

INFERTILITY

Infertility is a condition that prevents natural reproduction. It can be caused by hormonal, anatomic, or pathologic conditions affecting the reproductive tract of men and women. Infertility can be diagnosed when a couple fails to conceive after 12 months of regular, unprotected sexual intercourse. It can also be diagnosed if a woman has been able to get pregnant but unable to carry a fetus to term.

The underlying cause of infertility is 30% due to the male, 30% due to the female, and 30% combined or unknown. Infertility affects about 10-15% of people in the United States.

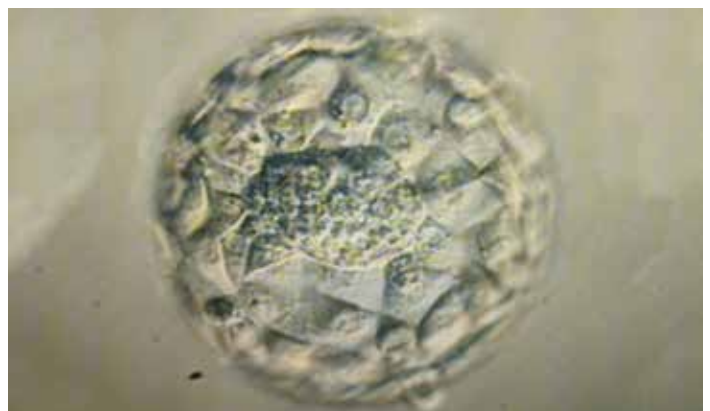
To learn more go to www.ascp.org/patients.

UNDER THE MICROSCOPE

This is a picture of an embryo that has developed for five days, called a blastocyst. Someone undergoing IVF will have the embryo transferred either after 3 days or five days of development. During the blastocyst stage, the embryo can be biopsied for genetic testing.

WHEN TO SEE A DOCTOR

- Infertility is a problem of couples, and should be considered for evaluation if you have been actively trying to conceive for 12 months.
- As soon as infertility is suspected, either partner can contact a physician to initialize a workup. Infertility physicians practice in a number of environments: in specialized assisted reproductive clinics (some are associated with IVF programs), or within gynecology or urology hospital departments, or private practice.
- For men and women who desire fertility: prospective sperm, egg, or embryo banking can occur before toxic (chemotherapy for cancer) or surgical treatments that may lead to a decline in fertility.



WORKUP OF INFERTILITY

Medical History: Infertility diagnosis starts with a complete medical history of both male and female partners by a skilled physician, including previous attempts to conceive, menstrual history, co-existing disorders, prior surgeries or treatments. Hormonal factors such as polycystic ovary syndrome, or anovulation (common in severely underweight women) may require specific therapies. Toxin exposures, or anabolic steroid use for bodybuilding may impair normal sperm production in men. These are just a few examples of causes of infertility that can be elicited in an interview..

Initial Physical and General Examination: This is a general requirement, intended to discover specific anatomic changes that can alter fertility (undescended testes, cervical outlet obstruction), assess body changes of normal sex hormone production, and rule out a seemingly unrelated illness that may impact fertility.

For women, a pelvic exam and/or pelvic ultrasound may be performed to see internal structures. Biopsy of the uterine lining, to confirm an appropriate degree of hormonal responsiveness and rule out uterine infections, may be performed.

Laboratory analysis of semen from the male partner is performed to measure sperm abundance, microscopic structure, and motility.

Semen Analysis: This is used to diagnosed infertility in men. Typical sperm count is around 15 million sperm per milliliter of semen; typical movement/motility is that 50% of sperm should be active; typical shape/morphology is that at least 4% of sperm is normally shaped.

Blood Tests Overview: Blood tests in men and women are performed to assess hormonal integrity of the neuro-gonadal axis, rule out interfering diseases of the thyroid and other endocrine organs, and assess ovarian and testicular function. Expected normal ranges for each test are provided by the actual performing laboratory, in accordance with methods and standardization in place at that specific facility. The ordering physician will have access to that information, and can help you interpret the results. Do not expect that the exact numbers you read online applies to your particular results.

