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.

Sampling: 1 mL serum early and a specimen 3-6 weeks post infection.

Reference Interval: Negative: titer < 1:64
A threefold increase in titre is considered significant.

Bence-Jones Protein see Free Light Chains Structure, Urine

Beta-2-Microglobulin, Serum or Urine see Microglobulin β-2-, Serum or Urine

Beta-Crosslaps, Serum

Related Information: Pyridinolines
Vitamin D, Serum

Background: Collagen alpha$_1$ or alpha$_2$ chains are linked at the carboxy or aminoterminal end with the helix of adjunct collagen by hydroxypyridiniumderivates. During proteolytic breakdown of collagen type I the hydroxypyridinium interlinked alpha$_1$ or alpha$_2$ chains are released into serum and urine and are known as N-terminal crosslaps (NTX), C-terminal crosslaps (CTX) and collagen type I C-terminal telopeptide. All peptides are released during the turnover of skin and bone tissue, however, the major amount in serum or urine of CTX and NTX are products of bone resorption.

Alpha-CTX is the non-isomerized form of aspartic acid; the beta form which is the isomerized form, forms spontaneously but delayed posttranslational. It indicates tissues degradation composed of mature collagen such as mature bone, but not recently formed bone tissue.

Sampling: All types of collagen resorption products have a circadian rhythm peaking during the night and with a low during daytime (plus/minus 30%)

Standard procedure:

Schedule sampling between 7:30 -8:30 in the morning after a strict 12h fasting period (only pure water allowed!). Sample into EDTA tube. EDTA whole blood is stable for 8h at room temperature; EDTA plasma is stable for 24h room temperature, 1 month at -20°C.

Reference Interval:			
	Male		< 0.60 ng/mL
	Female	< 45 years	< 0.60 ng/mL
		> 45 years	< 1.00 ng/mL

Levels increases after menopause in serum and urine by 50-70%

During anti-bone-resorptive therapy, levels are expected to decrease after 6 month by 55-70%

Bile Acids, Serum or Feces

Related Information: Bilirubin, Fractionated, Serum
Gamma Glutamyl Transferase (Gamma-GT), Serum

Synonyms: Cholylglycine; Bile Acid Conjugates; Cholic and Chenodeoxycholic Acid

Background: Bile acids are produced by hepatocytes from cholesterol. The two primary bile acids are cholic and chenodeoxycholic acids. In bile they solubilize cholesterol, thus being essential for cholesterol elimination and conjugate with glycine, taurine, amino acids. Theses primary bile acids undergo bacterial degeneration to form deoxycholic, lithocholic acids and oxidation products (ursodeoxycholic acids). 95% of bile acids are reabsorbed in the small intestine and undergo enterohepatic circulation. Normally < 1% of the bile acid pool is found in serum, but is elevated in cirrhosis, obstructive jaundice, hepatitis due to decreased clearance, but with normal ratio secondary to primary bile acids. In cirrhosis, a disproportionate decrease in cholic acid occurs with a reduced ratio of primary to secondary bile acids. In cholestasis, no secondary bile acids are formed.

Determination of bile acids in serum is one of the most sensitive methods to evaluate liver function.

Sampling: Serum: 1 mL serum. Overnight fasting sample preferred.
Feces: Collect feces for 24h in a sterile container without preservatives. Keep refrigerated during collection period. Note total weight on the request sheet. Before aliquoting approx. 2 g of stool, mix well.

Reference Interval: Serum: < 7.0 µmol/L
Feces: 410 - 1210 µmol / 24h

Bilharzia (Schistosomiasis) Serology

Background: For definite diagnosis of schistosomiasis identification of ova of S. haematobium, S. mansoni, S. japonicum in rectal or bladder biopsy in feces or urine is necessary.

Antibodies persist following therapy. Differentiation between recent or chronic infection is not possible; Positive results indicate chronic active or inactive schistosomiasis. No distinction between the sites of infection or the various forms of the fluke by serology.

