Acetaminophen, Serum

Related Information: Alanine Aminotransferase, Serum
Aspartate Aminotransferase, Serum

Synonyms: Anacin-3®; Datril®; Liquiprin®; Paracetamol; Tempra®; Tylenol®
also acetophenetidin and phenacetin

Background: Acetaminophen is available in combination with codeine, acetylsalicylic acid, and coffeine or single and is seen frequently in overdose situations.

A metabolite, N-acetyl-p-benzoqinoneimine is inactivated by cysteine and mercapturic acid conjugation, glutathione is required for theses conjugation reactions. Standard therapy of poisoning is a 72h protocol of oral N-acetylcysteine (Mucomyst®), or an IV. administration for 20h to prevent hepatotoxicity by N-acetyl-p-benzoqinoneimine, which can not be detoxified due to depletion of glutathione stores caused by overdosing.

Rapid absorption, peak plasma levels within 30-60 min after therapeutic dose, in overdose situation, peak may be reached after 4h.

Bioavailability 75%-95%; urinary excretion 1-4%; plasma binding 20%-50%; volume of distribution 0.8-1.1 L/kg; half life time adults: 1-3h, neonates: 2-5h; peak time 0.5 -1.5h, peak concentration 20 µg/mL after 20 mg/kg orally.

Sampling: 1 mL heparin plasma

Reference Interval:

Therapeutic: 10-30 µg/ mL

Toxic: > 150 µg/mL within 4h post ingestion, > 50 µg /mL within 12h post ingestion

A good indicator for toxicity and to calculate half life: Assess post ingestion 4h blood level and post ingestion 8h: Half life exceeding 4h are consistent with hepatic dysfunction.

Acetylcholine Receptor Antibody, Binding

Related Information: Thyreoglobulin Antibody
Thyroperoxidase Autoantibody

Synonyms: Acetylcholine Receptor Blocking Antibody

Background: Two types of antibodies are known in Myasthenia Gravis (MG): Autoantibodies binding to sites of the acetylcholine receptor which are not involved in acetylcholine binding and autoantibodies blocking the binding of alpha bungarotoxin.

Sensitivity: overall, up to 35% of myasthenia Gravis patients have false negative test results, up to 50% in cases of ocular MG, up to 25% in patients with generalized MG. A higher number of false negatives are seen within the first year after onset of the disease.

False positive results occur in patients with Eaton Lambert syndrome and rarely in first degree relatives of MG patients, in patients with amyotrophic lateral sclerosis, primary biliary cirrhosis, carcinomas, autoimmune diseases and thymomas.

Specificity: Overall high, up to 99%.

Useful marker in the diagnosis of MG, monitor MG therapy while levels correlate with clinical improvement. Assessment of patients with thymomas: up to 50% of patients with thymomas have myasthenia gravis disease.

Sampling: 1 mL serum

Reference Interval: < 0.4 nmol/L

Acetylcholine Receptor Blocking Antibody see Acetylcholine Receptor Antibody, Binding

Acetylsalicylic Acid (ASA), Serum see Salicylate, Serum

Acid Phosphatase Total, Plasma

Related information: Prostatic Acid Phosphatase, Serum
Prostate Specific Antigen, Free, Serum
Prostate Specific Antigen, Serum

Synonyms: Phosphatase, Acid

Test includes: Prostatic Acid Phosphatase (will be determined if elevated in males only)

Background: Please see: Prostatic Acid Phosphatase, Serum

The family of acid phosphatases consists of isoenzymes derived from the prostate (characterized as tartrate sensitive) and from erythrocytes, macrophages and of other origin (tartrate resistant). Acid phosphatase may be increased in diseases of the prostate such as carcinoma, prostatitis, benign hyperplasia, urine retention, and in non-prostatic diseases such as bone metastasis of non prostatic origin and in myelocytic leukemias, Gaucher disease, and Niemann-Pick disease. The tartrate resistant form is not of prostatic origin and is a bone resorption marker.

False negative results may occur in adenocarcinoma confined within the prostate or extensive large forms of prostatic carcinomas.

Sampling: 2 mL serum, transport to laboratory immediately or separate plasma and freeze. Do not sample immediately after rectal examination of the prostate or TUR to avoid false positive results. Due to diurnal variation, morning collection is recommended. Serum bilirubin > 2 mg/dL interferes to a high degree with measurement, giving unreliable results.

Reference Interval:

Male	< 7.2 U/L
Female	< 6 U/L
Children	< 8 U/L

Activated Partial Thromboplastin Time

Related Information: Fibrinogen, Functional
Prothrombin Time
Thrombin Time

Synonyms: Partial Thromboplastin Time;
Thromboplastin Time, Partial; PTT; APTT; aPTT

Background: PTT measures the clotting time from the activation of factor XII down to the final fibrin clot, thus covering the intrinsic and common pathway function, whereas the prothrombin time measures the function of the extrinsic and common pathways. PTT prolongations are caused by factor VIII, IX, XI, XII, prekallikrein and HMWK dysfunction and to a lesser extent to fibrinogen, factors II, V, and X of the common pathway (but not factor VII). Inhibitors such as lupus anticoagulants may or may not prolong PTT. Useful in monitoring therapeutic anticoagulants (heparin, hirudin, argatroban). PTT becomes prolonged for single factor deficiency if the factor is below 20%-40%, for multiple factor deficiency less severe functional impairment is indicated by PTT. Increase of factor VIII during acute phase reaction decreases PTT. To make sure that PTT prolongation by heparin therapy is not due to lupus anticoagulant factor, it is recommended to perform a Heparin Antifactor Xa assay in the first testing.

Causes of PTT prolongation:

Hereditary:

PT normal: deficiency of factor VIII, IX, XI, XII, prekallikrein, HMWK

PT prolonged: deficiency of fibrinogen, factor II, V, X

Acquired:

Lupus anticoagulant: (binding to phospholipids and interfere with their role as a cofactor, but usually associated with thrombosis) PT normal

Heparin: PT normal or abnormal

Hirudin or argatroban: PT more affected

Vitamin K deficiency, Coumadin® and liver dysfunction: PT more affected

DIC: PT more affected

Sampling: 2 mL citrate plasma. Plasma should be separated within 1h if PTT is used for monitoring heparin therapy, since PF4 released from platelets neutralize heparin.

Reference Interval: 25-40 seconds in adults, in newborns up to 55 seconds, decreasing at the age of 6 month to adult values.

Activated Protein C Resistance

Related Information: Activated Partial Thromboplastin Time
Antithrombin III
Protein C
Protein S , Total

Synonyms: APC Resistance, Factor V Leiden Screening Test

Background: Resistance to activated protein C (APC) leads to a hypercoagulable state. The test includes: APTT with $CaCl_2$, APTT with activated protein C and $CaCl_2$. Both assays are run in a 1:5 dilution in factor V deficient plasma. Ratio of APTT run with activated protein C over APTT run with $CaCl_2$ is reported.

Protein C is vitamin K dependant, produced in the liver, and requires thrombin and thrombomodulin for activation. Protein C in the presence of protein S inactivates factors Va and VIIIa .
Patients heterozygous for protein C or protein S may exhibit recurrent venous thrombosis. Patients homozygous in deficiency for protein C may present with general microvascular thrombosis in the neonatal period. Young patients have been reported with resistance to the action of APC with normal levels of protein C, protein S, antithrombin III and a point mutation in factor V gene and can be diagnosed by calculation of the ratio PTT in the presence of APA divided by PTT in absence of APC (see above).

Sampling: 2 mL citrate plasma. To avoid contamination with tissue factors, draw 1-3 mL (6-10 mL if blood is drawn from an indwelling catheter) into another container, discard, and draw the coagulation sample. Immediately invert sample 5-10 times gently to mix thoroughly. Tube must be filled at least 90% of requested tube volume. Separate the plasma from the cells within 30 min. Store at 2-8° C for maximum of 4h. Or freeze rapidly on dry ice and store at –70° C. Storage at –70° C up to 6 month.

Test results are not affected by oral anticoagulants or heparin, at less than 1 u/mL.

Reference Interval:

Normal: ratio > 2

Suspicious on hereditary protein C resistance: ratio 1.4-1.9

Acute Phase Proteins see Acute Phase Reactants, Serum

Acute Phase Reactants, Serum

Synonyms: Acute Phase Proteins

Overview: please see individual parameter

- Alpha 1 Antitrypsin, Serum
- Alpha 1 Microglobulin, Serum or Urine
- C Reactive protein, Serum
- C3 Complement (ß1C / §1A-Globulin), Serum
- C4-Complement (ß1-E), Serum
- Haptoglobin (Hp), Serum
- Ceruloplasmin (Cp) , Serum, Plasma

Sampling: 1 mL serum each test

Adenovirus, Serology and Antigen

Background: Adenoviruses are non-enveloped viruses with icosahedral nucleocapsids and linear double stranded DNA named on the isolation from adenoids.

Adenoviruses are known to cause an exudative pharyngitis similar to group A Streptococcus

pharyngitis, pneumonia, epidemic keratoconjunctivitis or acute hemorrhagic conjunctivitis as well as hemorrhagic cystitis. Type 40 and 41 are causes of diarrhea in children. Transmission occurs by the fecal-oral route or infectious aerosols, predisposing schools, nursing facilities and hospitals. Severe adenovirus infections with fatal outcome have been reported in children and immunocompromised adults. Sarcomas are only induced in laboratory rodents, no evidence that adenoviruses cause cancer in humans has been found.
Serotypes 3,4,7,27 cause respiratory diseases, types 8 and 19 cause epidemic kerato-conjunctivitis, types 11 and 21 cystitis, type 40 and 41 gastroenteritis in children.

