Vinson, J.A., 1986.

COMPARATIVE HUMAN BIOAVAILABILITY OF COPPER

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 copper (2 mg) was taken orally in 200 ml of water in the form of copper sulphate, copper gluconate and copper yeast. Blood (1 ml) was taken by means of a fingerprick sample. The experiment was repeated 1 week later with another form of copper. 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.	6.28	8.55	6.22
2.	11.36	9.07	7.78
3.	5.96	7.38	16.22
4.	11.28	6.22	18.32
5.	6.38	10.21	10.98
Average ± Std. Dev.	8.25 ± 2.80	8.35 ± 1.56	11.90 ± 5.24

The Copper yeast was the most absorbed, i.e. the most bioavailable of the three forms. The yeast was 44% more absorbed than the sulphate and 43% more absorbed than the gluconate. The time for the maximal concentration was also measured and the Copper yeast was the most slowly absorbed of the three forms, 3.7 ± 0.6 hours as compared with 1.3 ± 0.3 hours for the copper sulphate and 1.7 ± 0.3 hours for the copper gluconate. Thus, the copper yeast acts as a time-release formation in addition to being the most bioavailable form of copper.

Urine Protocol and Results

Three volunteers participated in the urine study. Each subject took one of the three forms of Copper 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 Copper (mg)		
Subject	Sulphate	Gluconate	Yeast
1.	0.282	0.278	0.137
2.	0.425	0.542	0.146
3.	0.360	0.065	0.041
Average ± Std. dev.	0.356 ± 0.072	0.295 ± 0.239	0.108 ± 0.058

The Copper yeast produced the least excretion of copper. Coupled with the blood data, this result indicates that Copper Yeast is stored in the body tissues more than the other forms of copper.

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