LABORATORY TESTS RELATED TO INFERTILITY- WOMEN

**Please note that reference ranges are set by individual laboratories for their specific populations and vary accordingly. Therefore, discussion of your specific testing results with your healthcare provider is recommended.*

Neuro-endocrine stimulation of the ovaries is mediated by hormones produced in the pituitary gland of the brain, which act directly upon the gonads. This includes LH, FSH, and Prolactin. Other hormones produced directly by the ovary, such

as estradiol and progesterone, act upon the uterine lining (endometrium) to cycle and prepare the endometrium for implantation of an embryo. Aside from these dynamically changing hormonal levels that vary with the menstrual cycle, the extent of ovarian oocyte reserve can be estimated by levels the hormone Antimullerian Hormone (AMH) which is produced by ovarian cells adjacent to eggs.

Luteinizing Hormone (LH): This test measures the health of a woman's ovaries by measuring the amount of LH in the blood. This test is important because it may indicate an issue with the production of LH, which is related to fertility. This test also indicates which phase of the menstrual cycle a women is in, indicating when she is ovulating. A typical reference range* for women is between 1.68-15 IU/L during the mid-cycle peak, around 21.9-56.6 IU/L during the middle of the cycle (ovulation) and 0.61-16.3 IU/L during the end of the cycle, the luteal phase.

Follicle-Stimulating Hormone (FSH): This test also measures the health of a woman's ovaries, as well as measuring the amount of FSH in the blood. This test is important because FSH regulates the reproductive processes. A typical reference range* for menstruating women is between 4.7-21.5 mIU/mL.

Prolactin (PRL): This test measures the levels of Prolactin in the blood, which is a hormone that stimulates breast development and milk production in women. This test is important because high levels of prolactin in non-pregnant women can help indicate infertility-related conditions in women. A typical reference range* for non-pregnant women is between 2-29 ng/ml; a typical reference range* for pregnant women is between 10-209 ng/ml.

Estradiol (E2): This test measures the levels of estradiol levels, which is one type of estrogen. This test is important because a hormonal imbalance of estrogen can indicate fertility or pregnancy issues. A typical reference range* for menstruating women is between 15-350 pg/mL. However, the levels can vary widely through the menstrual cycle. During the follicular phase, the typical reference range* is between 19-140 pg/ml; just prior to ovulation, the typical reference range* is between 110-410 pg/ml; during the end of the cycle, the luteal phase, the typical reference range* is between 19-160 pg/ml. During pregnancy, the estradiol levels will continue to increase until the fetus is mature.

Progesterone: This test measures the level of progesterone in your blood, which is produced in the ovaries. This test is important because progesterone is needed for a healthy menstrual cycle and to maintain pregnancy. A typical reference range* for women in the middle of their menstrual cycle is between 5-20 ng/mL. For pregnant women, a typical reference range* during the first semester is between 11.2-90 ng/mL; a typical reference range* during the second semester is between 25.6-89.4 ng/mL; a typical reference range* during the third semester is between 48.4-42.5 ng/mL.

Anti-Mullerian Hormone (AMH): This test measures the level of AMH in your blood, which is also produced by the ovaries. This test is important because it supports the female's eggs prior to fertilization. A typical reference range* for fertile women is between 1.0-4.0 ng/mL. Levels below 1.0 ng/mL is considered low and indicates a diminished reserve of eggs.

Thyroid Stimulating Hormone (TSH): This test measures the TSH levels in your blood, which stimulates the metabolism of almost all tissue in your body. This test is important because low TSH levels can indicate issues with fertility. A typical reference range* for women is between 0.4-4.0 mu/L.

Testosterone: This test measures the level of testosterone in your blood, which is a critical part of both female and male fertility. This test is important because high testosterone levels in women can indicate a potential fertility issue. A typical reference range* for women is between 15-70 ng/dL.

LABORATORY TESTS RELATED TO INFERTILITY- MEN

**Please note that reference ranges are set by individual laboratories for their specific populations and vary accordingly. Therefore, discussion of your specific testing results with your healthcare provider is recommended.*

Free and Total Testosterone: This test measures the levels of testosterone. This test is important because abnormal levels can indicate infertility. A typical reference range* for men is between 270-1070 ng/dL. The average level is 679 ng/dL, with testosterone levels peaking for men around 20 years of age.

Luteinizing Hormone (LH): This test measures the health of a men's testicles. This test is important because it may indicate a pituitary gland problem, meaning that it may not produce enough LH, which can lead to low level of testosterone. A typical reference range* for men is between 1.24-7.8 IU/L.

Follicle-Stimulating Hormone (FSH): This test also measures the health of testicles and the pituitary function. It is, therefore, often conducted with a LH test. This test is important because it may indicate a pituitary gland problem, meaning that it may not produce enough FSH, which can lead to low level of testosterone. A typical reference range* in adult men is 1.5-12.4 mIU/mL.

