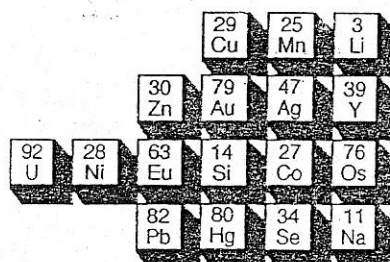


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Selenium, copper and zinc in some Azorean populations

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Introduction

The overall protection of cells from oxidative damage due to reactive oxygen species is mediated by enzymatic and non-enzymatic systems. Selenium, copper and zinc are essential trace elements with major roles, since they are related to Se-dependent glutathione peroxidase enzymes and to Cu, Zn-containing superoxide dismutase.

Epidemiological studies have been carried out in recent years to investigate the association between some blood parameters implicated in the antioxidant function and health conditions. The influence of various factors like age, gender, diet, medical treatment and lifestyle have been considered, especially in residents of particular geographic areas.

The aim of this work is to present data on serum selenium, copper and zinc concentrations in five populations with different socioeconomic and dietary habits living on the island of S. Miguel (Azores Archipelago, Portugal).

Subjects and methods

The studied groups consisted of volunteer men and women aged 20 to 60 years, recruited from patients attending the medical centres from one urban (Ponta Delgada), two rural (Rabo de Peixe and Água Retorta) and two fishing populations (Rabo de Peixe and Ribeira Quente), respectively. Subjects were also asked about the existence of chronic diseases, hypertension condition and alcohol, drugs and tobacco consumption.

Blood samples were taken by venipuncture

after an overnight fast. Serum was removed after centrifugation and was kept frozen at -20° C until analysis.

Selenium was quantified by a direct electrothermal atomic absorption spectrometric procedure with Zeeman background correction [1]. Zinc and copper were measured by atomic absorption with flame spectrometry. Accuracy of the procedures was checked with standard reference materials.

Results

Serum selenium, copper and zinc concentrations in subjects from the five studied populations are presented in Table 1. Significant sex differences were observed for selenium levels in the urban and fishing populations, but not in the rural ones. Except in subjects from Ribeira Quente and Água Retorta, we registered higher copper concentrations in women than in men, while the opposite was observed for zinc levels.

Selenium

The highest selenium levels were registered in the fishing populations, namely in men. In fact, mean values in both male and female groups from Rabo de Peixe and in men from Ribeira Quente were significantly higher than those found in the corresponding groups from Ponta Delgada and from both the rural populations (Table 1).

The differences in mean values are particularly important when we compare, within each gender, the two communities of Rabo de Peixe (30% for men and 15% for women) and the populations

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Table 1. Serum selenium, copper and zinc concentrations in populations of the island of S. Miguel (Azores Archipelago, Portugal): Ponta Delgada 1994, Rabo de Peixe 1996, Água Retorta and Ribeira Quente 1997.

Community (type)	Selenium ($\mu\text{g/l}$)		Copper ($\mu\text{g/dl}$)		Zinc ($\mu\text{g/dl}$)	
	M	W	M	W	M	W
Ponta Delgada (urban)	98 \pm 16* (48)	81 \pm 14 (50)	115 \pm 19* (48)	138 \pm 40 (50)	108 \pm 15** (48)	102 \pm 15 (50)
Rabo de Peixe (fishing)	110 \pm 25** (26)	90 \pm 21 (49)	135 \pm 42** (26)	157 \pm 54 (49)	111 \pm 17** (26)	99 \pm 16 (49)
Rabo de Peixe (rural)	84 \pm 22 (28)	78 \pm 18 (44)	127 \pm 26* (28)	157 \pm 48 (44)	108 \pm 18** (28)	97 \pm 15 (44)
Água Retorta (rural)	90 \pm 20 (28)	82 \pm 17 (71)	190 \pm 72 (28)	215 \pm 74 (71)	105 \pm 40 (28)	99 \pm 30 (71)
Ribeira Quente (fishing)	108 \pm 16** (26)	96 \pm 23 (63)	171 \pm 53 (26)	191 \pm 63 (63)	129 \pm 29 (26)	130 \pm 29 (63)

Values are Mean \pm SD (n samples). * P <0.01, ** P <0.05, denote significant differences (t-test) between men (M) and women (W) within the same population.

from Ribeira Quente and Água Retorta (about 20% and 17%, respectively).

Copper

The highest serum copper concentrations were exhibited by the populations from Água Retorta and Ribeira Quente. They were similar in men, but 12% higher in women from the rural population than in women from the fishing one.

Also, for both men and women, copper was more than 50% higher in Água Retorta than in the urban population.

When we compare the two fishing populations, we can see that higher levels were registered in both men and women from Ribeira Quente than in the two genders from the fishing community of Rabo de Peixe. However, higher values were found in women from Água Retorta (rural population) than in female group from Ribeira Quente.

Zinc

The highest values in zinc concentrations were found in Ribeira Quente, being significantly different from those observed in the other populations, where they are similar. The differences among the mean values for subjects from Ribeira Quente and those from the other populations were always higher for women than for men.

Final remarks

- (1) These are the first data on serum selenium, copper and zinc concentrations in Azorean populations. An extensive discussion of data from Ponta Delgada is in a separate paper [2].
- (2) Serum concentrations of the three elements are within the normal range when compared with other European populations [1,3,4].

However, attention should be paid to some particular findings.

- (3) Concerning selenium, the fishing populations showed the highest levels, namely men. Also, selenium seems to be higher in urban than in rural populations. The opposite was observed for copper concentrations. On the other hand, both men and women from Ribeira Quente exhibited the highest serum zinc concentrations, significantly different from all the other populations.
- (4) The differences in selenium mean values between the fishing and the rural communities of Rabo de Peixe are particularly interesting, since they belong to the same village but live apart from each other with different lifestyles.
- (5) Results are probably related to the specific cultural characteristics of the populations, in which diet, including drinking water, may play a central role. In fact, there are no scientific studies on the diet of these populations, but it is commonly said that the subsistence of the fishing and the rural populations depends mainly on fish and agricultural products, respectively. Besides, Ribeira Quente and Água Retorta are located in a very rich hydrological region. However, more detailed studies are essential to highlight these points.
- (6) So far, results suggest that the fishing populations (mainly Ribeira Quente) exhibit a better antioxidant status than the urban and rural ones. Further study of these and other parameters associated with the antioxidant defense system will also contribute to assess the status of these Azorean populations.

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References

- 1 Nève J, Chamart S, Molle L. Optimization of a direct procedure for determination of selenium in plasma and erythrocytes using Zeeman-effect atomic absorption spectroscopy. In Trace Element analytical chemistry in medicine and biology, ed P Bratter, P Schramel 1994, vol 4, pp 349-58. Berlin: Walter de Gruyter.
- 2 Viegas-Crespo AM, Pavão ML, Santos V, Santos MC, Paulo O, Nève J. Serum selenium, copper and zinc and lipid profile in Portuguese subjects of S. Miguel Island (Azores Archipelago). *J Trace Elem Med Biol* (in press).
- 3 Wang W-C, Heinonen O, Makela A-L, Makela P, Nauto V. Serum selenium, zinc and copper in Swedish and Finnish orienteers. A comparative study. *Analyst* 1995; 170: 837-40.
- 4 Van Cauwenbergh R, Robberecht H, Deelstra H, Picramenos D, Kostakopoulos A. Selenium concentration in serum of healthy Greek adults. *J Trace Elem Electrolytes Health Dis* 1993; 8: 99-109.