
Lab Dept: Chemistry

Test Name: CATECHOLAMINE FRACTIONATED, BLOOD

General Information

Lab Order Codes: CTL

Synonyms: Catecholamine Fractionation, Plasma, Free

CPT Codes: 82384 – Catecholamines, fractionated

Test Includes: Unconjugated norepinephrine, epinephrine, and dopamine levels reported in pg/mL. Includes unconjugated norepinephrine, epinephrine, and dopamine.

Logistics

Test Indications: Useful for diagnosis of pheochromocytoma and paraganglioma, as an auxiliary test to fractionated plasma and urine metanephrine measurements (plasma metanephrine is the preferred test for this diagnosis).

Diagnosis and follow-up of patients with neuroblastoma and related tumors, as an auxiliary test to urine vanillylmandelic acid (VMA) and homovanillic acid (HVA) measurements.

Evaluation of patients with autonomic dysfunction/failure or autonomic neuropathy.

Note: Recommended test is Catecholamine, Urine. [See Catecholamine Fractionation, Timed Urine](#). The plasma test has specific patient instructions and stress of the patient plays a major role in the results. [See Collection](#). This test should not be used as the first-line test for pheochromocytoma as plasma catecholamine levels may not be continuously elevated, but only secreted during a “spell”. By contrast, production of metanephrines (catecholamine metabolites) appears to be increased continuously. Plasma metanephrines and/or fractionated urine metanephrines are recommended as first-line lab tests for pheochromocytoma.

Lab Testing Sections: Chemistry - Sendouts

Referred to: Mayo Medical Laboratories (Test: CATP/8532)

Phone Numbers: MIN Lab: 612-813-6280

STP Lab: 651-220-6550

Test Availability:	Daily, 24 hours
Turnaround Time:	2 – 5 days, test set up Monday - Friday
Special Instructions:	See Patient Preparation , See Container

Specimen

Specimen Type:	Whole blood
Container:	Special container required: Catecholamine tubes containing EDTA-sodium metabisulfite solution must be used and are supplied by Mayo and available from Children's Laboratories. (Mayo Supply T066)
Draw Volume:	10 mL (Minimum: 6 mL) blood per specimen Note: Both Supine and Provocative (standing) testing may be ordered. If so, there should be two orders for CTL. The two specimens must be collected one after the other as described in Collection : below.
Processed Volume:	3 mL (Minimum: 2 mL) plasma per specimen
Collection:	Collection from an indwelling catheter by a Physician/Nurse is REQUIRED. If the collection instructions are not followed, falsely elevated test results are highly likely. <ol style="list-style-type: none">1. Calm the patient by giving complete instructions and reassurance regarding the procedure.2. Insert an indwelling intravenous catheter. Flush with 3 mL of NaCl, using positive pressure.3. Have the patient rest for 30 minutes in the supine position in a quiet room.4. At the end of 30 minutes, withdraw and discard a minimum of 2 mL of blood to remove the saline out of the catheter.5. If provocative sampling (eg, standing specimen) is required, perform the provocative maneuver immediately after obtaining the supine specimen. Obtain standing specimen immediately.6. For each specimen, draw 10 mL of blood into the chilled EDTA-sodium metabisulfite 10 mL tube.7. Send to lab immediately on ice. Note: A routine venipuncture is not recommended. See Limitations .
Special Processing:	Lab Staff: Separate plasma in a refrigerated centrifuge within 30 minutes of draw. Freeze 3 mL of EDTA (Minimum: 2 mL) plasma immediately in a plastic vial. Send specimens frozen. Forward promptly. Plasma EDTA Meta specimen stable frozen for 7 days.

Patient Preparation:

1. Unless the purpose of the measurement is drug monitoring, discontinue any epinephrine, norepinephrine or dopamine injections/infusion for at least 12 hours before specimen collection.
2. Discontinue drugs that release epinephrine, norepinephrine, or dopamine or hinder their metabolism (see [Limitations](#) for details), for at least 1 week before obtaining the specimen. If this is not possible for medical reasons, contact the laboratory and discuss whether a shorter drug-withdrawal period may be possible in a particular case.
3. **Do Not** perform the test on patients withdrawing from legal or illegal drugs known to cause rebound plasma catecholamine release during withdrawal (see [Limitations](#) for details).
4. The patient must refrain from eating, using tobacco, and drinking caffeinated beverages for at least 4 hours before the specimen is drawn.
5. Calm the patient by giving complete instructions and reassurance regarding the procedure.
6. Insert an indwelling intravenous catheter (heparin lock). Flush with 2 mL of NaCl, using positive pressure.
7. Have the patient rest for 30 minutes in the supine position in a quiet room.
8. [See Collection](#)

Sample Rejection:

Serum is an unacceptable specimen; plasma other than special EDTA metabisulfate from Mayo; warm or cold specimens; mislabeled or unlabeled specimens; gross hemolysis