Sampling: 1 mL serum, avoid hemolysis, avoid highly lipemic serum

Reference Interval: Serum antibody titer negative: < 1:16

Bilirubin Fractionated, Serum

Related Information; Acetaminophen, Serum
Alanine Aminotransferase (AST), Serum
Alkaline Phosphatase, Serum
Amylase, Isoenzymes, Serum
Amylase, Total, Serum
Amylase, Total, Urine
Aspartate Aminotransferase (AST), Serum
Ethanol, Blood, Urine
Gamma-Glutamyl Transferase (Gamma-GT), 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)
Leucine Aminopeptidase (LAP), Serum
Lipase, Serum
Prothrombin Time

Test includes: Total, conjugated and unconjugated Bilirubin

Synonyms: Total, direct, indirect Bilirubin

Background: Produced in the breakdown of heme and in the reduction of biliverdin, circulating in the plasma and is conjugated, called the direct form, by the liver to bilirubin diglucoronide, a water soluble pigment excreted in the bile.

Conjugated, direct bilirubin in serum is the most sensitive test for liver function and occurs in biliary diseases, intra-and extrahepatic lesions, hepatitis, cirrhosis, neoplasms, cholestatic drug reactions and in faulty excretory function of hepatocytes such as Dubin Johnson syndrome, Rotor's syndrome.

A total bilirubin increase is associated with:

Hemolytic diseases, hepatocellular dysfunction, diseases of hepatic ducts or common bile ducts. Also Gilbert's syndrome, an asymptomatic hereditary jaundice with increasing hyperbilirubinemia caused by Glucoronyl transferase deficiency. Dubin Johnson syndrome, anorexia, prolonged fasting, pulmonary embolism or infarction, congestive heart failure.

Limitations:

Drugs can interfere with the diazo method used for the test as well as causing jaundice in vivo. Such drugs are: diphenylhydantoin, azathioprine, phenothiazine, erythromycin, penicillin, sulfonamides, contraceptives, anabolic androgenic steroids, halothane, aminosalicylic acid, isoniazid, methyldopa, indomethacin, pyrazinamide.

False positive reactions with the diazo method are often seen during cephotetan, pansporin, cefuroxime therapy.

Sampling: 1 mL serum or capillary plasma (heparin or EDTA), avoid hemolysis, protect from light. Transport to laboratory within 4h or separate serum/plasma within 8 h and refrigerate thereafter.

Reference Interval:

Neonates: Bilirubin, total (mg/dL), maximum

Age	premature	full term
<1 day	8	6
24-48h	12	10
3-5 days	15	12
6-7days	15	10

Children and adults:	Total :	< 1.2 mg/dL
	Conjugated or direct bilirubin:	< 0.3 mg/dL
	Unconjugated or indirect bilirubin:	< 0.9 mg/dL

Critical value:

Newborn: Total bilirubin more than 15 mg/dL in term infants,
10-15 mg/dL in prematures.
Increase of more than 1 mg/dL per hour for more than 6 hours.

Biotin (Vitamin H), Serum

Background: Tissue biotin is a cofactor for carboxylation of pyruvate, acetyl-coenzyme A (CoA), propionyl CoA, and beta-methylcrotonyl CoA .

Deficiency presents as severe exfoliative dermatitis and alopecia, similar to zinc deficiency.

Secretion in the urine as intact biotin, and to lesser amounts as bis-norbiotin and biotin sulfoxide.

Sources for biotin are organs, egg yolk, milk, fish, and nuts. Biotin is stable to cooking.

Daily recommended intake approx. 30 µg, the bacterial intestinal flora contributes in part to the supply. Therapeutic large doses (5-10 mg) are applied to infants with seborrhea or genetic alteration of biotin dependent enzymes, no toxicity has been reported so far.

