

Test Code 4364	Magnesium, Serum or Plasma	MG
Methodology:	Spectrophotometric	
Performed:	Sunday – Saturday	
Reported:	2 – 4 hours (STAT: 1 hour)	
Specimen Required:	<p>Collect: One gold top or plain red. Acceptable: Green (heparin). Transport: Centrifuged gold, or 1 ml serum or plasma (Min: 0.3 ml) Pediatric Minimum/Transport (single test with no repeat): 0.2 mL plasma or serum (1 microtainer) at 2-8°C. Unacceptable Conditions: Hemolyzed, EDTA, oxalate/fluoride or citrate specimens. Stability: Ambient: 48 hours; Refrigerated: 7 days; Frozen: 1 month</p>	
Reference Interval:	1.6 – 2.6 mg/dl	
CPT Code:	83735	
Test Code 4360	Magnesium, OB (For obstetrical use only)	MG-OB
Methodology:	Spectrophotometric	
Performed:	Sunday – Saturday	
Reported:	1 hour	
Specimen Required:	<p>Collect: One gold top or plain red. (Min: 3 mL) Acceptable: Green (heparin). Transport: Centrifuged gold, or 1 ml serum or plasma (Min: 0.3 ml). Stability: Ambient: 48 hours; Refrigerated: 7 days; Frozen: 1 month</p>	
Reference Interval:	4.0 – 8.0 mg/dl (OBSTETRICAL PATIENT ONLY)	
CPT Code:	83735	
Test Code 6495	Magnesium, Urine	U-MG /TV
Methodology:	Spectrophotometric	
Performed:	Monday – Saturday	
Reported:	1 – 2 days	
Specimen Required:	<p>Collect: 24-hour urine in clean, plastic container with secure lid. Refrigerate during collection. Transport: Entire urine collection promptly at 2-8°C. Remarks: Specify total volume and hours of collection. On receipt: Adjust pH to 1.5 – 2.0 using 6M HCl. Unacceptable Conditions: Specimens containing preservatives or in metal containers. Stability: Ambient: Unstable ; Refrigerated: 7 days; Frozen: 1 month</p>	
Reference Interval:	12 – 292 mg/24 hours	
CPT Code:	83735	

Test Code 2673

Malaria Smear

MALARIA

Methodology: Stain/Microscopic
Performed: Daily
Reported: 1 Hour

Specimen Required: **Collect:** One 5 mL lavender (EDTA).
Transport: 5 mL lavender (EDTA) or 5 thin blood smears (unstained, unfixed) and 5 thick smears (unstained, unfixed). If unable to allow slides to dry completely, please transport in cardboard slide holder. Transport at 20-25°C
Remarks: Sample must be received within 24 hours of collection; testing must be performed within 48 hours of collection. Thick smears are made by dropping 10 to 20 µL of blood onto a slide and spreading it into a dime-sized area with a wooden or plastic applicator.
Stability: Ambient: 24 hours

Reference Interval: Negative

CPT Code: 87207

Manual Differential

Methodology: Microscopic
Performed: As needed
Reported: Same day

Specimen Required: **Collect:** One 5 mL lavender (EDTA). (Min: 0.5 mL drawn in 3 mL lavender)
Transport: 3 mL whole blood (lavender, EDTA) at ambient temperature. (Min: 0.5 mL)
Unacceptable Conditions: Hemolyzed or clotted samples.
Stability: Ambient: 24 hours; Refrigerated: 48 hours

Reference Interval:

AGE	Neut %	Lymph %	Mono %	Eos %	Baso %
Birth - 2 Months	20-87	20-60	2-10	0-6	0-3
3 Mo - 2 Years	17-49	20-60	2-10	0-6	0-3
3 - 10 Years	33-35	20-60	2-10	0-6	0-3
11-17 Years	45-70	20-40	2-10	0-6	0-3
18 or > Years	45-80	20-40	2-10	0-6	0-3

CPT Code: 85007

Masson Trichrome Stain

CPT Code: 88313

Mayer's Mucicarmine Stain

CPT Code: 88313

Metabolic Panel, Comprehensive

Refer to Comprehensive Metabolic Panel.

