2 diabetes in men and women.

The application of the GI to pregnancy outcomes is more recent. Pregnancy is a condition in which the GI may be of particular relevance because maternal glucose is the main energy substrate for intrauterine growth, and elevated maternal blood glucose levels are well recognized to contribute to excessive fetal growth. A review article evaluating the evidence regarding the effect of GI on maternal and fetal nutrition concluded that there was insufficient evidence to recommend a low-GI diet during normal pregnancy, as 1 of 8 studies showed an increase in SGA babies. That study, however, had very small numbers. There is probably some benefit of low-GI diet advice in reducing a woman's risk of having a large-for-gestational-age infant. For pregnancy complicated by GDM, however, a low-GI diet may confer benefits. Current evidence, although limited, consistently supports the advantages of, and has demonstrated no disadvantages of, a low-GI diet. Pregnant women with GDM are likely to benefit from following a low-GI meal pattern, with no significant adverse effects, and consideration of the GI should be given when formulating a diet for GDM. Using a low-GI diet for women with GDM has been shown to halve the number needing to use insulin, with no compromise of obstetric or fetal outcomes.

The Glycemic index is only one tool that can be used to determine carbohydrate quality. In another clinical trial, in intensively monitored women with GDM, a low-GI diet and a conventional high-fiber diet produced similar pregnancy outcomes. Excess glucose is also not the only fuel that can contribute to fetal overgrowth. Until further larger-scale intervention trials, preferably randomized controlled trials, are completed, a low-GI diet should

not replace the current pregnancy recommendations from government and health agencies.

Conclusions

There is good evidence to support a need for supplementation with folate, iodine, and calcium for all pregnancies. There is good evidence for supplementation with vitamin C in pregnant women who smoke. There is no good current evidence to show value in supplementation for iron and vitamins A, B6, B12, A, E, or D at this time, although there are many suggestive studies for vitamin D. All pregnant women should be encouraged to eat a balanced diet rich in fresh or frozen fruits and vegetables, high-quality carbohydrates including whole grains, and with a good mix of proteins from beans, lean meats, fish, and seafood. Their diet should be low in added sugar, red meat, and processed foods. Information beyond this simple prescription is simply not yet available for pregnant women or their offspring.

PREGNANCY
DIET SECRETS

Chapter 3

METABOLIC PROGRAMMING DURING **PREGNANCY**

Industrialized countries worldwide are faced with a progressive increase in metabolic conditions such as obesity, and the velocity of propagation is particularly outstanding in the pediatric population. Evidence that overweight or obesity, heightened blood pressure, and impaired glucose metabolism are programmed by early nutrition points to fetal and early postnatal life as critical periods and intervention targets.

The data implicating early nutritional influences on the cardiometabolic risks in humans derive mainly from epidemiological studies of extreme prenatal circumstances, such as exposure to famine. In these demonstrations, low birth weight is the main risk factor, taken to reflect a poor intrauterine nutritional environment. In well-nourished women, again, childbirth weight, low or high, and a suboptimal intrauterine environment have been linked to maternal intake of single dietary factors. However, a fact not previously properly addressed, but not to be ignored, is that the diet is always a mixture of several nutrients with possible complex interactions.

Previous demonstrations suggest that the gut microbiota composition is linked to the immunological and metabolic development of the child. The current intervention study targeted at dietary elements is associated with these developmental components, specifically at the dietary low-fiber and high saturated fat composition, together with aberrant gut microbiota development by probiotics. We have shown that the joint actions of diet and probiotics benefited the mothers' glucose metabolism and weight management.

Here, we studied whether these benefits achieved from the mothers' diet can be extended to their children's metabolic health at the age of 6 months. The high 32–33 split proinsulin, a well-characterized predictor of insulin resistance in adults and older children, was taken as a novel marker of adverse metabolic status in infancy. To further investigate the infants' metabolic status and the usefulness of high split proinsulin in its assessment, waist circumference, skinfold thickness, and adipocyte-derived cytokines—leptin and adiponectin— were taken as secondary outcomes.

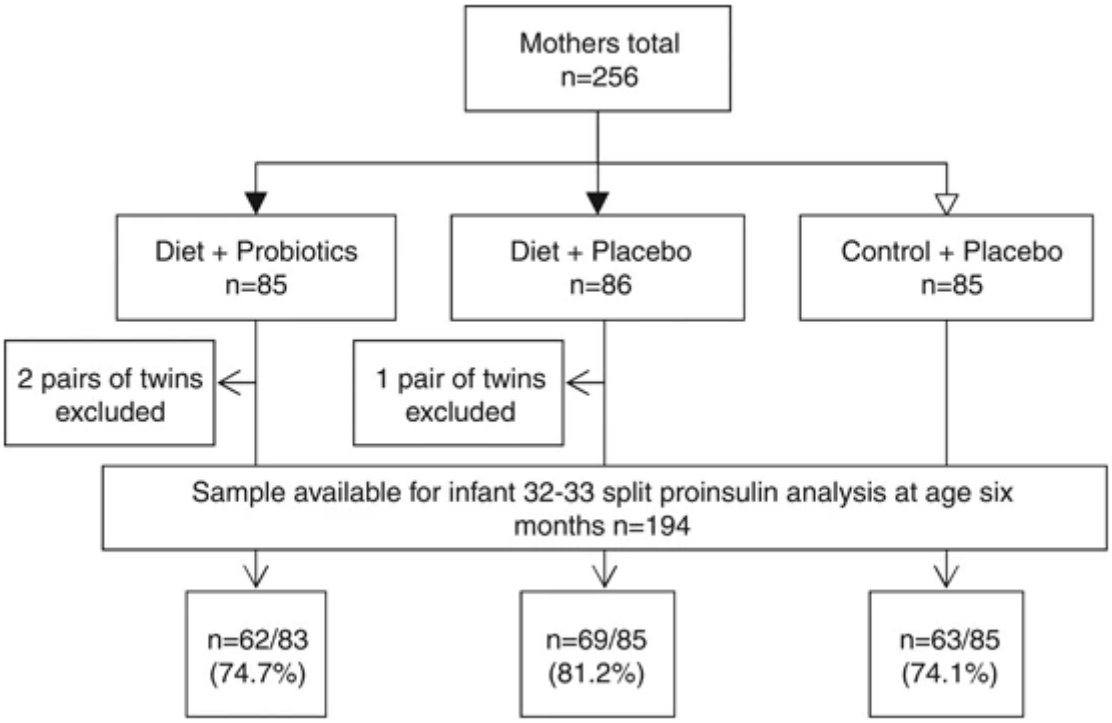
Subjects and methods

Study design

A total of 256 pregnant women were recruited from maternal welfare clinics in the area of Turku, Southwest Finland, in the first trimester of pregnancy between April 2002 and November 2004 to participate in a prospective, randomized mother-infant nutrition and probiotics study. Pregnant women afflicted with any form of chronic disease, except allergy, were excluded from the study. The women visited the study clinic three times during pregnancy, at a median of 14 (range 7–18), 24 (20–27), and 34 weeks of gestation (30–37), respectively. At the first study visit, representing the baseline, mothers were randomized into three study groups (Figure 1), two dietary intervention and one control group, according to computer-generated block randomization of six women. The study statistician, who was not involved in the study visits, generated the randomization list. The mother-infant pairs visited the study clinic at a median infant age of 6 months (range 5–8). The study complies with

the Declaration of Helsinki, as revised in 2000. Written informed consent was obtained from the women and the Ethics Committee of the Hospital District of Southwest Finland approved the study.

Figure 1



Subject flow. The mothers were randomized into three study groups at the first study visit. The study was open with respect to the dietary intervention, double-blinded to intervention with probiotics or placebo, and single-blinded to controls with a placebo.

Maternal dietary and probiotic intervention

All pregnant women attended municipal well-women clinics. At each study visit, women in the dietary intervention groups (diet/probiotics and diet/placebo) received intensive dietary counseling in accordance with that currently recommended, with this being added to standard counseling given to all pregnant women in well-women clinics in Finland. The counseling was given in layman terms by a nutritionist who encouraged the participants to pay attention to the amount and type of fat and the amount of fiber in the diet.

Further, to strengthen the dietary course and to demonstrate sources of favorable fat and fiber content, various food products, available on the market, were provided for use at home. The efficacy and safety of this dietary counseling during pregnancy have been reported elsewhere. The dietary intervention groups (diet/probiotics and diet/placebo) received capsules of probiotics (Lactobacillus rhamnosus GG, American Type Culture Collection 53103, Valio Ltd, Helsinki, Finland; and Bifidobacterium lactis, Chr. Hansen, Horsholm, Denmark; 1010 colony-forming units each daily) or placebo (microcrystalline cellulose and dextrose anhydrate; Chr. Hansen) in a double-blind manner, whereas the control group (control/placebo) received placebo in a single-blind manner. The maternal probiotic intervention continued from early pregnancy till the end of exclusive breastfeeding, a maximum of 6 months postpartum.

Evaluation of maternal food and nutrient intake

The maternal dietary intake was evaluated in the context of all study visits using 3 days' food diaries, including one weekend day, and using household measures. The daily dietary intakes of energy, foods, and nutrients were calculated by the computerized program Micro-Nutricia, version 2.5 (Research Centre of the Social Insurance Institution, Turku, Finland). Maternal energy, fiber and energy-yielding nutrient intake levels were analyzed. The foods consumed were combined as groups (grain, meat, fish and dairy products, fruits and berries, soft margarine and vegetable oil, sugar and sweets) in the analyses, but milk, cheese, sour milk products, vegetables, and butter consumption levels were also analyzed separately.

Evaluation of clinical characteristics

The weight, height, blood pressure, and fasting plasma glucose concentration of the women were measured at every study visit (glucose was not measured in the second visit). Total gestational weight gain was calculated and the appropriate gestational weight gain evaluated according to the prepregnancy body mass index. We recorded maternal diagnoses, including gestational

diabetes mellitus, from the well-women clinic records, and determined their smoking habits. The duration of pregnancy was calculated from the date of the last menstruation.

Infants' weight, length, and head circumference at birth were measured in the hospital maternity ward, with measurements comparable to those used in the study visits. At the age of 6 months, they underwent a physical examination, breastfeeding status was recorded and their anthropometrics were measured; weight was measured with Data Baby Scale 930 (Oriola, Espoo, Finland), length with an Infantometer (Pedihealth, Oulu, Finland), waist and head circumference with a measuring tape and the supra-iliac skinfold with a Holtain Tanner/Whitehouse Skinfold caliper (Marsden Weighing Group, Henley-on-Thames, Oxfordshire, UK).

Sampling

To evaluate the infants' metabolic status, serum 32–33 split proinsulin, intact proinsulin, and adiposity-derived hormones, leptin, and adiponectin were chosen as metabolic markers, as these are not sensitive to the non-fasting state unlike blood glucose and insulin concentrations. Indeed, for obvious ethical reasons, overnight fasting was not possible at the age of 6 months. Venous blood samples were collected before noon and were successfully obtained from 194 (76%) infants (Figure 1).

Analytical methods

Serum was separated immediately and the samples were initially stored at −20 °C and then at −70 °C. The NIHR Cambridge Biomedical Research Centre, Core Biochemical Assay Laboratory (Cambridge, UK), analyzed the infants' samples. Serum leptin, adiponectin, 32–33 split proinsulin, and intact proinsulin concentrations were assayed on a 1235 AutoDELFIA immunoassay system (PerkinElmer Life Sciences, Boston, MA, USA). All assays were in-house, two-step time-resolved fluorometric assays as previously described, and samples were analyzed in duplicate. Samples in which the coefficient of variation of the duplicates was greater than 10% were repeated. Quality control samples with concentrations spanning the working range of the assay were run each day. The between-batch imprecision for the quality control samples was less than 8% for all assays and analyte concentrations. Maternal

plasma glucose concentrations were analyzed on the day of sampling as previously reported.

Statistical analyses

The serum 32–33 split and intact proinsulin concentrations were primary outcome variables, leptin and adiponectin concentrations, waist circumference and supra-iliac skinfold were secondary outcome variables. Any 32–33 split and intact proinsulin values above the 85th percentile of the concentrations (7.9 and 6.64 pmol/l, respectively) were considered high values. These were dichotomized, as the clinically important difference in mean levels is not known, and we considered differences in proportions of higher values to be more relevant than those in overall mean levels. As the agreement between high concentrations was good (kappa-coefficient κ=0.80), only the dichotomized 32–33 split proinsulin concentration was analyzed as a final outcome variable. To evaluate high split proinsulin as a metabolic marker, logistic regression analysis was used for dichotomized split proinsulin, which was explained by continuous or dichotomized (the 85th percentile as a cutoff point) adipocytokine ratio and anthropometrics measured at the age of 6 months.

The group comparisons in categorized and continuous outcome variables were assessed by univariate logistic regression analysis or by analysis of variance when appropriate. As most of the associations between the clinical characteristics and high split proinsulin were nonlinear, the characteristics of mother and child were categorized according to median, tertiles, or quartiles. The effects of other possible explaining factors on infants' high 32–33 split proinsulin were analyzed using univariate logistic regression analyses. In the final multivariate models, the intervention was forced and the explaining factors, if $P<0.10$ in univariate analysis, were introduced to the forward stepwise logistic model (criterion for entry $P<0.10$). The group comparisons are given as unadjusted and adjusted odds ratios (OR) with 95% confidence intervals using the control/placebo group as a reference group.

Maternal dietary intakes during and after pregnancy were divided into tertiles (T1=lowest, T2=middle, and T3=highest). The χ2-test was used to study associations between dietary intakes and outcome variables. The effect of the probiotic intervention on the association between dietary components and infant's high split proinsulin was analyzed by the method of Mantel–Haenszel and by the Beslow–Day test; P<0.20 was used to indicate interaction. P-values <0.05 were considered statistically significant. Statistical analyses were performed with SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).

Results

Clinical characteristics of mothers and infants are shown in Table 1. All pregnant women were Caucasian, and the majority had a college or university education (74%). The infants were healthy and their anthropometrics were comparable in the diet/probiotics, diet/placebo, and control/placebo groups. The infants' median 32–33 split proinsulin concentration was 3.3 pmol/l (range 1.2–21.9), intact proinsulin was 3.7 pmol/l (1.2–20.0), leptin was 3.7 ng/ml (0.7–14.8) and adiponectin was 13.5 μg/ml (3.6–37.3) at the age of 6 months.