Sampling:

Serum:	2 mL citrate plasma.
Feces:	approx. 2 g of stool
Bronchial secret:	1-2 mL

Reference Interval:

Serology

Expected value of a single specimen for IgA:	negative < 0.7 COI
	borderline 0.7-1.0 COI
	positive >1 COI
IgG antibody negative	< 20 RE/mL

Feces	antigen detection: negative
Bronchial secret	antigen detection: negative

Adrenal Corticotropin see Adrenocorticotropic Hormone, ACTH

Adrenaline, Plasma see Catecholamines Fractionation, Plasma

Adrenaline, Urine see Catecholamines Fractionation, Urine

Adrenocorticotropic Hormone (ACTH), Plasma

Related Information: Cortisol, Free, Urine
Cortisol, Serum or Plasma
Growth Hormone, Serum
Testosterone total, free, Serum or Plasma

Synonyms: ACTH, Adrenal Corticotropin,

Background: ACTH is regulated via hypothalamic corticotropin releasing hormone (CRH) and ACTH provoke release of cortisol, androgens and mineral corticoids from the adrenal cortex.
Useful to distinguish ACTH dependent from ACTH independent Cushing syndrome; evaluate ectopic ACTH production; monitoring patients with adrenalectomy; diagnosis of Nelson´s syndrome; evaluation of secondary hypopituitarism.

ACTH in Pituitary Cushing s syndrome may be high normal or elevated. In ectopic ACTH syndrome ACTH usually high. Elevated in Nelson's syndrome, Addison's disease and adrenogenital syndrome. Cushing s due to adrenal adenoma or carcinoma usually very low.

Sampling: 1 mL heparin or EDTA plasma. Pre cool collection tube on ice, store on ice for immediate transport to the laboratory, or separate plasma and freeze at -70° C immediately. ACTH levels may be elevated by stress. Diurnal variation: Peak in the morning. Late PM levels up to 50% of morning levels. Specimens should be drawn between 6 and 10 AM or between 9 and 12 PM and always at the same time in case of follow up. Glucuronide therapy depresses ACTH.

Reference Interval:

Adults	at 8 AM	< 10-52 pg/mL
	at midnight	< 10 pg/mL

Higher values in cord blood and newborns

Al, Serum see Aluminium, Serum or Urine

Alanine Aminotransferase (ALT), Serum

Related information:
Acetaminophen, Serum
Alkaline Phosphatase, Serum
Antimitochondrial Antibody
Antinuclear Antibody
Aspartate Aminotransferase, Serum
Bilirubin, Fractionated, Serum
Ceruloplasmin (Cp), Serum or Plasma
Copper (Cu), Serum or Urine
Ethanol, Blood, Serum or Urine
Ferritin, Serum or Plasma
Gamma-Glutamyl Transferase, Serum
Glutamate Dehydrogenase (GLDH), Serum
Hepatitis B (HBV) Serology and Antigen Detection
Hepatitis B Virus DNA Detection (HBV-DNA)
Hepatitis C Antibody (Anti-HCV)
Hepatitis E Antibody (Anti-HEV)
Lactate Dehydrogenase (LDH), Serum

Synonyms: ALT; Glutamic Pyruvate Transaminase; GPT; SGPT

Background: ALT is a liver specific enzyme, values > 15 fold of the upper limit of the reference interval indicates acute hepatic necrosis of viral toxic or ischemic cause.

For diseases of the liver/biliary system ALT as a single parameter has a diagnostic sensitivity of 71%-83%. In combination of ALT, GGT, ChE the diagnostic sensitivity and specificity is nearly 100%.

In alcoholic liver disease, ALT is less sensitive than AST; AST to ALT ratio typically is 2 to 1 or higher. Low increased ALT (50 U/L to 400 U/L) indicates liver metastasis, cirrhosis, occlusion of biliary tract.

Moderate increased ALT (50 U/L to 1000 U/L): Toxic liver damage, chronic hepatitis, primary biliary cirrhosis, cholangitis.

High ALT (>1000 U/L) : acute viral hepatitis, hepatic ischemia

Limitations: In typhoid fever AST to ALT ratio increase > 1. In viral hepatitis, AST to ALT decrease to 0.5-0.8. Increase of ALT is observed in obesity. Thyroid disease can cause a slight elevation.

Sampling: 1mL serum or plasma. Avoid hemolysis. Activity in red cells is 6 times of that in serum.

Reference Interval:

		(U/L)
Adults	male	10-41
	female	10-31
Children	1-30days	1-25
	2-12 month	4-35
	1-3 years	5-30
	4-9 years	5-25
	10-18 years	5-30

Albumin, Liquor see Cerebrospinal Fluid (CSF), Liquor

Albumin, Serum

Related Information: C Reactive Protein, Serum
Protein Electrophoresis, Serum
Protein, Quantitative, Urine
Protein, Total, Serum

Background: Albumin accounts for approx 60% of total protein. Albumin is synthesized in the liver. Half life is 15-19 days.

High albumin indicates dehydration.

Decreased albumin occurs in liver disease, malabsorption, malnutrition, renal loss through nephrotic syndrome, loss through gastrointestinal diseases, 3rd degree burns, exfoliative dermatitis, loss through third spacing and dilution by IV. fluids.

Genetic variation: congenital analbuminemia, bis albuminemia.

Albumin, prealbumin and transferrin decrease with acute phase inflammatory or infectious processes (negative acute phase reactants).

Limitations: Albumin levels may decrease (< 0.5 g/dL) in patients in supine position. Drugs such as acetaminophen, amiodarone, estrogen/progestin, interleukin-2, oral contraceptives, phenytoin, prednisone, and valproic acid may decrease albumin. Increase may be related to anticonvulsants, furosemide, phenobarbital, prednisolone.

Sampling: 1 mL serum

Reference Interval:	(g/dL)		
	Children	Newborn	3.5-4.9
		1 year	3.6-5.0
		2-20 years	3.7-5.1
	Adults	21-60 years	3.5-5.3
		61-70	3.4-4.8
		71-80	3.3-4.7
		81-90	3.1-4.5
		>90	3.0-4.5
Critical value:	Less than 1.5 g/dL		

Albumin, Urine

Related Information: Protein, Quantitative, Urine

Background: Useful in diagnosis of hypoalbuminemia. Please see: Albumin, Serum also Protein, Quantitative, Urine.

Sampling: 5 mL aliquot of 24 h collected urine, please note total quantity.

Reference Interval: < 50 mg/24 h

Alcohol see Ethanol

Aldolase, Serum or Plasma

Related Information: Creatinine Kinase (CK, ANC-activated), Serum
Creatinine Kinase Isoenzymes, Serum
Myoglobin, Blood, Serum or Plasma
Myoglobin, Qualitative, Urine

Synonyms: ALD, Fructose Biphosphate Aldolase

Background: A marker enzyme in diseases of the skeletal muscles e.g. muscular dystrophy and dermatomyositis. Not elevated in neurogenic muscular atrophies (poliomyelitis, multiple sclerosis). Serum aldolase may also be elevated in hepatitis, myocardial infarction, hemorrhagic pancreatitis, gangrene, some neoplasias. Used in therapy monitoring of inflammatory myopathies.

Limitations:

Levels may be elevated up to 20 U/L by desoxycorticosterone, cortisone, ACTH injections.

Sampling: 2 mL blood, 1 mL serum or preferred, due to lacking platelet enzyme: 1 mL heparin plasma or 1 mL EDTA plasma. Avoid hemolysis. Transport to laboratory immediately or separate serum or plasma immediately and freeze.

Reference Interval:

Adults	male	2.1-8.0 U/L
	female	1.4-6.0 U/L
Children	0-2 years	2.0-12-0 U/L
	3-16 years	1.0-6.2 U/L

Normal range for inactive patients or at bed rest may be up to 50% lower.

Aldosterone, Serum or Plasma

Related Information: Aldosterone, Urine
Potassium, Serum or Plasma
Renin Activity, Plasma

Background: Aldosterone is produced under feed back loops of the renin angiotensin system in the zona glomerulosa of the adrenal cortex. Aldosterone and renin determination are key diagnostic tools in the diagnosis of primary hyperaldosteronism (PH) characterized by hypocalcemia, hyperaldosteronemia, and hypertension and suppressed renin activity.

Secondary hyperaldosteronism is part of a response in patients with decreased renal plasma flow or reduced plasma volume observed in congestive heart failure, cirrhosis, nephritic syndrome, renal artery stenosis. Elevated renin and aldosterone levels are also seen in Bartter syndrome and Gitelman's syndrome. Patients on thiazide diuretics may have test results mimicking PH.

Sampling: 2 mL blood or 1 mL serum

Patient preparation: Antihypertensive drugs, cyclic progestogens, estrogens, heparin therapy, thermal stress, after starvation influence the value, best is discontinuation of medications at least 2 weeks before sample collection. Patient should be on normal sodium diet for 2 weeks (135 mmoL or 3 g sodium per day). Aldosterone peaks in the morning.

For collection, the patient should be in supine or upright position 4h before and during blood drawing. Please specify all information influencing the values on the request form.

After blood is drawn, please transport the specimen to the laboratory immediately or separate serum and freeze sample.

