MAYO CLINIC LABORATORIES

Test Definition: DCORT

11-Deoxycortisol, Serum

Overview

Useful For

Diagnostic workup of patients with congenital adrenal hyperplasia

Part of metyrapone testing in the workup of suspected secondary or tertiary adrenal insufficiency

Part of metyrapone testing in the differential diagnostic workup of Cushing syndrome

Testing Algorithm

For more information see Steroid Pathways.

Special Instructions

- Steroid Pathways

Method Name

Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Serum

Necessary Information

Indicate if specimen was collection before or after metyrapone administration.

Specimen Required

Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube:
Preferred: Red top
Acceptable: Serum gel
Submission Container/Tube: Plastic vial
Specimen Volume: 0.5 mL
Collection Instructions:
1. Morning (8 a.m.) specimen is preferred.
2. Centrifuge and aliquot serum into a plastic vial.

Specimen Minimum Volume

0.4 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)	28 days	
	Ambient	28 days	
	Frozen	28 days	

Clinical & Interpretive

Clinical Information

11-Deoxycortisol (compound S) is the immediate precursor of cortisol:

11 beta-hydroxylase
11-deoxycortisol---------->cortisol

Compound S is typically increased when corticotropin (previously adrenocorticotropic hormone: ACTH) levels are increased (eg, Cushing disease, ACTH-producing tumors) or in 11-beta-hydroxylase deficiency, a rare subform of congenital adrenal hyperplasia (CAH). In CAH due to 11-beta-hydroxylase deficiency, cortisol levels are low, resulting in increased pituitary ACTH production and increased serum and urine 11-deoxycortisol levels.

Pharmacological blockade of 11-beta-hydroxylase with metyrapone can be used to assess the function of the hypothalamic-pituitary-adrenal axis (HPA). In this procedure, metyrapone is administered to patients, and serum 11-deoxycortisol levels or urinary 17-hydroxy steroid levels are measured either at baseline (midnight) and 8 hours later (overnight test), or at baseline and once per day during a 2-day metyrapone test (4-times a day metyrapone administration over 2 days). Two-day metyrapone testing has been largely abandoned because of the logistical problems of multiple timed urine and blood collections and the fact that overnight testing provides very similar results. In either case, the normal response to metyrapone administration is a fall in serum cortisol levels, triggering a rise in pituitary ACTH secretion, which, in turn, leads to a rise in 11-deoxycortisol levels due to the ongoing 11-deoxycortisol-to-cortisol conversion block.

In the diagnostic workup of suspected adrenal insufficiency, the results of overnight metyrapone testing correlate closely with the gold standard of HPA-axis assessment, insulin hypoglycemia testing. Combining 11-deoxycortisol measurements with ACTH measurements during metyrapone testing further enhances the performance of the test. Impairment of any component of the HPA-axis results in a subnormal rise in 11-deoxycortisol levels. By contrast, standard-dose or low-dose ACTH(1-24) (cosyntropin)-stimulation testing, which forms the backbone for diagnosis of

primary adrenal failure (Addison disease), only assess the ability of the adrenal cells to respond to ACTH stimulation. While this allows unequivocal diagnosis of primary adrenal failure, in the setting of secondary or tertiary adrenal insufficiency, metyrapone testing is more sensitive and specific than either standard-dose or low-dose ACTH(1-24)-stimulation testing.

Metyrapone testing is also sometimes employed in the differential diagnosis of Cushing syndrome. In Cushing disease (pituitary-dependent ACTH overproduction), the ACTH-hypersecreting pituitary tissue remains responsive to the usual feedback stimuli, just at a higher "set-point" than in the normal state, resulting in increased ACTH secretion and 11-deoxycortisol production after metyrapone administration. By contrast, in Cushing syndrome due to primary adrenal corticosteroid oversecretion or ectopic ACTH secretion, pituitary ACTH production is appropriately shut down, and there is usually no further rise in ACTH and, hence 11-deoxycortisol, after metyrapone administration. The metyrapone test has similar sensitivity and specificity to the high-dose dexamethasone suppression test in the differential diagnosis of Cushing disease but is less widely used because of the lack of availability of an easy, automated 11-deoxycortisol assay. In recent years, both tests have been supplanted to some degree by corticotropin-releasing hormone (CRH)-stimulation testing with petrosal sinus serum ACTH sampling.

