MAYO CLINIC LABORATORIES

Test Definition: RFAMA

Renal Function Panel, S

Overview

Useful For

Aids in diagnosis and management of conditions affecting kidney function

General health screening

Screening patients at risk of developing kidney disease

Management of patients with known kidney disease

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
KS	Potassium, S	Yes	Yes
NAS	Sodium, S	Yes	Yes
CL	Chloride, S	Yes	Yes
HCO3	Bicarbonate, S	Yes	Yes
AGAP	Anion Gap	No	Yes
BUN	Bld Urea Nitrog (BUN), S	Yes	Yes
CRTS1	Creatinine with eGFR, S	Yes	Yes
CA	Calcium, Total, S	Yes	Yes
GLURA	Glucose, Random, S	Yes	Yes
ALB	Albumin, S	Yes	Yes
PHOS	Phosphorus (Inorganic), S	Yes	Yes

Method Name

KS, NAS, CL: Potentiometric, Indirect Ion-Selective Electrode

HCO3: Photometric, Enzymatic

AGAP: Sodium-(Bicarbonate + Chloride)

BUN: Photometric, Urease

CRTS1: Enzymatic Colorimetric Assay

CA: Photometric, 5-nitro-5'-methyl-BAPTA

GLURA: Photometric/Hexokinase

ALB: Photometric, Bromcresol Green

PHOS: Photometric, Ammonium Molybdate

NY State Available
Yes

Specimen

Specimen Type
Serum

Necessary Information
Patient's age and sex are required.

Specimen Required
Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Specimen Volume: 0.6 mL

Collection Instructions:

1. Serum gel tubes should be centrifuged within 2 hours of collection.

2. Red-top tubes should be centrifuged and aliquoted within 2 hours of collection.

Forms
If not ordering electronically, complete, print, and send a Renal Diagnostics Test Request (T830) with the specimen.

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK

Specimen Minimum Volume
0.5 mL

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)		

Clinical & Interpretive

Clinical Information

A renal function panel could be ordered when a patient has risk factors for kidney dysfunction such as high blood pressure (hypertension), diabetes, cardiovascular disease, obesity, elevated cholesterol, or a family history of kidney disease. A renal function panel may also be ordered when someone has signs and symptoms of kidney disease, though early kidney disease often does not cause any noticeable symptoms. It may be initially detected through routine blood or urine testing.

Reference Values

SODIUM

<1 year: not established

> or =1 year: 135-145 mmol/L

POTASSIUM

<1 year: not established

> or =1 year: 3.6-5.2 mmol/L

CHLORIDE

<1 year: not established

1-17 years: 102-112 mmol/L

> or =18 years: 98-107 mmol/L

BICARBONATE

Males

<1 year: not established

1-2 years: 17-25 mmol/L

3 years: 18-26 mmol/L

4-5 years: 19-27 mmol/L

6-7 years: 20-28 mmol/L

8-17 years: 21-29 mmol/L

> or =18 years: 22-29 mmol/L

Females

<1 year: not established

1-3 years: 18-25 mmol/L

4-5 years: 19-26 mmol/L

6-7 years: 20-27 mmol/L

8-9 years: 21-28 mmol/L

> or =10 years: 22-29 mmol/L

ANION GAP

<7 years: not established

> or =7 years: 7-15

BLOOD UREA NITROGEN (BUN)

Males

<12 months: not established

1-17 years: 7-20 mg/dL

> or =18 years: 8-24 mg/dL

Females

<12 months: not established

1-17 years: 7-20 mg/dL

> or =18 years: 6-21 mg/dL

CREATININE

Males

0-11 months: 0.17-0.42 mg/dL

1-5 years: 0.19-0.49 mg/dL

6-10 years: 0.26-0.61 mg/dL

11-14 years: 0.35-0.86 mg/dL

> or =15 years: 0.74-1.35 mg/dL

Females

0-11 months: 0.17-0.42 mg/dL

1-5 years: 0.19-0.49 mg/dL

6-10 years: 0.26-0.61 mg/dL

11-15 years: 0.35-0.86 mg/dL

> or =16 years: 0.59-1.04 mg/dL

eGFR

>60 mL/min/BSA

Estimated GFR calculated using the 2009 CKD_EPI creatinine equation.

CALCIUM

<1 year: 8.7-11.0 mg/dL

1-17 years: 9.3-10.6 mg/dL

18-59 years: 8.6-10.0 mg/dL

60-90 years: 8.8-10.2 mg/dL

>90 years: 8.2-9.6 mg/dL

GLUCOSE

0-11 months: not established

> or =1 year: 70-140 mg/dL

Total Protein

> or =1 year: 6.3-7.9 g/dL

Reference values have not been established for patients who are <12 months of age.

ALBUMIN

> or =12 months: 3.5-5.0 g/dL

Reference values have not been established for patients who are <12 months of age.

PHOSPHORUS

Males

1-4 years: 4.3-5.4 mg/dL

5-13 years: 3.7-5.4 mg/dL

14-15 years: 3.5-5.3 mg/dL

16-17 years: 3.1-4.7 mg/dL

> or =18 years: 2.5-4.5 mg/dL

Reference values have not been established for patients that are less than 12 months of age.

Females

1-7 years: 4.3-5.4 mg/dL

8-13 years: 4.0-5.2 mg/dL

14-15 years: 3.5-4.9 mg/dL

16-17 years: 3.1-4.7 mg/dL

> or =18 years: 2.5-4.5 mg/dL

Reference values have not been established for patients that are less than 12 months of age.