Sampling: 2 mL serum

Reference Interval: > 200 pg/mL
< 100 pg/mL interpreted as a biotin deficiency

Bordetella pertussis, Culture

Related information: Bordetella pertussis, Serology

Background: B. pertussis causes whopping cough. The disease begins with mild respiratory infection and develops within 2 weeks into the distinctive whooping cough. Pertussis like symptoms are also caused by Chlamydia trachomatis, adenoviruses, and respiratory syncytial virus. Diagnosis can be made by B. pertussis cultivation from nasopharyngeal specimens. Despite vaccination programs, pertussis is still one of the most common causes of death from infectious diseases worldwide. Pertussis is highly contagious, immunized persons can be transiently colonized and spread the organism.

Sampling: Perform a nasopharyngeal swap near septum and the floor of the nose under rotating. Inoculate at bedside immediately. Since routine agar does not support the growth of the organism, either the swap should be plated at beside on Bordet-Gengou agar plate, derived from the laboratory or a special transport medium (to order from the laboratory) has to be used. Successful cultivation even under optimal conditions is poor about 50%.

Reference Interval: Report on diagnostic finding
Growth or no growth of Bordetella pertussis or B. parapertussis

Bordetella pertussis, Serology

Related information: Bordetella pertussis, Culture

Background: The value of the antibody detection is limited by the time required for seroconversion. There is a lack of association between antibody levels and protective immunity. Patients with acute infection develop IgG and IgM and IgA antibody responses, vaccinated individuals show increase of IgM and IgG, IgA antibodies are lacking.

Sampling: 1 mL serum

Reference Interval: Differentiation of immunoglobulin class

IgA antibody negative:	< 9 RE/mL
borderline:	9-11 RE/mL
positive:	>11 RE/mL
IgG antibody negative:	< 9 RE/mL
borderline:	9-11 RE/mL
positive:	>11 RE/mL
IgM antibody negative:	< 9 RE/mL
borderline:	9-11 RE/mL
positive:	>11 RE/mL

Borrelia, Serology

Synonyms: Borreliosis; Lyme Disease

Test includes: B. burgdorferi, -afzelii, -garinii

Background: Borrelia spp. are irregular coiled spirochetes, Giemsa and silver stain positive, culturable from the tick vector but not from patient's specimens in serum containing media and transmitted by arthropods. Diseases caused are Lyme disease and relapsing fever.

Borrelia burgdorferi is the cause of Lyme disease transmission by Ixodes dammini, or I. pacificus. The reservoirs are mammals (white footed mouse) and large mammals. Feeding time of the ticks must exceed 24 h to transmit a sufficient dose for infection. In the US, the most common tick borne diseases are Lyme disease, Rocky Mountain spotted fever, ehrlichiosis, relapsing fever, and tularemia.

B. burgdorferi is disseminated into heart, joints, CNS. The disease occurs stage wise: Erythema chronicum migrans, a non-pruritic red rash with a clear center at the site of the bite in 75% of the cases and later usually accompanied by flulike transient symptoms (arthralgias, headache, fever chills, fatigue).The second stage with heart and CNS involvement (neuroborreliosis) occurs after weeks to month (myocarditis, aseptic meningitis, neuropathies with Bell s palsy). The third phase is characterized by arthritis of the large joints and CNS symptoms.

B. recurrentis is transmitted by the human body louse and B. hermsii by soft ticks (Ornithodoros) with rodents as the reservoirs.

Antibodies of the IgM class are detectable after 2-3 weeks post infection, peaking at 3-6 weeks.

Treatment: Doxycycline, amoxicillin, penicillin G, ceftriaxone.

Prevention: Two Lyme disease vaccines have been developed: LYMErixTM by SmithKline Beecham Pharmaceuticals and ImuLymeTM by Pasteur Merieux Connaught, however the vaccine is not effective in all individuals.

Sampling: 1 mL serum

Reference Interval: Screening by EIA method. Validation by Western blot assay. Differentiation of immunoglobulin class for B. burgdorferi, -afzelii, -garinii antibody.