For more information see Steroid Pathways.

Reference Values

< or =18 years: <344 ng/dL
>18 years: 10-79 ng/dL

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

Interpretation

In a patient suspected of having congenital adrenal hyperplasia (CAH), elevated serum 11-deoxycortisol levels indicate possible 11-beta-hydroxylase deficiency. However, not all patients will show baseline elevations in serum 11-deoxycortisol levels. In a significant proportion of cases, increases in 11-deoxycortisol levels are only apparent after corticotropin (previously adrenocorticotropic hormone)(1-24) stimulation.(1)

Serum 11-deoxycortisol levels below 1700 ng/dL when measured 8 hours after metyrapone administration is indicative of probable adrenal insufficiency. The test cannot reliably distinguish between primary and secondary or tertiary causes of adrenal failure, as neither patients with pituitary failure, nor those with primary adrenocortical failure, tend to show an increase of 11-deoxycortisol levels after metyrapone is administered.

For more information see Steroid Pathways.

Cautions

Ethanol, estrogens (exogenous and pregnancy-related), barbiturates, valproic acid, phenytoin, and exogenous glucocorticoids may cause impaired response to metyrapone.

There have been occasional reports of addisonian crisis during 2-day metyrapone testing. For this reason, 2-day metyrapone testing probably should not be performed when plasma cortisol values are less than 3 mcg/dL.

Clinical Reference

1. Tonetto-Fernandes V, Lemos-Marini SH, Kuperman H, et al. Serum 21-deoxycortisol, 17-hydroxyprogesterone, and 11-deoxycortisol in classic congenital adrenal hyperplasia: clinical and hormonal correlations and identification of patients with 11 beta-hydroxylase deficiency among a large group with alleged 21-hydroxylase deficiency. J Clin Endocrinol Metab. 2006;91(6):2179-2184
2. Lashanske G, Sainger P, Fishman K, et al. Normative data for adrenal steroidogenesis in a healthy pediatric population: age- and sex-related changes after adrenocorticotropin stimulation. J Clin Endocrinol Metab. 1991;73(3):674-686
3. Holst JP, Soldin SJ, Tractenberg RE, et al. Use of steroid profiles in determining the cause of adrenal insufficiency. Steroids. 2007;72(1):71-84
4. Berneis K, Staub JJ, Gessler A, et al. Combined stimulation of adrenocorticotropin and compound-S by single dose metyrapone test as an outpatient procedure to assess hypothalamic-pituitary-adrenal function. J Clin Endocrinol Metab. 2002;87(12):5470-5475
5. Idkowiak, J, Cragun, D, Hopkin RJ, Arlt W. Cytochrome P450 oxidoreductase deficiency. In: Adam MP, Feldman J, Mirzaa GM, et al, eds. Gene Reviews [Internet]. University of Washington, Seattle; 2005. Updated August 3, 2017. Accessed May 2, 2024. Available at www.ncbi.nlm.nih.gov/sites/books/NBK1419/
6. Held PK, Bird IM, Heather NL. Newborn screening for congenital adrenal hyperplasia: review of factors affecting screening accuracy. Int J Neonatal Screen. 2020;6(3):67. doi:10.3390/ijns6030067

Performance

Method Description
The specimen and an internal standard are assayed by liquid chromatography tandem mass spectrometry. The analyte is detected by multiple-reaction monitoring.(Unpublished Mayo method)

PDF Report
No

Day(s) Performed
Tuesday

Report Available
3 to 10 days

Specimen Retention Time
14 days

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 account representative. For assistance, contact Customer Service.

Test Classification

This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

82634

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
DCORT	11-Deoxycortisol, S	1657-6

Result ID	Test Result Name	Result LOINC® Value
46923	11-Deoxycortisol, S	1657-6