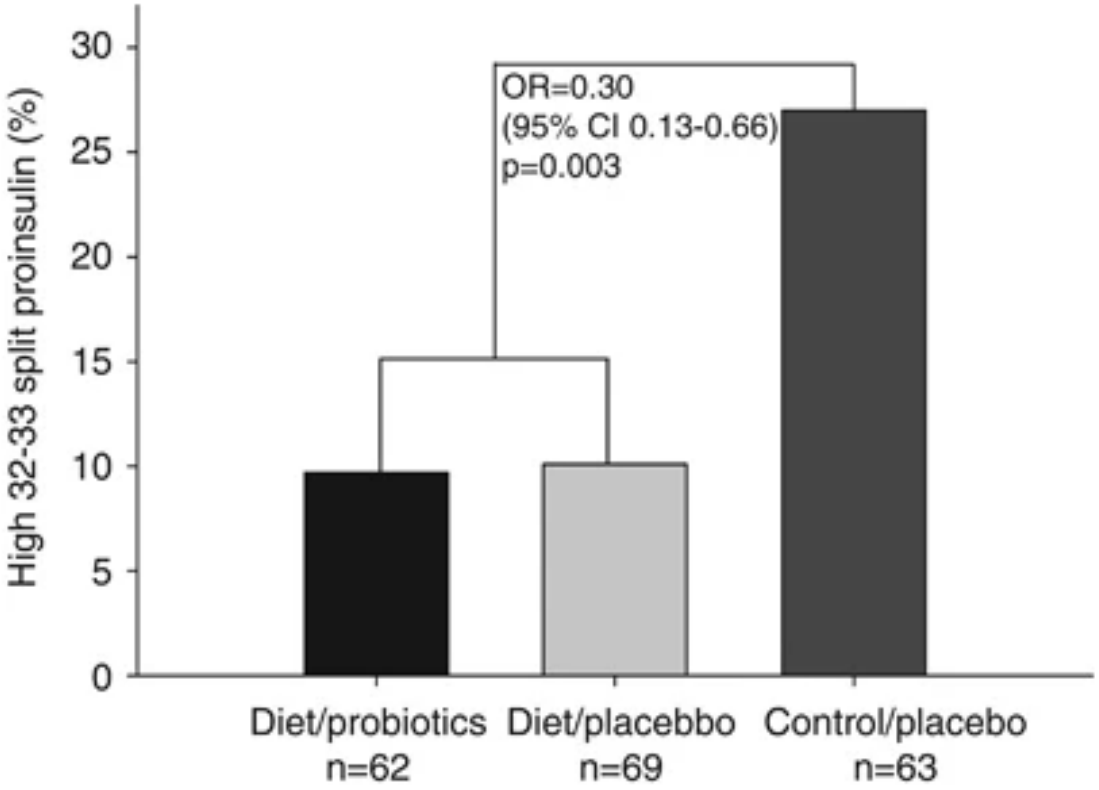
The cluster of metabolic markers in infancy

By evaluating the usefulness of high split proinsulin as a marker of adverse metabolic status in infancy, we found that higher skinfold thickness (OR=1.24, P=0.045), waist circumference (OR=1.14, P=0.035) and leptin/adiponectin ratio (OR=1.90, P=0.029), each of them included as continuous variables, were associated with an increased likelihood of high 32–33 split proinsulin. Lower (<3320 g; Q1 vs Q2–Q4) birth weight infants had an increased risk for subsequent high split proinsulin (OR=2.59, P=0.027), whereas the other infants' anthropometrics at birth or at the age of 6 months were not statistically significantly related to the high split proinsulin.

Impact of maternal dietary intervention on the infants' metabolic status

The infants' risk of high 32–33 split proinsulin concentration was lower in dietary counseling with probiotics or placebo groups compared with the control group (Figure 2); diet/probiotics unadjusted OR=0.29 (95% confidence intervals 0.11–0.80, P=0.016) and diet/placebo OR=0.31 (0.12–0.80, P=0.015). To determine the difference between the diet/probiotics (9.7%) and the diet/placebo groups (10.1%) with a 0.05 two-sided significance level and 90% power, the required sample size was more than 100 000 infants per group. The independent effect of dietary intervention on the infants' high split proinsulin concentration remained statistically significant in multivariate analysis, with breastfeeding at 6 months, mother's glucose concentration at 6 months, and weight gain during pregnancy. These adjusted and unadjusted logistic regression analyses are shown in Table 2. According to univariate analyses, the intervention did not affect other metabolic markers measured in the infants (data not shown); however, breastfed infants tended to have a reduced risk of high leptin/adiponectin ratio compared with formula-fed infants (OR 0.54; P=0.054).

Figure 2



The impact of dietary intervention on the infants' high (above the 85th percentile cut-off point) 32–33 split proinsulin concentration. The number of infants with high 32–33 split proinsulin was 6 (9.7%) in diet/probiotics, 7 (10.1%) in diet/placebo and 17 (27.0%) in the control/placebo group. The group comparison, diet/probiotics, and diet/placebo groups combined versus the control/placebo group are given as unadjusted odds ratio (OR) with a 95% confidence interval (95% CI).

Impact of diet on the infants' metabolic status

To evaluate the impact of maternal nutrition during pregnancy and at 1 and 6 months postpartum on the infants' risk of adverse metabolic programming, using high 32–33 split proinsulin, skinfold thickness, waist circumference, and leptin/adiponectin ratio, maternal dietary consumption was investigated in

tertiles, as depicted in Table 3. Infants whose mothers' intake of fat, cheese, or soft margarine and vegetable oil was in the highest or in the lowest tertile were more prone to high split proinsulin than were those whose mothers' intake was in the middle tertile. A corresponding nonlinear association was found between maternal butter intake and infants' waist circumference and also an association between maternal fat intake and infants' waist circumference. In contrast, extreme consumption of fruits and berries, butter, and milk in the maternal diet resulted in lower infant risk of high split proinsulin compared with the middle tertile. The highest tertile of grain product intake in the maternal diet was associated with the greatest risk of high split proinsulin and high skinfold thickness in infants.

Interaction between probiotics and dietary components—exploratory analysis

To take into account the complexity of the diet, the interaction between probiotics and dietary components was studied. The effect of probiotic versus placebo administration on the percentage of infants with high 32–33 split proinsulin in tertiles of intake of dietary components is shown in Table 4. The probiotic intake contributed to the pattern of association between dietary components and infants' high split proinsulin according to the Breslow–Day test. The interaction was suggested if $P<0.200$. Interestingly, even when Bonferroni-adjusted, the maternal high milk, fruits, and berries consumption combined with probiotics culminated in a more prevalent high split proinsulin concentration in this group of infants compared with children whose mothers were not receiving probiotics. Further, the probiotics tended to reduce the detrimental effect of maternal low cheese, middle milk, and low or middle fruit and berries consumption, as well as high fat intake, on the infant's risk of high split proinsulin concentration.

Discussion

Our results indicate that dietary counseling and a balanced nutritional environment early in life support a beneficial metabolic development of the

infant. Together with our previous demonstration that maternal nutrition during pregnancy contributes to the infant's blood pressure, the present findings would further support the conception that several risk factors in the metabolic syndrome may be modifiable by diet during critical and sensitive periods of life, as previously shown in adults.

From our prospective study, we have thus far learned that by modifying the dietary intake of fat and fiber by detailed dietary counseling and by the provision of appropriate food products combined with probiotics, we are not only improving the quality of the maternal diet but also the maternal glucose metabolism up to 1 year after pregnancy. In the present study, the risk reduction in infants' high 32–33 split proinsulin concentration was already detected at the age of 6 months, although, the intervention did not influence the infants' adiposity measurements of leptin/adiponectin ratio. Further, maternal dietary counseling per se, with or without probiotics, was independently related to a lowered risk of high split proinsulin concentration in infants, irrespective of possible confounding variables such as maternal gestational diabetes mellitus, pregnancy weight gain or childbirth size, previously linked to adverse metabolic outcomes in the child.

As the maternal and fetal nutritional environments are closely related, an explanation for the beneficial effect of dietary counseling could be extrapolated from the current knowledge that a higher intake of unsaturated fatty acids can improve insulin sensitivity, whereas a high saturated fat content in the diet promotes the secretion of proinflammatory cytokines, causally linked to insulin resistance. Further, higher fiber consumption, by reducing the risk of gestational diabetes mellitus or by facilitating maternal weight control, was presupposed to benefit the infant's metabolic programming. These previous data are in agreement with our findings that maternal intake of fat and specific fat-containing food products affected metabolic markers in infancy. The effects of grain products, fruits, and berries

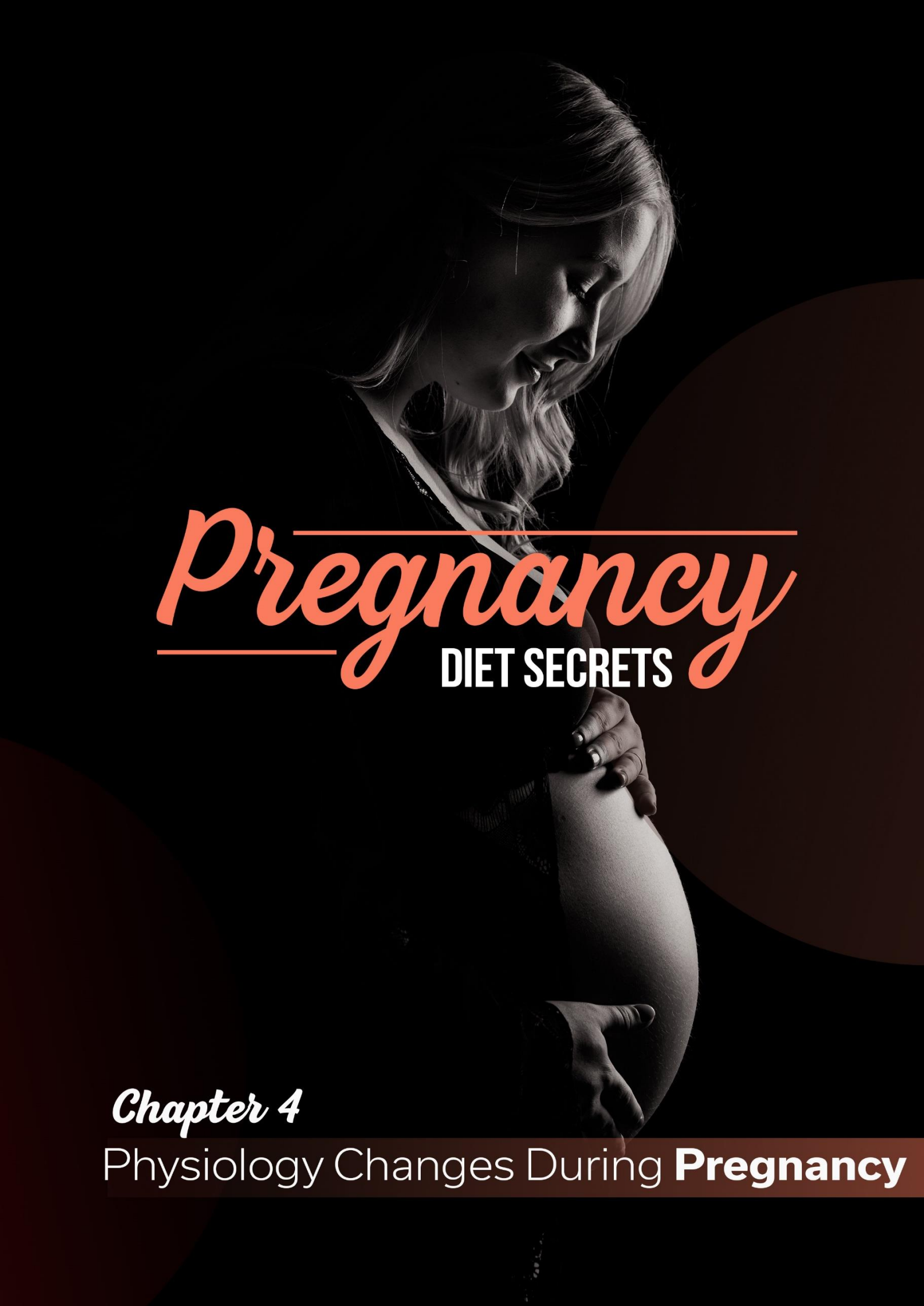
on infants' risk may be mediated by the effect of dietary fiber. Interestingly, in contrast to what has been previously shown, maternal energy, protein, or carbohydrate intakes were not related to infants' high split proinsulin concentration in our analyses. Furthermore, a longer duration of breastfeeding reduced the infants' risk of high split proinsulin and leptin/adiponectin ratio. The advantage of breastfeeding may be related to protection against obesity or to the collective composition of the gut microbiota. Indeed, bifidobacteria, which typify the gut microbiota of the healthy breastfed infant, may dampen the systemic endotoxemia induced by bacterial lipopolysaccharides, and may thereby improve the metabolic status. The independent effect of the maternal probiotic intervention on the infant's risk of high split proinsulin was not possible to study in this study population as the estimated sample size for such evaluation was more than 100 000 mother-infant pairs per group. However, our exploratory results suggest that probiotics may interact with dietary components and enhance the association between maternal dietary components and infants' high split proinsulin concentration. This is not surprising in light of previous studies. For example, dietary fatty acids and gut microbiota share similar signaling pathways in immune responses, possibly controlling the low-grade inflammation frequently detected in metabolic disorders. Thus, our results, together with those of recent human and animal studies, point to the relevance of late gestation and early postnatal life and the importance of dietary quality in metabolic development.

A large body of evidence supports the role of 32–33 split proinsulin as a marker of insulin resistance. Raised concentrations of split proinsulin in adults have been interpreted as evidence of β-cell dysfunction and risk of impaired glucose tolerance, but its role as a metabolic marker in infancy has remained poorly understood. We found a positive association between the high split proinsulin concentration and the ratio of adipocyte-derived cytokines—leptin and adiponectin—which have been found to correlate with adiposity, and metabolic disorders in newborns and children, and, further, to efficaciously reflect cardio-metabolic risks. On the other hand, weight status at

the age of 6 months predicts obesity in childhood, and here abdominal obesity, known to impair β-cell function, was linked to the high split proinsulin concentration. A limitation of this study was that infants have not fasted before blood sampling. As fasting infants is unethical, we selected metabolic markers that were not very sensitive to the non-fasting state. Taken together, a high level of split proinsulin at the age of 6 months likely indicates susceptibility to adverse metabolic programming in these infants.

Conclusion

In conclusion, we have shown for the first time in humans that favorable metabolic programming, measured especially by a lower incidence of high 32–33 split proinsulin, can be achieved by balancing the diet of the mother during pregnancy and by breastfeeding the infant. Thus, the intrauterine and immediate postnatal period comprises a window of opportunity for interventions aiming to reduce the risk of metabolic disorders in both mother and infant and implies a prospect of achieving health benefits for two generations.



Pregnancy
DIET SECRETS

Chapter 4
Physiology Changes During **Pregnancy**

Pregnancy brings a variety of changes to the body. They can range from common and expected changes, such as swelling and fluid retention, to less familiar ones such as vision changes. Read on to learn more about them.

Hormonal changes during pregnancy

The hormonal and physiological changes that come with pregnancy are unique.

Pregnant women experience sudden and dramatic increases in estrogen and progesterone. They also experience changes in the amount and function of several other hormones. These changes don't just affect mood. They can also:

- create the "glow" of pregnancy
- significantly aid in the development of the fetus
- alter the physical impact of exercise and physical activity on the body

Estrogen and progesterone changes

Estrogen and progesterone are the chief pregnancy hormones. A woman will produce more estrogen during one pregnancy than throughout her entire life when not pregnant. The increase in estrogen during pregnancy enables the uterus and placenta to:

- improve vascularization (the formation of blood vessels)
- transfer nutrients
- support the developing baby

Besides, estrogen is thought to play an important role in helping the fetus develop and mature.

Estrogen levels increase steadily during pregnancy and reach their peak in the third trimester. The rapid increase in estrogen levels during the first trimester may cause some of nausea associated with pregnancy. During the second trimester, it plays a major role in the milk duct development that enlarges the breasts.

