



A Guide to Fertility



Understanding Fertility and Infertility

What Will You Find in This Ebook?

- 🍃 Understanding Fertility
 - Sperm
 - Eggs
 - Uterus, Fallopian Tubes, and Cervix
 - Hormonal Cycle

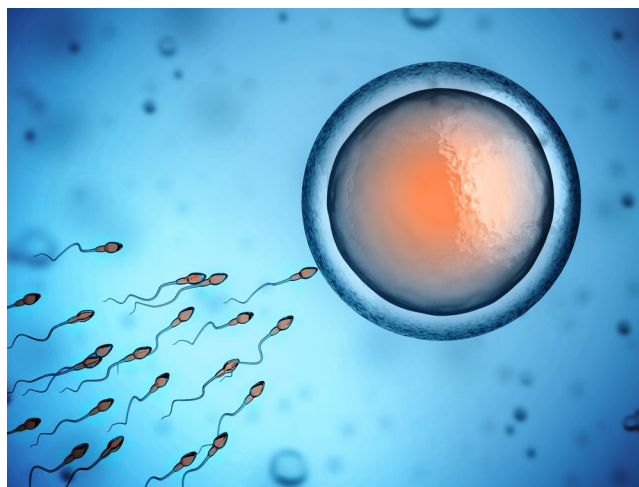
- 🍃 Understanding Infertility
 - What is Infertility?
 - Diagnosis and Treatment
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- 🍃 How Can You Support Your Fertility
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Understanding Fertility

Sperm meets egg. Sperm fertilizes egg.
And a baby is born 9 months later.

It sounds like an easy process, but for people struggling to get pregnant, it can be elusive, stressful and heartbreaking. Oftentimes, there's no easy explanation for why they can't get pregnant, so they struggle and stress without getting any closer to pregnancy. The thing is the path to delivering a healthy full-term baby is a multistep, intricate process. If there is a breakdown in any one of the steps, the final result will not occur.



By understanding each step and removing obstacles, we have the potential to correct the issue, and the likelihood of conception and delivery increases. Let's start by understanding the process!

In a very basic sense, natural fertility requires six basic components:

- 🌿 capable sperm
- 🌿 capable eggs
- 🌿 a location (the fallopian tubes) for the egg and sperm to fertilize to create an embryo
- 🌿 a means to get pregnant (whether this is a functioning penis and vagina for vaginal intercourse, or access to fertility services)
- 🌿 a place (the uterus) for the embryo to implant and grow into a baby
- 🌿 proper hormone signaling

In this first section of the ebook, we'll go through these factors and delve deep into the hormones involved in the menstrual cycle and, thus, fertility. Understanding your cycle is an important first step in understanding your body and how best to support your own fertility.

Sperm

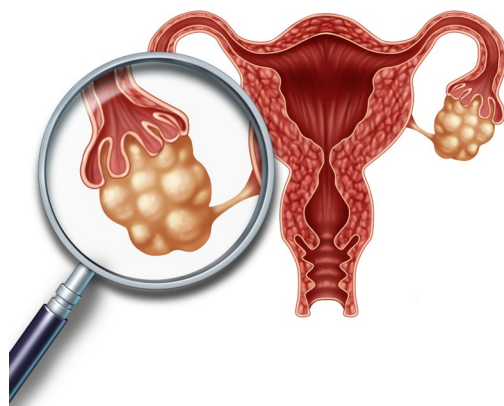
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Sperm production normally begins with puberty and continues until death. The characteristics of sperm that affect fertility are:

- 🌿 total volume of sperm
- 🌿 concentration of sperm
- 🌿 number of motile (swimming) sperm
- 🌿 shape of the sperm