Reference Interval: (ng/dL)

Aldosterone			
	Newborn / Children	12h	34.3-125.3
		24h	21.7-105.4
		2 days	19.1-112.3
		3 days	9.0-91.3
		4 days	8.3-92.1
		5 days	7.2-83.0
		6-30 days	6.9-81.2
		1-12 month	6.9-55.2
		1-2 years	6.1-49.5
		2-6 years	4.0-27.1
		6-14 years	3.1-14.8
	Adults	Supine position	2.9-14.5
		Upright position	6.5-28.5
	Renin	in supine position	3-19
		after stimulation	5-40

Aldosterone, Urine

Related Information: Aldosterone, Serum or Plasma
Aldosterone, Urine
Potassium, Serum or Plasma
Potassium, Urine
Renin Activity, Plasma
Sodium, Urine

Background: see Aldosterone, Serum or Plasma

Sampling: Patients preparation and standardization: Please see Aldosterone, Serum or Plasma

Collect 24h urine in a container supplemented with 10 mL of 20% hydrochloric acid. Aliquot of 5 mL is used for the test. Keep cool during the collection period. Ship a 5 mL aliquot to the laboratory, note total quantity.

Reference Interval: 3.0-15.0 µg/24h

Alkaline Phosphatase, Serum

Related Information:
Alkaline Phosphatase, Liver- Intestine- Bone Isoenzymes, Serum
Alkaline Phosphatase, Placental Isoenzyme, Serum
Aspartate Aminotransferase (AST), Serum
Bilirubin, Fractionated, Serum
Ethanol, Blood, Serum or Urine
Gamma-Glutamyl Transferase (Gamma-GT), Serum
Hepatitis B (HBV), Serology and Antigen Detection
Hydroxyproline,Total, Urine
Leucine Aminopeptidase (LAP), Serum
Osteocalcin, Serum or Plasma

Background: Sources for serum Alkaline Phosphatase (ALP) are intestine, kidney, placenta, but 80% originates from liver, where it is synthesized by the biliary epithelium and excreted by the bile. AP may be increased in obstructive biliary processes even with normal bilirubin values.
Use: Elevated in non-fasting specimens, bone growth, acromegaly, osteogenic sarcoma, liver-bone metastasis, leukemia, myelofibrosis, mastocytosis, myeloma, Paget's disease, thus use as a tumor marker, hyper-or hypovitaminosis of vitamin D may cause elevations. Other conditions are hyperthyroidism, hyperparathyroidism, chronic alcohol abuses. Especially useful in biliary obstructions caused by pancreas head tumors, choledocholithiasis, cholestasis, however usually normal in patients with cholecystitis or cholangitis without stone formation.
Elevated values also in cirrhosis, infiltrative liver diseases (sarcoid, TB, amyloidosis, abscess), autoimmune cholangiopathy, in viral hepatitis, diabetes mellitus, rheumatic diseases (30-50% of the patients).
In children very high, transient levels without signs of diseases have been reported.
Drugs: Many drugs cause an up to 10 fold increase of ALP.
Decrease may occur after blood transfusion, in hypophosphatasia or during zinc deficiency (needed as a cofactor).
Wilson's disease: high bilirubin and decreased ALP, Ratio <2 is distinctive.
Lower levels are seen during sepsis, viral diseases, such as infectious mononucleosis, CMV infections.

Sampling: 2 mL blood or 1 mL serum, fasting sample

Reference Interval:

Children	< 300 U/L
Adults	35-120 U/L
Pregnancy, particularly third trimester	< 240 U/L

Values may increase in upright position. The higher range in children is due to bone growth.

Alkaline Phosphatase Liver- Intestine- Bone Isoenzymes, Serum

Related Information: Alkaline Phosphatase, Serum
Alkaline Phosphatase, Placental Isoenzyme, Serum
Calcium (Ca), Total, Serum
Hydroxyproline, Total, Urine
Osteocalcin, Serum
Pyridinolines

Background: Test is used to determine the fraction of liver-intestine isoenzyme or bone isoenzyme.
Bone fraction is cleared by the liver and may be elevated during liver diseases.
An increased bone fraction is associated with Paget disease, osteoblastic tumors, hyperparathyroidism, rickets, and osteomalacia. Useful in monitoring bone mineralization during hormone replacement therapy in postmenopausal women. Useful tool in detection of bone metastasis from prostate or breast carcinomas. 35% of patients with diabetes mellitus have an elevated bone fraction
Increase in intestinal fraction is observed in diabetes mellitus, renal failure, and cirrhosis.
Determination of isoenzymes is only of value if total alkaline phosphatase elevation is not explained by findings such as gamma glutamyl transferase activity, LDH, cirrhosis, bilirubin.

Sampling: 1 mL serum, fasting state.

Reference Interval:

liver, gall, intestine isoenzyme fraction	6-74 U/L
bone isoenzyme fraction	11-102 U/L

Remark: Intestine isoenzyme fraction lacking in 60% of the normal population.

Alkaline Phosphatase Placental Isoenzyme, Serum

Related Information: Alkaline Phosphatase, Serum
Alkaline Phosphatase, Liver-Intestine-Bone Isoenzymes, Serum
Calcium (Ca), Total, Serum
Hydroxyproline, Total, Urine
Pyridinolines

Background: The placental isoenzyme or placenta like isoenzymes such as Regan and Nagao are more stable than the liver or bone forms, especially they are insensitive to heat. Germ cells and placenta synthesize the enzymes.
Elevated levels are found in patients with malignancies, the highest frequency (80%) occurs in germ cell tumors, particularly seminoma, resp dysgerminoma in females. Other tumors are serous carcinomas of the ovary, non-seminomatous germ cell tumors, endometrial carcinomas, and leukemia.

Sampling: 1 mL serum, fasting.

Reference Interval: < 100 mU/L

Alpha$_1$ - Antitrypsin, Serum

Related Information: Alpha 1 Antitrypsin Phenotyping
Bilirubin, Fractionated, Serum
C-Reactive Protein, Serum
Protein Electrophoresis, Serum

Synonyms: A_1 Antitrypsin, AAT, Acute Phase Proteins, Alpha$_1$ Protease Inhibitor

Background: A_1 Antitrypsin deficiency is associated with chronic obstructive lung disease or liver cirrhosis. AAT is a protease inhibitor blocking the action of trypsin, elastase, chymotrypsin, collagenase, leukocytic protease, plasmin, thrombin, enzymes which are released as during inflammation of the lung. As a response AAT is a member of the Acute Phase Proteins.
Liver disease is caused by the toxic effect of the ATT mutant and starts to present in infancy with prolonged jaundice, neonatal hepatitis syndrome, mild aminotransferase elevation, portal hypertension, severe liver dysfunction in children, chronic hepatitis in adults and in carcinoma.
A screening in newborn revealed a prevalence of ATT deficiency of 0.064%.
Limitations: Difficult to interpret during elevation of CRP, often false normal results during pulmonary inflammation.

Sampling: 2 mL serum

Reference Interval: 90-200 mg/dL
however, as compared to a highly purified research standard, there is an overestimation by the tested values of 30% - 50%. Low at birth.

Alpha$_1$-Antitrypsin Phenotyping

Background:
The Z allele is associated with emphysema or cirrhosis. The frequency in England is:

Allele	Frequency (%)	serum level (mg/dl)	Emphysema risk
MN	86	150-350	base
MS	9		base
MZ	3	90-210	base
SS	0.25	100-140	base
SZ	0.2	75-120	mild
ZZ	0.029	20-45	high
Null-null		0	very high

Absence of homozygous ZZ, alpha 1 antitrypsin is usually associated with z state, but SS and SZ may be affected as well.

Sampling: 4 mL blood or 2mL serum, avoid hemolysis

Alpha $_1$-Fetoprotein (AFP), Serum

Related Information: CA19-9, Serum (Gastrointestinal)
Carcinoembryonic Antigen (CEA), Serum
Chorionic Gonadotropin (hCG, beta-HCG), Serum
Pregnancy-Associated Protein A, Serum

Background: AFP is a fetal serum protein and is one of the major carcinoembryonic proteins. Chemically it is related to albumin. In the fetus, AFP is synthesized in hepatocytes, yolk sac, gastrointestinal tract, and in the kidney. As a tumor related protein it occurs in primary hepatoma and in non-seminomatous germ cell tumors.

AFP as a tumor marker in hepatocellular carcinoma displays often >1000ng/mL and correlates negative with the prognosis.

Combining with human chorionic gonadotropin (hCG) AFP is used in monitoring germ cell tumors: In endodermal sinus tumors AFP is elevated, hCG normal ; in choriocarcinoma AFP is normal, hCG elevated; in embryonal carcinoma AFP and hCG are elevated, in seminoma AFP is normal, hCG may be elevated.

In prenatal screening, AFP, hCG and unconjugated estriol are used in combination to asses the risk for hereditary defects.

Low AFP direct attention to trisomy 21 and trisomy 18.

High AFP may indicate risk for anencephaly (low unconjugated estriol), atresia of the esophagus and duodenum, encephalocele, gastroschisis, hemolytic disease, liver necroses due to herpes infection, hydrocephalus, multiple gestation (hCG and unconjugated estriol are also high), myelomeningocele, omphalocele and trisomy 13.

Limitations: AFP is elevated in non-malignant diseases of the liver (necrosis, hepatitis, cirrhosis) but usually < 150 ng/mL

Sampling: 1 mL serum. Note week of gestation when used in prenatal screening.

Reference Interval:

Tumor marker (ng/mL)

Children	male	female
0-1 month	0.6-16.4	0.6-19.0
1-12 month	0.6-28.0	0.6-77.0
1-3 years	0.6-7.9	0.6-11.1
4-6 years	0.6-5.6	0.6-4.2
7-12 years	0.6-3.7	0.6-5.6
13-18	0.6-3.9	0.6-4.2
Adults	< 8	nonpregnant < 8
		Pregnant see below

Prenatal screening (ng/mL)

week of gestation	median	twice median
16	29.9	59.8
17	33.0	66.0
18	37.6	75.2
19	42.3	84.6
20	47.6	95.2
21	54.0	108.0
22	60.5	121.0

1,4-alpha-D-Glucanohydrolase, Urine or Serum see Amylase, Total, Urine or Serum

ALT see Alanine Aminotransferase (ALT), Serum

Aluminium, Serum or Urine

Related Information: Calcium (Ca), Total, Serum
Synonyms: Al, Serum

Background: Transferrin is the carrier for Al as for other trace elements in the plasma, where 80% is bound and 20% are free or complexed with citrate or other molecules.