Progesterone levels also are extraordinarily high during pregnancy. The changes in progesterone cause laxity or loosening of ligaments and joints throughout the body. In addition, high levels of progesterone cause internal structures to increase in size, such as the ureters. The ureters connect the kidneys with the maternal bladder. Progesterone is also important for transforming the uterus from the size of a small pear — in its non-pregnant state — to a uterus that can accommodate a full-term baby.

Pregnancy hormones and exercise injuries

While these hormones are absolutely critical for a successful pregnancy, they also can make exercise more difficult. Because the ligaments are looser, pregnant women may be at greater risk for sprains and strains of the ankle or knee. However, no studies have documented an increased rate of injury during pregnancy.

A pregnant woman's entire posture changes. Her breasts are larger. Her abdomen transforms from flat or concave to very convex, increasing the curvature of her back. The combined effect shifts the center of gravity forward and may lead to changes in her sense of balance.

Weight gain, fluid retention, and physical activity

Weight gain in pregnant women increases the workload on the body from any physical activity. This additional weight and gravity slow down the circulation of blood and bodily fluids, particularly in the lower limbs. As a result, pregnant women retain fluids and experience swelling of the face and limbs. This water weight adds another limitation to exercise.

Many women begin to notice slight swelling during the second trimester. It often continues into the third trimester. This increase in fluid retention is responsible for a significant amount of weight gain women experience during pregnancy. Tips for easing swelling include:

- rest
- avoid long periods of standing
- avoid caffeine and sodium
- increase dietary potassium

Weight gain is usually the primary reason that the body can't tolerate prepregnancy levels of exercise. This even applies to the seasoned, elite, or professional athlete. Round ligament strain increased the size of the uterus, and pelvic instability from the laxity of the ligaments may lead to increased discomfort during exercise.

Sensory changes

Pregnancy can dramatically alter how a woman experiences the world through sight, taste, and smell.

Vision changes

Some women experience vision changes during pregnancy, characterized by increased nearsightedness. Researchers don't know the precise biological mechanisms behind changes in vision. Most women return to prepregnancy vision after giving birth.

Common changes during pregnancy include blurriness and discomfort with contact lenses. Pregnant women often experience an increase in intraocular pressure. Women with preeclampsia or gestational diabetes may be at an elevated risk of rare eye problems, such as retinal detachment or vision loss.

Taste and smell changes

Most women experience changes in their sense of taste during pregnancy. They typically prefer saltier foods and sweeter foods than non-pregnant women. They also have a higher threshold for strong sour, salty, and sweet

tastes. Dysgeusia, a decrease in the ability to taste, is most commonly experienced during the first trimester of pregnancy.

Certain taste preferences may vary by trimester. Although many women experience a dulled sense of taste for a short period of time postpartum, they typically regain full taste capability after pregnancy. Some women also experience a metallic taste in the mouth during pregnancy. This can aggravate nausea and may indicate a nutrient imbalance. Learn more about impaired taste.

At times, pregnant women also report changes in their sense of smell. Many describe a heightened awareness and sensitivity to a variety of odors. There's little consistent and reliable data indicating that pregnant women actually notice and identify certain odors and intensity of odors more than their non-pregnant counterparts. Nevertheless, the vast majority of pregnant women report a perceived increase in their own sensitivity to odors.

Breast and cervical changes

Hormonal changes, which begin in the first trimester, will lead to many physiological changes throughout the body. These changes help prepare the mother's body for pregnancy, childbirth, and breastfeeding.

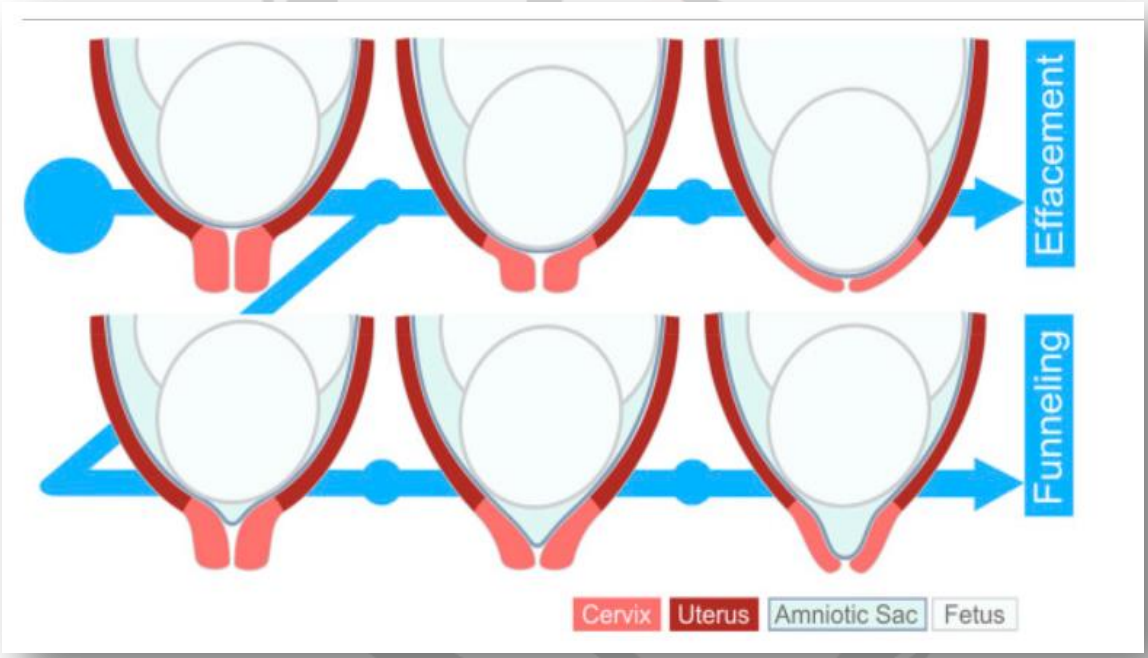
Breast changes

Pregnant women's breasts often undergo a series of significant changes during pregnancy as their bodies prepare to supply milk to the newborn baby. Pregnancy hormones that affect skin pigmentation often darken the areola. As the breasts grow, pregnant women may experience tenderness or sensitivity and notice that the veins are darker and the nipples protrude more than before pregnancy. Some women may develop stretch marks on the breasts, particularly if they undergo rapid growth. Many women will also notice an increase in the size of the nipple and areola.

Small bumps on the areolas often appear. Most women will begin producing, and even "leaking," small amounts of a thick, yellowish substance during the second trimester. This substance is also known as colostrum. In addition to producing the colostrum for the baby's first feeding, milk ducts in the breasts expand in preparation for producing and storing milk. Some women may notice small lumps in the breast tissue, which can be caused by blocked milk ducts. If the lumps don't disappear after a few days of massaging the breast and warming it with water or a washcloth, a doctor should examine the lump at the next prenatal visit.

Cervical changes

The cervix, or the entry to the uterus, undergoes physical changes during pregnancy and labor. In many women, the tissue of the cervix thickens and becomes firm and glandular. Up to a few weeks before giving birth, the cervix may soften and dilate slightly from the pressure of the growing baby.



In early pregnancy, the cervix produces a thick mucus plug to seal off the uterus. The plug is often expelled in late pregnancy or during delivery. This is also called a bloody show. Mucous streaked with a small amount of blood is

common as the uterus prepares for labor. Prior to delivery, the cervix dilates significantly, softens, and thins, allowing the baby to pass through the birth canal.

Changes in the hair, skin, and nails

Many women will experience changes in the physical appearance of their skin during pregnancy. Although most are temporary, some — such as stretch marks — can result in permanent changes. In addition, women who experience some of these skin changes during pregnancy are more likely to experience them again in future pregnancies or even while taking hormonal contraceptives.

Hair and nail changes

Many women experience changes in hair and nail growth during pregnancy. Hormone changes can sometimes cause excessive hair shedding or hair loss. This is especially true in women with a family history of female alopecia.

But many women experience hair growth and thickening during pregnancy and may even notice hair growth in unwanted places. Hair growth on the face, arms, legs, or back can occur. Most changes in hair growth return to normal after the baby is born. It's common, however, for hair loss or increased shedding to occur up to a year postpartum, as hair follicles and hormone levels regulate themselves without the influence of pregnancy hormones.

Many women also experience faster nail growth during pregnancy. Eating well and taking prenatal vitamins adds to the growth hormones of pregnancy. Although some may find the change desirable, many may notice increased nail brittleness, breakage, grooves, or keratosis. Healthy dietary changes to increase nail strength can help prevent breakage without the use of chemical nail products.

"Mask" of pregnancy and hyperpigmentation

The vast majority of pregnant women experience some type of hyperpigmentation during pregnancy. This consists of darkening in skin tone on body parts such as the areolas, genitals, scars, and the linea alba (a dark line) down the middle of the abdomen. Hyperpigmentation can occur in women of any skin tone, although it's more common in women with darker complexions.

In addition, up to 70 percent of pregnant women experience a darkening of the skin on the face. This condition is known as melasma or the "mask" of pregnancy. It can be worsened by sun exposure and radiation, so a broad-spectrum UVA/UVB sunscreen should be used daily during pregnancy. In most cases, melasma resolves after pregnancy.

Stretch marks

Stretch marks (striae gravidarum) are perhaps the most well-known skin change of pregnancy. They're caused by a combination of physical stretching of the skin and the effects of hormone changes on the skin's elasticity. Up to 90 percent of women develop stretch marks by the third trimester of pregnancy, often on the breasts and abdomen. Although the pinkish-purple stretch marks may never fully disappear, they often fade to the color of surrounding skin and shrink in size postpartum. Stretch marks can itch, so do apply creams to soften and reduce the urge to scratch and possibly damage the skin.

Mole and freckle changes

The hyperpigmentation caused by changes in hormones during pregnancy can cause changes in the color of moles and freckles. Some darkening of moles, freckles, and birthmarks can be harmless. But it's always a good idea to see a dermatologist or physician about changes in size, color, or shape.

Pregnancy hormones can also cause the appearance of dark patches of skin that are often unpreventable. Although most skin pigmentation changes will fade or disappear after pregnancy, some changes in a mole or freckle color may be permanent. It's a good idea to have a skin check for potential skin cancer or pregnancy-specific skin conditions if you notice any changes.

Pregnancy-specific rashes and boils

Small percentages of women may experience skin conditions that are specific to pregnancy, such as PUPPP (pruritic urticarial papules and plaques of pregnancy) and folliculitis. Most conditions involve pustules and red bumps along the abdomen, legs, arms, or back. Although most rashes are harmless and resolve quickly postpartum, some skin conditions may be associated with

premature delivery or problems for the baby. These include intrahepatic cholestasis and pemphigoid gestationis.

Circulatory system changes

The following are common during pregnancy:

- huffing and puffing while climbing stairs
- feeling dizzy after standing quickly
- experiencing changes in blood pressure

Because of the rapid expansion of the blood vessels and the increased stress on the heart and lungs, pregnant women produce more blood and have to utilize more caution with exercise than non-pregnant women.

Heartbeat and blood volume during pregnancy

During the second trimester of pregnancy, the mother's heart at rest is working 30 to 50 percentTrusted Source harder. Most of this increase results from a more efficiently performing heart, which ejects more blood at each beat. Heart rate may increase up to 15 to 20 percent during pregnancy. It's not uncommon to approach 90 to 100 beats per minute in the third trimester. Blood volume increases progressively during pregnancy until the last month. The volume of plasma increases 40-50 percent and red blood cell mass 20-30 percent, creating a need for increased iron and folic acid intake.

Blood pressure and exercise

There are two types of circulatory changes that may have an impact on exercise during pregnancy. Pregnancy hormones can suddenly affect the tone in blood vessels. A sudden loss of tone may result in the feeling of dizziness and perhaps even a brief loss of consciousness. This is because the loss of pressure sends less blood to the brain and central nervous system.

Additionally, vigorous exercise may lead to decreased blood flow to the uterus while diverting blood to muscles. However, this has not been shown to have a

long-term impact on the baby. Furthermore, there's evidence trusted Source to suggest that individuals who exercise have improved blood supply trusted Source to the placenta at rest. This may be beneficial to placental and fetal growth and weight gain.

Dizziness and fainting

Another form of dizziness can result from lying flat on the back. This dizziness is more common after 24 weeks. However, it can happen earlier during multi-fetal pregnancies or with conditions that increase amniotic fluid.

Lying flat on the back compresses the large blood vessel leading from the lower body to the heart, also known as the vena cava. This decreases blood flow to and from the heart, leading to a sudden and dramatic decline in blood pressure. This can cause dizziness or loss of consciousness.

After the first trimester, it's not recommended to do exercises that involve lying on the back due to the impact of blood vessel compression. Lying on the left side may help relieve dizziness and is a healthy position for sleep.

Women experiencing any of these conditions, particularly during exercise, should consult their doctor.

Respiratory and metabolic changes

Pregnant women experience increases in the amount of oxygen they transport in their blood. This is because of the increased demand for blood and the dilation of blood vessels. These growth forces increase in metabolic rates during pregnancy, requiring women to up energy intake and use caution during periods of physical exertion.

Breathing and blood oxygen levels

During pregnancy, the amount of air moved in and out of the lungs increases by 30 to 50 percentTrusted Source due to two factors. Each breath has a greater volume of air, and the rate of breathing increases slightly. As the uterus enlarges, the room for movement of the diaphragm may be limited. Therefore, some women report the feeling of increased difficulty in taking

deep breaths. Even without exercise, these changes may cause shortness of breath or the feeling of being “air hungry.” Exercise programs may increase these symptoms.

Overall, pregnant women have higher blood oxygen levels. Studies have shown that pregnant women consume more oxygen at rest. This does not seem to have an impact on the amount of oxygen available for exercise or other physical work during pregnancy.

Metabolic rate

Basal or resting metabolic rate (RMR), the amount of energy the body expends while at rest, increases significantly during pregnancy. This is measured by the amount of oxygen used during periods of total rest. It helps estimate the amount of energy intake required to maintain or gain weight. Changes in metabolic rates explain the need to increase calorie consumption during pregnancy. The body of a pregnant woman slowly increases its energy requirements to help fuel the changes and growth taking place in both the mother and baby.

Metabolic rates increase substantially by just 15 weeks’ gestation and peak in the third trimester during the greatest growth phase. This increased metabolic rate may put pregnant women at a higher risk of hypoglycemia, or low blood sugar. Although the metabolic rate may drop slightly as the pregnancy reaches term, it remains elevated over prepregnancy levels for several weeks postpartum. It will remain elevated for the duration of breastfeeding in women producing milk.

Body temperature changes

An increase in basal body temperature is one of the first hints of pregnancy. Slightly higher core temperature will be maintained through the duration of pregnancy. Women also have a greater need of water during pregnancy. They can be at higher risk of hyperthermia and dehydration without caution to exercise safely and remain hydrated.

Hyperthermia – overheating during pregnancy

Heat stress during exercise creates concern for two reasons. First, an increase in the mother's core temperature, as in hyperthermia, can be harmful to the baby's development. Second, loss of water in the mother, as in dehydration, can decrease the amount of blood available to the fetus. This can lead to an increased risk of preterm contractions.

In non-pregnant women, moderate aerobic exercise causes significant increases in core body temperature. Pregnant women, whether they exercise or not, experience a general increase in base metabolic rate and core temperature. Pregnant women regulate their core temperature very efficiently. Increased blood flow to the skin and the expanded skin surface release increased body heat.