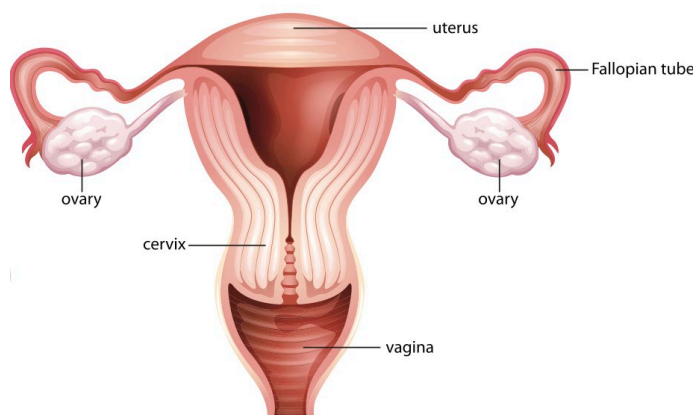
Eggs

Unlike sperm production, a person with ovaries is born with all the eggs they will ever have. At birth, they have one to two million egg cells, and by puberty approximately 300,000 remain. The number of eggs decreases with time until there are no eggs left. Ultimately, only about 400 egg cells will mature and be released into the fallopian tubes for potential fertilization. The rest are reabsorbed by the body, and this is one reason why making babies later in life can be a challenge. By the time we're 40, those eggs are over 40 years old and declining in number quite rapidly.



Egg quantity and egg quality are both critical factors.

- 🌿 “Egg quantity” (also known as the ovarian reserve) is the number of eggs that a person has.
- 🌿 “Egg quality” refers to whether eggs have the normal number of chromosomes. Egg quality is closely related to patient age.



Uterus, Fallopian Tubes, and Cervix

The uterus is an organ with two layers. There is a muscular layer (“myometrium”) that can change size and shape when a person is pregnant. And there is an inner layer (“endometrium”) that builds up every month and is released during a person’s period. The cervix is the opening of the uterus, and the fallopian tubes connect on each side of the upper uterus.

In a fertile person, the eggs are released monthly by a cycle of events involving the ovaries, hormones, and the uterus. If the person doesn’t conceive, they have a period. This is called the menstrual cycle.

A Way to Get Pregnant

For fertilization to occur naturally for heterosexual couples, vaginal intercourse is needed. The penis needs to ejaculate sperm and the vagina must be able to receive the sperm, although fertility specialists can now sometimes overcome problems in these areas. Same-sex couples and those couples who are unable to have vaginal intercourse need access to fertility services.

Hormones and Your Cycle

To really understand the menstrual cycle (and fertility), it’s helpful to make sense of the roles of the hormones. Hormones are responsible for the cycle phases. The following are the “big four” (but not the only) hormones of the menstrual cycle:

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Estrogen: For females, estrogen is the hormone largely responsible for the physical changes that happen in puberty. Estrogen comes mainly from the ovaries, but smaller amounts are also produced in the adrenal glands and fat tissue. Estrogen is responsible for growing and maturing the uterine lining (the lining that is shed during menstruation). It also causes an egg to mature before ovulation. Levels of estrogen are highest in the first half of the menstrual cycle. Estrogen also has many effects on the other parts of the body including the brain, bones, breasts, heart, and skin.

Progesterone: This hormone balances the effects of estrogen in the body. It is generally considered to have a calming influence. It increases feelings of emotional and physical well-being. Progesterone is produced after ovulation by the corpus luteum (the tissue that the egg came from) and controls the buildup of the uterine lining. Progesterone also maintains the uterine lining if a pregnancy does occur. Progesterone influences sleep, appetite, breast tissue, and bone strength. Progesterone levels are highest during the second half of the cycle. If pregnancy doesn't occur, levels fall and the lining of the uterus is shed as a period.

Follicle Stimulating Hormone (FSH): This hormone is released from the pituitary gland in the brain. Its main role is to stimulate the ovarian follicles to prepare for ovulation.

Luteinizing Hormone (LH): LH comes from the pituitary gland and is the hormone that causes the mature ovarian follicle to rupture and release an egg. This is ovulation!

