

Estradiol (E2)

MDL Test Number: 611

Methodology: Immunoassay

CPT Codes: 82670 x 1



Specimen Collection Platform:

Serum in Serum Separator Tube (SST)

Turnaround Time:

24 - 72 hours

Stability:

Room temperature

Test Additions*:

30 days to add tests

Specimen Collection:



1. Immediately after blood collection, invert the tube(s) gently 5 times to ensure mixing of clot activator.



2. Allow the tube to rest upright for at least 30 minutes after collection to ensure proper clotting.



3. Centrifuge for at least 15 minutes at 2200-2500 rpm within one hour of collection.



4. Do not remove the stopper or pour off serum.



What is Estradiol (E2)?

Estradiol, often shortened to E2, is the main form of estrogen, the hormone most responsible for female reproductive health. The ovaries make most of it. Smaller amounts come from the adrenal glands (small glands that sit on top of the kidneys), from body fat,

and from the placenta during pregnancy

Estradiol levels are not steady. They rise and fall in a repeating pattern across the menstrual cycle, working together with two hormones from the pituitary gland (LH and FSH) to control the release of an egg each month. Levels are highest during the reproductive years and peak just before an egg is released. After menopause, the ovaries slow down, and estradiol drops to a much lower level. Because the amount changes so much from week to week, the same number can be perfectly normal at one point in the cycle and unexpected at another. That is why estradiol results are reported by cycle phase rather than as a single normal value.

Why test for Estradiol (E2)?

A healthcare provider may order an estradiol test to see how well the ovaries are working and to better understand a patient's reproductive health. Common reasons include:

- **Finding out where a patient is in her menstrual cycle** (usually tested along with LH and FSH)
- **Looking into periods that are irregular, have stopped, or never started**
- **Evaluating difficulty getting pregnant**, and tracking how eggs are developing during fertility treatments such as in vitro fertilization (IVF)
- **Watching for ovarian hyperstimulation**, a possible complication of fertility treatment in which the ovaries overreact to medication
- **Understanding where a patient is in the transition to menopause**
- **Checking how well estrogen replacement therapy is working**



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Special Instructions:

- **Biotin supplements:** Biotin (vitamin B7) is found in many over-the-counter hair, skin, and nail supplements, and it can interfere with this test and give an incorrect result. Patients should stop taking biotin at least 72 hours (3 days) before the blood draw. It is worth asking every patient about it, since many people do not think of supplements as medication.
- **Fulvestrant (Faslodex):** This breast cancer drug is close enough in structure to estradiol that the test can mistake one for the other and read falsely high. For a patient taking fulvestrant, this test is not a reliable measure of estradiol, and a different method that is not affected by the drug should be used instead.
- **When very low levels are expected:** This test is designed for the range typically seen in women of reproductive age. Its lowest reportable value is 20 pg/mL; results below that point are reported as less than 20 pg/mL. Levels in women past menopause and in women taking estrogen-blocking medication often fall below this point.
- **Comparing results over time:** Different laboratories and different instruments can produce somewhat different estradiol numbers from the same sample. When results are being tracked over time, use the same test at the same laboratory each time so the comparison is meaningful.

Limitations:

Every laboratory test has limits. For estradiol, the main ones are:

- This test is an immunoassay, and its lowest reportable value is 20 pg/mL. Estradiol levels in women past menopause and in women taking estrogen-blocking medication are often below this point, so those results are reported as less than 20 pg/mL rather than as an exact number.
- Closely related hormones can be mistaken for estradiol. During pregnancy, another estrogen called estriol is present at high levels and can push results falsely high, so estradiol results collected during pregnancy should be interpreted with care.
- A small number of patients carry natural antibodies in their blood, often people who work closely with animals or who have received certain antibody-based treatments, that can interfere with the test and produce an unexpected result.
- Some newer medications are built on a structure similar to estradiol and may also interfere. If a result does not fit the patient's symptoms or history, it should be rechecked using a different method.
- An estradiol result is one piece of a larger picture. It is meant to be read together with the patient's symptoms, medical history, and other test results, never on its own.

Reference Range(s):

Estradiol is measured in picograms per milliliter (pg/mL). Because levels change throughout the menstrual cycle, results are compared against the expected range for that phase of the cycle:

Adult premenopausal female, by menstrual-cycle phase:

- **Follicular phase** (first half of the cycle, before an egg is released): **≤160 pg/mL**
- **Mid-cycle** (around the time an egg is released): **34–400 pg/mL**
- **Luteal phase** (second half of the cycle, after an egg is released): **27–246 pg/mL**

A result outside these ranges is not automatically a problem, and a result inside them does not rule one out. Only the ordering provider can interpret what a given number means for a given patient. Patients should always go by the reference range printed on their own laboratory report.

Analyte	Disorder	Expected Value*
Estradiol	PCOS / PMOS	N
Estradiol	Primary ovarian insufficiency (POI)	↓
Estradiol	Perimenopause	V
Estradiol	Postmenopause (natural)	↓↓
Estradiol	Normal early pregnancy	↑↑

*N – Normal Range, V – Variable, ↓ – Decreased, ↓↓ – Markedly Decreased, ↑↑ – Markedly Increased.

What are some references that discuss the medical necessity of testing Estradiol?

1. Bulun SE, Babayev E. Physiology and pathology of the female reproductive axis. In *Williams Textbook of Endocrinology* 15th edn (eds Melmed, S. et al.) Ch. 15 (Elsevier, Philadelphia, 2025).
2. Santoro N. Update in hyper- and hypogonadotropic amenorrhea. *J Clin Endocrinol Metab*, **96**, 3281–3288 (2011).
3. Nelson LM. Clinical practice. Primary ovarian insufficiency. *N Engl J Med*, **360**, 606–614 (2009).
4. Teede HJ, et al. Recommendations from the 2023 International Evidence-based Guideline for the Assessment and Management of Polycystic Ovary Syndrome. *J Clin Endocrinol Metab*, **108**, 2447–2469 (2023).
5. Harlow SD, et al. Executive summary of the Stages of Reproductive Aging Workshop +10: addressing the unfinished agenda of staging reproductive aging. *J Clin Endocrinol Metab*, **97**, 1159–1168 (2012).
6. Practice Committee of the American Society for Reproductive Medicine. Diagnostic evaluation of the infertile female: a committee opinion. *Fertil Steril*, **103**, e44–e50 (2015).



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