It's been shown that pregnant women do not have as much of an increase in body temperature during exercise as those who are not pregnant. However, pregnant women should avoid exercising in non-breathable clothing and in very hot or humid conditions, since the impact of hyperthermia can be severe. The following may help reduce the risk of overheating while exercising:

- use fans during indoor activity
- exercise in the pool
- wear light-colored, loose-fitting clothing

Dehydration

Most women who exercise for 20 to 30 minutes or who exercise during hot and humid weather will sweat. In pregnant women, loss of bodily fluids from sweat can decrease the blood flow to the uterus, the muscles, and some organs. The developing fetus needs a constant supply of oxygen and nutrients carried through the blood, so the injury may result from a lack of fluid.

In most conditions, uterine oxygen consumption is constant during exercise and the fetus is safe. However, exercising can be dangerous for women with pregnancy-induced hypertension. That's because this condition limits uterine blood volume as the vessels clamp down and deliver less blood to the area.

If you're cleared for exercise during pregnancy, be sure to follow common-sense tips. Avoid excessive heat and humidity and rehydrate, even when you're not thirsty.

PREGNANCY DIET SECRETS

CHAPTER 5

PRE-PREGNANCY NUTRITIONAL ISSUES

Thinking of becoming pregnant? Begin by performing a nutrition and lifestyle check up! Evaluate your weight, the foods on your plate, and your physical activity patterns.

Pre-conception nutrition is a vital part of preparing for pregnancy. Factors such as a woman's weight compared with her height and what she eats can play an important role in a mother's health during pregnancy and the health of her baby.

Remember alcohol is not recommended during pregnancy or for those who may become pregnant. Alcohol intake in early pregnancy (often before women know they are pregnant) can have harmful effects on the developing baby.

Importance of a healthy diet before becoming pregnant

A woman's nutritional status during pregnancy depends on the availability of nutritional reserves, that is, stores of particular micronutrients such as calcium and iron, which have been built up in her body from prior consumption of foods containing those micronutrients. As these reserves build-up before a woman becomes pregnant, maintaining good nutrition prior to conception is vital for ensuring adequate nutritional status during pregnancy. Women who are underweight or overweight, or who have deficiencies in particular micronutrients rarely "catch-up" by improving their diet once they are pregnant, as at this stage their body already faces additional nutritional demands because of the growing baby.

Maintaining a healthy diet prior to conception is also important because the ongoing development of the baby depends on the health of the embryo from which it is formed. The embryo is the name of the first cells which reproduce when a sperm and egg meet and conceive. The embryo then implants in the wall of the woman's uterus (womb) and goes on to divide into two types of cells; those that form the fetus and those that form the placenta (which provides nutrition to the fetus during pregnancy). Evidence suggests that maternal nutritional status has an important influence on the proportions of cells that go on to form the fetus and placenta. In undernourished women (women who do not consume enough energy or calories), a greater proportion of cells are likely to form the placenta compared to the fetus, which means the fetus will be relatively small when it begins growth and its development in the womb will be restricted. This increases the likelihood that the baby will be too small (weigh less than 2.5kg) when it is born.

Not consuming enough of particular micronutrients can also retard fetal development in the early stages of pregnancy. In particular, there is strong evidence of an association between folate deficiency and deficits in the development of the neural tube.

Pre-pregnancy Weight

Your pre-pregnancy weight directly influences your baby's birth weight. Studies show that underweight women are more likely to give birth to small babies, even though they may gain the same amount in pregnancy as normal-weight women. Overweight women have increased risks for problems in pregnancy such as gestational diabetes or high blood pressure. Talk with your healthcare provider about whether you need to lose or gain weight before becoming pregnant.

Current research stresses the importance of being at a healthy weight for optimum fertility. Being very overweight or underweight may make becoming pregnant more difficult and may lead to complications during pregnancy, such as gestational diabetes or high blood pressure.

A woman's body composition is important for ideal hormone balance. Fat cells make estrogen; too few or too many fat cells can affect the amount of estrogen in the body and therefore affect fertility.

Besides body weight, other factors that can affect fertility are PCOS (polycystic ovarian syndrome), insulin resistance, excessive exercise, cigarette smoking, alcohol use, celiac disease, and gluten sensitivity, eating disorders, and emotional stress. Your nutrition and lifestyle can influence many of these factors.

A mother's pre-pregnancy weight has a direct influence on her baby's birth weight. Studies show that underweight women are more likely to give birth to small babies, even though they may gain the same amount in pregnancy as normal-weight women. Overweight women have increased risks for complications in pregnancy such as gestational diabetes or high blood pressure.

Tips for achieving and maintaining a healthy weight are:

1. Be physically active for at least 30 minutes most days of the week.
2. Participate in strength training several times each week to build muscle mass and help decrease body fat.

3. Balance calories to achieve and maintain a healthy weight.
4. Eat a healthy diet.

Make an appointment to talk with a doctor about whether you need to lose or gain weight before becoming pregnant.

Pre-pregnancy Nutrition

Many women do not eat a well-balanced diet before pregnancy and may not have the proper nutritional status for the demands of pregnancy. Generally, a pregnant woman needs to add about 300 extra calories daily to meet the needs of her body and her developing baby. However, those calories, as well as her entire diet, need to be healthy, balanced, and nutritious.

The USDA and the U.S. Department of Health and Human Services have prepared the following healthy dietary guide to help you in selecting a variety of healthy foods before, during, and after pregnancy.

- Grains: Foods that are made from wheat, rice, oats, cornmeal, barley, or another cereal grain are grain products. Make half of your grains whole grains. Examples of whole grains include whole wheat, brown rice, and oatmeal.
- Vegetables: Vary your vegetables. Choose a variety of vegetables, including dark green, red, and orange vegetables, legumes (dry beans and peas), and starchy vegetables.
- Fruits: Any fruit or 100 percent fruit juice counts as part of the fruit group. Fruits may be fresh, canned, frozen, or dried, and may be whole, cut-up, or pureed.
- Dairy: Milk products and many foods made from milk are considered part of this food group. Switch to fat-free or low-fat dairy products that are high in calcium.
- Protein: Go lean with protein. Choose low-fat or lean meats and poultry. Vary your protein routine by choosing more fish, nuts, seeds, peas, and beans.
- Oils are not a food group, yet some, such as nut oils, contain essential nutrients and should be included in the diet in moderation. Others, such as animal fats, are solid at room temperature and should be avoided.

In addition to the above food groups, the following nutrients should be included in a woman's pre-conception diet and continued into pregnancy:

Folic acid

Current dietary guidelines recommend that women who may become pregnant consume 400 micrograms (0.4 mg) of folic acid daily. Folic acid is a B-vitamin found in spinach, black-eyed peas, fortified breakfast cereals and enriched grains, asparagus, Brussels sprouts, kidney beans, peanuts, wheat germ, broccoli, and green peas.

Folic acid can help prevent 50-70% of neural tube defects (birth defects of the spinal cord) in addition to other birth defects.

Folic acid is most beneficial during the first 28 days after conception when most neural tube defects occur. Unfortunately, many women do not realize they are pregnant before 28 days. Therefore, folic acid intake should begin prior to conception and continue through pregnancy.

Your health care provider may recommend a folic acid supplement to ensure your intake is adequate.

Iron

Many women have low iron stores as a result of monthly menstruation and diets low in iron. Building iron stores helps prepare a mother's body for the needs of the fetus during pregnancy. Good sources of iron include the following:

- Meats such as beef, pork, lamb, liver, and other organ meats.
- Poultry such as chicken, duck, and turkey (especially dark meat).
- Fish and shellfish including sardines, anchovies, clams, mussels, and oysters. Check with your health care provider before consuming other types of fish as some may contain high levels of mercury.
- Leafy greens of the cabbage family such as broccoli, kale, turnip greens, and collards.
- Legumes such as lima beans and green peas, dry beans and peas such as pinto beans and black-eyed peas, and canned baked beans.
- Whole-grain bread and iron-enriched white bread, pasta, rice, and cereals.
- Calcium. Preparing for pregnancy includes building healthy bones. If there is not enough calcium in the pregnancy diet, the fetus may draw calcium from the mother's bones, which can put women at risk for osteoporosis later in life. The recommended calcium intake for women is 1,000 milligrams. Three servings of milk or other dairy products each day equal about 1,000 milligrams of calcium.

Always consult your health care provider regarding your healthy diet and exercise needs.

Women at risk of poor nutrition

All women experience increased nutritional requirements during pregnancy, and thus all women should ensure they are well informed about and attempt to maintain a healthy balanced diet before and during pregnancy. However, some women may find it harder to access or consume all the necessary components of a healthy diet throughout their life and during pregnancy. For example, those who are food insecure may be unable to access enough food to nourish themselves and their baby.

Women should also be aware that poor nutrition results from a complex range of factors, of which nutritional intake is just one. Infectious disease, physical labor, and adolescent growth all create nutritional demands which may mean

that a diet that meets the needs of a normal healthy woman is insufficient for a growing adolescent, a woman who is ill or one who engages in physical labor during pregnancy.

Lifestyle habits such as smoking and drug use can limit the extent to which the body absorbs and uses nutrients and so these behaviors increase the risk of poor nutritional status during pregnancy.

Women who have an increased risk of experiencing poor nutrition during pregnancy include:

- Vegan and vegetarian women, as many micronutrients are largely sourced from animal-derived foods;
- Aboriginal and Torres Straight Islander women, who are predisposed to poor nutrition due to socioeconomic and demographic factors such as poverty and food insecurity;
- Women of low socioeconomic status who generally have poorer nutrition and health and are more likely to give birth to a low birth weight infant;
- Women with health conditions including diabetes and infectious conditions which create additional nutritional demands on the body;
- Women who have recently given birth, as short birth intervals do not give a woman's body the chance to recuperate and build up nutritional stores between pregnancies;
- Women with multiple pregnancies (twins, triplets, etc.) which place greater nutritional demand on the pregnant woman's body;
- Women exposed to stress, as this can increase nutrient losses and change eating patterns;
- Women who smoke, consume alcohol or take illicit drugs as these can increase nutrient losses and change eating patterns;
- Adolescent women as their bodies are still growing and require

nutrients to sustain their growth. As such, the growing fetus competes with the growing adolescent body for nutrients;

- Women with severe nausea or vomiting during pregnancy (known as hyperemesis gravidarum), a condition that occurs in 1-2% of pregnancies and typically occurs beyond 16 weeks gestation.

Women who find it difficult to access food should seek help from a health professional or support group. For example, those from low socioeconomic backgrounds who have difficulty accessing food should seek assistance from an agency that helps people access food. Those with special eating requirements (e.g. lactose intolerance) may need individual nutritional advice from their GP, a nutritionist, or dietitian. Women who have deficiencies in particular micronutrients may also require nutritional supplements during pregnancy.

PREGNANCY
DIET SECRETS

CHAPTER 6

NUTRITIONAL NEEDS DURING PREGNANCY

Your body goes through numerous physical and hormonal changes during pregnancy. The way you nourish your body during this time will affect your health and your baby's. You must eat a healthy, balanced diet to help ensure you stay healthy throughout your pregnancy. The food you eat is your baby's main source of nourishment, so it's critical to consume foods that are rich in nutrients. Proper nutrition can help promote your baby's growth and development.

By following some fairly easy nutrition guidelines, you can be on your way to a healthy pregnancy.

Increased nutrients

Your body has increased nutritional needs during pregnancy. Although the old adage of "eating for two" isn't entirely correct, you do require more micronutrients and macronutrients to support you and your baby.

Micronutrients are dietary components, such as vitamins and minerals, that are only required in small amounts. Macronutrients are nutrients that provide calories, or energy. These include carbohydrates, proteins, and fats.

You need to consume more of each type of nutrient during pregnancy.

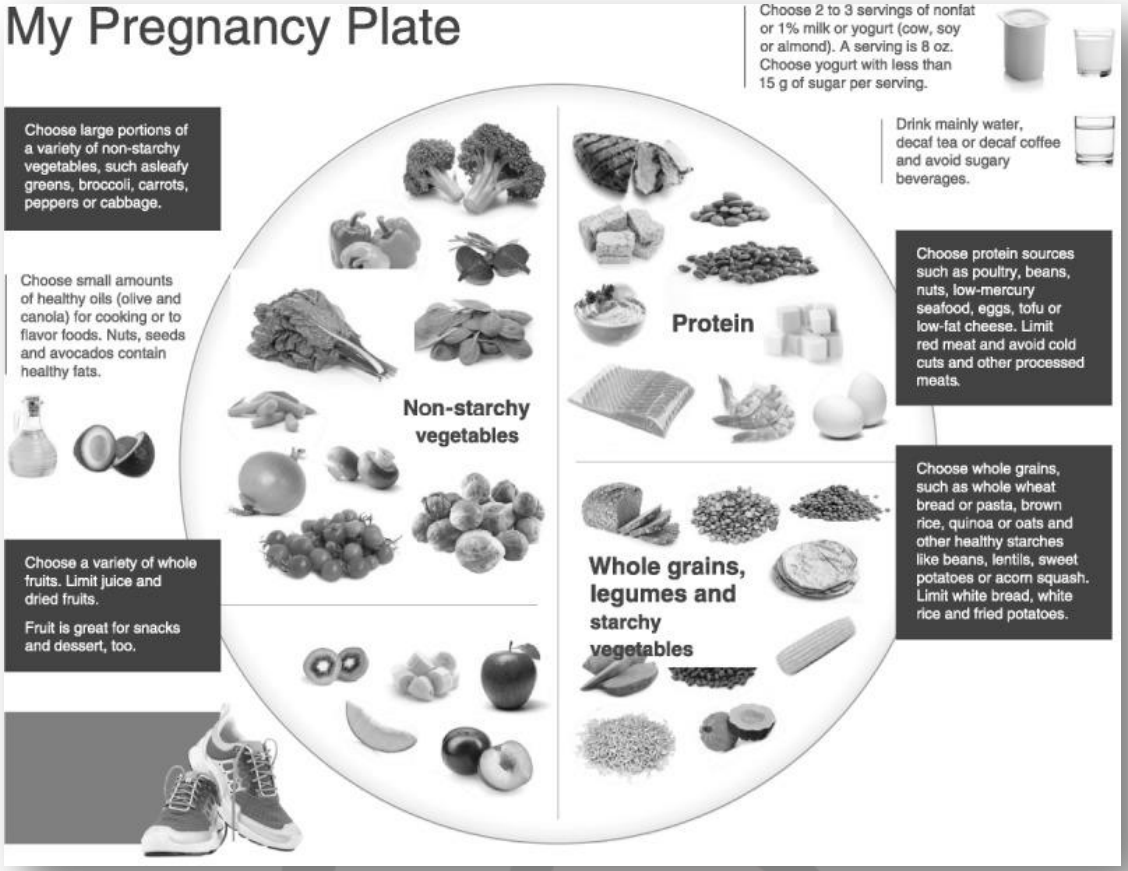
Nutrient	**Daily requirements for pregnant women**
calories	additional 300, in second and third trimesters
calcium	1200 milligrams
folate	600–800 micrograms
iron	27 milligrams

Most pregnant women can meet these increased nutritional needs by choosing a diet that includes a variety of healthy foods. A simple way to ensure you're getting all the necessary nutrients is to eat different foods from each of the food groups every day. In fact, all meals should include at least three different food groups.