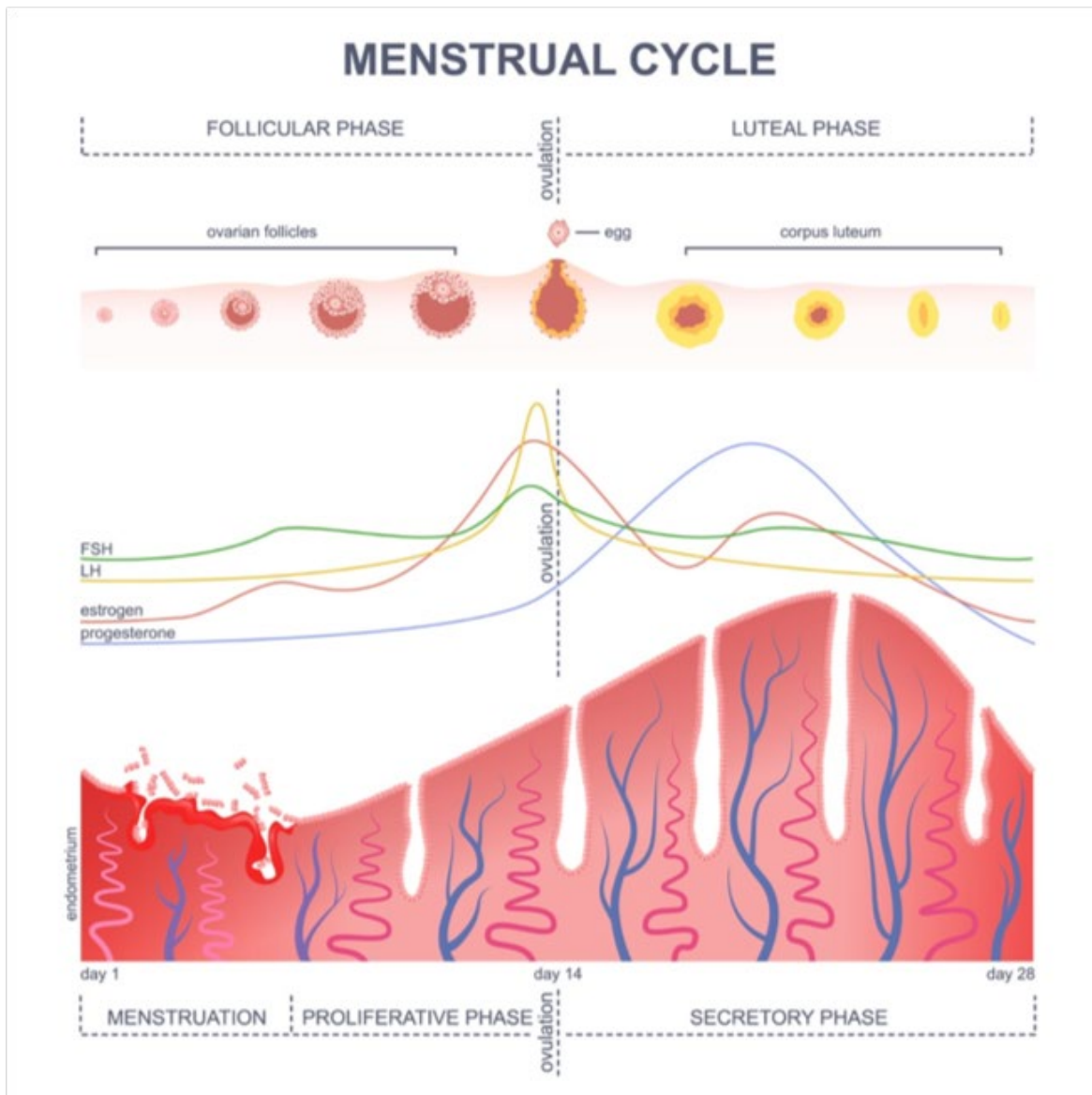
Menstruation and the Follicular Phase

The follicular phase of the cycle begins with the first full day of menstrual flow (day 1 of the cycle). At the start of this phase, levels of both estrogen and progesterone are low. These low levels of estrogen and progesterone tell the brain to release follicle stimulating hormone (FSH).

During the follicular phase, a few key things are happening:

1. 5 or 6 ovarian follicles are starting to mature
2. A dominant follicle emerges in preparation for ovulation (the release of an egg by an ovary). This process is triggered by low levels of estrogen and progesterone that signal the release of FSH.
3. A healthy uterine lining (endometrium) is beginning to build up to support a possible pregnancy.

