Occult Blood in Stool (Hemoccult) f

Related Information: Carcinoembryonic Antigen (CEA), Serum
Ferritin, Serum or Plasma
Iron (Fe), Serum , Iron (Fe), Urine
Transferrin and Total Iron Binding Capacity, Serum

Background: In developing countries most common cause of blood loss in the stool is during hookworm infection, in industrialized countries colorectal adenocarcinoma. Other sources of bleeding are upper gastrointestinal tract or small intestine bleeding or other colorectal causes.
Used in screening particularly for colorectal adenocarcinoma, which is the second most common cause of death from cancer, but less than 30% sensitivity, and even in carcinomas > 2 cm sensitivity if low.
Used in the diagnosis of upper gastrointestinal bleeding, celiac disease, Meckel diverticulum, vascular ectasias, polyposis.

Sampling: Patient should avoid vitamin C intake 5 days prior to sampling as well as alcohol, aspirin, halogens, cimetidine.
2 g stool, contact to toilet sanitizers or other disinfectants must be avoided. Ship to laboratory within one day.

Reference interval:		
	Negative	< 2 mg total hemoglobin per g faeces
	Borderline	2 - 3 mg
	Positive	> 3 mg

Opiates Quantitative, Urine f

Test includes: Morphine, codeine, hydrocodone, hydromorphone, oxycodone, oxymorphone.
Background: Opioids are the most effective analgesics with high potential for addiction.
Half life 2 - 4 h, but 5 - 13 h in neonates, volume of distribution 2 - 4 L/kg, protein binding 35%
False positive results are caused by poppy seeds; interpretation must be carefully if test is used for forensic purposes.
Sampling: 10 mL random urine

Reference Interval:		
	Therapeutic range	< 300 ng/mL
	Immunological drug screen: negative	< 300 ng/mL

Osmolality, Serum f

Related Information: Antidiuretic Hormone, Plasma
Carbohydrate Deficient Transferrin (CDT)
Ethanol, Blood or Urine
Osmolarity, Urine
Sodium, Serum or Plasma

Background: Osmolality is a measurement of the number of particles in a solution independent of particle size, weight, and charge.
Useful parameter in evaluation of electrolyte and water balance, hydration or dehydration status, antidiuretic hormone function, liver diseases, hyperosmolar coma.
High serum osmolality occurs in hypernatremia, dehydration, hypovolemia, hyperglycemia, azotemia and ethanol or methanol or ethylene glycol intoxication.
Low serum osmolality may be secondary to overhydration, hyponatremia, and alteration in antidiuretic hormone secretion.
Urine to serum ratio after 12 h dehydration is usually > 3, in case of diabetes insipidus the ratio drops to 0.2 - 0.7.
During dehydration, the ratio serum sodium to serum osmolality remains normal
Sampling: 2 mL serum, ship to laboratory within 2 h or refrigerate at 4°C.

Reference Interval:
275 - 295 mOsm/kg H_2O
Borderline 265 - 320 mOsm/kg H_2O
> 380 mOsm/kg H_2O may reflect hyperglycemia
> 400 mOsm/kg H_2O may be associated with grand mal seizures
> 420 mOsm/kg H_2O may be lethal
Urine to serum osmolality ratio: 1 - 1.3
Sodium in serum to serum osmolality ratio: 0.43 - 0.50

Osmolality, Urine f

Related Information: Antidiuretic Hormone, Plasma
Osmolality, Serum
Sodium, Serum or Plasma

Background: The parameter is used to evaluate the concentration ability of the kidney, antidiuretic hormone secretion, diabetes insipidus, dehydration and overhydration. Values < 400 mOsm/kg H_2O suggests renal impairment, < 100 mOsm/kg H_2O overhydration, > 800 mOsm/kg H_2O dehydration. To facilitate interpretation, serum osmolality should be measured.
Urine to plasma ratio is normally within 0.2 - 4.7. Low concentration ability is reflected by a low ratio slightly above 1.0, overnight fluid restriction gives values normally > 3.
Sampling: 2 mL of random urine