Each food group has something to offer your body. For example:

- Grains are a good source of energy.
- Fruits and vegetables are packed with antioxidants, fiber, and water-soluble and fat-soluble vitamins.
- Meats, nuts, and legumes provide your body with protein, folate, and iron.
- Dairy products are a great source of calcium and vitamin D.

What and how much to eat?



Your body can't function properly if it's missing the nutrients from any of these food groups. Remember that your goal is to eat a wide variety of foods during pregnancy. Whenever possible, choose natural, low-fat foods over processed junk foods. Chips and soda, for example, contain no nutritional value. You and your baby will benefit more from fresh fruits, vegetables, and lean proteins, such as chicken, fish, beans, or lentils.

This doesn't necessarily mean that you need to avoid all of your favorite foods during pregnancy. However, you must balance them with nutritious foods so that you don't miss any important vitamins or minerals.

Including the following nutrients in your daily diet will help ensure that you satisfy your body's nutritional needs during pregnancy.

Protein

Protein is critical for ensuring the proper growth of fetal tissue, including the brain. It also helps with breast and uterine tissue growth during pregnancy. It even plays a role in your increasing blood supply, allowing more blood to be sent to your baby.

You should eat three servings of protein per day. Good sources include:

- lean beef and pork
- beans
- chicken
- salmon
- nuts
- peanut butter
- cottage cheese

Calcium

Calcium helps build your baby's bones and regulates your body's use of fluids.

Pregnant women need at least three servings of calcium per day. In pregnant teens, the recommendation is five servings. Good sources of calcium include:

- milk
- yogurt
- cheese
- cabbage
- tofu
- eggs
- pudding

Folate

Folate, also known as folic acid, plays an important part in reducing the risk of neural tube defects. These are major birth defects that affect the baby's brain and spinal cord, such as spina bifida and anencephaly.

When you're pregnant, you need 600 to 800 micrograms of folate. You can get folate from these foods:

- liver
- nuts
- dried beans and lentils
- eggs
- nuts and peanut butter
- dark green leafy vegetables

Iron

Ironworks with sodium, potassium, and water to increase blood flow. This helps ensure that enough oxygen is supplied to both you and your baby.

You should be getting 27 milligrams of iron per day. Good sources of this nutrient include:

- dark green, leafy vegetables
- citrus fruits
- enriched bread or cereals
- lean beef and poultry
- eggs
- dried fruits

Other considerations

Aside from eating well, it's important to drink at least eight glasses of water each day and to take prenatal vitamins. It's difficult to obtain sufficient amounts of certain nutrients, including folate and iron, from food alone. Make

sure to speak with your doctor about which prenatal vitamins you should take to ensure that you and your baby stay healthy.

Cravings and food aversions

During pregnancy, many women experience aversions to particular foods, meaning they never want to eat them. They may also have cravings for at least one type of food. It's unclear why women develop food cravings or aversions during pregnancy. However, researchers believe hormones play a role.

Common cravings during pregnancy include:

- chocolate
- spicy foods
- fruits
- comfort foods, such as mashed potatoes and pizza


It's fine to give in to these cravings sometimes, especially if you crave foods that are a part of a healthy diet. However, you should try to limit your intake of junk food and processed foods.

Food aversions may only be problematic if they involve foods that are important for the baby's growth and development. Talk to your doctor if you have adverse reactions to foods you should be eating during pregnancy. Your doctor can suggest other foods or supplements to compensate for the lack of certain nutrients in your diet.

Pica

Pica is a disorder that causes cravings for items that contain no nutritional value. Pregnant women with pica may want to eat clay, cigarette ashes, or starch, among other strange substances. When a woman has pica during pregnancy, it may indicate a lack of a specific vitamin or mineral.

It's important to notify your doctor if you crave nonfood items or have eaten nonfood items. Eating such items can be dangerous for you and your baby.

Healthy weight gain during pregnancy

Many women are concerned about weight gain during pregnancy. They fear they will gain too much weight and never get back to their prepregnancy size. However, some weight gain is normal during pregnancy, and it shouldn't be cause for concern. The extra weight provides nourishment to the baby. Some of it is also stored for breastfeeding after the baby is born.

Women gain an average of 25 to 35 pounds during pregnancy. It's normal to gain less weight if you start out heavier or to gain more weight if you were underweight before pregnancy. You can speak with your doctor about the appropriate amount of weight for you to gain during your pregnancy. The chart below provides some general guidelines.

Recommended weight gain during pregnancy

Starting weight	Body mass index*	Recommended weight gain
underweight	< 19.8	28 to 40 pounds
normal weight	19.8 to 26.0	25 to 35 pounds
overweight	26.0 to 29.0	15 to 25 pounds
obese	>29.0	0 to 15 pounds

*Body mass index can be calculated using the following equation: weight (in pounds) / height (in inches)2 x 703.

Don't worry too much about the number on the scale. Instead of focusing on your weight, you should concentrate on eating a variety of nutritious foods. Healthy eating is incredibly important, and dieting to lose weight or prevent weight gain is harmful to you and your baby.

Healthy exercise

Besides eating a nutrition-focused diet, exercising during pregnancy can help you manage your weight. Swimming and walking are good choices. However, you should avoid any extreme sports or contact sports, such as rock climbing and basketball.

If you didn't exercise before your pregnancy, start out slowly and don't overdo it. It's also important to drink plenty of water so that you don't get dehydrated. Make sure to talk to your doctor before you start a new exercise routine.

Takeaway: Evaluate your diet

Make sure you're eating a balanced and nutritious diet during your pregnancy so you and your growing baby can be as healthy as possible. Think about nutritional value, and limit your intake of high-fat, high-sugar, and high-sodium foods.

Eat these:

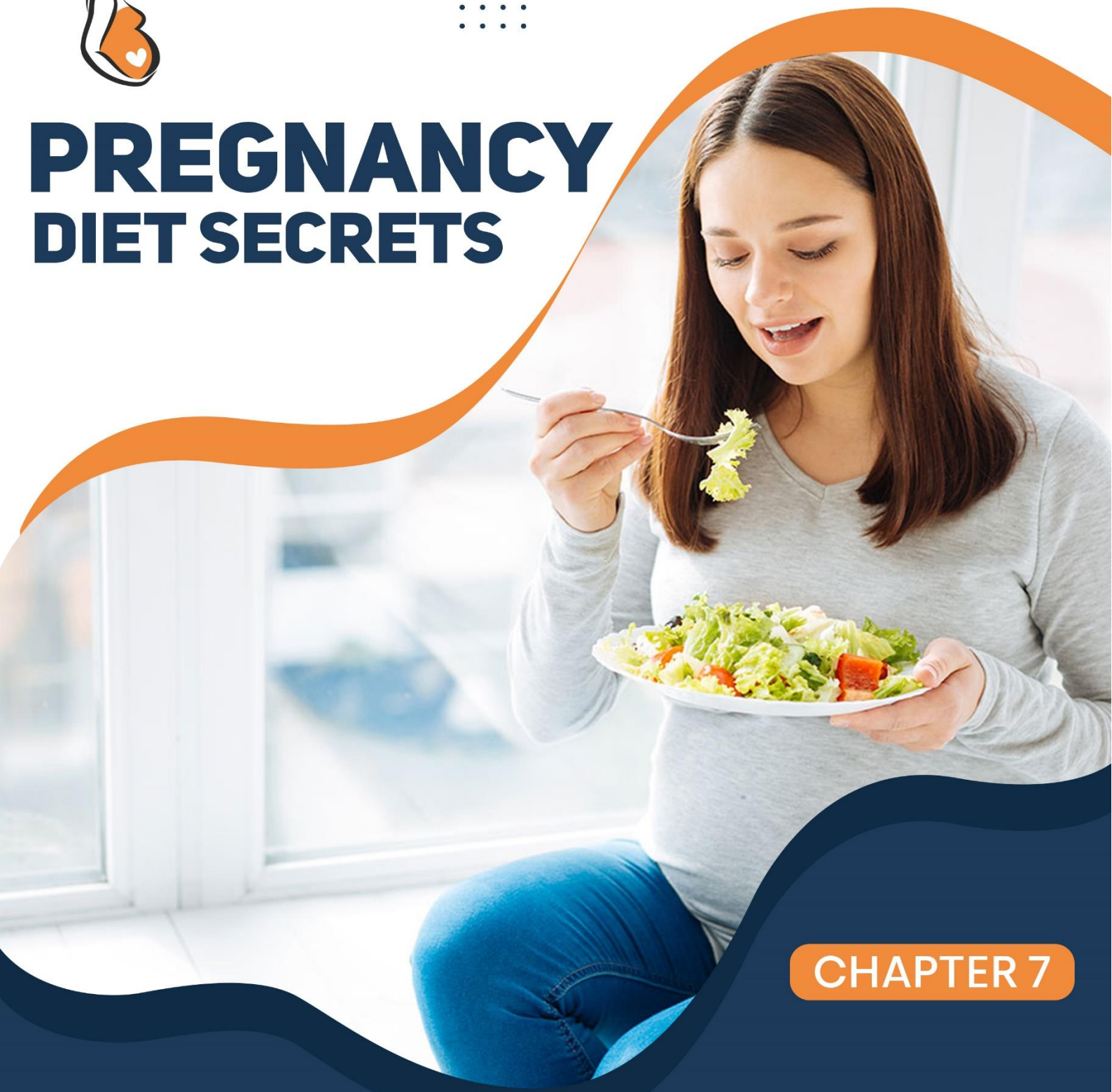
- at least three servings of protein per day
- six or more servings of whole grains per day
- five or more servings of fruits and vegetables per day
- three or more servings of dairy products per day
- foods with essential fats
- prenatal vitamins

Avoid these:

- alcohol
- excessive caffeine
- raw meats and seafood
- high-mercury fish
- uncooked processed meats
- unpasteurized dairy

You can work with your doctor and dietitian to create a more specific meal plan based on your age, weight, and medical history.

PREGNANCY DIET SECRETS



CHAPTER 7

Pregnancy Diet:

What to Eat and What to Avoid?

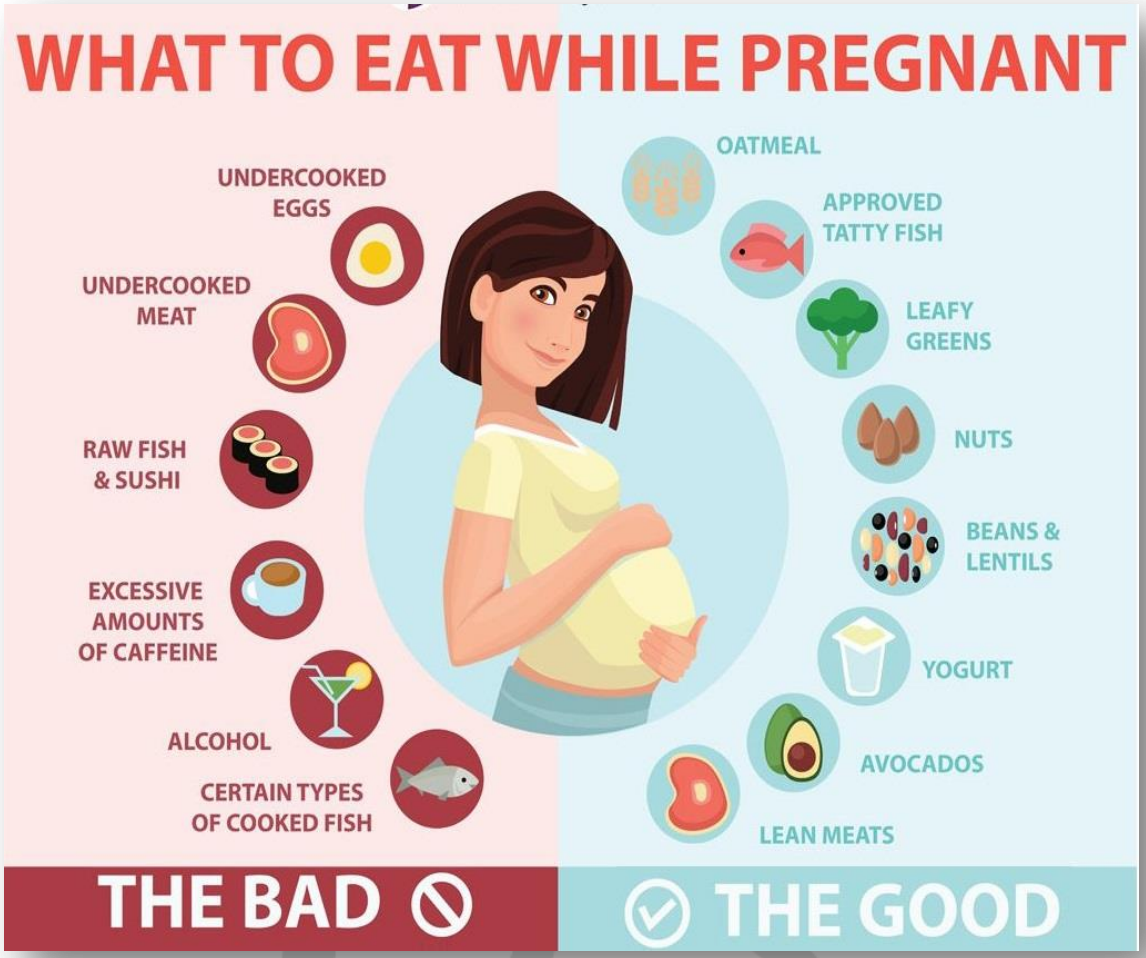
Pregnant women need to ensure that their diet provides enough nutrients and energy for the baby to develop and grow properly. They also need to make sure that her body is healthy enough to deal with the changes that are occurring.

For a healthy pregnancy, the mother's diet needs to be balanced and nutritious – this involves the right balance of proteins, carbohydrates, and fats, and consuming a wide variety of plants like vegetables, and fruits.

Some women's diets may be impacted by ethical beliefs, religious requirements, or health conditions, so checking with a doctor is an important part of planning a pregnancy diet.

Fast facts about eating during pregnancy:

- A pregnant woman's calorie intake grows during pregnancy. She does not eat for two; her calorie consumption just goes up a few hundred calories a day for most pregnant women.
- Typical weight gain, if the mother is carrying just one baby, varies considerably based on pre-pregnancy weight and other factors. An underweight pregnant women is recommended to gain the most, whereas an overweight woman is recommended to gain the least.
- A woman's body absorbs iron more efficiently and blood volume increases when she is pregnant, so she has to consume more iron to make sure that both she and her baby have an adequate oxygen supply.



Rules

Fruits and vegetables are the cornerstones of any nutritious diet, and they are especially important during pregnancy.

As mentioned above, the mother should follow a varied, balanced, and nutritious diet, and it must include:

Fruit and vegetables

Aim for five portions of fruit and vegetables per day. They may be in the form of juice, dried, canned, frozen, or fresh. Fresh and frozen (if frozen soon after picking) produce usually have higher levels of vitamins and other nutrients.

Experts stress that eating fruit is usually better for you than just drinking the juice, as natural sugar levels in juice are very high. Consider vegetable juices like carrot or wheatgrass for dense nutrition.

Starchy carbohydrate-rich foods

Starchy carbohydrate-rich foods include potatoes, rice, pasta, and bread. Carbohydrates are high in energy and are therefore an important component of a good pregnancy diet.