This part of the ovarian cycle is the proliferative phase of the uterine cycle. Cervical mucus and vaginal discharge are minimal at the beginning of this phase, but will soon appear as creamy, whitish in color, and tacky to the touch.



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Ovulation

Ovulation (the release of an egg by an ovarian follicle) typically happens around day 12-14 of the cycle. It is triggered by a high level of estrogen and a sharp rise in luteinizing hormone (LH). LH is the signal that pushes the egg out of the follicle. Once the egg leaves, the follicle becomes a corpus luteum, and the luteal phase of the cycle begins. When it leaves the ovary, the egg will travel to a fallopian tube. This is often where fertilization occurs.

Ovulation usually happens 14 days before the beginning of the next period. It is the time during the cycle that fertilization of an egg is most likely to occur. An ovulating person's "fertile window" is considered to be the day of ovulation, the 5 days preceding it, and a few days after. This is because sperm can live for 5 days once they're in the vagina, cervix, or uterus. Cervical mucus is clear, thin, and stretchy (sometimes described as egg white consistency) at this time in the cycle in order to help sperm in their mission to fertilize an egg.

Luteal Phase (Secretory Phase of the Uterine Cycle)

The luteal phase is named for the corpus luteum, which is what's left behind after ovulation. The corpus luteum secretes the hormone progesterone, halting the production of FSH. The uterine lining continues to thicken to prepare for a pregnancy. The lining secretes proteins to support and nourish the potential fertilized egg. Progesterone also signals breast tissue to prepare to produce milk. This is why some people feel breast tenderness during this part of the cycle and before menstruation occurs. Cervical mucus thickens with the high levels of progesterone at this point in the cycle. Vaginal discharge will noticeably lessen.

Progesterone causes basal body temperature (early morning temperature, before getting out of bed) to rise after ovulation occurs. For folks tracking fertility, this rise is an indicator that ovulation occurred 12-24 hours earlier.

If fertilization and implantation didn't happen, LH and FSH levels quickly fall. The corpus luteum also breaks down and estrogen and progesterone levels decrease. Low levels of estrogen and progesterone levels trigger the shedding of the uterine lining, and we're back to day 1 with a period!

If pregnancy occurs, the placenta takes over the production of progesterone by secreting an ever-increasing supply. Progesterone is essential for the survival of the fertilized egg and the fetus throughout gestation.

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What is Infertility?

Infertility is a medical condition where the ability to conceive (become pregnant) and then give birth to a child is limited or impaired in some way. While infertility can be socially isolating, it is very common. Infertility affects an estimated 1 in 7 couples. Recent data from the CDC report that 7.3 million women in the United States, or 12% of all reproductive age women aged 15-44, used some type of fertility service from 2011 to 2015. There is an even higher number of people who experience infertility, because some people don't seek help.



Infertility is often defined as the failure to conceive after one year. This is the definition because 85% of couples attempting to conceive will do so within one year, and only an additional 7% will successfully conceive in the year following. This metric is helpful in providing a general rule for when most couples should seek fertility services. However, there are important exceptions to this rule,

which will be addressed here.

This definition leaves out many patients seeking fertility treatment, including single individuals wanting to become parents, same-sex couples, and patients who suffer from recurrent miscarriages even though they get pregnant easily. Plus, some patients may not want to get pregnant right away but rather want to get testing or treatment for fertility preservation. This means that the patient wants to get pregnant later in life, or they are going to have a medical or surgical treatment that could make it harder to get pregnant later.

Infertility has many causes. Some patients might be fertile in one sense but suffer from infertility in another sense. For example, a person may have normal eggs but not have a uterus ("uterine factor") or functional fallopian tubes ("tubal factor"). A partner may suffer from performance anxiety during intercourse, have problems with their sperm, or consistently be away during peak fertility of their partner's menstrual cycle. Or, an individual may not have a male partner at all (all are "male factor"). Some patients can become pregnant easily, but then consistently lose those pregnancies early in the first trimester ("recurrent pregnancy loss").

