Vinson, J.A., 1980

BIOAVAILABILITY OF ZINC

Zinc is an essential trace element for humans and animals. The recommended daily allowance is 15 mg of Zinc per day in the diet of a human adult.

Zinc deficiency produces profound physiological changes. Growth retardation, loss of taste acuity, skin ulcers, and sexual dysfunction have demonstrated in human studies as resulting from a deficiency of Zinc. A deficiency is common in many diseases, including anaemia, cancer and atherosclerosis. Deficiency also occurs as a result of stress. Pregnancy, oral contraceptives and corticosteroids also produce a deficiency state.

Bioavailability Study

Rats were used in this study because their diet can be controlled and large numbers may be easily studied for long periods of time. More valid statistical conclusions are possible with large numbers of subjects. In this study nine groups of five rats each were used. All rats were fed an zinc deficient food from ICN Nutritional Biochemicals for 1 month. Supplementation was in the form of inorganic zinc - zinc sulphate, commercial amino acid chelate or Re-natured Zinc yeast. The amount of zinc fed was at one of three levels, 50 parts per million (ppm), 100 ppm and 250 ppm using a protocol similar to the one in: *J. Agric. Food Chem.*, **27**, 387, 1979. At the end of the supplementation period, all rats were sacrificed and their liver analysed for zinc by atomic absorption spectroscopy. Statistics were done using a two tailed t-test. The results are listed in Table 1.

Table 1:

Form of Zinc (Zn)	Zn in Food (ppm)	Average Blood Zn(ppm)	Average Liver Zn(ppm)
Inorganic	50	2.77 ± 0.09	6.85 ± 0.99
Inorganic	100	2.98 ± 0.24	8.09 ± 1.67
Inorganic	250	3.41 ± 0.55	8.96 ± 1.12
Amino Acid Chelate	50	2.76 ± 0.57	6.75 ± 1.10
Amino Acid Chelate	100	3.06 ± 0.60	8.32 ± 2.10
Amino Acid Chelate	250	3.41 ± 0.97	9.66 ± 1.82
Re-natured	50	2.79 ± 0.25	7.26 ± 1.23
Re-natured	100	3.45 ± 0.47	9.29 ± 1.38
Re-natured	250	3.98 ± 0.74	11.33 ± 1.21

From this data the relative bioavailability can be calculated. The slope of the plot of zinc in food (x-axis) vs. zinc in blood or liver (y-axis) represents the bioavailability. The inorganic zinc for comparison is said to be 100% bioavailable. The bioavailability of the other forms of zinc may then be compared by comparing their slopes to that of Inorganic zinc. The results are shown in Table 2.

Table 2:

Form of Zinc	Slope of Plot	Relative Bioavailability
	Blood	
Inorganic	0.00334	100%
Amino Acid Chelate	0.00336	102%
Re-natured	0.00576	172%
	Liver	
Inorganic	0.0110	100%
Amino Acid Chelate	0.0142	129%
Re-natured	0.0206	187%

There was no significant difference in blood bioavailability of the 3 forms of Zn. The Zn yeast was significantly more bioavailable in the liver than the inorganic Zn at a confidence level of 67%.

The concentration of Zinc in the blood represents the current zinc status of the individual. Blood is the carrier of zinc, which is essential to all parts of the body. The concentration of zinc in the liver represents the pool of available zinc in the case of a deficiency. Also, the liver enzymes containing Zinc are synthesised.

The Zn yeast was more absorbed in the blood and more retained in the liver and thus is the preferred form for human supplementation.