Protein

Healthful, animal-sourced proteins include fish, lean meat, and chicken, as well as eggs. All pregnant women and especially vegans should consider the following foods as good sources of protein:

- Quinoa – known as a "complete protein," it includes all the essential amino acids.
- Tofu and soy products.
- Beans, lentils, legumes, nuts, seeds, and nut butter are a good source of protein and iron.

Pregnant women who ate seafood had lower levels of anxiety compared with those who did not. Pregnant mothers who never consumed seafood had a 53 percent greater risk of suffering from high levels of anxiety.

Fats

Fats should not make up more than 30 percent of a pregnant woman's diet. Researchers from the University of Illinois reported in the Journal of Physiology that a high-fat diet may genetically program the baby for future diabetes.

There are other risks to pregnancy with an overly high-fat diet, so a balance is needed, and monounsaturated and omega-3's or "healthy fats" should be the primary fat choices. In the journal Endocrinology, a team from Oregon Health

& Science University explained that Food and Nutrition Bulletin because the blood flow from the mother to the placenta is reduced.

Examples of foods high in monounsaturated fats include olive oil, peanut oil, sunflower oil, sesame oil, canola oil, avocados, many nuts, and seeds.

Fiber

Wholegrain foods, such as wholemeal bread, wild rice, whole grain pasta, pulses like beans and lentils, fruit, and vegetables are rich in fiber.

Women have a higher risk of developing constipation during pregnancy; eating plenty of fiber is effective in minimizing that risk. Studies have shown that eating plenty of fiber during pregnancy reduces the risk or severity of hemorrhoids, which also becomes more common as the fetus grows.

Calcium

It is important to have a healthy daily intake of calcium. Dairy foods, such as cheese, milk, and yogurt are rich in calcium. If the mother is vegan, she should consider the following calcium-rich foods; calcium-fortified soymilk and other plant milk and juices, calcium-set tofu, soybeans, bok choy, broccoli, collards, Chinese cabbage, okra, mustard greens, beans, kale, and soynuts.

Zinc

Zinc is a vital trace element. It plays a major role in normal growth and development, cellular integrity, and several biological functions including nucleic acid metabolism and protein synthesis.

Since all these functions are involved in growth and cell division, zinc is important for the development of the fetus. The best sources of zinc are chicken, turkey, ham, shrimp, crab, oysters, meat, fish, dairy products, beans, peanut butter, nuts, sunflower seeds, ginger, onions, bran, wheat germ, rice, pasta, cereals, eggs, lentils, and tofu.

Iron and pregnancy

Iron makes up a major part of hemoglobin. Hemoglobin is the oxygen-carrying pigment and main protein in the red blood cells; it carries oxygen throughout the body.

During pregnancy, the amount of blood in the mother's body increases by almost 50 percent – she needs more iron to make more hemoglobin for all that extra blood.

Most women start their pregnancy without adequate stores of iron to meet the increasing demands of their bodies, particularly after the 3rd or 4th month. If iron stores are inadequate, the mother may become anemic, and there is a higher risk of:

- Preterm delivery.
- Low-weight baby.
- Stillbirth.
- Newborn death.
- Tiredness, irritability, depression (in the mother) during the pregnancy.

If the mother is anemic later in the pregnancy, there is a higher risk of losing a lot of blood when she gives birth. The following foods are rich sources of iron:

- Dried beans.
- Dried fruits, such as apricots.
- Egg yolk.
- Some whole-grain cereals, if they are fortified with iron.
- Liver is rich in iron, but doctors and most dietitians advise pregnant women to avoid liver. Liver is very high in vitamin A, which may harm the baby during pregnancy.
- Lean meat.
- Oysters (pregnant women should eat them cooked).
- Poultry.
- Salmon.
- Tuna.
- Lamb, pork, and shellfish also contain iron, but less than the items listed above.
- Legumes – lima beans, soybeans, kidney beans, dried beans, and peas.
- Seeds – Brazil nuts and almonds.
- Vegetables, especially dark green ones – broccoli, spinach, dandelion leaves, asparagus, collards, and kale.
- Wholegrains – brown rice, oats, millet, and wheat.

Non-animal sources of iron are less easily absorbed by the body. Mixing some lean meat, fish, or poultry with them can improve their absorption rates.

Foods to avoid

The following foods are best avoided during pregnancy:

- **Mercury in some types of fish** – shark, swordfish, and marlin should be avoided or kept to an absolute minimum.
- **Uncooked or partially cooked meat** – this should be avoided, it should be cooked right through. Uncooked shellfish – there is a risk of bacterial or viral contamination which can cause food poisoning. Some bacteria and viruses can also cross the placenta and harm the baby.
- **Raw eggs** – including any foods with raw or partially cooked eggs in them. Eggs must be well cooked through to avoid salmonella infection.
- **Uncooked or undercooked ready-prepared meals** – it is crucial that ready-prepared meals are cooked through until they are piping hot. The risk of listeriosis exists, as well as infection from other pathogens.
- **Pate** – any type of pate, be it vegetable or meat-based – the risk here is also of listeria infection.
- **Soft mold-ripened cheese** – such as blue-veined cheese, Brie, or Camembert. There is a risk of listeria infection. Listeria is a group of bacteria that can cause potentially fatal infections to pregnant women and their babies.
- **Empty calorie foods** – cakes, biscuits, cookies, chips, and candy should be kept to a minimum. Many of these options are high in sugar and fat, have little nutritional content, and may undermine a pregnant woman's efforts at maintaining healthy body weight.

Should I stop drinking alcohol completely?

Only very small amounts of alcohol may be consumed each week by pregnant mothers.

Public health authorities throughout the world have been progressively reducing the maximum amount of alcohol a woman should drink each week.

A fetus's liver cannot process alcohol anywhere nearly as well as an adult's can. Too much exposure to alcohol can seriously undermine the baby's development. Most doctors advise pregnant mothers to avoid alcohol altogether.

Some guidelines recommend only very small amounts per week if the mother chooses to drink while pregnant. Heavy drinking during pregnancy may harm both the mother and the baby. There is a risk that the baby will develop FAS

(fetal alcohol syndrome), so many mothers choose to remove the risk of any issues by eliminating alcohol from their diet during pregnancy.

Should pregnant women avoid caffeine?

If a pregnant mother consumes too much caffeine during her pregnancy, there is a raised risk of low birth weight, which can lead to health problems later on. There is also a higher risk of miscarriage.

Many foods and drinks contain caffeine, not just coffee. Examples include some sodas, energy drinks, chocolate, and tea. Some cold and flu remedies also contain caffeine. A pregnant woman should talk to her doctor, nurse, or pharmacist before taking a remedy.

Most health authorities around the world say that coffee does not need to be cut out completely, but should not exceed more than 200 milligrams per day. A standard mug of instant coffee contains 100 milligrams of caffeine.

Weight gain

According to the Institute of Medicine, USA, a woman whose body mass index (BMI) is between 18.5 and 24.9 should gain 25-35 pounds (11.4-15.9 kilograms) during the 9 months. A woman who is overweight at the start of pregnancy should gain between 15-25 pounds (6.8 to 11.4 kg). Weight gain recommendations may also vary, depending on the woman's age, fetal development, and her current health.

Excessive or insufficient weight gain can undermine the health of both the fetus and the mother.

Supplements

The information below should never supersede what a doctor tells a patient; it is important for pregnant women to consult a doctor before pursuing any supplementation.

Iron

A woman pregnant woman should be consuming 27 milligrams of iron per day. The majority of women can get adequate amounts if they follow a healthy diet.

Some, however, may need iron supplements to prevent iron deficiency. Some women may experience heartburn, nausea, or constipation when taking iron

supplements. To avoid these problems, they should take their pills with meals, start off with smaller doses, and then work their way up to the full dose slowly.

Folic acid

The National Health Service (NHS), United Kingdom, recommends that supplements in the form of folic acid should be 400 mcg (micrograms) per day up to the 12th week of pregnancy. Ideally, women should have been on them before becoming pregnant, the NHS says.

Vitamin D

Guidelines in the UK say that a pregnant woman should take supplements containing 10 mcg of vitamin D daily. Summer sunlight is a good source of vitamin D (the light does not have the vitamin, but triggers the skin to synthesize it) – however, exposure should be limited because too much sunlight on the skin can cause burning and raises the risk of developing skin cancer.

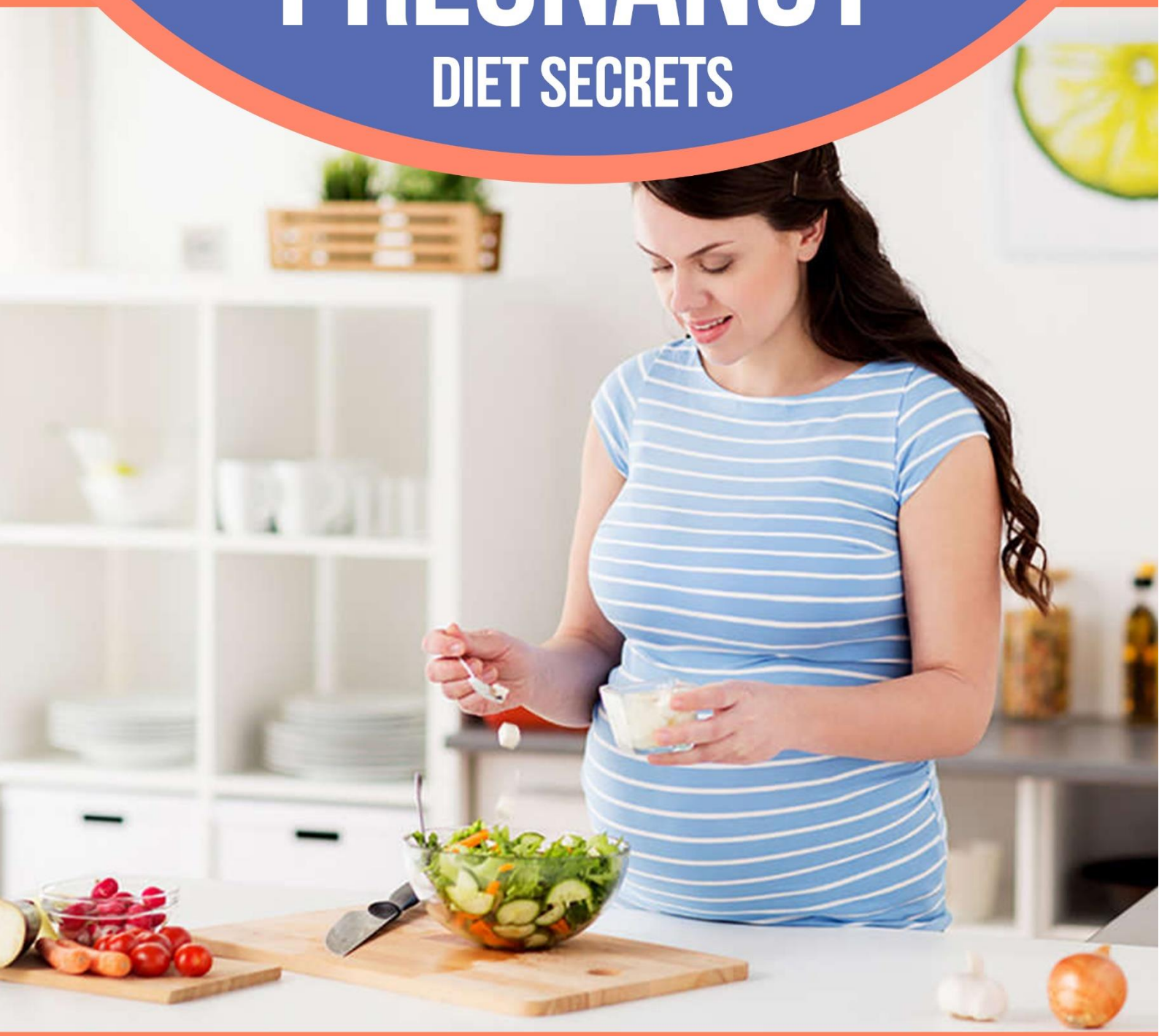
Zinc

A study published in the Food and Nutrition Bulletin reported that observational studies have shown that "zinc deficiency during pregnancy may cause adverse pregnancy outcomes for the mother and fetus." After assessing several studies they found that pregnant women on zinc supplements were 14 percent less likely to have a premature delivery.

Avoid vitamin A supplements

Pregnant women should avoid having too much vitamin A, as this may harm their baby. The exception to this rule is when a doctor advises it for a specific reason. It may be determined, for example, that a mother is deficient in vitamin A during her pregnancy, in this case, a doctor may advise supplementation.

PREGNANCY
DIET SECRETS



Chapter 8

Healthy Eating Guidelines for
Food Safety During Pregnancy

It is easier to get a foodborne illness when you are pregnant. Following general food safety recommendations helps you have a healthy pregnancy. Use the information in this fact sheet to help you choose foods that will keep you and your baby safe and healthy.

General Food Safety Recommendations

- When handling raw meats, fish, shellfish, poultry, and eggs, wash your hands with hot, soapy water for at least 20 seconds before and after preparation.
- Clean and disinfect all surfaces after handling food in the kitchen, especially raw foods, using either:

a kitchen sanitizer (follow directions on bottle) or

a bleach solution (5 ml household bleach to 750 mL of water)

And rinse with water.

- Wash your hands and kitchen surfaces often to help prevent bacteria from spreading. Wash and disinfect your refrigerator often to reduce the chance of bacteria spreading from one food to another.

- Defrost frozen foods in the refrigerator, in cold water, or in the microwave. Do not defrost food at room temperature.
- Fully cook all meats, fish, shellfish, and poultry. You can check that they are fully cooked by using a food thermometer.
- Avoid raw fish and shellfish such as sashimi and sushi (with raw fish), raw oysters, clams, and mussels.
- Avoid raw or lightly cooked egg or egg products. Eggs should be cooked until both the white and the yolk is firm; egg dishes should be cooked thoroughly. If a recipe calls for raw eggs, use pasteurized egg products instead.
- Wash raw vegetables and fruit well with clean, running water before eating.
- Fully cook sprouted seeds such as alfalfa, clover, radish, and mung bean. Do not eat sprouts if they are not cooked to steaming hot (for example, in a stir-fry). Raw sprouts can be contaminated with bacteria.

- Separate raw and cooked foods to avoid cross-contamination. Clean all knives, cutting boards, and utensils between uses.
- Keep hot food hot (60°C or above) and cold food cold (4°C or below). Your fridge should be set to 4°C or lower.
- Put all perishables, prepared food, and leftovers into the refrigerator or freezer within two hours.
- Keep leftovers for no more than four days, preferably only two to three days, in the refrigerator. When serving leftovers, reheat the food through to steaming (to at least 74°C).
- Do not drink unpasteurized fruit juice or cider. Pasteurized juice and cider is the safest choice.

Listeria

Listeria is a type of bacteria that can cause serious food-borne illness during pregnancy which can be harmful to your baby. Women who are pregnant are at a higher risk of becoming ill from *Listeria* than women who are not pregnant.

Refrigerated ready-to-eat foods with a long shelf life that are eaten without further cooking are at risk of being contaminated with *Listeria*. Some examples of high-risk foods include soft cheeses, hot dogs, deli meats, and pâtés.

To reduce your risk of food-borne illness from *Listeria* avoid:

- unpasteurized (raw) dairy products
- unpasteurized (raw) cheese
- unpasteurized fruit juices and cider
- pre-packaged or prepared fruit and vegetable salads
- raw or undercooked meat, poultry, seafood, and eggs.

