

# ZINC

ZN 0125 CH

5 x 25 ml

## SUMMARY OF TEST

Zinc is second to iron as the most abundant trace element in the body, 1.4 to 2.3 g being present in the 70-kg adult. Tissues and fluids especially rich in zinc are prostate, semen, liver, kidney, retina, bone, and muscle. Zinc is transported in blood plasma mostly by albumin and by  $\alpha_2$ -macroglobulin, with a small amount associated with transferrin and free amino acids. The major route of zinc excretion is via the feces. Pancreatic secretion accounts for about 25% of total excretion. Biliary losses are small. Urinary losses of zinc, about 0.6 mg/d in an adult consuming about 12 mg Zn/d, seem to be directly related to zinc intake and status. Sweat losses are similar to those in urine but can be appreciable in tropical climates or under physical stress.

Nutritional zinc deficiency in humans is fairly prevalent throughout the world. Primary clinical features include retardation of growth and skeletal maturation, testicular atrophy, and hepatosplenomegaly. Growth failure, reduced taste acuity, and hypogonadism in young adults have been ascribed to zinc deficiency. Old age, pregnancy, lactation, and alcoholism are also associated with a higher incidence of poor zinc nutrition. Moderate zinc deficiency is characterized by growth retardation in children and adolescents, hypogonadism in males, mild dermatitis, poor appetite, delayed wound healing, abnormal dark adaptation, mental lethargy, and impaired immune responses. Manifestations of severe cases of zinc deficiency include bullous-pustular dermatitis, alopecia, weight loss, diarrhea, neuropsychiatric disorders, recurrent infection, and ultimately death if not treated. Pregnant women are at higher risk of acquired zinc deficiency because of the high uptake of zinc by the fetus and associated tissues. Zinc is required for normal fetal development and influences pregnancy outcome. It has been suggested that excessive iron and folic acid supplements, often prescribed during pregnancy, interfere with zinc absorption and utilization and may exacerbate the effects of marginal zinc intakes. The use of oral contraceptives produces a decrease in plasma zinc with an increase in erythrocyte zinc.

The most clearly defined genetic disorder of zinc metabolism is acrodermatitis enteropathica. Manifestations of the disease are those of zinc deficiency, including retarded growth, hypogonadism, dermatological and ophthalmic lesions, and gastrointestinal disturbances. The patients exhibit lowered plasma zinc concentrations. Symptoms are completely alleviated with zinc sulfate supplementation. Zinc deficiency is also often associated with sickle cell anemia; zinc supplementation may be of benefit in decreasing symptoms and crises of some patients with sickle cell anemia.

The determination of plasma or serum zinc concentrations by AAS is the simplest and analytically most reliable test for the routine assessment of zinc. Photometric methods are now available for those laboratories without an AAS instrument, and they give results that are comparable to those obtained by AAS.

## PRINCIPLE OF THE METHOD

Nitro-PAPS reacts with zinc in alkaline solution to form a purple colored complex, the absorbance of which is measured at 575 nm. Interference from copper and iron are virtually eliminated by pH and chelating additives.

## KIT COMPONENTS

### For in vitro diagnostic use only.

The components of the kit are stable until expiration date on the label.

Keep away from direct light sources.

### Reagent A: 5 x 20 ml (liquid) blue cap

Composition: borate buffer 370 mM pH 8.20, salicylaldehyde 12.5mM, dimethylglyoxime 1.25 mM, surfactants and preservatives.

### Reagent B: 5 x 5 ml (liquid) blue cap

Composizione: Nitro-PAPS 0.40 mM.

### Standard: zinc solution 200 $\mu$ g/dl - 5 ml

Store all components at 2-8°C.

## MATERIALS REQUIRED BUT NOT SUPPLIED

Current laboratory instrumentation. Spectrophotometer UV/VIS with thermostatic cuvette holder. Automatic micropipettes. Glass or high quality polystyrene cuvettes. Saline solution.

## REAGENT PREPARATION

Mix one vial of reagent B with a vial of reagent A.

