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COMPARATIVE HUMAN BIOAVAILABILITY OF ZINC

Introduction

The bioavailability of a mineral can be determined in two ways - by comparing the absorption of the mineral using the area under the blood concentration-time curve or by measuring the excretion in the urine.

Blood Protocol and Results

Five volunteers (three males and two females) aged 21-44 participated in the study. Each subject appeared on the experimental day after an overnight fast. The zinc (10 mg) was taken orally in 200 ml of water in the form of zinc sulphate, zinc gluconate and zinc yeast. Blood (1 ml) was taken by means of a fingerprick sample. The experiment was repeated 1 week later with another form of zinc. The blood was analysed by atomic absorption spectroscopy. The area under the curves were measured by means of a computer programme using Simpson's Area Rule. Statistics were done using a paired t-test. The results are shown in the table below:

	Area (Arbitrary units)		
Subject	Sulphate	Gluconate	Yeast
1.	8.76	28.91	30.36
2.	33.06	30.33	59.28
3.	18.57	13.03	17.24
4.	23.74	16.55	28.97
5.	7.22	12.81	24.52
Average ± Std. Dev.	18.3 ± 10.9	20.3 ± 8.6	32.1 ± 16.0

The Zinc yeast was the most absorbed, i.e. the most bioavailable of the three forms. The yeast was 75% more absorbed than the sulphate and 58% more absorbed than the gluconate. The area (bioavailability) of the Zinc yeast was significantly higher than the inorganic and gluconate forms (94% and 93% confidence level, respectively). The time for the maximal concentration was also measured and the Zinc yeast was the most slowly absorbed of the three forms, 2.8 ± 1.0 hours as compared with 1.0 ± 0.4 hours for the zinc sulphate and 1.5 ± 0.4 hours for the zinc gluconate, (the zinc yeast was significantly different than the other forms at more than the 97% confidence level). Thus, the zinc yeast acts as a time-release formation in addition to being the most bioavailable form of zinc.

Urine Protocol and Results

Four volunteers participated in the urine study. Each subject took one of the three forms of Zinc as before and collected a 24 hour post-dose urine. The 24 hour urine preceding the dosing was collected for the pre-dose sample. The results are shown below:

	24 hour Post-Dose - Pre-Dose Zinc (mg)		
Subject	Sulphate	Gluconate	Yeast
1.	1.121	1.106	0.028
2.	0.711	0.229	0.445
3.	0.986	0.223	0.676
4.	0.169	0.353	0.025
Average ± Std. dev.	0.747 ± 0.421	0.478 ± 0.423	0.293 ± 0.372

The Zinc yeast produced the least excretion of zinc and was significantly less than the inorganic and gluconate forms (88% and 67% confidence level, respectively). Coupled with the blood data, this result indicates that Zinc Yeast is stored in the body tissues more than the other forms of zinc.

The zinc yeast was more absorbed and retained than the other forms of zinc and is thus the form of zinc recommended for human supplementation.