MAYO CLINIC LABORATORIES

Test Definition: CORT

Cortisol, Serum

Overview

Useful For

Discrimination between primary and secondary adrenal insufficiency

Differential diagnosis of Cushing syndrome

This test is **not recommended** for evaluating response to metyrapone.

Method Name

Immunoenzymatic Assay

NY State Available

Yes

Specimen

Specimen Type

Serum

Ordering Guidance

The preferred screening test for Cushing syndrome measures 24-hour urinary free cortisol. Order CORTU / Cortisol, Free, 24 Hour, Urine.

For confirming the presence of synthetic steroids, order SGSS / Synthetic Glucocorticoid Screen, Serum.

For patients taking exogenous glucocorticoids, order CORTU / Cortisol, Free, 24 Hour, Urine.

For evaluating response to metyrapone, order DCORT / 11-Deoxycortisol, Serum.

For evaluation of congenital adrenal hyperplasia, the following tests provide better, accurate, and specific determination of the enzyme deficiency:
-DCORT / 11-Deoxycortisol, Serum
-OHPG / 17-Hydroxyprogesterone, Serum
-DHEA_ / Dehydroepiandrosterone (DHEA), Serum

Specimen Required

Collection Container/Tube:
Preferred: Serum gel
Acceptable: Red top
Submission Container/Tube: Plastic vial

Specimen Volume: 0.6 mL serum

Collection Instructions:

1. Morning (8 a.m.) and afternoon (4 p.m.) specimens are preferred.
2.Within 2 hours of collection, centrifuge the specimen.
3. For red-top tubes aliquot the serum into a plastic vial after centrifugation.

Additional Information:

1. Include time of collection.
2. **If multiple specimens are collected, send separate order for each specimen**.

Specimen Minimum Volume

Serum: 0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	14 days	
	Ambient	7 days	
	Frozen	90 days	

Clinical & Interpretive

Clinical Information

Cortisol, the main glucocorticoid (representing 75%-90% of the plasma corticoids) plays a central role in glucose metabolism and in the body's response to stress.

Cortisol levels are regulated by corticotropin (previously adrenocorticotropic hormone :ACTH), which is synthesized by the pituitary gland in response to corticotropin-releasing hormone (CRH). CRH is released in a cyclic fashion by the hypothalamus, resulting in diurnal peaks (6 a.m.-8 a.m.) and troughs (11 p.m.) in plasma ACTH and cortisol levels.

The majority of cortisol circulates bound to cortisol-binding globulin (CBG-transcortin) and albumin. Normally, less than 5% of circulating cortisol is free (unbound). The free cortisol is the physiologically active form and is filterable by the renal glomerulus.

Although hypercortisolism is uncommon, the signs and symptoms are common (eg, obesity, high blood pressure, increased blood glucose concentration). The most common cause of increased plasma cortisol levels in women is a high circulating concentration of estrogen (eg, estrogen therapy, pregnancy) resulting in increased concentration of cortisol-binding globulin.

Spontaneous Cushing syndrome results from overproduction of glucocorticoids as a result of either primary adrenal disease (adenoma, carcinoma, or nodular hyperplasia) or an excess of ACTH (from a pituitary tumor or an ectopic source). ACTH-dependent Cushing syndrome due to a pituitary corticotroph adenoma is the most frequently diagnosed subtype; most commonly seen in women in the third through fifth decades of life. The onset is insidious and usually occurs 2 to 5 years before a clinical diagnosis is made.

Causes of hypocortisolism are:
-Addison disease-primary adrenal insufficiency
-Secondary adrenal insufficiency:
-Pituitary insufficiency
-Hypothalamic insufficiency
-Congenital adrenal hyperplasia-defects in enzymes involved in cortisol synthesis

Reference Values

0-<3 months: 1.1-19 mcg/dL
3 months-<12 months: 2.6-23 mcg/dL
12 months-<13 years: 2.2-13 mcg/dL
13 years-<16 years: 3.0-17 mcg/dL
16 years-<18 years: 3.8-19 mcg/dL
> or =18 years:
a.m.: 7-25 mcg/dL
p.m.: 2-14 mcg/dL

For International System of Units (SI) conversion for Reference Values, see
www.mayocliniclabs.com/order-tests/si-unit-conversion.html

Interpretation

In primary adrenal insufficiency, corticotropin (previously adrenocorticotropic hormone :ACTH) levels are increased, and cortisol levels are decreased; in secondary adrenal insufficiency, both ACTH and cortisol levels are decreased.

When symptoms of glucocorticoid deficiency are present and the 8 a.m. plasma cortisol value is less than 10 mcg/dL (or the 24-hour urinary free cortisol value is <50 mcg/24 hours), further studies are needed to establish the diagnosis. First, the basal plasma ACTH concentration should be measured, followed by the short cosyntropin stimulation test.