Interpretive**Reference Range:**

NOREPINEPHRINE	Supine: 70 - 750 pg/mL
	Standing: 200 - 1700 pg/mL
EPINEPHRINE	Supine: < or = 111 pg/mL
	Standing: < or = 141 pg/mL
DOPAMINE	<30 pg/mL (no postural change)

Critical Values:

N/A

Limitations:

Catecholamines in plasma are chemically labile and the specimens must be handled carefully, both because of rapid specific metabolism and rapid oxidation on exposure to air. For example, plasma-free norepinephrine has a half-life of approximately 2 minutes. To enhance

accuracy, one must pay careful attention to the circumstances of [specimen collection](#) and to the [preparation of the patient](#).

Many alterations in physiologic and pathologic states can profoundly affect catecholamine concentrations. Any environmental factor that may increase endogenous catecholamine production should be avoided. These include noise, stress, discomfort, body position, and the consumption of food, caffeinated beverages or nicotine. Caffeine and nicotine effects are short term, a few minutes to a few hours.

Other substances and drugs that may also affect the results include:

1. Substances which result in increased release or diminished metabolism of endogenous catecholamines.

- Monoamine oxidase inhibitors (MOI's – a class of antidepressants with marked effects on catecholamine levels, particularly if the patient consumes tyrosine rich foods, such as nuts, bananas, or cheese)
- Catecholamine reuptake inhibitors including cocaine and synthetic cocaine derivatives, such as many local anesthetics, some of which are also antiarrhythmic drugs (eg, lidocaine)
- Some anesthetic gases, particularly halothane
- Withdrawal from sedative drugs, medical or recreational, in particular alcohol, benzodiazepines (eg, Valium), opioids and some central acting antihypertensive drugs, particularly clonidine, but, generally not cannabis or other hallucinogens such as lysergic acid diethylamide (LSD), mescal, or peyote.
- Vasodilating drugs (eg, calcium antagonists, alpha-blockers)
- Tricyclic antidepressants usually exert a negligible effect.

2. Substances that reduce or increase plasma volume acutely (eg, diuretics, radiographic contrast media, synthetic antidiuretic hormone [eg, desmopressin 1-deamino-8-d-arginine vasopressin, DDAVP])

3. Drugs which are metabolized to endogenous catecholamines. In the main this concerns Cardopa and L-dopa. These drugs are converted to dopamine, and dopamine measurements in patients taking these drugs will be artifactually elevated. Since isolated dopamine elevations are extremely rare, they should always be viewed with suspicion. A review of HPLC trace should be requested. On a careful review, our methodology usually, but not always, allows us to identify the unmetabolized parent drug, alongside dopamine.

Historically, a third category of potentially interfering substances was represented by molecules, which are either similar in chemical structure, antibody epitopes, or chromatographic migration pattern to the catecholamines, or have metabolites that can be mistaken for the catecholamines. The current HPLC-based assay is not subject to any significant direct interference of this kind. In particular, the following drugs, which used to be considered potential interferences, do not cause problems which cannot be resolved, in most cases, with the current assay: acetaminophen, allopurinol, amphetamines and its derivatives (methamphetamine, methylphenidate [Ritalin], fenfluramine, methylenedioxymethamphetamine [MDMA] [ecstasy]), atropine, beta-blockers (atenolol, labetalol, metoprolol, sotalol), buspirone, butalbital, carbamazepine, chlorazepate, chlordiazepoxide, chlorpromazine, chlorothiazide, chlorthalidone, clonidine, codeine, diazepam, digoxin, dimethindene, diphenhydramine, diphenoxylate, dobutamine,

doxycycline, ephedrine and pseudoephedrine, fludrocortisones, flurazepam, guanethidine, hydralazine, hydrochlorothiazide, hydroflumethiazide, indomethacin, insulin, isoprenaline, isosorbide dinitrate, L-Dopa, methenamine madelate (mandelic acid), methyl dopa, methylprednisolone, nitrofuantioin, nitroglycerine, oxazepam, pentazocine, phenacetin, phenformin, pheonobarbital, phenytoin, prednisone, probenecid, progesterone, propoxyphene, propranolol, quinidine, spironolactone, tetracycline, thyroxine, and tripeleennamine.

On occasion, when interference cannot be resolved an interference comment will be reported.

The variability associated with age, gender, and renal failure is uncertain.

Do not perform this test on patients withdrawing from legal or illegal drugs known to cause rebound plasma catecholamine release during withdrawal.

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

References: [Mayo Clinic Laboratories](#) April 2023

Update: 5/6/2013: Updated reference ranges.
04/13/2023: Test down. See link in "Test Includes" section for further information.
7/11/2023: Test resumed, methodology changed but reference and reportable ranges are not affected. Added specimen stability.