Test Code 4370 **Metanephrines, Urine (24-Hour)** **META UF**

Methodology: Gas Chromatography/Mass Spectrometry
Performed: Referral – ARUP (Sunday, Tuesday – Saturday)
Reported: 2 – 5 days

Specimen Required: **Collect:** 24-hour urine. Refrigerated during collection.
Transport: 5 mL aliquot from a well-mixed 24-hour collection at 2-8°C. Submit sample in an ARUP Standardized Transfer Tube. Record 24-hour total volume on tube. (Min: 1.5 mL)
Pediatric Minimum/Transport (single test with no repeat): 1.5 mL aliquot from a well-mixed 24-hour collection at 2-8°C or frozen. Record 24-hour total volume on tube.
Remarks: Adequate refrigeration is the most important aspect of specimen preservation. Stability is enhanced at pH 2 – 3. A pH of less than 2 may cause assay interference.
Stability: Ambient: 24 hours; Refrigerated: 2 weeks; Frozen 1 month

Reference Interval:

Components	Reference Interval															
Metanephrine	Pediatric specimens are reported in units of µg/g creatinine															
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Adult	0 – 4000 µg/g crt															
Creatinine (24-Hour)	By report (reports may vary based on instrumentation).															

Random Specimens – Reported in units of µg/g crt creatinine

Components	Reference Interval
Metanephrine	30-350 µg/d
Normetanephrine	50-650 µg/d

Note: Secreting neuroendocrine tumors are typically associated with metanephrine or normetanephrine concentrations several times higher than the upper reference intervals. Other reasons for elevated concentrations include intense physical activity, life threatening illness and drug interferences. Essential hypertension is often associated with slight elevations (metanephrine < 700 µg/day and normetanephrine < 900 µg/day). Other reasons for slight and moderate elevations include emotional and physical stress and improper specimen collection.

Medications which may interfere with catecholamines and metanephrines include amphetamines and amphetamine-like compounds, appetite suppressants, bromocriptine, buspirone, caffeine, carbidopa-levodopa (Sinemet), clonidine, dexamethasone, diuretics (in doses sufficient to deplete sodium), methyl dopa (Aldomet), MAO inhibitors, nose drops, propafenone (Rythmol), tricyclics and vasodilators. The effects of some drugs on catecholamine metabolite results may not be predictable.

The metanephrines-to-creatinine ratio will be reported whenever the patient is under 18 years, the urine collection is random or other than 24 hours, or the urine volume is less than 400 mL/24 hours.

CPT Code: 83835

Methyl Alcohol

Refer to Methanol.

Test Code 6563 Methylene tetrahydrofolate Reductase Mutation Detection (Thermolabile Form) (C677T & A1298C)

Methodology: Polymerase Chain Reaction/Fluorescence Monitoring

Performed: Assay: Mon and Thu; DNA isolation: Sun-Sat

Reported: Within 7 days

Specimen Required: **Collect:** One 5 mL lavender (EDTA). Also acceptable: yellow (ACD), lt. blue (sodium/citrate), green (sodium or lithium heparin).
Transport: 5 mL whole blood at 2-8°C. **Do not freeze.**
Pediatric Collect/Transport: 1 mL whole blood at 2-8°C. **Do not freeze.**
Unacceptable Conditions: Serum, plasma, frozen whole blood, clotted blood, and severely hemolyzed samples.
Stability: Ambient: 24 hours; Refrigerated: 5 days; Frozen: Unacceptable

Reference Interval: Negative: This sample is negative for MTHFR C677T and A1298C mutations.