Bauxite is the commercial source of Al. A role in Alzheimer disease is currently discussed.

Useful in monitoring patients on parenteral nutrition, burn patients on intravenous albumin, patients with chronic renal failure, professional exposed individuals, patients undergoing dialysis.

Signs for intoxications: Encephalopathy, osteomalacia, osteodystrophy, proximal myopathy, progressive dementia, microcytic hypochromic anemia.

Sources of Al intake: Dialysis water, medications, phosphate binders, sucralfate, albumin concentrate, environmental exposure.

Sampling: Patient's preparation: Aluminium containing antacids (Amphojel®, Basaljel® Gelusil®, Maalox®, Mylanta®, and Sucralfate®) should be discontinued 1 day before sample drawing. 5 mL EDTA blood, for blood drawing, use plastic syringes and tubes only. Urine:
10 mL of a 24 h collected urine, kept cool; use an acid-pre washed metal free container.

Reference Interval:

Serum:	Normal individual 0-6 ng/mL, in dialysis patients < 40 ng/mL
Urine:	0-32 ng/day
Critical serum value:	> 100 ng/mL serum, CNS toxicity may occur
Toxic:	> 200 ng/mL

Amantadine, Serum

Related Information: Influenza Type A and B, Serology

Synonyms: Symmetrel®

Background: Amantadine (1-amioadamantane hydrochloride) is a cyclic amine that inhibits uncoating of viral RNA of influenza A virus within infected cells. Rimantadine is acting similar, but is 10 times more active.

Excretion in the urine unmetabolized, dose reduction is necessary in the elderly and in renal insufficiency.

Used as a prophylactic medication. Postexposure prophylactic procedure is controversial; it may reduce duration of fever and systemic symptoms by 1-2 days.

Adverse effects are gastrointestinal intolerance and central nervous system complaints.

Neurotoxicity may occur at high levels 1-5 µg/mL, particularly with concomitant antihistamines and anticholinergic drugs.

Bioavailability 50%-90%; urinary excretion 50%-90%; plasma binding 70%; volume of distribution 5-8 L/kg, lowers with age; half life time 12-20h, increases with age; peak time 1-4h; peak concentration 350-500 ng/mL after 100 mg orally.

Sampling: 2 mL serum

Reference Interval:	Therapeutic:	300-600 µg/mL
	Toxic:	> 1000 µg/mL

Aminolevulinic Acid see Delta-Aminolevulinic Acid, Urine

Amiodarone, Serum

Related Information: Digoxin, Serum
Procainamide, Serum

Synonyms: Cordarone®; Pacerone®

Test includes: Desethylamidarone

Background: An antiarrhythmic drug with substantial toxicity and a long half life, used in the therapy of atrial fibrillation and recurrent ventricular arrhythmias.

Amiodarone decreases hepatic enzyme systems for clearance of other drugs particularly cyclosporine, digitalis, flecainide, lidocaine, phenytoin, procainamide, quinidine, theophylline, and warfarin.

In 5-10% of patients hypo-or hyperthyreosis develops. Possible liver complications in 25% of the patients require monitoring by AST or ALT.

Bioavailability 25-70%, urinary excretion 0%, plasma binding 100%, volume of distribution 20-110L/kg, half life time 13-37 days, peak time 2-10 h, peak concentration 1.5-2.5 µg/mL after 400 mg/day orally steady state.

Sampling: 1 mL serum, protect from light. To reach steady state it takes 50-100 days. Time to peak concentration after oral dose is 4-7 h, of value is sample drawing after 18 h.

Reference Interval:

Therapeutic: 0.7-2.5 µg/mL, Desethylamidarone : 0.5-3 µg/mL

Toxic: > 5 µg /mL, may start at 3 µg/mL

Amitriptyline, Serum or Plasma

Related Information: Nortriptyline, Serum

Test includes: Nortriptyline

Synonyms: Elavil®; Endep®; Etrafon®; Limbirtol®; Triavil®

Background: Therapeutic as a tricyclic antidepressant in endogenous depression. It inhibits uptake of serotonin and norepinephrine. Active metabolite: Nortriptyline. The formation of nortriptyline is catalyzed by CYP2C19, CYP3A4 and other cytochrome P450's, formation of 10-hydroxy metabolites are catalyzed by CYP2D6.

Common side effects are anticholinergic. Seizure threshold may be lowered; arrhythmias or orthostasis are seldom observed. Avoid in pregnant or lactating women. Contraindicated in patients under monoamine oxydase inhibitors and in narrow angle glaucoma.

Amitriptyline: Bioavailability 37%-59%; urinary excretion 2%; plasma binding 95%; volume of distribution 12-18 L/kg, increase with age; half life 16-26h increase with age; peak time 2-5h; peak concentration 30-100 ng/mL after 100 mg/d in steady state.

Sampling: 1 mL serum.

Reference Interval:

Therapeutic value:	amitriptyline 80-200 ng/mL; nortriptyline: 50-150 ng/mL,
Optimal:	nortriptyline plus amitriptyline; 60-220 ng/mL
Toxic:	amitriptyline > 300 ng/mL.
	amitriptyline plus nortriptyline: > 500 ng/mL

Ammonia, Plasma

Related Information: Amino Acid, Screening, Plasma or Urine
Insulin, Serum
Lactic Acid, Whole Blood, Plasma or CSF

Synonyms: NH_3

Background: Elevated in liver diseases, Reye syndrome, urinary tract infection with distension or stasis, urea cycle disorders, in normal neonates within the first 48 h of life, gastrointestinal bleeding. Useful in neonatal diagnosis of unexplained nausea, vomiting, neurological deterioration in combination with plasma amino acids, organic and orotic acids in the urine.

Not a good predictor in hepatic coma patients. Not always high in urea cycle disorders. High protein intake may cause increased levels. Gastrointestinal hemorrhage may elevate levels.

Cigarette smoke may increase levels by 10-20 µg/dL per cigarette.

Sampling: 1 mL EDTA plasma. Avoid venous stasis, fill tube completely, keep tube tightly closed by stopper, place tube on ice immediately. Transport to laboratory within 60 min or centrifuge at 4°C and freeze plasma, stable 1 week at -70°C. Avoid hemolysis.

Reference Interval:		
	Neonates	64-107 µmol/L
	< 2 weeks	56-92 µmol/L
	Children	21-50 µmol/L
	Adults	
	Male	15-55 µmol/L
	Female	11-48 µmol/L

Amoeba Antibody, Serology

Related Information: Amoeba, Direct Examination, Stool
Clostridium Difficile
Echinococcosis, Serology
Giardia Lamblia, Microscopy
Helminths, Feces, Microscopy
Rota Virus, Serology
Toxoplasmosis, Serology

Background: Besides Giardia lamblia, Entamoeba histolytica is the most common protozoal infection worldwide. The clinical presentation with diarrhea and cramping abdominal pain is unspecific and vary with the immune competence of the host. E. histolytica is able to invade the intestinal mucosa, spreading to the liver and causing liver abscess. Humans are the primary reservoir, infections occur by ingestion of the cyst form on contaminated food or water.

Sensitivity is highest in extraintestinal amebiasis, lower in amebic dysentery, lowest in asymptomatic carriers. In the acute phase negative results are possible, in highly endemic areas antibodies are persistent and of minor value for diagnosis.

Sampling: 1 mL serum

Reference Interval: Antibody titer < 1:32

Amoeba Direct Examination, Stool

Related Information: Amoeba, Antibody, Serology
Clostridium Difficile
Echinococcosis, Serology
Giardia Lamblia, Microscopy
Helminths, Feces, Microscopy
Rota Virus, Serology
Toxoplasmosis, Serology

Background: see Amoeba, Antibody, Serology.

Sampling: Stool, ca 2 g, collect in sterile collection container, deliver to the laboratory within 1h. Longer transit times are possible with preservatives such as polyvinyl alcohol or formalin or zinc sulphate or sodium acetate acetic acid formalin fixative. Do not freeze! Cyclic peaks in E. histolytica: 7-10 days

Reference Interval:

Report on diagnostic findings: Negative result: No parasite, no WBC, no RBC no Charcot Leyden crystals seen by microscopy. A single negative result does not rule out parasitic infection. To enhance sensitivity, please send in 3 specimens on 3 different days.

Amphetamine, Urine

Synonyms: Crank, Bennies, Crystal, Dexies, Dexedrine®, Ferndex® Ice, Speed, Poppers

Test includes: Amphetamine, Methamphetamine, Methylenedioxyamphetamine, Metylenedioxymethamphetamine

Background: Amphetamines are used in severe obesity, hyperkinetic syndrome, narcolepsy. Amphetamine have a high potential for abuse. Tolerance develops if repeatedly used.
Half life: 10-20 h, volume of distribution 2-4 L/kg, protein binding 10%- 40%.

Limitations: Some over the counter amines give a positive result; many drugs are metabolized to methamphetamine or amphetamine such as amphetaminil, benzphetamine, clobenzorex, deprenyl, famprofazone, fencamine, fenethylline, fenproporex, furfenorex, mefenorex, mesocarb, propylamine.

