

REFERENCE RANGES

MKSAP® 19

U.S. traditional units are followed in parentheses by equivalent values expressed in S.I. units.

Hematology

Absolute neutrophil count—greater than 1500/ μL ($1.50 \times 10^9/\text{L}$)

Activated partial thromboplastin time—25-35 s

D-dimer—less than 0.5 $\mu\text{g}/\text{mL}$ (0.5 mg/L)

Erythrocyte count— $4.2\text{-}5.9 \times 10^6/\mu\text{L}$ ($4.2\text{-}5.9 \times 10^{12}/\text{L}$)

Erythrocyte sedimentation rate

Male—0-15 mm/h

Female—0-20 mm/h

Erythropoietin—5-36 mU/mL (5-36 U/L)

Haptoglobin, serum—50-150 mg/dL (500-1500 mg/L)

Hematocrit

Male—41%-51%

Female—36%-47%

Hemoglobin, blood

Male—14-17 g/dL (140-170 g/L)

Female—12-16 g/dL (120-160 g/L)

Leukocyte count—4000-10,000/ μL ($4.0\text{-}10 \times 10^9/\text{L}$)

Mean corpuscular hemoglobin—28-32 pg

Mean corpuscular hemoglobin concentration—32-36 g/dL
(320-360 g/L)

Mean corpuscular volume—80-100 fL

Platelet count—150,000-450,000/ μL ($150\text{-}450 \times 10^9/\text{L}$)

Prothrombin time—11-13 s

Reticulocyte count—0.5%-1.5% of erythrocytes; absolute:
23,000-90,000/ μL ($23\text{-}90 \times 10^9/\text{L}$)

Blood, Plasma, and Serum Chemistry Studies

Albumin, serum—3.5-5.5 g/dL (35-55 g/L)

Alkaline phosphatase, serum—36-92 U/L

α -Fetoprotein, serum—0.6-6.6 ng/mL (0.6-6.6 $\mu\text{g}/\text{L}$)

Aminotransferase, alanine (ALT)—0-35 U/L

Aminotransferase, aspartate (AST)—0-35 U/L

Ammonia, plasma—40-80 $\mu\text{g}/\text{dL}$ (23-47 $\mu\text{mol}/\text{L}$)

Amylase, serum—0-130 U/L

Bilirubin, serum

Total—0.3-1.2 mg/dL (5.1-20.5 $\mu\text{mol}/\text{L}$)

Direct—0.3 mg/dL (0.5-1 $\mu\text{mol}/\text{L}$)

Blood gases, arterial (ambient air)

pH—7.38-7.44

PCO_2 —35-45 mm Hg (4.7-6.0 kPa)

PO_2 —80-100 mm Hg (10.6-13.3 kPa)

Oxygen saturation—95% or greater

Blood urea nitrogen—8-20 mg/dL (2.9-7.1 mmol/L)

B-type natriuretic peptide level

Heart failure unlikely—less than 100 pg/mL (100 ng/L)

Heart failure likely—greater than 400 pg/mL (400 ng/L)

Calcium, serum—9-10.5 mg/dL (2.2-2.6 mmol/L)

Carbon dioxide, serum—See Bicarbonate

Chloride, serum—98-106 mEq/L (98-106 mmol/L)

Complement, serum

C3—55-120 mg/dL (550-1200 mg/L)

C4—10-40 mg/dL (100-400 mg/L)

C-reactive protein, blood—0-0.8 mg/dL (0-8.0 mg/L)

Cardiovascular risk prediction

Low risk—less than 1.0 mg/L

Average risk—1.0-3.0 mg/L

High risk—greater than 3.0 mg/L

Creatine kinase, serum—30-170 U/L

Creatinine, serum—0.7-1.3 mg/dL (61.9-115 $\mu\text{mol}/\text{L}$)

Electrolytes, serum

Sodium—136-145 mEq/L (136-145 mmol/L)

Potassium—3.5-5.0 mEq/L (3.5-5.0 mmol/L)

Chloride—98-106 mEq/L (98-106 mmol/L)

Bicarbonate—23-28 mEq/L (23-28 mmol/L)

Fibrinogen, plasma—150-350 mg/dL (1.5-3.5 g/L)

Folate, serum—4.0-20 ng/mL (9.1-45.3 nmol/L)

Glucose, plasma—fasting, 70-100 mg/dL (3.9-5.6 mmol/L)

γ -Glutamyltransferase, serum—0-30 U/L

Immunoglobulins

Globulins, total—2.5-3.5 g/dL (25-35 g/L)