For the cosyntropin-ACTH stimulation test, serum cortisol is measured before and at various time intervals after an ACTH injection. The criteria for a normal response are:
-An increase in serum cortisol to a peak value of at least 15 mcg/dL post-cosyntropin
-Usually also associated with an increase in serum cortisol of at least 7 mcg/dL above the baseline (if baseline cortisol is >15 mcg/dL this criterion does not apply)
-Basal serum cortisol greater than 5 mcg/dL (criterion applies when blood drawn before 9 a.m.)

False normal responses may be present in patients on oral estrogen therapy or in patients with mild secondary adrenal insufficiency.

Other frequently used tests are the metyrapone and insulin-induced hypoglycemia test. Consult the Endocrine Testing

Center at 800-533-1710 for test information and interpretation of test results.

Cushing syndrome is characterized by increased serum cortisol levels. However, the 24-hour urinary free cortisol excretion is the preferred screening test for Cushing syndrome, specifically CORTU / Cortisol, Free, 24 Hour, Urine, which utilizes liquid chromatography/tandem mass spectrometry (LC-MS/MS). A normal result makes the diagnosis unlikely.

When cortisol measurement by immunoassay gives results that are not consistent with clinical symptoms, or if patients are known to, or suspected of, taking exogenous synthetic steroids, consider testing by LC-MS/MS; see CINP / Cortisol, Mass Spectrometry, Serum. For confirming the presence of synthetic steroids, order SGSS / Synthetic Glucocorticoid Screen, Serum.

Cautions

Acute stress (including hospitalization and surgery), alcoholism, depression, and many drugs (eg, exogenous cortisones, anticonvulsants) can obliterate normal diurnal variation, affect response to suppression/stimulation tests, and cause elevated baseline levels.

Patients taking prednisone may have falsely increased cortisol levels because prednisone is converted to prednisolone after ingestion and prednisolone has 41% cross-reactivity.

Cortisol levels may be increased in pregnancy and with exogenous estrogens.

Some patients with depressive disorders have a hyperactive hypothalamic-pituitary-adrenal axis, similar to Cushing syndrome.

A low plasma cortisol level does not give conclusive indication of congenital adrenal hyperplasia. See Ordering Guidance for alternative testing.

In rare cases, some individuals can develop antibodies to mouse or other animal antibodies (often referred to as human anti-mouse antibodies [HAMA] or heterophile antibodies), which may cause interference in some immunoassays. Caution should be used in interpretation of results, and the laboratory should be alerted if the result does not correlate with the clinical presentation.

Clinical Reference

1. Findling JW, Raff H. Diagnosis and differential diagnosis of Cushing's syndrome. Endocrinol Metab Clin North Am. 2001;30(3):729-747
2. Buchman AL. Side effects of corticosteroid therapy. J Clin Gastroenterol. 2001;33(4):289-294
3. Rifai N, Horvath AR, Wittwer CT. eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier; 2018
4. Javorsky B, Carroll T, Algeciras-Schimnich A, Singh R, Colon-Franco J, Findling J: SAT-390 new cortisol threshold for diagnosis of adrenal insufficiency after cosyntropin stimulation testing using the Elecsys cortisol II, access cortisol, and LC-MS/MS assays. J Endocr Soc. 2019;3(Suppl 1):SAT-390. doi:10.1210/js.2019-SAT-390
5. Karbasy K, Lin DC, Stoianov A, et al. Pediatric reference value distributions and covariate-stratified reference intervals for 29 endocrine and special chemistry biomarkers on the Beckman Coulter Immunoassay Systems: a CALIPER study of healthy community children. Clin Chem Lab Med. 2016;54(4):643-657. doi:10.1515/cclm-2015-0558
6. Thau L, Gandhi J, Sharma S. Physiology, Cortisol. In: StatPearls. StatPearls Publishing; Updated August 28, 2023, Accessed September 8, 2025. Available at www.statpearls.com/point-of-care/20047

Performance

Method Description
The Access cortisol assay is a competitive binding immunoenzymatic assay. A specimen is added to a reaction vessel with rabbit antibody to cortisol, cortisol-alkaline phosphatase conjugate, and paramagnetic particles coated with goat anti-rabbit capture antibody. Cortisol in the specimen competes with the cortisol-alkaline phosphatase conjugate for binding sites on a limited amount of specific anti-cortisol antibody. Resulting antigen:antibody complexes bind to the capture antibody on the solid phase. After incubation in a reaction vessel, materials bound to the solid phase are held in a magnetic field while unbound materials washed away. Then the chemiluminescent substrate Lumi-Phos 530* is added to the reaction vessel and light generated by the reaction is measured with a luminometer. The light production is inversely proportional to the amount of cortisol in the specimen. The amount of analyte in the specimen is determined from stored, multi-point calibration curve.(Package insert: Access Cortisol. Beckman Coulter; 2021)

PDF Report
No

Day(s) Performed
Monday through Saturday

Report Available
1 to 3 days

Specimen Retention Time
14 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Superior Drive

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 account representative. 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

82533

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
CORT	Cortisol, S	87429-7

Result ID	Test Result Name	Result LOINC® Value
CORTP	Cortisol, S	83088-5
CAM	AM Result	9813-7
CPM	PM Result	9812-9