Sampling: Random urine, 5 mL

Reference Interval: < 600 ng/mL
Critical value: 1000 ng/mL

Amylase Isoenzymes, Serum

Related Information: Amylase, Total, Serum
Amylase, Total, Urine
Bilirubin, Fractionated, Serum
Calcium (Ca), Total, Serum
C-Reactive Protein, Serum
Lipase, Serum

Test includes: Total amylase, pancreatic amylase, salivary amylase

Background: At least 6 isoenzymes are known, three originate in the pancreas, three in the salivary gland.

See also: Amylase, Total, Serum

Sampling: 1 mL serum

Reference Interval:

Total amylase:	28-100 U/L
Pancreatic amylase:	13-54 U/L
Salivary amylase:	< 46 U/L

Children up to 2 years do not synthesize pancreatic amylase.

Amylase Total, Serum

Related Information: Amylase, Isoenzymes, Serum
Amylase, Total, Urine
Bilirubin, Fractionated, Serum
Calcium (Ca), Total, Serum
C-Reactive Protein, Serum
Lipase, Serum

Synonyms: 1,4-apha-D Glucanohydrolase, Serum

Background: Useful in the diagnosis of abdominal pain. Elevated levels of lipase and amylase occur in pancreatic diseases such as acute or chronic pancreatitis, pancreatic pseudocyst, abscess, neoplasm, or trauma or common duct stones.

Non-pancreatic causes: inflammatory salivary lesions, mumps, peptic ulcer, intestinal infarction and obstruction, hepatic cirrhosis, peritonitis, appendicitis, burns, ketoacidosis, some carcinomas of the lung and ovary, type I hyperlipoproteinemia, ruptured ectopic pregnancy. Rare: Pinworm in the pancreatic duct.

80% of patients with pancreatitis present with increased serum amylase within one day. Amylase is renal secreted, renal failure increases serum levels. Urine levels persist longer than serum levels.

Increase of amylase is associated with drugs causing Sphincter Oddi spasm such as bethanechol, codeine, fentanyl, meperidine, morphine, pentazocine as well as pancreatitis inducing

substances such as aminosalicylic acids, amoxapine, azathioprine, chlorthalidone, cimetidine, clozapine, diazoxide, felbamate, luvastatin, glucocorticoids, hydantoin, hyro-flumethazine, isoniazid, mirtazapine, penicillamine, sulfamethoxazole. Other drugs are cisplatin, thiazide, and valproic acid.

For differentiation isoenzymes determination test for salivary and pancreas are available.

Sampling: 1 mL serum, increase within 2-12h after onset of pancreatitis, peak 12-30h, remaining increased for 3-4 days, shorter half life than lipase. Stable at room temperature for one week. Oxalate, citrate, lipemic sera may depress results.

Reference Interval: 28-100 U/L

Newborns: very low activity, no pancreatic type, mainly salivary type.

Children up to 2 years: no panctratic type of amylase activity

Children older than 3 years: reach adult reference range

Amylase Total, Urine

Related Information: Amylase, Total, Serum
Lipase, Serum

Synonyms: 1,4-alpha-D Glucanohydrolase, Urine

Background: Please see Amylase, Total, Serum

In addition to serum amylase and lipase, urine amylase is used in the diagnosis of acute pancreatitis: Increase in 4-8h, peak 18-38h return to normal in 7-10 days. Urine amylase persists several days after serum levels have returned.

To improve the specificity, determine amylase/creatinine clearance:

ACCR = [urine amylase (U/L) x serum creatinine (mg/L) : serum amylase (U/L) x urine creatinine (mg/mL)] x 100

The normal reference is approx 2.5%. Increased values are observed in most of the cases with increased serum amylase.

Macroamylase is a benign elevation of serum amylase and low urine amylase, ACCR is < 2%.

Limitations: Glucose >1000 mg/dL may interfere

Sampling: For most reliable results collect urine during a 2h to 4h period and keep on ice during the collection period. Specify duration of collection and total amount. Ship 5 mL to the laboratory.

Reference Interval: <500U/L or 0-17 U per hour

Anacin-3® see Acetaminophen, Serum

ANCA see Antineutrophil Cytoplasmatic Antibody (ANCA)

Androstenedione, Serum

Related Information: Cortisol, Serum or Plasma
Dehydroepiandrosterone Sulphate (DHEA-S), Serum
17-alpha-Hydroxyprogesterone (17-OHP), Serum or Plasma
Testosterone, Serum

Background: Androstenedione is produced in equal amounts by adrenal cortex and ovaries. Metabolized into estrogens by aromatase enzymes (fat tissue, liver) and androgens such as testosterone.

Values are increased in Stein-Leventhal syndrome, ovarian-stromal-hyperplasia, Cushing syndrome and adrenal tumors. 60% of female hirsutism will show elevation of androstenedione.

Diurnal Variation: Peak at 7 AM, a nadir at 4 PM. Sharp rise around the age of 20 years, abrupt decline after menopause.

Sampling: 1 mL serum. Fasting morning specimen preferred, also sample one week before or after menstrual period. Separate serum within 1 h after collection and freeze serum.

Reference Interval:

Age	Male (ng/dL)	Female (ng/dL)
1-5 month	5-45	5-35
1-9 year(s)	5-55	5-45
10-17 years	10-100	25-200
Adults	50-250	20-310
Post menopausal:		20-220

Angiotensin 1 see Renin

Angiotensin Converting Enzyme, Serum

Synonyms: ACE; Angiotensin-I- Converting Enzyme

Background: Known to release a dipeptide in an enzymatic reaction from angiotensin I to form an octapeptide angiotensin II, ACE is produced in epithelial cells of the lung and macrophages. Clinically used in the diagnosis of sarcoidosis with low sensitivity and specificity (prevalence in sarcoidosis 30-90%, depending on the study) it is mainly now used in monitoring the activity of the disease under therapy.

Used in Gaucher disease and in other granulomatous diseases, in diabetes mellitus, leprosy. Reports also on increased ACE in myeloma, amyloidosis, biliary cirrhosis.

Up to 35% of patients in acute histoplasmosis have elevated ACE levels.

Limitations: Increased ACE is observed during captopril, enalapril, lisinopril administration.

Sampling: 1 mL serum

Reference Interval: 20-60 U/L

values up to 50% higher in children and young adults under the age of 20.5% of the normal adult population display elevated levels.

To enhance sensitivity for diagnosis of sarcoidosis, genotype related reference ranges have been described:

Genotype II	4.6 -	30.6 U/L
Genotype ID	10.0 -	47.6 U/L
Genotype DD	17.9 -	64.3 U/L

Antibodies to Bacteria and Fungi

Overview, please see:
Aspergillus fumigatus, Serology
Bordetella pertussis, Serology
Borrelia, Serology
Brucella, Serology
Candida albicans, Serology and Culture
Coxiella burnetii (Q-Fever), Serology, Screening
Corynebacterium diphtheriae (Diphtheria)
Helicobacter Pylori
Legionella Pneumophila
Leishmaniasis, Serology
Leptospira, Serology
Listeria monocytogenes, Serology
Mycoplasma pneumoniae, Serology
Neisseria gonorrhoeae
Pneumococcal Antibody, Serology
Rickettsia see Coxiella burnetii, Serology
Salmonella, Culture, Serology
Shigella, Culture and Serology
Staphylococcus see Antistaphylolysin, Serum
Streptococcus see Antibody to Streptolysin O
Tetanus Antitoxin Antibody IgG
Treponema pallidum (TPAH Serology)
Yersinia enterocolitica and
Yersinia pseudotuberculosis, Culture and Serology

Sampling: for each test 2 mL serum

Antibodies to DNA

Overview, please see: Anti double stranded (ds-DNA) please see Antibodies, dsDNA
Anti single stranded (ss-DNA) please see Antibodies, ssDNA

Sampling: for each 1 mL serum

Antibodies to Parasites

Overview, please see: Amoeba, Antibody, Serology
Echinococcosis, Serology
Malaria
Toxocara Canis, Serology
Toxoplasmosis, Serology
Trypanosoma cruzi (Chagas Disease), Serology

Sampling: for each 1 mL serum

Antibodies to Viruses

Overview, please see: Adenovirus, Serology and Antigen
Central European tick-borne fever
Coxsackie Virus, Serology
Cytomegalovirus (HCMV, CMV), Serology
Echo Virus, Serology
Epstein Barr Virus (EBV), Serology
Hantavirus, Serology see Bunyaviruses, Serology
Hepatitis A Antibodies, IgG and IgM (IgG anti-HAV, IgM anti-HAV)
Hepatitis B (HBV), Serology and Antigen Detection
Hepatitis C Antibody (Anti-HCV)
Hepatitis D Antibody (Anti-Delta Serology)
Hepatitis E Antibody (Anti-HEV)
Herpes Simplex Virus Type 1, 2 (HSV), Serology
Human Herpesvirus Typ 6, Serology
HIV Type 1 and 2, Serology
Influenza Type A and B, Serology
Measles (Morbilli), Serology
Mumps Virus, Serology
Parainfluenza Virus, Serology
Parvovirus B19, Serology
Poliomyelitis Virus Type I, II, III , Serology
Rabies Antibody, Serology
Respiratory Syncytial Virus, Serology
Rota Virus, Serology
Rubella, Serology
Varicella-Zoster Virus, Serology

Sampling: for each 2 mL serum

Antibodies, ssDNA

Related Information: Complement C3 Complement (beta1C/beta 1A-Globulin), Serum
Synonyms: Antibodies to Single Stranded DNA;
Anti-ss-DNA Antibody,
ss-DNA- Antibody