Interpretive Data: The 677T and A1298C mutations in the heterozygous or homozygous states correlate with reduced enzyme activity. But only individuals homozygous for the C677T mutation or compound heterozygous for the C667T/A1298C mutations have significantly elevated plasma homocysteine levels. Homozygosity for the C677T mutation (from 1.5 to 15% of the population) is associated with intermediate and mild hyperhomocystinemia and a threefold increased risk for premature cardiovascular disease. Although correlation data is known, penetrance information is not available. Less is known about the penetrance and risk associated with compound heterozygosity for the C667T/A1298C. Double homozygotes have not been reported in the population. Mutations in genes or mutations other than C677T and A1298C in the *MTHFR* gene that may cause increased plasma homocysteine, coronary heart disease, or venous thrombosis are not ruled out. Patient DNA is assayed for the C677T and A1298C mutations in the methylenetetrahydrofolate reductase gene by polymerase chain reaction (PCR), and fluorescence monitoring using hybridization probes. Sensitivity and specificity for detection of this mutation are 99.9%. This test is performed pursuant to an agreement with Roche Molecular Systems, Inc. This test is performed pursuant to an agreement with Nuvelo, Inc. Due to the unique nature of genetic testing, patients should receive pre- and post-test counseling. Informed consent is recommended. Consent forms are available from ARUP upon request or online at www.aruplab.com. Please refer to Statement C in the Compliance Statements section in the front of this User's Guide. **Note:** For genotyping individuals with a family history of neural tube defects, please contact the laboratory. This test is not recommended for nonsymptomatic patients under 18 years of age.

CPT Code(s): 83890 Isolation; 83898 Amplification; 83896 x4 Nucleic acid probe; 83912 Interpretation and report

Methyl Green Pyronine-Y

CPT Code: 88313

Methyl Green Stain Only

CPT Code: 88313

Test Code 6520 **Methylmalonic Acid (MMA), Serum Quantitative** **MMA QNT-P**

Methodology: High Performance Liquid Chromatography/Mass Spectrometry
Performed: Referral – ARUP (Sunday - Saturday)
Reported: 3 – 5 days

Specimen Required: **Collect:** One 7 mL plain red, SST or 7mL plasma from EDTA, heparin, sodium fluoride potassium oxalate or citrated plasma.
Transport: 3 mL serum or plasma, frozen.
Pediatric Minimum/Transport (single test with no repeat): 1.0 mL serum or plasma, frozen.
Stability: Ambient: Unacceptable; Refrigerated: 4 days; Frozen: 1 month

Reference Interval: ≤ 0.4 µmol/L

Interpretive Data: This test is performed pursuant to a licensing agreement with Competitive Technologies, Inc.

CPT Code: 83921

Mexate

Refer to Methotrexate.

Test Code 4371 **Microalbumin, Urine, Quant** **U-MICROALB**

Methodology: Nephelometry
Performed: Monday - Friday
Reported: 1 – 3 days

Specimen Required: **Collect:** 24-hour urine. Acceptable: random and other timed urine collections. Specimen must be refrigerated during collection.
Transport: Entire urine collection, or a 5 mL aliquot from a well-mixed 24-hour, random or other timed urine collection; at 2-8°C.
Remarks: Specify total volume and collection time on test request form. Frozen samples are also acceptable.
Stability: Ambient: 4 hours; Refrigerated: 7 days

Reference Interval: Albumin mg/dL: 0.0 – 1.8 mg/dL
Albumin mg/TV: 2 – 21 mg/TV
Albumin µg/minute: 0 – 20 µg/min

CPT Code: 82043 Microalbumin

Test Code 9620 **Microalbumin/Creatinine Ratio, Urine** **U-MALB/CR**

Methodology: Nephelometry/Spectrophotometry
Performed: Monday - Friday
Reported: 1 – 3 days

Specimen Required: **Collect:** Random or timed urine collection in clean container with secure lid.
Transport: Entire urine collection, or a 5 mL aliquot from a well-mixed random or other timed urine collection (Min: 1 mL), promptly. If transport will be delayed, refrigerate and transport at 2 – 8°C.
Remarks: Specify total volume and hours of collection.
Stability: Ambient: 4 hours; Refrigerated: 7 days

Reference Interval: Albumin mg/dL: 0.0 – 1.8 mg/dL
Albumin mg/TV: 2 – 21 mg/TV
Albumin µg/min: 0 – 20 µg/minute
Albumin/Creatinine: 0 – 30 mg/g creat

CPT Code(s): 82570 Creatinine; 82043 Microalbumin

Microsomal Antibody

Refer to Thyroid Antibody.