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Other reasons for infertility include:

- 🌿 problems related to ovaries, ovulation, or eggs, including a lack of eggs (“primary ovarian insufficiency”)
- 🌿 abnormal menstrual cycles and excess of androgens (“polycystic ovary syndrome”)
- 🌿 a lack of periods due to lack of hormone release from the brain (“hypothalamic amenorrhea”)

Sometimes, there is no clear reason. When there is no obvious reason for infertility, the term “unexplained infertility” is used. This happens about 15% of the time.



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Diagnosis and Treatment of Infertility

Sperm

If there is a male partner, a **semen analysis** will be done to look at several components of the sperm. Semen analysis is not a perfect test, and there is a very large range of what is considered normal. However, given that male factor is a major contributor to the failure to conceive (present in 40% of heterosexual infertile couples), semen analysis is one of the first tests of infertility.

If the semen analysis is abnormal, it is often repeated to confirm the abnormal finding. If confirmed, the patient meets with a reproductive urologist. At this point, options are discussed including lifestyle changes, medications, and surgery. If these options to improve sperm quantity/quality are not available, feasible, or successful, **intrauterine insemination ("IUI")** and **in vitro fertilization ("IVF")** may be offered. IUI and IVF may also be offered if the patient does not have a male partner. A *sperm donor* can be used with IUI or IVF if a patient has very poor sperm quantity and/or quality. A sperm donor would also be used for patients who do not have a partner with testes.

IUI is a half-day process. Semen is collected from the male patient and then washed and prepared in the lab. Later that day, their female partner undergoes a pelvic exam in the office (like a pap smear) where a thin tube is passed through the cervix. The sperm is pushed through the tube into the inside of uterus. This brings the sperm closer to the fallopian tubes and ovaries, increasing the chance of pregnancy.

IVF is a roughly month-long process. In IVF, the female partner's eggs are stimulated using special medications called *gonadotropins* and monitored closely with ultrasound. During this time, ovulation is prevented until the eggs are ready to be collected. Once ready, eggs are collected using a needle attached to an ultrasound probe placed in the vagina. The patient is asleep during this procedure. Then the eggs are fertilized in the lab to make embryos. The resulting embryos are transferred directly to the uterus through a tube. The process is similar to IUI, except the embryo, not sperm, is put into the uterus.

Eggs

As patients age, both the quality and quantity of eggs go down. This starts off gradually but then drops off dramatically as one approaches age 40. For this reason, many clinics recommend a test called PGS (preimplantation genetic screening) for patients over the age of 37 who are undergoing IVF. In PGS, embryos are biopsied and checked to see if they have the correct number of chromosomes.

Patients with lower egg quality or quantity are often “fast tracked” to IVF treatment, as it has the best chance for success, especially when there is concern for rapidly diminishing fertility. For patients with advanced age or very poor egg quantity and egg quality, or for patients who lack ovaries or a partner with ovaries, an *egg donor* can be used in IVF.

Another condition that can have an effect on the ovaries is **endometriosis**. Endometriosis occurs when the uterine lining (called endometrium) moves outside of the uterus. It is very common, affecting an estimated 10% of reproductive aged women. Diagnosis and treatment of endometriosis often requires surgery. It is a complex disease and treatment will depend on how severe it is and what the patient’s goals are.

Hormones

In order for eggs to mature and for **ovulation** (the release of the egg from the ovary) to happen, special hormone centers in the brain send messages to the ovaries. These centers are known as the hypothalamus and pituitary gland.

If you are having trouble getting pregnant, your doctor will want to hear about your complete menstrual history in order to see if the hormonal process is happening normally.

A person may have good egg quantity and quality but still be infertile if ovulation is not taking place. Without ovulation, an egg cannot be found and fertilized by a sperm. This is what happens for most PCOS (“polycystic ovary syndrome”) patients. People with PCOS have plenty of eggs but are not able to get pregnant because they do not have consistent ovulation. In this case, medications can help. The most common medications are *clomiphene citrate* (Clomid) and *letrozole* (Femara). These medications act in different ways to do the same thing. Both methods stimulate the release of *follicle-stimulating hormone*, or FSH. These medications can also be given with IUI or IVF, though this is not required.