Background: Present in most patients with active lupus erythematosus (SLE) as well as in more than 50 % of patients with inactive lupus. 20 - 50 % of patients with rheumatoid arthritis and mixed connective tissue disease present ssDNA antibodies. Less than 25 % of the cases with scleroderma-progressive systemic sclerosis, Sjoegren´s syndrome, dermatomyositis-polymyositis are ss-DNA antibody positive. SLE may present with more than 500 U/mL.
Limitations: Most individuals have IgM ssDNA antibodies, which have a lower affinity to DNA as compared to dsDNA antibodies, the sensitivity for SLE is therefore low.
Sampling: 1 mL serum
Reference Interval: Negative: titre < 1:10

Antibodies, dsDNA

Related Information: Complement C3 Complement (beta1C/beta 1A-Globulin), Serum
Synonyms: Anti-ds-DNA; Anti-Double Stranded DNA Antibodies;
Antibody to Native DNA

Background: Determination of IgG autoantibodies is a relatively specific test, besides anti - SM Antibodies, in Systemic Lupus Erythematosus (SLE) and is positive in 60-80 % of the SLE patients at some time during the course of the disease. Increase often precedes reactivation of the disease as well as falling C3 and C4 levels. ESR, WBC and urinary protein excretion may be early deterioration markers. Specificity is linked to the measured level, particularly SLE patients with renal disease have higher values.
Rarely cross reaction with some types of histone antibodies occur.
Sampling: 1 mL serum, refrigerate for extended transit time.
Reference Interval: Negative < 100 IU/mL

Antibody to Streptolysin O see Anti-Streptolysin O-Antibody

Anticyclic Citrullinated Peptide Antibody

Related Information: Lupus Anticoagulans/Lupus Inhibitors, Serum or Plasma
Rheumatoid Factor, Serum or Body Fluid

Synonyms: Anti CCP; Anticitrullinated Peptide Antibodies;
CCP Antibodies; Cyclic Citrullinic Peptide

Background: Citrulline is an amino acid occurring in filaggrin from the precursor profilaggrin during cell differentiation. Autoantibodies may be induced by the citrullinated form and are primary of the IgG class. The test is specific for rheumatoid arthritis (RA) in the early phase. Specificity 96 - 99 %, however, 60 - 88 % sensitivity. In combination with testing rheumatoid factor, specificity is even higher.

Sampling: 1 mL serum

Reference Interval: Antibody: < 1.0 COI

Antideoxyribonuclease-B Titer, Serum

Related Information: Antibody to Streptolysin O

Synonyms: Anti DNAse-B; Antistreptococcal DNAse-B; DNAse B antibody;
Streptodornase; Anti-streptodornase

Background: Used for detection of an immunological response to an extracellular product of Streptococcus pyogenes. The parameter is valuable in patients presenting with glomerulonephritis or rheumatic fever without clinical documentation of S. pyogenes infection.

Advantage over ASO: Value remains for a longer period elevated than ASO, less false positive results due to liver diseases than ASO. Titer is in the positive range in 80 - 85 % of the patients with Streptococcal infection. Rise is slow as compared to ASO, peak at 4-8 weeks, persist for several month. ASO together with antideoxyribonuclease-B Titer detects 95 % of Streptococcal infections.

Sampling: 1 mL serum. Acute and convalescent specimens should be performed concurrently.

Reference Interval:

Preschool children	< 60 IU/mL
School children	< 170 IU/mL
Adults	< 200 IU/mL

Antidiuretic Hormone, Plasma

Related Information: Methadone, Urine
Osmolality, Serum
Osmolality, Urine
Sodium, Plasma
Sodium, Serum

Synonyms: ADH; Vasopressin

Background: ADH is synthesized in the hypothalamus, released by the posterior pituitary gland responding to osmoreceptors and baroreceptors and is involved in water reabsorption in

the distal tubulus. Insufficient ADH results in polyuria, increase in serum and decrease in urine osmolality and hypernatremia.

Useful in the diagnosis of urine concentration disorders such as diabetes insipidus, inappropriate ADH syndrome, and ectopic ADH production. Increased plasma ADH occurs in acute intermittent porphyria, Guillain-Barre syndrome, tuberculosis, tuberculous meningitis, pneumonia, and nephrogenic diabetes insipidus. Decreased in neurogenic diabetes insipidus, nephrotic syndrome, and psychogenic polydipsia.

Tumors of the hypothalamus or pituitary gland causing diabetes insipidus are craniopharyngioma, ependymoma, germinoma, pinealoma, leukemia, metastases and sarcoidosis.

Sampling: 2 mL EDTA plasma. Patient should be calm during collection. ADH levels are influenced by: Nicotine, alcohol, caffeine, diuretics. Draw sample into pre chilled tube, place on ice, and transport to the laboratory within 1h or centrifuge immediately in a pre-chilled centrifuge at 4°C to separate platelets completely, since platelets contain ADH, and freeze plasma.

Reference Interval: 0.6-6.0 pg/mL

More specific values are derived by comparing to urine osmolality

ADH in pg/mL	Osmolality in mOsm/kg
<1.5	270-280
<2.5	270-285
1-5	285-290
2-7	290-295
4-12	295-300

Antiglobulin Test, direct (Direct Coombs)

Synonyms: Antihuman Globulin; Coombs Test, Direct ; DAT; Direct Antiglobulin Test; Direct Coombs

Test includes: Antiglobulin testing with polyspecific antiglobulin serum and use of monospecific reagents (anti IgG, anticomplement) when polyspecific reagent is positive.

Background: DAT detects nonagglutinating antibodies which are bound to the surface of red cells, detecting immunoglobulins and complement components. Useful in the work up of antibody induced hemolysis such as autoimmune hemolytic anemia, transfusion reactions or HDN.

Limitations: 4 % of patients with auto-immunohemolytic signs have a false negative direct Coombs test. Some drugs may cause false positive results with no hemolytic clinical signs (methyldopa, penicillin, cephalosporins, quinidine, insulin, sulfonamides, and phenacetin).

Sampling: 10 mL whole blood, do not (!) refrigerate. The correct patients identification and labeling of the tubes are critical. Please provide diagnosis, medications and transfusion history.

Reference Interval: negative

Antiglobulin Test, indirect (Indirect Coombs)

Synonyms: AHG, Indirect
Antibody Detection
Antibody screening
Antiglobulin Test, Indirect
Coombs indirect
IAT; Indirect Antihuman Globulin Test

Background: Serum is tested against group O screening cells to detect antiglobulin antibodies. Further antibody identification will be performed, depending on initial results such as antigen typing, cold and warm auto absorption, selective cell panels, enzyme panels.
The test detects 99.6 % alloantibodies, however, antibodies against very infrequent antigens are not detected since not represented in the in the identification panel. Also the sensitivity is low to week immunogenic antibodies.

Sampling: 10 mL whole blood

Reference Interval: negative

Antihistidyl Transfer tRNA Synthetase see Jo-1 Antibody

Antimitochondrial Antibodies

Related Information: Alkaline Phosphatase, Serum
Aspartate Aminotransferase, Serum
Bilirubin, Fractionated, Serum
Gamma-Glutamyl Transferase (Gamma-GT), Serum

Synonyms: AMA, Mitochondrial antibody

Background: Primary biliary cirrhosis (PBC), primary or secondary sclerosing cholangitis and duct obstruction may lead to cirrhosis. PBC is a chronic progressive autoimmune disease with antimitochondrial antibodies present in up to 95 % of the patients.

Sampling: 1 mL serum

Reference Interval: Negative: titer < 1:100
Patients with PBC present in 75 – 95% of the cases titers >1:160, however very low titres are seen in 10 % of PBC.
Patients with other autoimmune diseases often have 1:20 to 1:80 titers. Transient low titers occur in chlorpromazine or halothane sensitive patients.

Antineutrophil Cytoplasmatic Antibody (ANCA)

Related Information: Antimitochondrial Antibodies
Antinuclear Antibody

Applies to: C-ANCA, Proteinase-3 (PR3), and P-ANCA,
Myeloperoxidase Antibody (MPO)

Background: The class of ANCA is composed of antineutrophil cytoplasmatic antibodies (C-ANCA mainly directed against PR3) and perinuclear (P-ANCA, mainly directed against MPO-) antibodies. MPO is a 146kDa protein, functioning as a producer of bacteriotoxic O_2 radicals. PR3 is a 29kDa serineprotease with proteolytic activity on elastin, fibronectin, laminin, hemoglobin, collagen IV, and inhibitable by alpha$_1$ antitrypsin.

C-ANCA:
Class C-ANCA are present in Wegener Granulomatosis (WG). For PR3 diagnostic sensitivity is 75 % to 90 % in patients with systemic vasculitides and necrotizing glomerulonephritis and inflammation of the respiratory tract,
Diagnostic sensitivity is lower for polyangiitis (45 %), Chung Strauss syndrome (10 %), idiopathic glomerulonephritis (25 %).
Due to higher titers in C-ANCA during high activity of disease, C-ANCA is useful in monitoring therapy of polyneuritis cranialis, Tolosa Hunt Syndrome, peripheral neuropathies, polychondritis. Raising titers may precede reactivation of disease weeks to month.
PR3 antibodies (IgG class) may occur in pulmonary hemorrhages and in Schoenlein-Henoch Purpura (IgA class).
P-ANCA:
Occur in microscopic polyangiitis (45 %), Chung Strauss Syndrome (60 %)
Goodpasture Syndrome, hydralazine related nephritis/ Lupus Erythematodes.
P-ANCA also may occur in chronic inflammatory bowl disease (Morbus Crohn, Colitis Ulcerosa) primary sclerosing cholangitis, primary biliary cirrhosis, chronic polyarthritis, Systemic Lupus Erythematodes and autoimmune hepatitis, but PR3 specific antibodies are usually low, instead antibodies directed against other ANCA class antigens are elevated such as alpha enolase, elastase, lysozyme cathepsin G, lactoferrin and others.

