

Sampling: Culture: 2 g of fresh stool; Serology: 1 mL serum, acute and convalescent serum recommended (at least 1 week apart)

Reference Interval:

Culture:	Report of diagnostic finding
Serology:	Differentiation of immunoglobulin classes Y. enterocolitica and Y. pseudotuberculosis
IgA antibody negative:	< 0.8 COI
borderline:	0.8 - 1.1 COI
positive:	> 1.1 COI
IgG antibody negative:	< 16 RE/ml
borderline:	16 - 22 RE/ml
positive:	> 22 RE/ml

Validation by immunoblot

Zinc (Zn), Serum or Urine or Seminal Fluid

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Related Information: Albumin, Serum
Copper (Cu), Serum or Urine

Background: Zn is an essential trace element with effects on weight, immune function, growth and development. It is a functional compound of more than 300 enzymes. Zinc is mainly eliminated in the feces, minor quantities in the urine. Serum zinc represents approx 1% of total body zinc stores. Serum zinc is poorly correlated with the status of the zinc stores. In mild zinc deficiency status, serum zinc may be normal. High urine but low serum levels are found in cirrhosis, neoplastic diseases, increased catabolism and in states of urinary loss of zinc such as viral hepatitis, hemolytic anemias, sickle cell diseases, alcoholism, renal diseases. Serum levels are lowered in fever, sepsis, inflammation, corticosteroid therapy, oral contraceptives, pregnancy, and myocardial infarction. Since albumin is the major binding protein for zinc, hypoalbuminemia presents with low serum zinc levels. Copper and zinc are competitive in intestinal resorption, dietary zinc supplement may decrease copper levels. Also folic acid and iron may compete with zinc absorption. Drugs decreasing zinc levels are phenytoin, prednisone, valproic acid.

Zinc deficiencies may occur in breast fed infants whose mother's milk is low of zinc, premature infants with low hepatic stores, in growing children, in prepubertal boys with delayed sexual maturity, in malabsorption disorders and diarrhea, in diabetes, nephrotic syndrome, cirrhosis, in AIDS patients, burn patients, in patients receiving high intravenous supplement of amino acids, in pregnant women due to the high uptake by the fetus.

Acrodermatitis enteropathica is characterized by zinc malabsorption which develops in babies presenting with facial and diaper rash when weaned, progressing to growth retardation, diarrhea, impaired T cell function, infections, delayed testicular development. Usually serum and urine zinc concentrations are low, but serum zinc may be normal in some cases.

Sampling: Serum: 1 mL serum. Blood to collect in a metal free container, avoid powdered gloves, avoid probe to contact rubber. Avoid hemolysis or stasis, since red cells contain zinc

concentrated 10 times as compared to serum. Serum should be separated immediately after sampling since zinc concentration in whole blood samples increases 5 - 8% per h.

Urine: For precise evaluation, due to a circadian rhythm, a 24h urine specimen is recommended. Collect in a metal free container and keep cool. Avoid contact with rubber, if specimen can only be obtained by a catheter, a silicon catheter should be used. Ship 10ml to the lab, note total quantity.

Reference Interval:	Serum: Adults	60 - 120 µg/dL
	Children	75 - 100 µg/dL
	Spontaneous urine	300 - 800 µg/dL
	Collected urine:	140 - 800 µg/24h
	Patients supplemented with zinc	> 2000 µg/24h
Seminal fluid:	90 - 250 µg/mL	