IgG antibody negative:	< 17 RE/mL
borderline:	17-20 RE/mL
positive:	> 20 RE/mL
IgM antibody negative:	< 15 RE/mL
borderline:	15-20 RE/mL
positive:	> 20 RE/mL

Brain Natriuretic Peptide, Serum

Related Information: Albumin, Serum
Creatinine, Serum or Plasma
Digoxin, Serum
Magnesium (Mg), Serum
Osmolality, Serum
Renin Activity, Plasma

Synonyms: B-Type Natriuretic Peptide; BNP; Natriuretic Peptide, Brain

Background: BNP, is a polypeptide, which is produced by the ventricular myocardium under stimulation of volume expansion and overload. The hormone displays natriuretic and vasodilatory effects, suppressing the renin angiotensin system.

BNP is a useful parameter in diagnosis and treatment of congestive heart disease (CHF) since correlating with severity and prognosis. Also helpful in the diagnosis of cardial versus non-cardial dyspnea.

Limitation: In the very early stage of acute CHF presenting with dyspnea or edema, BNP may be normal. Elevated levels may occur in pulmonary embolism, right heart failure, and pulmonary hypertension.

Sampling: 2 mL serum, place on ice, if transit time is less than 6h,otherwise freeze.

Reference Interval:

In healthy individuals < 125 pg/mL

Varies with age and sex.

Values correlate with degree of congestive heart failure.

	BNP pg/mL 5th-95th percentile approx	median approx (pg/mL)
Patients with cardiac disease, but without symptoms	15-499	95
Patients with limited ability to perform exercise	10-1100	220
Patients with limitations in ordinary physical activity	40-1300	450
Patients not able to perform exercise	150-1300	1000

Brucella, Serology

Background: Brucella species organisms are small gram negative rods. The major human pathogens are B. melitensis (reservoir goat and sheep) and B. abortus (cattle).

Transmission is via unpasteurized milk or cheese from infected animals of the domestic livestock or by skin contact.

The organism localize in the reticuloendothelial cells (liver, spleen, bone marrow, lymph nodes) and replicates intracellular. After an incubation period of 1-3 weeks, fever, chills, fatigue, malaise and weight loss occurs. The undulating fever occurs in a minority of patients. Liver spleen and lymph nodes are often enlarged.

Drug of choice: Tetracyclines plus rifampin

Sampling: 1 mL serum

Reference Interval: Antibody agglutination test: negative

Bunyaviruses, Serology

Background: Bunyaviruses are enveloped viruses, with helical capsid symmetry, 100 nm in seize circular single stranded with negative polarity RNA. The virus was first as isolated in Africa (Bunjamwera), causing encephalitis. Now 4 distinct Hantaviruses are known in N. America and more than 20 serotypes worldwide. As a member of the Bunyavirus family Hantaviruses cause Korean hemorrhagic fever in Europe and Asia with headache, petechial hemorrhages, shock, and renal failure. Mortality is about 10%. Hantaviruses are also classified as roboviruses for rodent borne viruses, since they are transmitted from rodents directly without an arthropod vector in opposition to arboviruses (arthropod born). In the early nineties, first in New Mexico an outbreak (hantavirus pulmonary syndrome) occurred clinically presenting influenza like syndromes (fever, myalgia), followed in 3-6 days by progressive cough and shortness of breath with pleural effusions and in serve cases by respiratory failure, tachypnea, tachycardia, hypotension. Laboratory chemistry revealed hemoconcentration, thrombocytopenia, increased partial thromboplastin time leucocytosis, increased serum lactate dehydrogenase and aspartate aminotransferase levels were observed. Antibodies may be present at the time of clinical symptoms. The virus is transmitted by inhalation of aerosols created from urine or feces from deer and mice (Peromyscus). Transmission from person to persons was observed in an outbreak in Argentina. Mortality in Hantavirus pulmonary syndrome is close to 40%. No vaccine, no effective antiviral drug available.

Sampling: 1 mL serum at the acute phase and follow up sera 2-3 weeks later.

Reference Interval: Differentiation of antibodies of immunoglobulin classes IgG and IgM for Hantaviruses (Hantaan, Puumala, Dobrava, Seoul) and Sandfly fever virus (Toscana virus)
(Method: Immunoblot)