Lab Dept: Chemistry

Test Name: ESTROGENS, FRACTIONATED

General Information

Lab Order Codes: ESTF

Synonyms: Estrogens, E1 + E2 Fractionated

CPT Codes: 82671 - Estrogens, fractionated

Test Includes: Estrone (E1) and Estradiol (E2) levels reported as pg/mL.

Logistics

Test indications:

- Simultaneous high-sensitivity determination of serum estrone and estradiol levels.
- Situations requiring either higher sensitivity estradiol measurement, estrone measurement or both ;as part of the diagnosis and workup of precocious and delayed puberty in females and to a lesser degree in males ; as part of the diagnosis and workup of suspected disorders of sex steroid metabolism, eg, aromatase deficiency and 17 alpha-hydroxylase deficiency ;as an adjunct to clinical assessment, imaging studies, and bone mineral density measurement in the fracture risk assessment of postmenopausal women and, to a lesser degree, older men.
- Monitoring low-dose female hormone replacement therapy in postmenopausal women
- Monitoring antiestrogen therapy (eg, aromatase inhibitory therapy)
- Applications that require moderately sensitive measurement of estradiol including: Evaluation of hypogonadism and oligo-amenorrhea in females ;assessing ovarian status, including follicle development, for assisted reproduction protocols (eg, in vitro fertilization)
- In conjunction with luteinizing hormone measurements, monitoring of estrogen replacement therapy in hypogonadal premenopausal women
- Evaluation of feminization, including gynecomastia, in males
- Diagnosis of estrogen-producing neoplasms in males, and to a lesser degree, females.

Lab Testing Sections: Chemistry - Sendouts

Referred to: Mayo Clinic Laboratories (Mayo test: ESTF)

Phone Numbers: MIN Lab: 612-813-6280

STP Lab: 651-220-6550

Test Availability: Daily, 24 hours

Turnaround Time: 2 – 4 days

Special Instructions: Requires Red NO GEL tube for specimen collection. Must be processed within 2 hours of collection.

Specimen

Specimen Type: Blood

Container: Red NO GEL tube

Draw Volume: 3.6 mL (Minimum: 2.4 mL) blood

Processed Volume: 1.2 mL (Minimum: 1.2 mL) serum

Collection: Routine blood collection

Special Processing: Lab Staff: Specimen must be centrifuged within 2 hours of collection. Centrifuge specimen, remove serum aliquot into plastic screw-capped vial. Store and ship at refrigerated temperatures.

Patient Preparation: N/A

Sample Rejection: Mislabeled or unlabeled specimens; specimens collected in SST tubes

Interpretive

Reference Range:

Estrone (E1):

Children 1-14 days: Estrone levels in newborns are very elevated at birth, but will fall to prepubertal levels within a few days.

Males

Tanner stage	Mean age	Reference range (pg/mL)
Stage I (>14 days and prepubertal)	7.1 years	Undetectable – 16 pg/mL
Stage II	11.5 years	Undetectable – 22 pg/mL
Stage III	13.6 years	10 – 25 pg/mL
Stage IV	15.1 years	10 – 46 pg/mL
Stage V	18 years	10 – 60 pg/mL

Puberty onset (transition from Tanner stage I to Tanner stage II) occurs for boys at a median age of 11.5 (+/-2) years. For boys there is no proven relationship between puberty onset and body weight or ethnic origin. Progression through Tanner stages is variable. Tanner stage V (adult0 should be reached by age 18.

Adults: 10 – 60 pg/mL

Females

Tanner stage	Mean age	Reference range (pg/mL)
Stage I (>14 days and prepubertal)	7.1 years	Undetectable – 29 pg/mL
Stage II	10.5 years	10 – 33 pg/mL
Stage III	11.6 years	15 – 43 pg/mL
Stage IV	12.3 years	16 – 77 pg/mL
Stage V	14.5 years	17 – 200 pg/mL

Puberty onset (transition from Tanner stage I to Tanner stage II) occurs for girls at a median age of 10.5 (+/-2) years. There is evidence that it may occur up to 1 year earlier in obese girls and in African American girls. Progression through Tanner stages is variable. Tanner stage V (adult) should be reached by 18.

The reference ranges for children are based on the published literature, (1,2) cross-correlation of our assay with assays used to generate the literature data for young adults

Adults:

Premenopausal: 17 – 200 pg/mL
Postmenopausal: 7 – 40 pg/mL

Conversion Factor pg/mL to pmol/L
pg/mL x 3.704 = pmol/L (molecular weight=270)

Estradiol (E2):

Children 1-14 days: Estradiol levels in newborns are very elevated at birth but will fall to prepubertal levels within a few days.

Males

Tanner stage	Mean age	Reference range

Stage I (>14 days and prepubertal)	7.1 years	Undetectable – 13 pg/mL
Stage II	12.1 years	Undetectable – 16 pg/mL
Stage III	13.6 years	Undetectable – 26 pg/mL
Stage IV	15.1 years	Undetectable – 38 pg/mL
Stage V	18 years	10 – 40 pg/mL
Puberty onset (transition from Tanner stage I to Tanner stage II) occurs for boys at a median age of 11.5 (+-2) years. For boys there is no proven relationship between puberty onset and body weight or ethnic origin. Progression through Tanner stages is variable. Tanner stage V (adult) should be reached by age 18.		
Adults: 10 – 40 pg/mL		
Females		
Tanner stage	Mean age	Reference range
Stage I (>14 days and prebutertal)	7.1 years	Undetectable – 20 pg/mL
Stage II	10.5 years	Undetectable – 24 pg/mL
Stage III	11.6 years	Undetectable – 60 pg/mL
Stage IV	12.3 years	15 – 85 pg/mL
Stage V	14.5 years	15 – 350 pg/mL
Puberty onset (transitions from Tanner stage I to Tanner stage II) occurs for girls at a median age of 10.5 (+/-2) years. There is evidence that it may occur up to 1 year earlier in obese girls and in African American girls. Progression through Tanner stages is variable. Tanner stage V (adult) should be reached by age 18.		
Adults: Premenopausal: 15 – 350 pg/mL Postmenopausal: <10 pg/mL		
Conversion Factor pg/mL to pmol/L pg/mL x 3.676 = pmol/L (molecular weight=272)		

Critical Values: N/A

Limitations:	Fulvestrant is a member of a new class of drugs called selective estrogen receptor degraders (SERDS). Fulvestrant has modest cross-reactivity (1%-5%) in estradiol immunoassays, but because the peak dose levels of this drug are between 10-fold (reproductive age women) and more than 200-fold (postmenopausal women) higher than the naturally circulating estradiol concentrations in the treated women, this causes dramatically false-high results in estradiol immunoassays, when blood sampling occur in close temporal proximity to dosing. By contrast, estradiol measurements by mass spectrometry display more than 1000-fold lower cross-reactivity (<0.001%), meaning that the impact of Fulvestrant on serum estradiol measurements by mass spectrometry is negligible, even if blood sampling occurs at peak dose.
Methodology:	Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)
References:	Mayo Clinic Laboratories (August 2020)