Interpretation

Renal function panel results are not diagnostic but rather indicate that there may be a problem with the kidneys and that further testing is required to make a diagnosis and determine the cause. Results of the panel are usually considered together, rather than separately. Individual test result can be abnormal due to causes other than kidney disease, but taken together with risks and signs and symptoms, they may give an indication of whether kidney disease is present.

Cautions

No significant cautionary statements.

Clinical Reference

1. Oh MS: Evaluation of renal function, water, electrolytes, and acid-base balance. In Henry's Clinical Diagnosis and Management by Laboratory Methods. 22nd edition. Edited by RA McPherson, MR Pincus. Philadelphia, PA: Elsevier Saunders; 2011:chap 14

2. AACC: Lab Tests Online: Access 03/22/2017. Available at https://labtestsonline.org/understanding/analytes/bmp

Performance

Method Description

KS, NAS, CL:

Ion-selective electrode (ISE) (indirect potentiometry). The ISE module performs indirect measurement of electromotive force (EMF). The ISE module measures the EMF difference between an ISE and a reference electrode. The EMF of the ISE is dependent on the ion concentration of the sample. The EMF of the reference electrode is constant. An electronic calculation circuit converts EMF of the sample to the ion concentration of the sample.(Package insert: Roche Diagnostics ISE reagent; Indianapolis, IN, 2006)

Bicarbonate (HCO3):

This is a photometric rate reaction. Bicarbonate (HCO3-) reacts with phosphoenolpyruvate (PEP) in the presence of phosphoenolpyruvate carboxylase (PEPC) to produce oxaloacetate and phosphate. The oxaloacetate produced is coupled with NADH in the presence of malate dehydrogenase (MDH) to produce malate and NAD. The consumption of NADH causes a decrease in absorbance and is monitored in the UV range of 320 nm to 400 nm. The rate of change is directly proportional to the concentration of bicarbonate.(Package insert: Roche Bicarbonate reagent, Indianapolis, IN, July 2000)

AGAP:

This is a calculated result. The following equation is used to calculate the anion gap (A gap):

A gap = Na - (Cl + HCO3)

BUN:

This is a kinetic ultraviolet assay where urease cleaves urea to form ammonia and CO2. The ammonia formed then reacts with a-ketoglutarate and NADH in the presence of urease/glutamate dehydrogenase (GLDH) to yield glutamate and NAD. The decrease in absorbance, due to the consumption of NADH, is measured kinetically and is proportional to the amount of urea in the sample.(Package insert: Roche Urea/BUN reagent; Indianapolis, IN, Sept 2000)

CRTS1:

This enzymatic method is based on the conversion of creatinine with the aid of creatininase, creatinase, and sarcosine oxidase to glycine, formaldehyde, and hydrogen peroxide. Catalyzed by peroxidase, the liberated hydrogen peroxide reacts with 4-aminophenazone and hydroxy(tosyloxy)iodobenzene (HTIB) to form a quinone imine chromogen. The color intensity of the quinone imine chromogen formed is directly proportional to the creatinine concentration in the reaction mixture.(Package insert: Roche Diagnostics, Indianapolis IN, 12/2016)

CA:

Calcium ions react with 5-nitro-5'-methyl-BAPTA (NM-BAPTA) under alkaline conditions to form a complex. This complex reacts in the second step with EDTA. The change in absorbance is directly proportional to the calcium concentration and is measured photometrically.(Package insert: Roche Calcium Gen.2 reagent, Roche Diagnostic Corp, Indianapolis, IN, 2012 July)

GLURA:

Glucose in the serum, in the presence of hexokinase, is converted to glucose-6-phosphate (G-6-P). Glucose-6-phosphate dehydrogenase (G-6-PDH), in the presence of NADP, oxides G-6-P to gluconate-6-phosphate and NADPH. The rate of NADPH formation is directly proportional to glucose concentration in the serum and is measured photometrically.(Package insert: Roche Glucose Reagent. Indianapolis, IN, January 2000)

ALB:

The dye, bromcresol green (BCG), is added to serum in an acid buffer. The color intensity of the blue-green albumin-BCG complex is directly proportional to the albumin concentration and is determined photometrically.(Package insert: Roche Albumin reagent; Roche Diagnostic Corp., Indianapolis, IN, July 1999)

PHOS:

The method is based on the reaction of phosphate with ammonium molybdate to form ammonium phosphomolybdate (without reduction). The addition of an accelerator gives rise to a more rapid rate of reaction. Sample blanking yields more precise results.(Package insert: Roche Phosphorus reagent, Roche Diagnostics Corp, Indianapolis, IN, 1999)

PDF Report
No

Performing Laboratory Location
Rochester

Fees & Codes

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
KS: 84132

NAS: 84295

CL: 82435

HCO3: 82374

BUN: 84520

CRTS1: 82565

CA: 82310

GLURA: 82947

ALB: 82040

PHOS: 84100

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
RFAMA	Renal Function Panel, S	24362-6

Result ID	Reporting Name	LOINC®
AGAP	Anion Gap	33037-3
ALB	Albumin, S	1751-7
BUN	Bld Urea Nitrog (BUN), S	3094-0
CL	Chloride, S	2075-0
GLURA	Glucose, Random, S	2345-7
HCO3	Bicarbonate, S	1963-8
PHOS	Phosphorus (Inorganic), S	2777-1
CA	Calcium, Total, S	17861-6
NAS	Sodium, S	2951-2
KS	Potassium, S	2823-3
CRTSA	Creatinine, S	2160-0
EGNB	eGFR Non-Black/African American	88294-4
EGBL	eGFR-Black/African American	88293-6