MAYO CLINIC LABORATORIES

Test Definition: PRA

Renin Activity, Plasma

Overview

Useful For

Investigation of primary aldosteronism (eg, adrenal adenoma/carcinoma and adrenal cortical hyperplasia) and secondary aldosteronism (renovascular disease, salt depletion, potassium loading, cardiac failure with ascites, pregnancy, Bartter syndrome)

This test is **not useful for** determination of plasma renin concentration.

Special Instructions

- Renin-Aldosterone Studies

Method Name

Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)
Portions of this test are covered by patents held by Quest Diagnostics

NY State Available

Yes

Specimen

Specimen Type

Plasma EDTA

Specimen Required

Patient Preparation: For 4 to 6 weeks before specimen collection, spironolactone (Aldactone) should be discontinued, as plasma renin activity cannot be interpreted if the patient is being treated with spironolactone.
Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube: Chilled, lavender top (EDTA)
Submission Container/Tube: Plastic vial
Specimen Volume: 0.8 mL
Collection Instructions:
1. Draw blood in a chilled syringe from a patient in a seated position; place specimen in a chilled, 3-mL lavender-top (EDTA) tube and mix well. Alternatively, draw blood directly in a chilled, EDTA tube.
2. Immediately place EDTA tube into an ice-water bath until thoroughly cooled.
3. Immediately centrifuge using a refrigerated centrifuge and aliquot plasma into a plastic vial.
Note: If a refrigerated centrifuge is unavailable, chill the centrifuge carriers before use. Centrifuge specimen for 5 minutes or less, then promptly aliquot plasma into a plastic vial.
4. Immediately freeze plasma.

Forms

If not ordering electronically, complete, print, and send 1 of the following forms with the specimen:
-General Request (T239)
-Cardiovascular Test Request (T724)
-Renal Diagnostics Test Request (T830)

Specimen Minimum Volume
0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma EDTA	Frozen	14 days	

Clinical & Interpretive

Clinical Information
The renal juxtaglomerular apparatus generates renin, an enzyme that converts angiotensinogen to angiotensin I. The inactive angiotensin I is enzymatically converted to the active octapeptide angiotensin II, a potent vasopressor responsible for hypertension of renal origin. Angiotensin II also stimulates the zona glomerulosa of the adrenal cortex to release aldosterone.

Renin secretion by the kidney is stimulated by a fall in glomerular blood pressure, by decreased sodium concentration at the macula densa at the distal tubule, or by stimulation of sympathetic outflow to the kidney, such as in renal vascular diseases.

Reference Values
0-2 years: 4.6 ng/mL/h (mean)* Range: 1.4-7.8 ng/mL/h
3-5 years: 2.5 ng/mL/h (mean)* Range: 1.5-3.5 ng/mL/h
6-8 years: 1.4 ng/mL/h (mean)* Range: 0.8-2.0 ng/mL/h
9-11 years: 1.9 ng/mL/h (mean)* Range: 0.9-2.9 ng/mL/h
12-17 years: 1.8 ng/mL/h (mean)* Range: 1.2-2.4 ng/mL/h
Mean data not standardized as to time of day or diet. Infants were supine, children sitting.
*Stalker HP, Holland NH, Kotchen JM, Kotchen TA. Plasma renin activity in healthy children. J Pediatr. 1976;89(2):256-258

Na-depleted, upright (peripheral vein specimen)
18-39 years: 10.8 ng/mL/h (mean)

2.9-24.0 ng/mL/h (range)
> or =40 years: 5.9 ng/mL/h (mean)
2.9-10.8 ng/mL/h (range)

Na-replete, upright (peripheral vein specimen)
18-39 years: 1.9 ng/mL/h (mean)
< or =0.6-4.3 ng/mL/hour (range)
> or =40 years: 1.0 ng/mL/h (mean)
< or =0.6-3.0 ng/mL/h (range)

Interpretation

A high ratio of serum aldosterone (SA) in ng/dL to plasma renin activity (PRA) in ng/mL/h, is a positive screening test result, a finding that warrants further testing. A SA:PRA ratio greater than or equal to 20 and SA of greater than or equal to 15 ng/dL indicates probable primary aldosteronism.