Reference Interval:

Neonates	75 - 300 mOsm/kg H_2O
Children and adults	250 - 900 mOsm/kg H_2O
Concentration ability after 14h fluid restriction:	> 800 mOsm/kg H_2O

Osmotic Fragility of Erythrocytes f

Related Information: Bilirubin, Fractionated, Serum
Reticulocyte Count

Background: In hereditary spherocytosis (HS) an increase of osmotic fragility of RBC occur. HS patients present chronic hemolysis clinically asymptomatic up to severe uncompensated hemolytic forms. A number of inherent defects of the erythrocyte membrane are known. Vertical stabilization of the membrane is given by interactions between the spectrin ankyrin band-3 and protein 4.1 glycophorin C linkage, horizontal stabilization is achieved by spectrin heterodimer and actin and protein 4.1 interactions. HS affects vertical stability; the lipid bilayer is not stable, loosing lipids. The most common forms are spectrin and ankyrin deficiencies, others are band -3 and protein 4.2 deficiencies.

HS may lead to reticulocytosis, elevation of indirect bilirubin, MHC may be elevated, decreased or normal, and MCHC is elevated.

Increased fragility is observed in heriditary pyropoikilocytosis (HPP) caused by alpha-spectrin deficiency (defective vertical interactions) or caused by altered spectrin with alteration of the horizontal interaction, leading to spherocytes, elliptocytes and poikilocytes forms, decreased MCV, increased MCHC.

Osmotic fragility is increased in hereditary stomatocytosis characterized by elevated MCV, decreased MCHC

A higher resistance to osmotic lysis is seen in hereditary xerocytosis (HX) with normal or elevated MCV and increased MCHC. Normal osmotic resistance is observed in hereditary elliptocytosis (HE) with normal to elevated MCV and normal MCHC.

HE and HPP erythrocytes show increased thermal sensitivity.

Other conditions altering osmotic stability: Patients with malaria display osmotic fragility in infected and non infected RBC. Decreased osmotic fragility is observed in hypochromic RBC hemoglobin C disease and in thalassemia.

Sampling: 5 mL of EDTA whole blood, avoid hemolysis and clotting, transport to laboratory within 1h. Severe anemia causes abnormal results.

Reference Interval: Hemolysis begins at 0.44% and ends at 0.32% NaCl.
In 10% of all HS patients false negative are obtained. Incubation for 24 h at 37°C will rule out the false negative results.

Osteocalcin, Serum or Plasma f

Related Information: Alkaline Phosphatase Isoenzymes, Serum
Alkaline Phosphatase, Serum
Calcium, Serum or Urine
Hydroxyproline, Total, Urine
Parathyroid Hormone, Intact, Serum
Pyridinolines or Vitamin D, Serum

Synonyms: Bone-Gamma-Carboxyglutamic-Acid-Containing-Protein; BGP; Bone-GLA-Protein

Background: Osteocalcin is synthesis vitamin K dependent. It takes place in osteoblasts and odontoblasts. It is the major noncollagen protein of the bone matrix 80% of the 49 amino acid, 5800 D protein is released into the bone matrix with a high affinity to hydroxyapatite. A small amount enters the circulation with a half life of 4 min and is cleared by the kidney, a glomerular filtration rate < 30 mL/min results in plasma levels above the reference range.

Serum levels are high in childhood, and a peak occurs in early puberty and in the menopause.

Useful in the diagnosis of primary hyperparathyroidism presenting with elevated values, in most cases also elevation of serum alkaline phosphatase.

In patients with secondary hyperparathyroidism values are elevated, in part due to decreased glomerular filtration rate.

Used as a marker for bone metastasis.

Used in monitoring osteoporosis, but not as a sole diagnostic tool.