Prolactin (PRL): This test measures how much prolactin is present in the blood. This test is important because it could indicate pituitary gland issues that can cause fertility issues. A typical reference range* in adult men is between 2-29 ng/mL.

Sex Hormone Binding Globulin (SHBG): This test measures the level of SHBG in your blood, which is a protein made by the liver. SHBG binds three sex hormones: estrogen, dihydrotestosterone (DHT), and testosterone. This test is important because SHBG controls the amount of testosterone that tissue in your body can use and is used in the evaluation of low testosterone in men. A typical reference range* in adult men is between 10-57 nmol/L.

EVALUATION OF AN ONGOING PREGNANCY

Once pregnancy is suspected the woman should consult with an obstetrician to confirm the pregnancy itself, initiate a specialized management plan tailored to her needs, and undertake routine prenatal care. Physical examination, fetal imaging by ultrasound, in addition to blood tests and other tests may be part of the plan.

Human Chorionic Gonadotropin (HCG)/Pregnancy Test: This test measures the amount of HCG in your blood, which indicates if you are pregnant. HCG is produced by cells in the placenta, indicating if you are pregnant and if the pregnancy is advancing accordingly. For negative pregnancy tests, the HCG level is less than 5.0mIU/mL; a HCG level between 6- 24 mIU/mL is indeterminate of pregnancy; a level above 25 mIU/mL is positive for pregnancy. In the beginning of pregnancy, the HCG levels typically double every 72 hours for the first 8-11 weeks. After that, the HCG levels will level off for the remainder of the pregnancy.

Preimplantation Genetic Screening (PGS): This test, only available for embryos created outside the body (in vitro fertilization, "test tube baby") analyzes cells from the embryo for chromosomal or genetic abnormalities. This test is usually conducted after the fertilized egg has developed for 5-6 days and is in the blastocyst stage (see picture above).

Postimplantation Genetic Screening: For common genetic disorders can be done as a blood test (Quad hormonal screen, high sensitivity sequencing of fetal DNA circulating in the mothers blood), or in a fetal sample collected during amniocentesis. Find the cause of abnormal levels of calcium in the blood, which can lead to chronic kidney disease. A typical reference range for adults is between 10-65 pg/mL.

For more information and to get involved:
www.ascp.org/patients

 Champions@ascp.org

 [@ASCPPatientChampions](https://www.instagram.com/ASCPPatientChampions)

 [/ASCPPatientChampions](https://www.facebook.com/ASCPPatientChampions)

 [#TheLabSavedMyLife](https://www.tiktok.com/tag/TheLabSavedMyLife)

MEET EMILY, NATHAN, ELLA AND EVIE



Emily always knew she wanted to be a mother. Yet, after three years of trying, Emily was still not pregnant. When they decided to try IVF, the laboratory was integral as it was necessary to monitor Emily's hormone levels every two days. Waiting to see if the implantation would be a success was one of the toughest and most exciting parts of the IVF process, Emily says, but the wait was worth it when she found out she was pregnant with twin girls. Emily's pregnancy was closely monitored through additional lab tests. Her daughters, Ella and Evie, were born prematurely, at 24 weeks and six days. The twins were admitted into the NICU and during their 107-day stay the laboratory played a critical role in monitoring Ella and Evie's development, checking their hemoglobin and oxygen levels. The lab tests supported the girls' medical team in ensuring the twins received everything they needed to become strong and healthy.

Today, Ella and Evie are happy, healthy and thriving, and Emily and Nate are thrilled with their family. Looking back on all they endured, Emily advises others experiencing infertility to "not let a diagnosis get in the way of your dreams. Explore your options and consider them as seriously as your desire to make your ideal outcome happen."

ASK YOUR DOCTOR

- What are the first tests, step, and appointments?
- What is your success rate for IVF?
- What tests are we running to monitor my chances?
- Can I request a specific phlebotomist (the person drawing your blood) if I have a favorite one?
- Do you offer genetic testing for my partner, my donor, my embryo?
- How often do you test during stimulation?

"The lab is the foundation of your diagnosis. They are the magic behind the scenes and if it wasn't for the lab, my girls wouldn't be here."

To learn more and to watch a video about Emily's journey, go to www.ascp.org/patients.

For more information and to get involved:
www.ascp.org/patients

 @ASCPPatientChampions

 /ASCPPatientChampions

 Champions@ascp.org