Kidney disease, such as unilateral renal artery stenosis, results in elevated renin and aldosterone levels. Kidney venous catheterization may be helpful. A positive test is a renal venous renin ratio (affected:normal) above 1.5.

For more information see Renin-Aldosterone Studies.

Cautions

Angiotensin-converting enzyme (ACE) inhibitors have the potential to falsely elevate plasma renin activity (PRA). Therefore, in a patient treated with an ACE inhibitor, the findings of a detectable PRA level or a low serum aldosterone/PRA ratio do not exclude the diagnosis of primary aldosteronism. In addition, a strong predictor for primary aldosteronism is a PRA level undetectably low in a patient taking an ACE inhibitor.

Clinical Reference

1. Young WF Jr. Primary aldosteronism: A common and curable form of hypertension. Cardiol Rev. 1999;7(4):207-214
2. Young WF Jr. Pheochromocytoma and primary aldosteronism: diagnostic approaches. Endocrinol Metab Clin North Am. 1997;26(4):801-827. doi:10.1016/s0889-8529(05)70283-8
3. Baudrand R, Vaidya A. The low-renin hypertension phenotype: genetics and the role of the mineralocorticoid receptor. Int J Mol Sci. 2018;19(2):546. doi:10.3390/ijms19020546

Performance

Method Description

The renin in plasma is allowed to act on the plasma's endogenous substrate, angiotensinogen, producing angiotensin I. This is measured by liquid chromatography-tandem mass spectrometry (LC-MS/MS). Renin activity is expressed in nanograms (ng) of angiotensin produced per mL of plasma per hour of incubation. The primary metabolite of renin activity, angiotensin I, is cleaved by converting enzyme to angiotensin II.

By inhibiting the action of converting enzyme and the angiotensinases with EDTA, dimercaprol (BAL) and 8-hydroxyquinoline, it is possible to indirectly measure the activity of renin during a controlled incubation by measuring the concentration (in ng) of angiotensin I that is generated.

It has been demonstrated that maximum renin activity occurs at a generation system pH of 5.5-6.0. Therefore, generation conditions are adjusted to this pH range.

Using the Hamilton STAR, EDTA Plasma is mixed with generation buffer in the 0 degrees C generation tray. The sample/buffer mix is transferred to a 37 degrees C generation tray. The 37 degrees C tray is incubated in a shaking waterbath for 1 hour. During that incubation time, the 0 degrees C tray has internal standard (IS) added and is crashed, then placed on a titer plate shaker for a minimum of 15 minutes. Once the hour incubation is complete, the 37 degrees C tray also has IS and crash solution added and is shaken for 15 minutes. The plates are then centrifuged and placed back on the Hamilton STAR. The supernatant layer is transferred to the designated 0 degrees C and 37 degrees C round bottom DW96 collection plates. The plates are dried down under nitrogen, reconstituted and analyzed for AngI by LC-MS/MS.

Transitions for LC-MS/MS
AngI-1 analyte: 433.1 m/z to 513.4 m/z; Internal standard: 435.1 m/z to 519.4 m/z
AngI-2 analyte: 433.1 m/z to 647.4 m/z; Internal standard: 435.1 m/z to 647.4 m/z
(Unpublished Mayo Method)

PDF Report
No

Day(s) Performed
Monday through Friday, Sunday

Report Available
2 to 5 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 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.

Test Definition: PRA

Renin Activity, Plasma

CPT Code Information

84244

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
PRA	Renin Activity, P	2915-7

Result ID	Test Result Name	Result LOINC® Value
8060	Renin Activity, P	2915-7