Test Code 3712**Mitochondrial M2 Antibody, IgG (ELISA)**

Methodology: Enzyme-Linked Immunosorbent Assay
Performed: Referral – ARUP (Sunday - Saturday)
Reported: 2 – 4 days

Specimen Required: **Collect:** One 4 mL SST
Transport: 1 mL serum at 2-8°C. (Min: 0.5 mL)
Pediatric Minimum/Transport (single test with no repeat): 0.15 mL serum at 2-8°C.
Remarks: Separate serum from cells ASAP.
Unacceptable Conditions: Plasma, severely lipemic, contaminated or hemolyzed samples.
Stability: After separation from clot: Ambient: 2 days; Refrigerated: 2 weeks; Frozen: 1 year (avoid repeat freeze/thaw cycles)

Reference Interval: < 1.0 Units: No antibody detected.
1.0 – 1.3 Units: Inconclusive
> 1.3 Units: Positive

CPT Code: 83516

Test Code 3861**Mononucleosis Screen****MONOSPOT**

Methodology: Direct solid-phase immunoassay
Performed: Daily
Reported: 24 hours

Specimen Required: **Collect:** One lavender (EDTA), green (heparin), blue (citrate). (Min: 3 mL lavender)
Transport: Lavender (EDTA), green (heparin), blue (citrate) at room temp.
Remarks:
Stability: Ambient: 24 hours, specimens can be refrigerated at 2-8°C for up to 72 hours.

Reference Interval: Negative

CPT Code(s): 86308

Morphine (Opiates), Urine

Refer to Drugs of Abuse (DAU7 Panel), Urine

Motrin

Refer to Ibuprofen.

MRSA Screen

Refer to Culture – Staphylococcus (MRSA Screen)

Methodology: Nephelometry/Electrophoresis/Radioimmunoassay
Performed: Referral to ARUP (Monday, Wednesday, and Thursday)
Reported: Within 3 – 5 days

Specimen Required: **Collect:** One 4 mL SST **and** 2 mL CSF. (Min: 0.5 mL serum and 1.5 mL CSF)
Transport: 1 mL serum **and** 2 mL CSF, frozen.
Pediatric Collect/Transport: 0.5 mL serum and 1.5 mL CSF, frozen.
Remarks: Serum sample should be drawn within 48 hours of CSF collection.
Stability: Refer to individual components.

Reference Interval:
 Immunoglobulin G, Serum

0- 30 days: 611-1542 mg/dL	9-11 months: 282-1026 mg/dL
1 month: 241-870 mg/dL	1 year: 331-1164 mg/dL
2 months: 198-577 mg/dL	2 years: 407-1009 mg/dL
3 months: 169-558 mg/dL	3 years: 423-1090 mg/dL
4 months: 188-536 mg/dL	4 years: 444-1187 mg/dL
5 months: 165-781 mg/dL	5-7 years: 608-1229 mg/dL
6 months: 206-676 mg/dL	8-9 years: 584-1509 mg/dL
7-8 months: 208-868 mg/dL	10 years and older: 768-1632 mg/dL

Immunoglobulin G, CSF 0-6.0 mg/dL

Albumin, Serum by Nephelometry 3500-5200 mg/dL

Albumin, CSF 0-35 mg/dL

Albumin Index 0.0-9.0

CSF IgG Synthesis Rate 0.0-8.0 mg/d

IgG Index 0.28-0.66

CSF IgG/Albumin Ratio 0.09-0.25

CSF Oligoclonal Bands Negative

Myelin Basic Protein 0.07-4.10 ng/mL

Interpretation By report

Note: A patient is considered positive for CSF oligoclonal bands if there are two or more bands in the CSF immunoglobulin region that are not present in the serum. In order to confirm local production of oligoclonal IgG in CSF, a matched serum sample is required. Oligoclonal bands present in CSF, but not in serum, indicate central nervous system production.

Hemolysis is associated with falsely elevated levels of MBP in the CSF. CSF should be free from contamination with blood, if possible. If all available CSF is bloody, centrifuge the sample and separate supernatant from cells prior to freezing the sample.