Sampling: 1 mL serum, keep cool, stable for 3 days at 4°C, otherwise freeze at –20° to -70°C.

Reference Interval:		
	C-ANCA negative:	titer <1:20
	Proteinase-3 (PR3) negative:	<20 U/mL
	P-ANCA negative:	titer <1:20
	Myeloperoxidase negative:	< 20 U/mL

Differentiation of ANCA antibodies (such as alpha enolase, elastase, lysozyme, cathepsin-G, MPO, lactoferrin, others) by immunoblot: Report of diagnostic antibodies

Antinuclear Antibody

Related Information: Cardiolipin Antibody
Antibodies to DNA
Aspartate Aminotransferase (AST), Serum
C4 Complement (beta1-E), Serum
Rheumatoid Factor, Serum or Body Fluid

Synonyms: ANA, FANA

Background: ANA provides a sensitive test for screening for autoimmune rheumatic diseases particularly Systemic Lupus Erythematosus (SLE). However specificity is low, and SLE has a low prevalence of 50 cases per 100 000 individuals.
Criteria (in part) of the American College of Rheumatology Classification for SLE 1982:
Malar rash, discoid rash, photosensitivity, oral ulcers, nasal ulcers, arthritis in at least 2 peripheral joints, pleuritis, pericarditis, and renal disease with proteinuria >0.5g/day, hemolytic anemia, Laboratory: positive ANA, anti-ds-DNA antibody, anti-Sm antibody.

Titres >1:160 needs further work up. Recommendation to confirm SLE include anti-DNA, RNP, Smith (Sm) and Sjoegren antibodies as well as topoisomerase-I antibody, Scl-70, Jo-1, antiphospholipid antibody.
A good marker for monitoring SLE disease progression is anti-ds-DNA antibody and eventually C3 and C4.

Frequency of positive ANA in various clinical syndromes
(from Kavanaugh et al, Guidelines of Clinical Use ot the ANA Test and Test for Specific Autoantibodies to Nuclear Antigens, Arch Pathol Lab Med 2000, 124 pp 71-81)

Positive ANA in %	Disease or Syndrome
95-100	SLE
60-80	Systemic sclerosis
40-70	Sjoegren syndrome
30-80	Idiopathic Inflammatory Myositis
20-50 but of high prognostic value	Juvenile chronic oligoarticular arthritis/ uveitis
20-60 but of high prognostic value	Raynaud syndrome
100	Drug induced SLE
100	Autoimmune hepatic disease
100	Mixed connective tissue disease

There is a 5% to 50% prevalence of ANA in: Rheumatoid arthritis, Multiple sclerosis, idiopathic thrombocytopenic purpura, thyroid disease, discoid lupus, patients with silicone breast implants, fibromyalgia,
Limitations: Persons older than 80 years, particularly women have a 50% incidence of low ANA

titers. Up to 5% of healthy individuals have titers > 1:160, titers > 1:40 are seen in 20-30% of the normal population. Low titres (< 1:80) occur mostly in rheumatoid arthritis, scleroderma, necrotizing vasculitis., Sjoegren syndrome, discoid lupus, chronic active hepatitis, pulmonary fibrosis, pneumoconiosis, tuberculosis, malignancies also in inactive SLE or during therapy. Drugs, especially associated with elevated titres: para-aminosalicylic acids, carbamazepine, chlorpromazine, ethosuximide, griseofulvin, hydralazine, isoniazid, methyldopa, penicillin, phenylbutazone, phenytoin, hydantoin, primidone, procainamide, propylthiouracil, trimethadine.

Sampling: 1 mL serum

Reference Interval:	Negative	titer < 1:40
	Borderline	titer 1:80-1:160
	Positive	titer > 1:160

Using immunofluorescence methods the pattern of nuclear fluorescence may be reported:

Peripheral pattern:	Correlates with antibody to native DNA correlates with SLE, SLE activity and lupus nephritis.
Homogenous pattern:	Correlates to SLA or other connective tissue disease.
Speckled pattern:	Antibody binds to nuclear antigens (saline extractable), not DNA related), found in many diseases and SLE
Nuclear pattern:	Patients with progressive systemic sclerosis and Sjoegren's syndrome
Discrete speckled pattern:	Centromere specificity is selective for CREST variant of scleroderma.

Antiplasmin see $Alpha_2$ - Antiplasmin, Functional

Anti-Staphylolysin, Serum

Background: Staphylococcus aureus produces an alpha hemolysin (staphylolysin), which is targeted to the membrane of erythrocytes. An infection by Staphylococcus aureus is followed within 2-3 weeks by an increase of antibodies directed against staphylolysin. The serum concentration of the antibodies peak at 2-3 month post infection and return to normal within 5-7 month.

Low antibody concentrations are linked to superficial infections, high concentrations to sepsis or abscess. Negative results do not rule out infection.

Useful in culture-negative patients and patients with osteomyelitis.

Sampling: 2 mL serum

Reference Interval:

Negative:	<2 IU/mL
Positive:	cut off: 8 IU/mL : 80 % of patients had signs of severe infection
	cut off: 2 IU/mL : 80 % of patients had signs of superficial infection

Anti-Streptococcal Hyaluronidase, Serum

Background: Hyaluronidase is an enzyme synthesized by Group A and Group B, C, G, H, and L Streptococci. Since antibodies against hyaluronidase are produced during Streptococcal infection the antibody concentration can be used in diagnoses and monitoring the infection.

Sampling: 2 mL serum

Reference Interval: < 150 IU/mL

Anti-Streptolysin O-Antibody

Synonyms:
Streptolysin O Antibody
Antistreptolysin O
ASLA
ASO Titer

Background: Streptolysin is a haemolysin synthesized by Group A Streptococci and acts as an immunogenic antigen.

Used in the diagnosis of beta hemolytic Streptococcus Group A infection without clinical documentation. Elevated titers in 80% of patients with acute rheumatic fever and in 95% of patients with acute glomerulonephritis.

Rise in titer begins 1 week after infection, peak 2-4 weeks later, falls to baseline within 6-12 month. Anti-DNase B remains elevated in contrast to an already fallen ASO titer at the onset of rheumatic fever or glomerulonephritis.

Sampling: 1 mL serum

Reference Interval:

Children:	< 2 years	< 50 Todd units
	2-5 years	< 100 Todd units
	5-19 years	< 166 Todd units
Adults:		< 125 Todd units
	borderline	125-200 Todd units

Antithrombin III

Related Information:
Activated Protein C Resistance
Protein C
Protein S, Total

Synonyms:
AT III; Heparin Cofactor Activity; Antithrombin III; Serine Protease Inhibitor

Background: Decreased activity of the anticoagulant protein is associated with hyper coagulation and risk for venous thrombosis. AT III inhibits thrombin, the factors Xa, IXa XIa, XIIa and kallikrein. Heparan sulfates (endothelial cells), heparin, glycosaminoglycans enhance the activity of ATIII.

The hereditary form is prevalent in 0,2% of the population, reaching up to 5% in older patients with

thrombosis and is caused by one or more of more than 100 described mutations located in the thrombin gene. Homozygous forms are incompatible with life, heterozygous patients have a 5 fold risk to develop venous thrombosis and display values of ATIII of 45-80%.

At birth antithrombin levels are lower (40-90%), reaching adult levels a month 6. Decreased activity may occur during the use of oral contraceptives, or third trimester pregnancy

The more common form is the acquired AT III deficiency which includes decreased hepatic synthesis caused by liver diseases or L-asparaginase treatment, consumption of ATIII by DIC, proteinuria (nephritic syndrome), Colitis ulcerosa and pulmonary embolism. Coumadin may increase AT II levels

Patients with substantial decrease may need very high doses of heparin to obtain prolonged PTT (heparin resistance).

Since antithrombin III in a functional assays will not be able to distinguish between decreased function(less common hereditary form) or protein concentration, it is recommended to perform an immunogenic assay if the functional assay display decreased values.

Sampling: 4 mL citrate blood or 2 mL citrate plasma. When drawing the specimen, first draw 1-2 mL into a tube to discard and draw sample second into the citrate tube, avoiding contamination with tissue thromboplastin. Tube must be filled completely. Avoid contamination with heparin, when using a catheter to obtain the sample, discard the first 6-10 mL .Mix with citrate by inverting. Place on ice and transport to the laboratory within 4 h or separate plasma and freeze at -70°C.

Reference Interval: 80% - 120%

APC Resistance see Activated Protein C Resistance

Apolipoprotein A-1 and B-100, Serum

Test includes: Apolipoprotein A-1 and Apolipoprotein B-100

Background: Apolipoprotein A-1 (Apo-1) is the main HDL particle associated protein. It removes cholesterol from the tissue and is considered as beneficial in preventing stroke and coronary heart disease. It is used in the evaluation of low HDL in familary Apo-1 deficiency, Tangier disease or LCAT deficiency.

Apolipoprotein B-100 (Apo B-100) is a constituent of VLDL, IDL, LDL, Lp(a). It is synthesized by the liver and delivers cholesterol to the tissue. It is a risk factor for coronary heart disease.

Sampling. 2 mL blood or 1 mL serum, patient must be fasting for 14h. Separate serum as soon as possible, and refrigerate but do not freeze. Stable for a maximum of 12h.