IgG—640-1430 mg/dL (6.4-14.3 g/L)

IgA—70-300 mg/dL (0.7-3.0 g/L)

IgM—20-140 mg/dL (0.2-1.4 g/L)

IgD—less than 8 mg/dL (80 mg/L)

IgE—0-90 U/mL (0-90 kU/L)

Iron studies

Ferritin, serum—15-200 ng/mL (15-200 $\mu\text{g}/\text{L}$)

Iron, serum—60-160 $\mu\text{g}/\text{dL}$ (11-29 $\mu\text{mol}/\text{L}$)

Iron-binding capacity, total (TIBC), serum—250-460 $\mu\text{g}/\text{dL}$
(45-82 $\mu\text{mol}/\text{L}$)

Transferrin saturation—20%-50% (serum iron \div TIBC \times 100)

Lactate dehydrogenase, serum—60-100 U/L

Lactate, plasma—0.5-1.6 mEq/L (0.5-1.6 mmol/L)

Lipase, serum—13-60 U/L

Magnesium, serum—1.5-2.4 mg/dL (0.62-0.99 mmol/L)

Osmolality, serum—275-295 mOsm/kg H_2O

Phosphatase, alkaline, serum—36-92 U/L

Phosphorus, serum—3.0-4.5 mg/dL (0.97-1.45 mmol/L)

Prostate-specific antigen, serum—less than 4 ng/mL
(4 $\mu\text{g}/\text{L}$)

Protein, serum

Total—6.0-7.8 g/dL (60-78 g/L)

Albumin—3.5-5.5 g/dL (35-55 g/L)

Globulins, total—2.5-3.5 g/dL (25-35 g/L)

Rheumatoid factor—less than 40 U/mL (40 kU/L)

Triglycerides—less than 150 mg/dL (1.69 mmol/L),
desirable

Urate, serum

Male—3.7-8.6 mg/dL (0.22-0.50 mmol/L)

Female—2.4-5.8 mg/dL (0.14-0.34 mmol/L)

Vitamin B₁₂, serum—200-800 pg/mL (148-590 pmol/L)

Endocrine

Adrenocorticotrophic hormone (ACTH), serum—9-52 pg/mL
(2-11 pmol/L)

Aldosterone, serum

Supine—2-5 ng/dL (55-138 pmol/L)

Standing—7-20 ng/dL (194-554 pmol/L)

Aldosterone, urine—5-19 $\mu\text{g}/24\text{ h}$ (13.9-52.6 nmol/24 h)

Catecholamines, fractionated, urine

Epinephrine—2-24 $\mu\text{g}/24\text{ h}$ (10.92-131.04 nmol/24 h)

Norepinephrine—15-100 $\mu\text{g}/24\text{ h}$ (88.65-591 nmol/24 h)

Dopamine—52-480 $\mu\text{g}/24\text{ h}$ (339.56-3134.4 nmol/24 h)

Cortisol, free, urine—less than 50 $\mu\text{g}/24\text{ h}$ (138 nmol/24 h)

Cortisol, serum, morning—5-25 $\mu\text{g}/\text{dL}$ (138-690 nmol/L)

Dehydroepiandrosterone sulfate (DHEAS), plasma
 Male—1.3-5.5 µg/mL (3.5-14.9 µmol/L)
 Female—0.6-3.3 µg/mL (1.6-8.9 µmol/L)

Epinephrine, plasma (supine)—less than 75 ng/L (410 pmol/L)

Estradiol, serum
 Male—10-30 pg/mL (37-110 pmol/L)
 Female—day 1-10, 14-27 pg/mL (50-100 pmol/L); day 11-20, 14-54 pg/mL (50-200 pmol/L); day 21-30, 19-41 pg/mL (70-150 pmol/L)

Follicle-stimulating hormone, serum
 Male (adult)—5-15 mU/mL (5-15 U/L)
 Female—follicular or luteal phase, 5-20 mU/mL (5-20 U/L); midcycle peak, 30-50 mU/mL (30-50 U/L); postmenopausal, greater than 35 mU/mL (35 U/L)

Growth hormone, plasma—after oral glucose, greater than or equal to 1 ng/mL (1 µg/L) is diagnostic of acromegaly

Hemoglobin A_{1c}, blood—less than 5.7%

Luteinizing hormone, serum
 Male—3-15 mU/mL (3-15 U/L)
 Female—follicular or luteal phase, 5-22 mU/mL (5-22 U/L); midcycle peak, 30-250 mU/mL (30-250 U/L); postmenopausal, greater than 30 mU/mL (30 U/L)