Tubes

If both fallopian tubes are blocked or missing, an egg cannot be fertilized by sperm or move into the uterus. **Tubal blockage** (also called occlusion) can be caused by pelvic infections (usually chlamydia or gonorrhea) or any other severe pelvic inflammation (such as a history of appendicitis or endometriosis).

One of the first tests done for infertility is an **HSG (hysterosalpingogram)**. In an HSG, contrast dye is injected into the uterus and X-rays are taken. If there is a blockage, no dye will be seen spilling out the end of the fallopian tube. HSG is also able to detect other problems, including some polyps and fibroids that change the shape of the uterus.

A person can still get pregnant if there is one tube that is working normally. Depending on what is wrong with the tubes, surgery may be offered to some patients to fix the tube. For patients who have had a tubal sterilization procedure (tubal ligation, or getting one's "tubes tied") in the past but now desire to have a baby, reversal surgery is sometimes possible. If surgery is not available or recommended, IVF is required to get pregnant.

Uterus

A simple pelvic ultrasound can detect many common problems with the uterus that can lead to infertility.

One common cause of infertility is having a type of growth in the myometrium known as **fibroids**. Fibroids can affect fertility by changing the shape of the uterus. This can stop a fertilized egg from attaching to the wall of the uterus. Fibroids also can cause a miscarriage. Surgical removal of fibroids is called myomectomy. Myomectomy is often done in a minimally invasive procedure. It can be done either by instruments passed through tiny incisions in the abdomen (laparoscopy) or through the vagina and cervix (hysteroscopy). Sometimes the surgery is done through large abdominal incisions (laparotomy). The type of surgery is based on the location, size, and number of the fibroids. Not all fibroids need to be removed, and not all fibroids cause infertility.

The endometrial layer of the uterus can also be the site of growths known as endometrial **polyps**. Polyps can prevent a fertilized egg from attaching to the wall of the uterus. Polyps are removed through a hysteroscopic procedure (through the vagina and cervix).

The uterus can have other structural problems, including an irregular shape. Or, the uterus might have a uterine septum, a band of tissue that divides the inside of the cavity in two. These problems can often, but not always, be corrected surgically. Several causes of “unexplained infertility” are probably due to problems with the uterus.

Another potential cause of unexplained infertility is a problem with the cervix. Both IUI or IVF can help in this case.

Some people are born without a uterus. Some people have their uterus removed during emergencies such as severe hemorrhage, for early stage cancer, or because they are born with a deformed uterus. For these patients with “**absolute uterine factor**” infertility, the only options to have a genetically related child is to use a gestational carrier (which is not legal in many countries and states) or receive a uterus transplant. Uterus transplant is experimental, but there have been over a dozen babies born worldwide. There are at least three active ongoing research trials in United States.

When to Seek Help with Fertility

Heterosexual couples who have vaginal intercourse on a regular basis should talk to a doctor if they don't get pregnant after 1 year. If the female partner doesn't have a normal uterus or regular periods, they should seek fertility services as soon as possible. In addition, they should seek care as soon as possible if:

- 🍃 the female partner has had pelvic infections
- 🍃 if either person has had sexually transmitted diseases
- 🍃 if the female partner has had uterine polyps or fibroids
- 🍃 if either person has had problems with infertility in the past with previous partners, or
- 🍃 if the female partner is over 40 years old

If the female partner is 35 years old or older, they should seek fertility services after 6 months of trying to conceive instead of 1 year.



Same-sex couples should talk to a doctor as soon as possible.

People with recurrent pregnancy loss should talk to a doctor about fertility testing after having 2 miscarriages.

If a person wants to freeze their eggs to delay childbearing, they should talk to a doctor about it as soon as possible. It's best to do it

before the age of 35, because as a person gets older their egg quality and quantity go down. Once eggs are frozen, they can be stored almost indefinitely. The egg freezing procedure takes at least 2-3 weeks.