Also, avoid the following foods unless they are cooked to steaming hot (74°C when measured with a food thermometer):

- pasteurized soft and semi-soft cheese (e.g. Brie, Camembert, chèvre, feta)
- pasteurized blue-veined cheese (e.g. Danish blue, Roquefort, Gorgonzola)
- pasteurized Hispanic-style fresh cheese (e.g. queso blanco, queso fresco, queso panela)
- refrigerated pâtés, meat spreads, and smoked seafood
- raw sprouts
- ready-to-eat deli meats and ready-prepared meals.

Safer choices during pregnancy include hard cheese (e.g. Parmesan, Cheddar, Swiss, and Colby), processed cheese slices and spreads, cream cheese, cottage cheese, and yogurt, when made from pasteurized milk.

Mercury in Fish

Fish is an excellent source of omega-3 fat, which is important for your baby's brain development. Some fish is also high in mercury. High amounts of mercury can be harmful to a growing brain. Choose fish that is low in mercury more often.

Vitamin A

A balanced diet rich in dark green and orange vegetables and fruit provides enough vitamin A for the healthy development of your baby's skin, eyes, and immune system.

Too much vitamin A may cause birth defects, especially during the first trimester. Do not take individual vitamin A or fish liver oil supplements during pregnancy.

Liver and liver products (e.g. liverwurst spread and liver sausages) are also high in vitamin A. The safest choice is to limit these foods during pregnancy. If you choose to eat liver products, have no more than 75g (2 ½ ounces) per week.

Choose a prenatal supplement that has less than 10,000 IU (3000 mcg) of preformed vitamin A (often listed as acetate, succinate or palmitate).

Caffeine

- Having too much caffeine during pregnancy may be harmful to your

baby.

- Limit caffeine to 300 milligrams per day. 300 milligrams is about two cups (500 mL) of coffee or six cups of black tea.

Alcohol

- No amount of alcohol has been shown to be safe during pregnancy.
- The safest choice is to avoid alcohol during pregnancy.

Herbal Products

- Check with your health care provider if you are currently using herbal products in tablet, capsule, or extract forms.
- The following herbs are considered safe in the amounts commonly used in foods or as herbal tea (2-3 cups per day): ginger, bitter orange/orange peel, Echinacea, peppermint, red raspberry leaf, rose hip, and rosemary.

Sweeteners (Sugar Substitutes)

- Sugar substitutes are safe in moderation during pregnancy. However, foods and drinks made with these mustn't replace more nutritious options.
- If you have concerns or questions about using sweeteners, talk to your health care provider or a dietitian.

Soy

- When part of balanced diet soy foods and foods containing soy products are safe to eat during pregnancy.
- Soy supplements are not recommended (for example, soy protein or isoflavone supplements).

Flax

- Limit flaxseed and flaxseed oil to the amounts commonly found in foods.

- It is not recommended to take flaxseed oil as a supplement.

Foods Not to Eat When You're Pregnant

Why are some foods off-limits when you're pregnant -- but fine if you're not? First, changes to your immune system now make you more vulnerable to food-borne illnesses. What would've meant stomach upset before could mean serious complications now – from dehydration to miscarriage.

Can pregnant women eat eggs?

Because raw eggs may be tainted with salmonella, a bacterium that can cause fever, vomiting, and diarrhea, watch out for restaurant-made Caesar salad dressing, homemade eggnog, raw cookie dough, and soft scrambled or sunny-side-up eggs -- any dish in which the eggs (both yolk and white) are not cooked completely. "If eggs are cooked, the risk is gone," adds Madeleine Sigman-

Grant, Ph.D., maternal child health and nutrition extension specialist at the University of Nevada.

Can pregnant women eat sushi?

Except for California rolls and other cooked items, sushi is not safe when you're expecting, either, because it may contain illness-inducing parasites.

Stay away from juice (like cider) sold at farm stands; it may not have undergone pasteurization, a processing method that kills bacteria and toxins. Though the majority of milk and juices sold in stores today are pasteurized, there are still some brands on shelves that aren't, so read labels.

Can pregnant women eat fish of all varieties?

Fish, which boasts omega-3 fatty acids that help Baby's brain development, is a great meal choice right now. But some varieties should be shunned due to high levels of methyl-mercury, a pollutant that can affect a baby's nervous system. These include swordfish, shark, and tilefish – all big species that live longer, accumulating more mercury in their flesh. (You may want to avoid these fish entirely during your childbearing years because of your body stores mercury for up to four years, Ward advises.)

Most types of fish contain traces of mercury, so you'll want to limit your weekly consumption of safer varieties too. According to the newest guidelines from the FDA, you can enjoy up to 12 ounces a week (roughly two meals) of lower-mercury fish such as salmon, catfish, pollack, shrimp, and canned light tuna. Of those 12 ounces, only 6 should come from canned "white" albacore tuna, which tends to contain more mercury than light tuna. If you're eating fish caught in local waters, check online with your state's department of health for advisories (if you can't find any information, limit yourself to 6 ounces).

Foods to Limit When You're Pregnant

Some foods are fine in small amounts but don't go overboard.

Can pregnant women drink caffeine?

When it comes to caffeine, "the studies can be very confusing," says Sigman-Grant. While one small study did link caffeine to increased health risks in the fetus, stronger studies have shown that caffeine is not harmful in moderate amounts. So currently the guidelines suggest no more than 300 milligrams per day, roughly the amount found in two or three 8-ounce cups of coffee. And that comes as a relief to many moms-to-be. Stephanie McClure, a mother of two, in Westerville, Ohio, had a terrible time going cold turkey. "After a few months I went to my doctor and asked if there was any way I could have just a little bit of coffee," remembers McClure, who says her doctor gave the okay for a couple of cups a day. "I immediately ran to Starbucks and ordered a mocha latte."

Can pregnant women eat nitrate-rich foods?

It's also smart to go easy on hot dogs (which should always be eaten cooked) and cured meats such as bacon and sausage. These contain nitrates, additives that have been called into question for possible links to brain tumors and diabetes. Although studies aren't conclusive, it makes sense to limit your consumption -- these foods aren't great nutritional choices anyway. What about your beloved diet sodas? They're considered safe during pregnancy and, beyond not being a stellar nutritional choice, there's no scientific evidence that they cause harm. But on the downside, at least one artificial sweetener (saccharin) that's often found in diet sodas does cross the placenta, and artificially sweetened drinks are usually low in nutritional value. So again, we recommend moderation.

Can pregnant women drink alcohol?

Alcohol has long been considered a no-no during pregnancy. But many doctors still advise their patients that an occasional drink is okay. "My doctor told me I could have up to 4 ounces of red wine once or twice a week and that it would be good for me," remembers Amy Quinn, a mom in Mullica Hill, New Jersey. So have the rules on drinking changed? Not, warn many experts. Heavy drinking can lead to Fetal Alcohol Syndrome (FAS), which causes mental

retardation and a host of abnormalities. But according to the March of Dimes, even moderate drinking may lead to more subtle physical and mental damage. And because no one knows exactly what amount of alcohol causes FAS, it's smart to steer clear.

Can pregnant women eat feta cheese, Brie, Gorgonzola, and other soft cheeses?

Soft cheeses such as Brie, feta, and Gorgonzola were once considered potentially harmful because they can harbor listeria. Listeriosis, an illness caused by the bacteria listeria, can be passed to the fetus, leading to miscarriage, premature delivery, or stillbirth. However, the FDA now allows soft cheese during pregnancy, as long as it's made with pasteurized milk. Most cheese sold in the United States is, but "don't ever take that for granted," says Ward. It's still important to check labels, especially with imported brands. If you live in a border state, steer clear of soft Mexican cheeses like queso blanco in markets (they aren't typically pasteurized).

Can pregnant women eat lunch meat?

When Jennifer Vito, a mom in San Antonio, heard that deli meat was also off-limits because of listeriosis concerns, she found it difficult to eliminate it when she was expecting. "If I can't have deli meat, what am I supposed to eat for lunch?" she says. "I ate a lot of peanut butter and jelly sandwiches and snacked on veggies." But deli meat is fine during pregnancy as long as you heat it first to kill bacteria (pop your sandwich in the microwave or order a hot or toasted sandwich at the deli – just make sure the meat is steaming before you eat it). "It's a pain to heat it, but it would be worse to get listeriosis," says Ward. If you would prefer to pass on deli meat, try other high-protein lunches like a veggie burger, a bean burrito, or chicken salad made with some leftover grilled chicken breast and low-fat mayo.

Can pregnant women eat fresh produce?

Finally, fruits and veggies should be a staple in your diet, especially during pregnancy, because they're high in vitamins and fiber. But take a few commonsense precautions: Rewash bagged lettuce (even if the label says it's triple-washed) to wash away any possible traces of salmonella or E. coli. You should wash the outside of all fruits and vegetables -- even if you're not going to eat the skin. "Otherwise you drag the germs into the flesh when you cut it," says Sigman-Grant.

But what's the bottom-line best advice on what to eat these nine months? Mix it up. "Don't rely on the same foods every day," Sigman-Grant says. "You dramatically diminish your risk of being exposed to something harmful if you eat a variety." What's more, by varying your diet, you'll also deliver a healthy mix of nutrients to your growing baby.

Pregnancy
Diet Secrets

CHAPTER 9

Drinking Alcohol During Pregnancy: Is it Safe? What are the Effects?

There is no known safe amount of alcohol use during pregnancy or while trying to get pregnant. There is also no safe time during pregnancy to drink. All types of alcohol are equally harmful, including all wines and beer.

FASDs are preventable if a woman does not drink alcohol during pregnancy.

Why Alcohol is Dangerous?

Alcohol in the mother's blood passes to the baby through the umbilical cord. Drinking alcohol during pregnancy can cause miscarriage, stillbirth, and a range of lifelong physical, behavioral, and intellectual disabilities. These disabilities are known as fetal alcohol spectrum disorders (FASDs). Children with FASDs might have the following characteristics and behaviors:

- Abnormal facial features, such as a smooth ridge between the nose and upper lip (this ridge is called the philtrum)
- Small head size
- shorter-than-average height
- Low body weight
- Poor coordination
- Hyperactive behavior
- Difficulty with attention
- Poor memory
- Difficulty in school (especially with math)
- Learning disabilities
- Speech and language delays
- Intellectual disability or low IQ
- Poor reasoning and judgment skills
- Sleep and sucking problems as a baby
- Vision or hearing problems
- Problems with the heart, kidney, or bones
- Learn more about FASDs »

How Much Alcohol is Dangerous?

There is no known safe amount of alcohol to drink while pregnant.

When Alcohol is Dangerous?

There is no safe time to drink alcohol during pregnancy. Alcohol can cause problems for the developing baby throughout pregnancy, including before a woman knows she is pregnant. Drinking alcohol in the first three months of pregnancy can cause the baby to have abnormal facial features. Growth and central nervous system problems (e.g., low birth weight, behavioral problems) can occur from drinking alcohol anytime during pregnancy. The baby's brain is developing throughout pregnancy and can be affected by exposure to alcohol at any time.

If a woman is drinking alcohol during pregnancy, it is never too late to stop. The sooner a woman stops drinking, the better it will be for both her baby and herself.

If you're pregnant and wondering if it's OK to indulge in the occasional small glass of merlot or to sip a little champagne on New Year's Eve, the advice you receive may be confusing.

Some doctors recommend that you completely avoid alcohol when you're expecting; others say that occasional light drinking is unlikely to harm your baby.

Chances are your friends are divided on this, too. One might confide that she enjoyed the occasional beer during her pregnancy and feels her child turned out fine, while another sees this as taking an unnecessary risk.

For decades, researchers have known that heavy drinking during pregnancy can cause birth defects. But the potential effects of small amounts of alcohol on a developing baby are not well understood.

Whatever the risks, many moms-to-be are choosing not to totally give up alcohol. A recent CDC study found that about one in eight pregnant women in the U.S. reports drinking at least one alcoholic beverage in the past month.

Here's what doctors say pregnant women should keep in mind when deciding whether to drink lightly or to steer clear of alcohol altogether.

How Much Is Too Much?

"The problem with drinking alcohol during your pregnancy is that there is no amount that has been proven to be safe," says Jacques Moritz, MD, director of gynecology at St. Luke's-Roosevelt Hospital in New York.

David Garry, DO, associate professor of clinical obstetrics and gynecology at the Albert Einstein College of Medicine and chair of the Fetal Alcohol Spectrum Disorders Task Force for the American College of Obstetricians and Gynecologists District II/NY, agrees. He says that researchers don't know enough about the potential effects of drinking alcohol at particular times during the pregnancy to be able to say that any time is really safe.

It's also difficult to predict the impact of drinking on any given pregnancy because some women have higher levels of the enzyme that breaks down alcohol.

"If a pregnant woman with low levels of this enzyme drinks, her baby may be more susceptible to harm because the alcohol may circulate in her body for a longer period of time," Garry tells WebMD.

How does drinking alcohol during pregnancy affect your baby's health?

Drinking alcohol at any time during pregnancy can cause serious health problems for your baby. Alcohol includes wine, wine coolers, beer, and liquor.

When you drink alcohol during pregnancy, the alcohol in your blood quickly passes through the placenta, and the umbilical cord to your baby. The placenta grows in your uterus (womb) and supplies the baby with food and oxygen through the umbilical cord. Drinking any amount of alcohol at any time during

pregnancy can harm your baby's developing brain and other organs. No amount of alcohol has been proven safe at any time during pregnancy.

There's no safe time to drink alcohol during pregnancy. Alcohol can cause problems for your baby any time during pregnancy, even before you know that you're pregnant. You may be pregnant and not know for 4 to 6 weeks.

Drinking alcohol during pregnancy increases your baby's chances of having these problems:

- Premature birth. This is when your baby is born before 37 weeks of pregnancy. Premature babies may have serious health problems at birth and later in life.
- Brain damage and problems with growth and development
- Birth defects, like heart defects, hearing problems, or vision problems. Birth defects are health conditions that are present at birth. Birth defects change the shape or function of one or more parts of the body. They can cause problems in overall health, how the body develops, or in how the body works.
- Fetal alcohol spectrum disorders (also called FASDs). Children with FASDs may have a range of problems, including intellectual and developmental disabilities. These are problems with how the brain works that can cause a person to have trouble in learning, communicating, taking care of himself, or getting along with others. They also may have problems or delays in physical development. FASDs usually last a lifetime. Binge drinking during pregnancy increases your chances of having a baby with FASDs. Binge drinking is when you drink four or more drinks in 2 to 3 hours.
- Low birth weight (also called LBW). This is when a baby is born weighing less than 5 pounds, 8 ounces.
- Miscarriage. This is when a baby dies in the womb before 20 weeks of pregnancy.
- Stillbirth. This is when a baby dies in the womb after 20 weeks of

pregnancy.

How can you keep your baby safe from alcohol during pregnancy?

If you don't drink alcohol during pregnancy, your baby can't have FASDs or any other health problems caused by alcohol. If you're pregnant or even thinking about getting pregnant, don't drink alcohol.

Some women may drink alcohol during pregnancy and have babies who seem healthy. Some women may have very little alcohol during pregnancy and have babies with serious health conditions. Every pregnancy is different. Alcohol may hurt one baby more than another. The best way to keep your baby safe from problems caused by alcohol during pregnancy is not to drink alcohol when you're pregnant.