In patients with rheumatoid arthritis values are in most cases decreased, but sometimes elevated. Usually, alkaline phosphatase values are moderate elevated.

Limitations: In patients with vitamin K deficiency, an osteocalcin with decreased activity, due to lacking decarboxylation is synthesized. The test does, however, not discriminate between functional and impaired osteocalcin.

Sampling: 1 mL serum, separate from red cells immediately since sensitive to proteolytic enzymes and freeze immediately. Ship frozen. Circadian rhythm with a peak in late afternoon, low in the morning.

Reference Interval:

Male	< 30 years	24 - 70 ng/mL
	30 - 49 years	14 - 42 ng/mL
	50 - 70 years	14 - 46 ng/mL
Female	Pre-menopausal (> 20 years)	11 - 43 ng/mL
	Post menopausal	15 - 46 ng/mL
	Osteoporosis patient	> 43 ng/mL

Oxalate, Urine f

Related Information: Magnesium, Serum or Urine
Urine Analysis, Microscopic
Urinanalysis, Chemical, Screening

Synonyms: Calcium Oxalate, Urine

Background: Oxalate excretion is a predictor for calcium oxalate stones as hyperoxaluria is found in one third of the patients with oxalate nephrolithiasis. Hyperoxaluria is more common in patients with malabsorption (surgical bowl resection, in inflammatory bowl diseases 3 - 10% incidence of nephrolithiasis). Patients forming oxalate stones absorb higher fractions from the gut

and excrete more oxalate in the urine as non-stone formers. Oral calcium co-intake decreases urinary excretion in patients with ileal diseases.

High oxalate excretion at levels above 140 mg/day may be due to two types of genetic disorders: Type I (autosomal recessive), which may lead to renal failure, is a defect in glyoxalate metabolism with increased oxalate synthesis with high urinary glyoxylic acid and glycolic acid excretion. Type II displays a high urinary oxalic acid and L-glyceric acid with normal levels of urinary glycolic acid.

Limitations: Ascorbic acid urine concentrations higher than 10 µg/dL may give false positive elevated levels. Oxalate levels are increased during methoflurane, gelatin, strawberries, pepper, rhubarb, beans beets, spinach, tomatoes, chocolate, tea, pecans intake.

Sampling: Aliquot 10 mL of a 24 h urine collection, add approx. 0.5 mL 25% hydrochloric acid and mix well, note total quantity of the 24 h urine collection. If a 24 h urine collection is not possible, the concentration of oxalate in the first morning urine may give a rough estimation of the urine oxalate concentration; daily urine output must be estimated as well. Avoid vitamin C one day prior to sampling

Reference Interval:

Female:	4 - 31 mg/24 h
Male:	7 - 44 mg/24 h
Children:	13 - 38 mg/24 h

Oxcarbazepine, Serum f

Synonyms: Trileptal®

Background: Oxcarbazepine (O) is indicated as monotherapy or as adjuvant treatment of partial seizures with or without secondary generalized tonic-clonic seizures. There is less hepatic enzyme induction as compared to carbamazepine and fewer hypersensitivity reactions, but hyponatremia occurs with the same frequency. Other side effects are dizziness, diplopia, and ataxia. O undergoes first pass metabolism to the active 10-hydroxy–oxcarbazepine (HC). Excretion in the glucuronide form of the 10 hydroxy metabolite.

Urinary excretion O: 1%, HC: 30% ; plasma binding HC: 45%; half life O: 2h, HC: 8 - 15 h increase in renal disease and age; peak time 2 - 4 h; peak concentration HC: 7 - 10 µg/mL after 300 mg orally

Sampling: 2 mL serum

Reference Interval: Therapeutic values:

Oxcarbazepine	< 3.0 µg/mL
Oxcarbazepine-10-OH-Metabolite	5.0 - 30.0 µg/mL

P- ANCA see Antineutrophil Cytoplasmatic Antibody (ANCA)