People with cancer who want to have a baby in the future should talk to a doctor about this before starting chemotherapy or any surgery that may harm the reproductive system. The preferred method of fertility preservation is freezing of embryos or eggs. However, these

methods require advance planning and weeks of treatment, which may not be feasible or realistic for many patients.

The most important step is learning as much as you can about your own fertility. We recommend you seek consultation with a fertility specialist if you have any questions or concerns.

How Can You Support Your Fertility

Learn Your Cycle

One of the best ways to understand your cycle is to track it over time. There are many ways to do this. You can mark your period on a calendar or a menstrual chart. There are also many menstrual and fertility tracker apps. Cycle tracking can be as simple as noting the days of your period. You may also want to note:

- 🍃 type of flow (spotting, light, heavy)
- 🍃 feelings and moods
- 🍃 physical symptoms
- 🍃 cervical mucus
- 🍃 motivation levels
- 🍃 basal body temperature
- 🍃 moon phases

The more detailed your charting is, the more you will understand your cycle and its effect on your daily life.

Once you start to get to know your cycle, there are some messages to pay attention to. Your body may be trying to tell you something if you notice any of the following:

- 🍃 Bleeding that lasts longer than 7 days
- 🍃 A cycle longer than 35 days or shorter than 21 days

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- 🌿 Bleeding that is heavier or lighter than usual (some variation may be normal)
- 🌿 Missing more than 3 periods in a row (irregular cycles can be normal during puberty and in perimenopause)
- 🌿 Severe cramps with your period that cause you to miss out on things you'd normally do
- 🌿 Bleeding in between periods or after sex

These symptoms can be caused by stress or illness, hormone imbalances, anovulatory cycles (a cycle where an egg isn't released), weight gain or loss (which are sometimes the cause of anovulatory cycles), abnormalities in your uterus, among other things. These things can be explored and addressed by a health care provider if you notice them occurring through your cycle tracking.

Lubricate!

To allow for the sperm to meet the egg appropriate lubrication is necessary. Sperm needs an alkaline environment in which to survive. Both partners should look to consume an alkaline promoting diet (avoiding coffee, soda, energy drinks, meat, and white flour).

Avoid using saliva as a lubricant during sex as it may harm sperm. The lubricant Pre-Seed™ is widely recommended by fertility specialists. Other lubricants may not have the proper pH and viscosity and may contain additives that hinder conception.

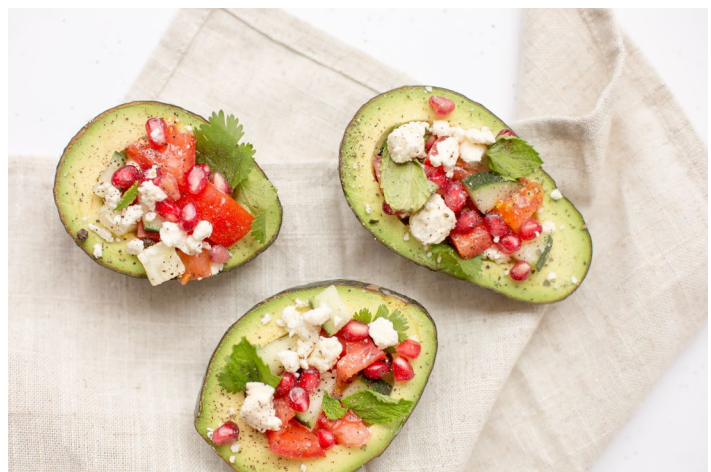
Avoid using soaps around the time of intercourse, as soap residue can damage sperm. Increase water and electrolyte consumption to a minimum of 64 oz of water daily.

Fertility Superfoods to Eat

Plant-based Fats

Avocados, nuts, olive oil, and grapeseed oil are good plant-based fats.

- 🌿 They can reduce the inflammation in the body. Keeping inflammation controlled helps promote regular ovulation and general fertility.