Reference Interval:			
	Apolipoprotein A-1	Male:	110-180 mg/dL
		Female:	110-210 mg/dL
	Apolipoprotein B-100	Male:	60-140 mg/dL
		Female:	50-130 mg/dL

Aspartate Aminotransferase (AST), Serum

Related information:
Acetaminophen, Serum
Alanine Aminotransferase (AST), Serum
Alkaline Phosphatase, Serum
Antimitochondrial Antibody
Bilirubin, Fractionated, Serum
Ceruloplasmin (Cp), Serum or Plasma
Copper (Cu), Serum or Urine
Ethanol, Blood, Serum or Urine
Ferritin, Serum or Plasma
Gamma-Glutamyl Transferase (Gamma-GT), Serum
Glutamate Dehydrogenase (GLDH), Serum
Hepatitis A Antibodies, IgG and IgM (IgG anti-HAV, IgM anti-HAV)
Hepatitis B (HBV), Serology and Antigen Detection
Hepatitis B Virus DNA Detection (HBV-DNA)
Hepatitis C Antibody (Anti-HCV)
Hepatitis C Genotyping
Hepatitis C Virus RNA Quantification (HCV-RNA)
Hepatitis D Antibody (Anti-Delta Serology)
Hepatitis E Antibody (Anti-HEV)
Lactate Dehydrogenase (LDH), Serum

Synonyms: AST; Glutamic Oxaloacetic Transaminase; GOT; SGOT

Background: AST and Alanine Aminotransferase (ALT) are enzymes linked to liver diseases. AST is not specific for liver it is present in the heart, skeletal muscle, kidney, brain, pancreas, lung, leucocytes and erythrocytes. The highest concentration of AST is reached in the liver and skeletal muscle. Half life: approx.17h

Liver diseases: In alcoholic liver disease AST is moderate elevated up to 250 U/L , due to pyridoxine deficiency in patients with alcoholic abuses and a higher sensitivity of ALT to the deficiency, AST to ALT ratio is >2 in alcoholic hepatitis.

In viral hepatitis, AST: LD ratio is usually > 3. AST value is 3 to 100 fold the upper limit of the reference interval. In chronic hepatitis C AST: ALT ratio > 1 suggests cirrhosis.

AST increases in hemochromatosis or in hepatotoxicity by chemicals.

Cholecystitis and choledocholithiasis increases AST 5 to 10 fold above the upper reference value.

EBV infection cause AST increase (5 fold above upper reference value), and a higher LD increase as well as Reye syndrome.

In some cases of acetaminophen therapy AST levels of 2000 U/L to 30.000 U/L have been reported.

Acute Myocardial Infarct (AMI): AST increases 6-12h after onset of pain, maximum at 16-48h, usually up to 5 fold of upper reference value , if >10 fold of maximum reference value risk of mor-

tality is increased. Return to baseline within 3-6 days after onset. In AMI usually the ratio AST to ALT is > 2. AST has a diagnostic specificity for AMI of 86% and a sensitivity of 96%.

Skeletal muscle: Diseases of the muscle such as trauma, dystrophy, dermatomyositis, polymyositis, Duchenne muscular dystrophy

Drugs: Decrease AST levels: allopurinol, cyclosporine, progesterone

Elevate AST levels: acetaminophen, aminosalicyclic acid, amiodarone, amitriptyline, steroids, anticonvulsants, aspirin, carbamazepine, cephalosporins , chlorambucil, chlorthiazides, chlorpromazine, estrogens, erythromycin, fluconazole, gentamycin, hydralazine, ibuprofen, indomethacin, interferon alpha, isoniazid, levodopa, lovastatin, meprobamate, methotrexate, methyldopa, metronidazole, naproxen, niacin, nortriptyline, opiates, oral contraceptives, oxacillin, penicillin, phenobarbital, phenothiazine, procainamide, progesterone, pyrazinamide, quinidine, rifampin, streptomycin, sulfonamides, tamoxifen, ticarcillin , tobramycin, tolbutamide, verapamil.

Sampling: 1 mL serum or plasma. Avoid hemolysis, the concentration AST in erythrocytes is 40 fold of plasma concentration. AST is stable in serum for 1 week at 8°C.

Reference Interval:

Children (U/L)	Newborn	25-75
	1-3 years	10-50
	4-6 years	10-45
	7-12 years	10-40
	13-18 years	10-36
Adults (U/L)	male	10-38
	female	10-32

Aspergillus fumigatus, Serology

Related Information: Immunoglobulin E

Background: Test may be useful in the diagnosis of invasive aspergillosis in immunocompromised patients and in the assessment of hypersensitivity pneumonitis.

Limitations: Cross reactions possible to histoplasmosis, coccidiomycosis, and blastomycosis. A negative result does not exclude infection, sensitivity between 60%-90%.

Sampling: 1 mL serum, acute and convalescent serum is recommended to obtain optimal diagnostic results.

Reference Interval: Differentiation of immunoglobulin class:

IgM antibody	negative	< 50 IU/mL
	Borderline	50 – 70 IU/mL
	positive	> 70 IU/mL
IgG antibody	negative	< 50 IU/mL
	Borderline	50 – 70 IU/mL
	positive	> 70 IU/mL

Astrovirus Antigen, Feces

Background: Astroviruses belong to the family Astroviridae, are small (27-32 nm in diameter), non-enveloped single stranded (ss) RNA viruses. The virus is inactivated by heating over 60°C for 10 min, but resistant to alcohol.

Until 1975 only known in animal's diarrhea diseases they are now known to cause mild, gastro-enteritis with watery diarrhea in children under the age of 7 years and less common in adults. Incubation period is 3-4 days and the illness lasts 1-5 days. Besides diarrhea, fever occurs in 20%, vomiting in 10%.

Prevalence in community settings was found to be 7%-8% with an excretion rate in asymptomatic individuals of 2%. Astroviruses account for 3%-5% of diarrheas in hospitalized children. Outbreaks occur in dare care centers, hospitals, nursing homes. Half of the infected individuals remain asymptomatic. Attack rates during outbreaks were found to be 50%, and secondary transmissions 30%.

Most adults (75% at the age of 10 years) have antibodies, suggesting the infection occurs commonly.

Sampling: approx. 2 g of stool.

Reference Interval: Report on diagnostic finding. Antigen detection.

Autoantibodies

Overview:

Acetylcholine receptor see Acetylcholine Receptor Antibody, Binding
Antihistidyl Transfer tRNA Synthetase see Jo-1 Antibody
Antineutrophil Cytoplasmatic Antibody (ANCA)
Antinuclear (ANA) see Antinuclear Antibody
Cardiolipin (IgA, IgG, IgM) see Cardiolipin Antibody
Cyclic citrulline Peptid (CCP) see Anticyclic Citrullinated Peptide Antibody
DNA (double- and single strand) see Antibodies, dsDNA and see Antibodies, ssDNA
Endomysium (IgA, IgG) see Endomysial Antibodies
Extractable Nuclear Antigen (ENA) see Ribonucleoprotein U1-snRNP Antibody Smith (SM) Antibody
SS-A/Ro and SS-B/La Antibodies
Histone (H1, H2A, H2B, H3, H4) see Histone-Antibodies
Intrinsic Factor see Intrinsic Factor Antibody (IFA)
Liver/Kidney microsomal (LKM) antibodies please see
Liver Kidney Microsomal Antibodies (LKM Antibodies)
Mitochondrial (AMA) see Antimitochondrial Antibodies
Myeloperoxidase (MPO) see Antineutrophil Cytoplasmatic Antibody (ANCA)
P-53 see P-53 Antibody, Serum
Parietal Cell Antibody

Phosphatidyl-choline, -ethanolamine, -glycerin, -inositol, -serine IgA, IgG, IgM
see Phospholipid-Antibodies, Serum
Platelet, free antibodies (serum), bound antibodies (EDTA-blood)
see Platelet Antibodies (free, bound)
RNP-U1 see Ribonucleoprotein U1-snRNP Antibody
Proteinase-3 (PR3) see Antineutrophil Cytoplasmatic Antibody (ANCA)
Scl-70 see Scl-70 Antibody
Scleroderma Antibody see Scl-70 Antibody
Sm Protein (Smith) see Smith (SM) Antibody
Smooth muscle (ASMA) see Smooth Muscle Antibodies (SMA)
Smith (SM) Antibody
Soluble liver antigen see Soluble Liver Antigen (SLA)-Antibody (Anti-SLA)
Sjoegren Antibodies see SS-A/Ro and SS-B/La Antibodies
SS-A (Ro) see SS-A/Ro and SS-B/La Antibodies
SS-B (La, Ha) see SS-A/Ro and SS-B/La Antibodies
Thyroperoxidase (MAK)
Thyroid (thyroglobulin, microsomal, TSH-Receptor) see Thyroglobulin Antibody
Thyroperoxidase Autoantibody
Thyrotropin Receptor Antibody, Serum
Topoisomerase I Antibody see Scl-70 Antibody

Sampling: for each test 1 mL of serum

B- and T Lymphocytes see Lymphocyte Immunophenotyping

Bartonella henselae, Serology

Synonyms: Bacillary Angiomatosis Serology
Cat Scratch Disease Serology

Background: Bartonella species includes B. quintana and B. henselae, responsible for cutaneous bacillary angiomatosis, bacillary peliosis of the liver and spleen, fever and bacteriemia (Bartonella bacteremic syndrome), endocarditis (so called culture negative endocarditis). Associated only with B. quintana: trench fever and with B. henselae only: Cat scratch disease.
Patients presenting with cat scratch disease are in >80% younger than 20 years, an inoculation papule is seen in 50 % followed by local lymphadenopathy and cats bites or scratches in 75 %. B. henselae has been isolated from blood and tissue. In the normal population, approx. 15% of the people showed IgG titres > or = 1:128. In patients with cat scratch disease, 85 % display titres > or = 1:128. Cross reactivity within other Bartonella species occur, e.g. Bartonella quintana, associated with trench fever. Seroconversion may take up to 3 weeks post infection; a late specimen may be helpful.