Stability of working reagent: 30 days at 2-8°C and 7 days at room temperature, well closed.

Stability of unopened vials: up to expiration date on labels at 2-8°C.

Stability since first opening of vials:  $\geq$  60 days at 2-8°C.

## PRECAUTIONS

Reagent may contain some non-reactive and preservative components. It is suggested to handle carefully it, avoiding contact with skin and swallow.

Perform the test according to the general "Good Laboratory Practice" (GLP) guidelines.

## SPECIMEN

Serum (preferred), plasma heparinate, urine

Sample is stable 7 days at 2-8°C and 1 month at -20°C.

## TEST PROCEDURE

Wavelength:	575 nm (allowed 570 $\div$ 582 nm)		
Lightpath:	1 cm		
Temperature:	25, 30 or 37°C		
dispense:	blank	standard	sample
reagent	2 ml	2 ml	2 ml
water	100 $\mu$ l	-	-
standard	-	100 $\mu$ l	-
sample	-	-	100 $\mu$ l

Mix, incubate at 25, 30 or 37°C for 5 minutes.  
Read absorbances of standard (As) and samples (Ax) against reagent blank.

## RESULTS CALCULATION

serum/plasma sample:

$\text{zinc } \mu\text{g/dl} = \text{Ax/As} \times 200$  (standard value)

## EXPECTED VALUES

serum: 70 - 150  $\mu\text{g/dl}$  (10.7 - 22.9  $\mu\text{mol/l}$ )  
urine: 150 - 1200  $\mu\text{g/24h}$  (2.3 - 18.4  $\mu\text{mol/24h}$ )

Each laboratory should establish appropriate reference intervals related to its population.

## QUALITY CONTROL AND CALIBRATION

It is suggested to perform an internal quality control. For this purpose a suitable human based control sera has to be used.

Please contact Customer Care for further information.

## TEST PERFORMANCE

### Linearity

the method is linear up to 1000  $\mu\text{g/dl}$ .

If the limit value is exceeded, it is suggested to dilute sample 1+9 with distilled water and to repeat the test, multiplying the result by 10.

### Sensitivity/limit of detection (LOD)

the limit of detection is 5  $\mu\text{g/dl}$ .

### Interferences

no interference was observed by the presence of:

hemoglobin  $\leq$  100 mg/dl

bilirubin  $\leq$  48 mg/dl

Lipids interfere.

### Precision

intra-assay (n=10)	mean ( $\mu\text{g/dl}$ )	SD ( $\mu\text{g/dl}$ )	CV%
sample 1	95.20	1.03	1.10
sample 2	135.70	3.47	2.60

inter-assay (n=20)	mean ( $\mu\text{g/dl}$ )	SD ( $\mu\text{g/dl}$ )	CV%
sample 1	94.28	3.49	3.70
sample 2	133.40	3.45	2.60

### Methods comparison

a comparison between Chema and a commercially available product gave the following results:

$$\begin{aligned} \text{Zinc Chema} &= x \\ \text{Zinc competitor} &= y \\ n &= 84 \end{aligned}$$

$$y = 0.902x + 8.81 \mu\text{g/dl} \quad r = 0.966$$

## WASTE DISPOSAL

This product is made to be used in professional laboratories. Please consult local regulations for a correct waste disposal.

S56: dispose of this material and its container at hazardous or special waste collection point.

S57: use appropriate container to avoid environmental contamination.

S61: avoid release in environment. Refer to special instructions/safety data sheets.

## REFERENCES

K.Ueno, T.Imamura, K.L.Cheng - Handbook of organic analytical reagents - CRC Press (1992).

Akita Abe, Sumiko Yamashita, Clin.Chem. 35/4, 552-554 (1989).

Tietz Textbook of Clinical Chemistry, Second Edition, Bur-tis-Ashwood (1994).

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## SYMBOLS

	for in vitro diagnostic use only
	lot of manufacturing
	code number
	storage at temperature interval
	expiration date (year/month)
	warning, read enclosed documents
	read the directions