CPT Code(s): 83916 Oligoclonal Immunoglobulin; 83873 Myelin Basic Protein, CSF; 82784 IgG, Serum; 82042 IgG, CSF; 82040 Albumin, Serum; 82040 Albumin, CSF

Test Code 3878

Mumps Virus Antibody, IgG

MUMPS

Methodology: Enzyme-Linked Immunosorbent Assay
Performed: Referral – ARUP (Sunday - Saturday)
Reported: 3 – 5 days

Specimen Required: **Collect:** One 4 mL SST.
Transport: 1 mL serum at 2-8°C. (Min: 0.2 mL)
Pediatric Minimum/Transport (single test with no repeat): 0.1 mL serum at 2-8°C.
Remarks: Separate serum from cells ASAP. Acute and convalescent samples must be labeled as such; parallel testing is preferred and convalescent samples **must** be received within 30 days from receipt of acute samples. **Please mark samples plainly as "acute" or "convalescent"**.
Unacceptable Conditions: Severely lipemic, icteric or hemolyzed samples. Heat inactivated or contaminated samples.
Stability: After separation from clot: Ambient: 2 days; Refrigerated: 2 weeks; Frozen: 1 year (avoid repeat freeze/thaw cycles)

Reference Interval: ≤ 0.90 IV: Negative - No significant level of detectable mumps virus antibody.
0.91 – 1.09 IV: Equivocal - Repeat testing in 10-14 days may be helpful.
≥ 1.10 IV: Positive - IgG antibody to mumps virus detected which may indicate a current or previous exposure/immunization to mumps virus. Positive IgG antibody levels in the absence of current clinical symptoms may indicate immunity.

Interpretive Data: IV = Index Value

Seroconversion between acute and convalescent sera is considered strong evidence of current or recent infection. The best evidence for infection is a significant change on two appropriately timed specimens, where both tests are done in the same laboratory at the same time.

CPT Code: 86735

Test Code 3879

Mumps Virus Antibody, IgM

MUMPS IGM

Methodology: Enzyme-Linked Immunosorbent Assay
Performed: Referral – ARUP (Monday, Wednesday, Friday)
Reported: 3 – 5 days

Specimen Required: **Collect:** One 4 mL SST.
Transport: 1 mL serum at 2–8°C. (Min: 0.5 mL)
Pediatric Minimum/Transport (single test with no repeat): 0.2 mL serum at 2-8°C.
Remarks: Separate serum from cells ASAP. Acute and convalescent samples must be labeled as such; parallel testing is preferred and convalescent samples **must** be received within 30 days from receipt of the acute samples. **Please mark sample plainly as "acute" or "convalescent"**.
Unacceptable Conditions: Severely lipemic, icteric or hemolyzed samples. Heat-inactivated serum.
Stability: After separation from clot: Ambient: 2 days; Refrigerated: 2 weeks; Frozen: 1 year (avoid repeated freeze/thaw cycles)

Reference Interval: ≤ 0.90 IV: Negative – No Antibody Detected
0.91 – 1.09 IV: Equivocal – Repeat testing in 10-14 days may be helpful.
≥ 1.1 IV: Positive – Presence of IgM antibody to mumps virus detected and may indicate a current or recent infection.

Interpretive Data: IV = Index Value

While the presence of IgM antibodies suggests current or recent infection, low levels of IgM antibodies may occasionally persist for more than 12 months post-infection or immunization.

CPT Code: 86735

Mycobacteria Culture

Refer to Culture – TB (Acid-Fast Bacilli)

Mycoplasma hominis Culture

Refer to Ureaplasma urealyticum and Mycoplasma hominis Culture.

Test Code 3891 **Mycoplasma pneumoniae Antibodies, IgG & IgM** **MYCO PAN**

Methodology: Enzyme-Linked Immunoassay
Performed: Referral – ARUP (Sunday - Saturday)
Reported: 3 – 5 days

Specimen Required: **Collect:** One 4 mL SST acute
Transport: 0.5 mL serum at 2-8°C. (Min: 0.2 mL)
Pediatric Minimum/Transport (single test with no repeat): 0.1 mL serum at 2-8°C.
Remarks: Separate serum from cells ASAP. Acute and convalescent samples must be labeled as such; parallel testing is preferred and convalescent samples **must** be received within 30 days from receipt of the acute samples. **Please mark samples clearly as "acute" or "convalescent"**.
Unacceptable Conditions: Plasma, severely lipemic, hemolyzed, icteric, heat-inactivated or contaminated samples.
Stability: After separation from clot: Ambient: 2 days; Refrigerated: 2 weeks; Frozen: 1 year (avoid repeated freeze/thaw cycles)

Reference Interval:

Components	Reference Interval
*Mycoplasma pneumoniae Antibody, IgG	<p>If Acute result: ≤ 0.20 U/L And Convalescent result: > 0.32 U/L Interpretation: Significant <i>M. pneumoniae</i> antibody rise indicating current or recent infection.</p> <p>If Acute result: ≤ 0.20 U/L And Convalescent result: ≤ 0.32 U/L Interpretation: No significant <i>M. pneumoniae</i> antibody change detected.</p> <p>If Acute result: ≥ 0.32 U/L And Convalescent result: ≤ 0.20 U/L Interpretation: Significant <i>M. pneumoniae</i> antibody fall indicating recent past infection.</p>
*Mycoplasma pneumoniae Antibody, IgM	<p>< 0.77 U/L: Negative – No clinically significant amount of <i>M. pneumoniae</i> antibody detected. $0.77 - 0.95$ U/L: Equivocal – <i>M. pneumoniae</i> specific IgM presumptively detected. Collection of a follow-up sample in 11-2 weeks is recommended to assure reactivity. > 0.95 U/L: Positive – Highly significant amount of <i>M. pneumoniae</i> specific IgM antibody detected.</p>
*For additional information refer to individual test.	

CPT Code(s): 86738 Mycoplasma IgG; 86738 Mycoplasma IgM

Test Code 6540 **Myelin Basic Protein** **MBP**

Methodology: Radioimmunoassay
Performed: Referral – ARUP (Monday, Wednesday, Friday)
Reported: 3 – 5 days

Specimen Required: **Collect:** CSF in a clean, plastic container with secure lid, frozen.
Transport: 1 mL CSF, frozen. (Min: 0.4 mL)
Pediatric Minimum/Transport (single test with no repeat): 0.5 mL CSF, frozen.
Remarks: Avoid hemolysis.
Stability: Ambient: Unacceptable; Refrigerated: 2 weeks; Frozen: 3 months

Reference Interval: 0.07 – 4.10 ng/mL

Interpretive Data: This test uses a commercial kit or reagent that has not been approved or cleared by the FDA. Its performance characteristics were determined by ARUP Laboratories.

Note: Hemolysis is associated with falsely elevated levels of MBP in the CSF. CSF should be free from contamination with blood, if possible. If all available CSF is bloody, centrifuge the sample and separate supernatant from cells prior to freezing the sample.

CPT Code: 83873

Myeloperoxidase Stain

CPT Code: 88319

Test Code 6545	Myoglobin, Serum, Quantitative	MYOGLB-S
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Methodology: Enzyme Immunoassay
Performed: Sunday – Saturday
Reported: 2 – 4 hours (STAT: 1 hour)

Specimen Required: **Collect:** One SST. (Min: 3 mL) Acceptable: plain red or green (heparin)
Transport: 1mL serum/plasma. (Min: 0.3 mL) at ambient or 2-8°C.
Remarks: Separate serum or plasma from cells ASAP.
Stability: Ambient: 8 hours; Refrigerated: 7 days; Frozen: 6 months

Reference Interval: 0 – 86 ng/mL

CPT Code: 83874

Test Code 2879	Myoglobin, Urine	U-MYOGLOB
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Methodology: Microparticle Enzyme Immunoassay
Performed: Referral – ARUP (Sunday – Saturday)
Reported: 2 – 3 days

Specimen Required: **Collect:** Random or 24-hour urine.
Transport: 1 mL aliquot from a random or 24-hour collection, at 2-8°C or frozen. Submit sample in one ARUP Standardized Transfer Tube. (Min: 0.5 mL)
Pediatric Minimum/Transport (single test with no repeat): 0.2 mL aliquot from a random or 24-hour collection, at 2-8°C or frozen.
Remarks: Mix random or 24-hour collection well and **adjust pH to 8.0-9.5.** (Myoglobin is unstable in urine unless pH is adjusted.)
Stability: Refrigerated: 3 days; Frozen: 1 month

Reference Interval: 0 – 1 mg/L

Interpretive Data: Patients with urine myoglobin greater than 15 mg/L are at risk of acute renal failure. Usual results are less than 1 mg/L are associated with vigorous exercise, myocardial infarct, mild muscle injury and other conditions.

CPT Code: 83874

Mysoline

Refer to Primidone & Metabolite.