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- Remember that sex hormones, eggs, sperm and fetal brain development are reliant on quality fats so pre-conception and pregnancy are not the times to be fat-free.
- Good fats may help women who truly struggle with infertility. According to Alissa Vitti, integrative nutrition expert and author of *Woman Code: Perfect Your Cycle, Amplify Your Fertility, Supercharge Your Sex Drive, and Become a Power Source* (2013), "Studies have shown that consuming a certain quantity of monounsaturated fats in the form of avocados during the IVF cycle increased the success rate by three and a half times, as opposed to women who don't eat good plant-based fats during that period." ¹
- Walnuts may be particularly beneficial for men. Researchers from UCLA in California found that men who ate a couple of handfuls of walnuts (75gms) a day saw improvements in their semen quality. They found improvements in sperm motility and morphology and the suggestion is that it is because walnuts are a rich source of the Omega-3 ALA (alpha-linolenic acid).

Plant-based Proteins

- Quinoa, beans, nuts, seeds, and other legumes, such as lentils and chickpeas are great sources of plant-based protein.
- It is best to avoid soy in a fertility-focused diet because of the effects it may have on estrogen.

Salmon

One of the richest sources of anti-inflammatory omega 3 fatty acids, WILD salmon is high in protein, selenium and B vitamins (especially B₁₂).

- Always choose fresh, wild Sockeye or Alaskan Salmon. For a calcium bonus, you can cook your salmon and make a pureed pate with the bones!

¹ <https://www.parents.com/getting-pregnant/fertility/what-to-eat-to-get-pregnant/>

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- 🌿 Couples who eat 2-3 servings of low-mercury seafood weekly are more likely to get pregnant and have a healthy pregnancy sooner than those who do not.²

Fresh, Vitamin C-rich Foods

Vitamin C is known to enhance and support fertility and reproductive health in both men and women!³

- 🌿 Vitamin C improves sperm quality, sperm motility and protects sperm from DNA damage. Better sperm quality helps to reduce the chance of miscarriage and chromosomal defects.
- 🌿 In women, Vitamin C plays a critical role in ovulation and supports the health of the follicle membrane; basically, Vitamin C is needed for healthy eggs and healthy ovulation.
- 🌿 Women who get enough Vitamin C also show increased levels of progesterone, less heavy menstrual bleeding, and enhanced immunity. Once pregnant, vitamin C also seems to protect against preeclampsia, premature rupture of the membranes and birth defects in the growing fetus.

² <https://academic.oup.com/jcem/advance-article-abstract/doi/10.1210/jc.2018-00385/5001729?redirectedFrom=fulltext>

³ <https://natural-fertility-info.com/vitamin-c-to-improve-fertility.html>

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Food's rich in vitamin C should be eaten raw for best benefit. Some favorites:

Papaya, bell pepper, broccoli, brussels sprouts, kiwi, tomatoes, citrus, mustard greens, parsley, persimmons, strawberries, cauliflower, kale, elderberries, spinach, red cabbage, and potatoes.⁴

Lentils, Beans and Leafy Greens

These are rich in folate. Folate affects ovarian function, implantation, embryogenesis and the entire process of pregnancy. It is also implicated in neural tube defects and recurrent spontaneous abortions.⁵ Getting your fill of folate-rich foods like lentils, beans, and greens⁶ will help prevent certain birth defects, support healthy sperm and healthy eggs and a healthy pregnancy. Leafy greens like spinach, beet and turnip greens are also high in iron which helps build a good endometrial lining.



Cruciferous Vegetables

Broccoli, kale, cabbage, cauliflower, brussels sprouts

- 🌱 Contain a phytonutrient called DIM which helps with estrogen metabolism and helps prevent fibroids and endometriosis.
- 🌱 Are rich sources of folate – the benefits of which are mentioned above!
- 🌱 Should be COOKED to reduce goitrogens. Goitrogens negatively impact thyroid function (and we want a healthy thyroid so we can have a healthy pregnancy).

⁴ <http://www.whfoods.com/genpage.php?tname=nutrient&dbid=109>

⁵ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4175124/>

⁶ <http://www.whfoods.com/genpage.php?tname=nutrient&dbid=63>