

## Overview

### Useful For

A part of second trimester or cross-trimester biochemical screening for Down syndrome and trisomy 18 syndrome

A marker of fetal demise

An adjunct biomarker in the prenatal diagnosis of disorders of fetal steroid metabolism, including Smith-Lemli-Opitz syndrome (SLO)(3-4), and X-linked ichthyosis (placental sulfatase deficiency disorders)

Evaluating primary or secondary fetal adrenal insufficiency after excluding other rare single gene defects, including aromatase deficiency, 17 alpha-hydroxylase deficiency and/or various forms of congenital adrenal hyperplasia

### Method Name

Immunoenzymatic Assay

### NY State Available

Yes

## Specimen

### Specimen Type

Serum

### Specimen Required

**Container/Tube:**

**Preferred:** Red top

**Acceptable:** Serum gel

**Specimen Volume:** 0.6 mL

### Specimen Minimum Volume

0.5 mL

### Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK

### Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
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Serum	Refrigerated (preferred)	14 days	
	Frozen	90 days	

## Clinical & Interpretive

### Clinical Information

Estrogens are involved in development and maintenance of the female phenotype, germ cell maturation, and pregnancy. There are 3 major biologically active estrogens in humans: estrone (E1), estradiol (E2), and estriol (E3). Like all members of the steroid hormone family, they diffuse into cells and bind to specific nuclear receptors, which in turn alter gene transcription in a tissue specific manner. E2 is the most potent natural human estrogen, closely followed by E1, while E3 possess only 20% of the E2 affinity for the estrogen receptor. In men and nonpregnant women, E1 and E2 are formed from the androgenic steroids androstenedione and testosterone, respectively. E3 is derived largely through conversion of E2, and to a lesser degree from 16 $\alpha$ -metabolites of E1. E2 and E1 can also be converted into each other, and both can be inactivated via hydroxylation and conjugation.

During pregnancy E3 becomes the dominant estrogen. The fetal adrenal gland secretes dehydroepiandrosterone-sulfate (DHEAS), which is converted to E3 in the placenta and diffuses into the maternal circulation. The half-life of unconjugated E3 (uE3) in the maternal blood system is 20 to 30 minutes since the maternal liver quickly conjugates E3 to make it more water soluble for urinary excretion. E3 levels increase throughout the course of pregnancy, peaking at term.

Decreased second trimester uE3 has been shown to be a marker for Down and trisomy-18 syndromes. uE3 is a part of multiple marker prenatal biochemical screening, together with alpha-fetoprotein (AFP), human chorionic gonadotropin (hCG), and inhibin-A measurements. Low levels of uE3 also have been associated with pregnancy loss, Smith-Lemli-Opitz syndrome (defect in cholesterol biosynthesis), X-linked ichthyosis and contiguous gene syndrome (placental sulfatase deficiency disorders), aromatase deficiency, and primary or secondary fetal adrenal insufficiency.

### Reference Values

Males: <0.07 ng/mL

Females: <0.08 ng/mL

For SI unit Reference Values, see <https://www.mayocliniclabs.com/order-tests/si-unit-conversion.html>

### Interpretation

In second trimester maternal serum screening (QUAD), , unconjugated E3 (uE3) forms part of a complex, multivariate risk calculation formula, using maternal age, gestational stage, and other demographic information, in addition to the results of the biochemical markers, for Down syndrome and trisomy 18 risk calculation.

A serum uE3 <0.15 multiples of the gestational age median in women, who otherwise screen negative in the quad test, can indicate Smith-Lemli-Opitz syndrome and X-linked ichthyosis.

A low uE3 level can indicate the possibility of aromatase deficiency, congenital adrenal hyperplasia, primary or secondary (including maternal corticosteroid therapy) fetal adrenal insufficiency and/or fetal demise.

### Cautions

Like any immunoassay, this test can occasionally be subject to analytical interferences. Some patients who have been exposed to animal antigens, either in the environment or as part of treatment or imaging procedures, may have circulating anti-animal antibodies present. These antibodies may interfere with the assay reagents to produce unreliable results. If the clinical picture is inconsistent with the test results, clinicians should consider the possibility of a preanalytical or analytical error and contact the laboratory.

**Clinical Reference**

1. Thaniyaporn S, Chanane W, Supatra S, et al: Association between isolated abnormal levels of maternal serum unconjugated estriol in the second trimester and adverse pregnancy outcomes. *J Matern Fetal Neonatal Med.* 2016;29:13, 2093-2097
2. Minsart AF, Van Onderbergen A, Jacques F, et al: Indication of prenatal diagnosis in pregnancies complicated by undetectable second-trimester maternal serum estriol levels. *J Prenat Med.* 2008;2(3):27-30
3. Bradley LA, Palomaki GE, Knight GJ, et al: Levels of unconjugated estriol and other maternal serum markers in pregnancies with Smith Lemli Opitz (RSH) syndrome fetuses [letter]. *Am J Med Genet* 1999;82:355-358
4. Reisch N, Idkowiak J, Hughes B, Prenatal Diagnosis of Congenital Adrenal Hyperplasia Caused by P450 Oxidoreductase Deficiency. *J Clin Endocrinol Metab.* 2013 Mar;98(3):E528-E536. doi: 10.1210/jc.2012-3449
5. Yarbrough ML, Stout M, Gronowski AM: Ch 69 Pregnancy and Its Disorders. *In* Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. Sixth edition. Edited by N Rafai, AR Horvath, CT Wittwer. Elsevier, 2018, pp 1655-1696

**Performance****Method Description**

The instrument used is the Beckman Coulter UniCel Dxl 800. The Access unconjugated estriol assay is a competitive binding immunoenzymatic assay. A sample is added to a reaction vessel with estriol-alkaline phosphatase conjugate, paramagnetic particles coated with goat anti-rabbit IgG, and polyclonal rabbit anti-estriol. Estriol in the sample competes with estriol-alkaline phosphatase conjugate for a limited number of binding sites on the specific anti-estriol antibody. After incubation in a reaction vessel, materials bound to the solid phase are held in a magnetic field while unbound materials are washed away. Then the chemiluminescent substrate Lumi-Phos 530 is added to the vessel and light generated by the reaction is measured with a luminometer. The light production is inversely proportional to the concentration of estriol in the sample. The amount of analyte in the sample is determined by means of a stored, multipoint calibration curve. (Package Insert: Beckman Coulter Access Unconjugated Estriol Assay, 2019)

**PDF Report**

No

**Day(s) Performed**

Monday through Friday

**Report Available**

1 to 3 days

**Specimen Retention Time**

2 weeks

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**Performing Laboratory Location**

Rochester

**Fees & Codes****Fees**

- Authorized users can sign in to [Test Prices](#) for detailed fee information.
- Clients without access to Test Prices can contact [Customer Service](#) 24 hours a day, seven days a week.
- Prospective clients should contact their Regional Manager. For assistance, contact [Customer Service](#).

**Test Classification**

This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

**CPT Code Information**

82677

**LOINC® Information**

Test ID	Test Order Name	Order LOINC® Value
UE3	Estriol, Unconjugated, S	2250-9

Result ID	Test Result Name	Result LOINC® Value
UE3	Estriol, Unconjugated, S	2250-9