If you're pregnant, trying to get pregnant or think you may be pregnant, don't drink alcohol. When you do get pregnant, get regular prenatal care (medical care you get during pregnancy). Tell your health care provider if you need help to stop drinking alcohol.

How can you stop drinking alcohol during pregnancy?

You may want to drink alcohol during pregnancy. Alcohol is often part of social activities, like parties or sports events. You may be used to having a glass of wine with dinner or at the end of a busy day. Giving up alcohol during pregnancy may be hard.

Here are some tips to help you stop drinking alcohol:

- Think about when you usually drink alcohol. Plan to drink other things, like fruity drinks or water. Use a fun straw or put an umbrella in the glass to make it seem more fun.
- Stay away from situations or places where you usually drink, like parties or bars.
- Get rid of all the alcohol in your home.
- Tell your partner and your friends and family that you're not drinking alcohol during pregnancy. Ask them to help and support you.

Can your partner's drinking affect your baby during pregnancy?

FASDs and other alcohol-related health conditions happen when you drink during pregnancy. Research is still being done to find out if alcohol harms a man's sperm before a woman gets pregnant.

PREGNANCY
DIET SECRETS

Chapter 10

Postpartum Nutrition Guidelines

After nine months of some pretty serious food restrictions, you'll likely be happy to hear that you can again enjoy all of your favorite foods and beverages (hello sushi and red wine!). With that said, there are some important changes you'll want to make to ensure that you and your baby are getting the nutrients you need — especially if you're breastfeeding. Here, common postpartum questions answered.

I'm breastfeeding. Are there specific foods I should eat?

The number one focus of any breastfeeding diet should be getting the right amount of calories. Your baby will take calories and nutrients before you will, meaning you need adequate nutrition to compensate for breastfeeding, says Alyssa Dweck, M.D., FACOG, an ob-gyn in Westchester County, New York. She recommends aiming for 300 calories more than your pre-pregnancy diet daily, divided between fat, carbs, and protein.

As with during pregnancy, you'll also need an extra 25 grams of protein for a total of around 70 to 80 grams per day. "Protein is important for postpartum recovery and for the growth and repair of your cells. And baby needs protein for cell growth and immune function," says Torey Armul, R.D., a nutritionist based in Columbus, Ohio, and spokesperson for the Academy of Nutrition and Dietetics. (Dr. Dweck notes that most Americans easily reach their goal every day, although you'll have to make more of an effort if you're vegetarian or vegan.) Good protein sources include yogurt, milk, lean beef, turkey, fish, eggs, tofu, beans, and nuts.

Finally, getting enough calcium is still essential for your baby's bones, and even more so for your own since your baby will take what she needs from you. What's more, "estrogen is low when you're nursing, so your bones are at risk for osteoporosis," says Dr. Dweck. Many moms tend to cut out dairy right away if an infant is gassy, fussy, or spitting up, says Armul — but don't jump the gun. It may take a couple of weeks for the baby's gut to adjust to life outside the womb before the issue resolves itself.

Are there foods to avoid if I'm breastfeeding?

Fortunately, all of the foods that were off-limits during pregnancy are back on the menu when you're breastfeeding. While pathogens like listeria, toxoplasmosis, and salmonella can still definitely make you sick, they can't make it into your breast milk and harm your baby (whereas they can pass through the placenta during pregnancy and potentially harm your unborn baby).

Should I adjust my diet so the baby doesn't develop allergies?

Worried about potential allergens like peanuts, dairy, or eggs? It may help to keep in mind that food allergies in babies are less common than you might think. "I think moms turn to their diet a little too often and cut foods out to help their babies digest food better, but babies have a very immature

gastrointestinal system for a while. They're fussy because their GI system is not mature yet," says Armul.

Symptoms that might indicate an intolerance that you should discuss with your pediatrician include excessive spitting up, reflux, or bloody stools. If you have to cut dairy from your diet, stock up on other calcium-rich foods (like tofu and leafy greens) and take a calcium supplement to hit 1,000 mg per day.

Keep in mind that some studies suggest that breastfeeding in the first four months of life may decrease the risk of a dairy allergy in early childhood—all the more reason to continue nursing.

Is it safe to drink while breastfeeding?

Alcohol is the one consumable you need to be cautious with when you're breastfeeding. However, while it does enter your breast milk, it's in small amounts, and moderate drinking (no more than two drinks per day) is fine research shows.

Alcohol levels peak about 30 to 50 minutes after you finish your drink; within about two to three hours, your body should have gotten rid of all the alcohol from one glass of wine. (Drink more and it will take a bit longer.) That means it's best to breastfeed right before you enjoy a glass of wine, although use your best judgment if you need to nurse after. A good rule of thumb: If you're safe to drive, you're safe to breastfeed, says Armul.

What do I need to know about nutrition if I'm not breastfeeding?

In the days after birth, iron is the one nutrient all new moms need. "Women often lose a lot of blood during childbirth, so it's important to replenish your red blood cells," says Armul. Eat a minimum of 18 mg of iron per day from sources like lean red meat, beans, lentils, oatmeal, bran, and iron-fortified cereals. You don't need to overdo it, though, since your body will naturally replenish your iron levels within a few days, Dr. Dweck says.

Otherwise, your nutritional needs don't change a ton after you give birth. Consuming a wide variety of foods helps support postpartum recovery by serving up the fiber, vitamins, and minerals your body needs. Eat a variety of as many fruits and veggies as you can handle, ideally 1 to 2 cups per meal, to boost your immune system and energy levels and stay regular.

How much water should I drink per day?

Getting enough water not only supports breastfeeding but helps all moms avoid constipation. For most moms, eight cups (64 ounces) of water per day is a good benchmark, although you'll need more if you're breastfeeding or sweating it out at the gym. You'll know you're not drinking enough if your urine is dark (think the color of tea instead of a clear yellow) and/or you're not urinating as much as usual.

What weight loss or gain is normal after having a baby? Are there any signs I should watch out for?

Postpartum weight loss will look different for every woman — so try not to let it consume you. “Spend a few weeks not focusing on your weight. Take care of yourself. Remember to eat and pay attention to self-care. Let weight loss come; in time, it tends to happen naturally,” says Armul.

After delivery, women generally lose 15 pounds automatically from the baby and placenta. If you’re breastfeeding, you’ll churn through an extra 500 to 700 calories per day, although you’ll also need to eat more to supply you and your baby with the nutrients you need. Bottom line: most women generally shouldn’t lose more than 1 to 2 pounds per week. Keep your metabolism humming by aiming to eat fresh, whole foods regularly throughout the day, including breakfast and light snacks.

It’s also normal for your weight to fluctuate, including gaining a couple of pounds in a week — especially early on. “Engorgement, as well as water retention, can cause weight gain, but it’s unreal weight,” says Dr. Dweck.

One red-flag warning sign: If you’re losing excessive amounts of weight, have lots of hair loss, are knock-down-drag-out tired, and feel cold all of the time, “it’s not abnormal to have a thyroid abnormality postpartum,” Dr. Dweck says. Make an appointment with your doctor right away to get your thyroid levels checked; a simple pill can get your levels back on track.

My hair is suddenly falling out in handfuls. How do I stop it?

Don’t worry — postpartum hair loss is completely normal! It can be scary but rest assured, it is temporary, and your hair will grow back. “Lots of hair loss can be notable six to seven months postpartum,” says Dr. Dweck, but talk to your doctor. She may want to check for thyroid problems or anemia, both of which are relatively common postpartum.

Dr. Dweck also suggests talking to your doctor about a biotin supplement. Since protein is what makes up hair itself, you'll also want to ensure you're eating 50 to 75 grams daily depending on whether you're breastfeeding. And fill up on vitamin C-rich foods (bell peppers, citrus fruits, berries, spinach, and broccoli), which your body uses to form collagen — the protein that makes hair strong.

Supplements and vitamins: What's the deal? Should I take them?

First, if you have any questions about supplements, your first step should be your doctor — he or she will be able to talk you through the pros and cons and find one that meets your nutritional needs. Dr. Dweck says she recommends that moms continue using their prenatal vitamin while nursing — although many bottle-feeding women also keep on supplementing.

"Prenatals are a cheap and easy way to cover your bases nutritionally, especially because it's hard with a new baby to cook and eat the right things. You can feel confident that even if your diet is lacking somewhat, you're getting the nutrients you need," says Armul. Keep in mind that iron and calcium absorption compete with each other, so don't take them at the same time. And of course, if you have any questions about your nutritional needs, don't hesitate to talk to your doctor.

I'm really constipated. Help!

Both water and fiber are key to keeping regular, so eat lots of whole grains along with fruits and veggies with the skin on to keep things moving. "Skip foods that can be constipating. A lot is convenient, high-sugar ones, like candies, cakes, chips, and cookies, that people gift to you and sound good when you're tired and exhausted," says Armul. Also limit pain meds, especially opioids, which can lead to postpartum constipation.

If you're still stopped up, talk to your doctor about taking a dietary supplement like Metamucil in small amounts, and be sure to drink even more water to

flush it out. If that doesn't work, Dr. Dweck says she sometimes recommends discontinuing iron supplements, but again, be sure to get the green light from your doctor first.

I'm breastfeeding twins. Do my nutritional needs differ from moms with one baby?

Keep taking your prenatal vitamin; your doctor may recommend taking additional calcium and/or iron supplement as needed. Moms who are exclusively breastfeeding twins should eat at least an additional 600 calories per baby, per day, sometimes more — though exactly how much you'll need varies.

Focus on eating healthy fats, like nuts, seeds, avocados, fish, and olive oil, which contain more calories per gram than protein or carbohydrates. You'll know you're not eating enough if your milk supply dwindles or if your babies

are not gaining weight or regularly urinating. If, however, you're feeling energetic, awake, and alert and are losing a reasonable amount of weight, "that's the best signal of all," says Dweck.

Nutrient Needs in the Postpartum Period

Recommendations for nutrient intake during the postpartum period are based on the

following goals:

• Replenish nutrient stores, specifically, calcium, vitamin B6, and folate (IOM, 1992)

• Support requirements of lactation, when the woman is breastfeeding

Non-breastfeeding women

There are no nutrient intake guidelines for non-breastfeeding women that are specific to the postpartum period. In this case, it is reasonable to use the DRIs for nonpregnant women as the basis for nutritional therapy, with adjustments for situations that might affect needs.

Breastfeeding women

Recommendations for intake of selected nutrients during lactation are reviewed below. Higher intakes may be needed for women who are breastfeeding more than one infant.

Requirements for some nutrients (e.g., fluoride and chromium) are thought to be unchanged by lactation. The increase in energy utilization increases the need for some nutrients (e.g., thiamin and niacin). Recommended intakes for other nutrients (e.g., copper, iodine, manganese, biotin, choline, riboflavin, and folate) are increased, based on the amount of the nutrient secreted in milk.

Recommendations for water intake (i.e., from food, beverages, and drinking water) are increased during lactation from 3.0 liters per day during pregnancy to 3.8 liters. (2.7 liters per day is the recommended amount for women who are not pregnant.)

Guidelines for intake, based on Institute of Medicine recommendations and the Dietary Reference Intakes (DRI) are reviewed below

Practical guidelines for overall intake (including recommended portion sizes and several servings) are included in later in this module.

Energy

For lactating women, recommendations for daily energy intake include an increase for breastmilk production (500 calories in the first 6 months, 400 calories after that), and a decrease for weight loss (170 calories in the first six months).

Protein

Although studies have shown that the protein concentration of breastmilk is not affected by protein intake, adequate intake is necessary to promote the conservation of maternal skeletal muscle. A factorial approach was used to determine the RDA for protein during lactation; it was assumed that protein and amino acid requirements increase in proportion to milk production. It is estimated that 1.3 g protein per kg is needed per day

Fat

The essential fatty acids linoleic (18:2 n-6) and alpha-linolenic acid (18:3 n-3) are important components of cell membranes and essential to the formation of new tissue.

Long-chain derivatives of linoleic and alpha-linolenic acids (arachidonic – AA and docosahexaenoic – DHA acids, respectively), are important for neural development.

Carbohydrate

Recommendations for carbohydrate intake increase during lactation, because of increased needs for the production of breastmilk.

Minerals

Calcium

The primary source of calcium in human milk seems to be from maternal bone resorption, and not maternal calcium intake. It is thought that this is a normal, physiologic adaptation and that there are no long-term detrimental effects on maternal bone mass. Thus, the AIs for calcium during lactation are the same as AIs for women who are not lactating.

Iron

Iron needs return to pre-pregnancy levels unless blood loss exceeded the usual amount lost during vaginal delivery (~500 mL). In addition, the gradual disintegration of excess red blood cells releases iron that can be used for the synthesis of new hemoglobin.

Zinc

Requirements for zinc during lactation are increased above pregnancy and nonpregnancy levels.

Vitamins

Vitamin D

Although there is concern about vitamin D-deficient rickets in infants, the literature does not support routine supplementation for all lactating women. However, when sunlight exposure is inadequate, an AI of 5.0 µg (200 IU)/day

is needed. The amount provided by most general vitamin supplements – 10.0 µg – is not excessive.

Vitamin A

To assure adequate body stores of vitamin A, the RDA for vitamin A is increased above that for non-pregnant women.

The upper limit for vitamin A intake for lactating women is the same as for nonpregnant and pregnant women (2800 µg preformed vitamin A per day for 14-18-year-olds, and 3000 µg preformed vitamin A for 19-50-year-olds).

Vitamin B6

There is evidence that low maternal intakes could lead to compromised B6 status in the infant, so an increased intake is suggested for lactating women.

Vitamin B12

As with pregnancy, it is thought that vitamin B12 concentrations in breastmilk are more reflective of the mother's current B12 intake than of B12 stores. The RDA for B12 during lactation is based on pre-pregnancy requirements and the amount of the vitamin secreted in breastmilk.

Vitamin B12 intake of women who are strict vegetarians may be marginal.

Conclusion

Women living under a wide variety of circumstances in the United States and elsewhere are capable of fully nourishing their infants by breastfeeding them. Throughout its deliberations, the subcommittee was impressed by the evidence that mothers can produce the milk of sufficient quantity and quality to support growth and promote the health of infants—even when the mother's supply of nutrients and energy is limited. With few exceptions (identified later in the summary under "Infant Growth and Nutrition"), the full-term exclusively breastfed infant will be well-nourished during the first 4 to 6 months after birth.

In contrast, the lactating woman is vulnerable to depletion of nutrient stores through her milk. Measures should be taken to promote food intake during

lactation that will prevent net maternal losses of nutrients, especially of calcium, magnesium, zinc, folate, and vitamin B6.

Breastfeeding is recommended for all infants in the United States under ordinary circumstances. Exclusive breastfeeding is the preferred method of feeding for normal full-term infants from birth to age 4 to 6 months. Breastfeeding complemented by the appropriate introduction of other foods is recommended for the remainder of the first year, or longer if desired. The subcommittee and advisory committee recognize that it is difficult for some women to follow these recommendations for social or occupational reasons. In these situations, appropriate formula feeding is an acceptable alternative.

In this guide, we have covered all the important facts related to Pregnancy Diet. All the do's and don’ts are explained thoroughly, how much quantity and how to eat, what all products are to be avoided for a healthy baby.


Pregnancy Diet Secrets
TRAINING GUIDE
Discover The Secrets To
Maintain Proper Nutrition For
A Happy And Healthy Pregnancy!