Metanephrides, fractionated, urine
Metanephrine, unconjugated—90-315 µg/24 h (456-1597 nmol/24 h)
Normetanephrine—122-676 µg/24 h (666-3691 nmol/24 h)
Metanephrides, total—224-832 µg/24 h (1136-4218 nmol/24 h)

Metanephrides, fractionated, plasma
Metanephrine, free—less than or equal to 57 pg/mL (0.2964 nmol/L)
Normetanephrine, free—less than or equal to 148 pg/mL (0.8288 nmol/L)
Metanephrides, total—less than or equal to 205 pg/mL (1.066 nmol/L)

Parathyroid hormone, serum—10-65 pg/mL (10-65 ng/L)

Progesterone, blood
 Male (adult)—0.27-0.9 ng/mL (0.9-2.9 nmol/L)
 Female—follicular phase, 0.33-1.20 ng/mL (1.0-3.8 nmol/L); luteal phase, 0.72-17.8 ng/mL (2.3-56.6 nmol/L); postmenopausal, less than 0.2-1 ng/mL (0.6-3.18 nmol/L); oral contraceptives, 0.34-0.92 ng/mL (1.1-2.9 nmol/L)

Prolactin, serum
 Male—less than 15 ng/mL (15 µg/L)
 Female—less than 20 ng/mL (20 µg/L)

Testosterone, total, serum
 Male (adult)—300-1200 ng/dL (10-42 nmol/L)
 Female—20-75 ng/dL (0.7-2.6 nmol/L)

Thyroid iodine (¹³¹I) uptake—10%-30% of administered dose at 24 h

Thyroid-stimulating hormone (TSH)—0.5-5.0 µU/mL (0.5-5.0 mU/L)

Thyroxine (T₄)
Total, serum—5-12 µg/dL (64-155 nmol/L)
Free—0.9-2.4 ng/dL (12-31 pmol/L)
Free T₄ index—4-11

Triiodothyronine (T₃)
Total, serum—70-195 ng/dL (1.1-3.0 nmol/L)
Free—3.6-5.6 ng/L (5.6-8.6 pmol/L)

Vitamin D
1,25-dihydroxy, serum—25-65 pg/mL (60-156 pmol/L)
25-hydroxy, serum—31-80 ng/mL (77-200 nmol/L)

Urine

Albumin-creatinine ratio—less than 30 mg/g

Calcium—100-300 mg/24 h (2.5-7.5 mmol/24 h) on unrestricted diet

Creatinine—15-25 mg/kg per 24 h (133-221 mmol/kg per 24 h)

Glomerular filtration rate (GFR)

Categories of Chronic Kidney Disease (from KDIGO)

- Stage G1—greater than or equal to 90 mL/min/1.73 m²
- Stage G2—60-89 mL/min/1.73 m²
- Stage G3a—45-59 mL/min/1.73 m²
- Stage G3b—30-44 mL/min/1.73 m²
- Stage G4—15-29 mL/min/1.73 m²
- Stage G5—less than 15 mL/min/1.73 m²

Albuminuria categories

- A1 (Normal)—less than 30 mg/g
- A2 (Moderately increased)—30-300 mg/g
- A3 (Severely increased)—greater than 300 mg/g

Protein-creatinine ratio—less than or equal to 150 mg/g

Uric acid—250-750 mg/24 h (1.48-4.43 mmol/24 h)
 (varies with diet)

Pulmonary

Forced expiratory volume in 1 second (FEV₁)—greater than 80% of predicted

Forced vital capacity (FVC)—greater than 80% of predicted
FEV₁/FVC—greater than 0.70

Cerebrospinal Fluid

Cell count—0-5/µL (0.5 × 10⁶/L)

Glucose—40-80 mg/dL (2.2-4.4 mmol/L); less than 40% of simultaneous plasma concentration is abnormal

Pressure (opening)—70-200 mm H₂O

Protein—15-60 mg/dL (150-600 mg/L)

Hemodynamic Measurements

Cardiac index—2.5-4.2 L/min/m²

Left ventricular ejection fraction—greater than 55%

Pressures

Pulmonary artery
 Systolic—20-25 mm Hg
 Diastolic—5-10 mm Hg
 Mean—9-16 mm Hg

Pulmonary capillary wedge—6-12 mm Hg

Right atrium—mean 0-5 mm Hg

Right ventricle
 Systolic—20-25 mm Hg
 Diastolic—0-5 mm Hg