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DO DIETARY INTAKE AND BLOOD LEVEL OF TOTAL SELENIUM PREDICT CIRCULATING LEVELS OF SELENIUM SPECIES? *A CROSS-SECTIONAL STUDY*

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Introduction

Selenium is an element which can be found in wastes of different origin and contaminated sites, including the' Waste Electric and Electronic Equipment' (WEEE). To assess exposure to this metalloid it should be required to assess its different chemical species, having markedly different toxicological and nutritional properties. Very little is known, in particular, about the ability of overall dietary selenium intake and blood selenium level to predict exposure to the single species of this element in the human.

Methodology

We investigated this issue by assessing through a food frequency questionnaire the total selenium dietary intake and by determining plasma selenium level in fifty-one adults randomly drawn from the municipal population of Modena, northern Italy, and by comparing their values to the plasma concentrations of the various selenium compounds obtained through speciation analysis. We calculated Pearson correlation coefficient among dietary and plasmatic selenium levels and for the single species of this element.

Results

Dietary intake did not correlate with total plasma selenium neither to the various selenium species, except for a weak inverse association with glutathione-peroxidase-bound selenium (GPx). Total plasma selenium concentration poorly correlated with most of the selenium species, with the exception of a direct association with selenite and human serum albumin-bound selenium (Se-HAS) (Figure 1, Table 1). In gender-specific analyses, some differences emerged about the associations of both dietary and blood total selenium with blood levels of selenium species. Age did not substantially influence these associations.

The speciation analysis showed that by increasing the time between samples collection and laboratory analysis performance (ranged 18-48 months), the total concentration of organic forms of selenium decreased, while the inorganic forms increased. This is probably due to a degradation of Se-protein P in selenite (Se IV) (Figure 2).

Figure 1. Relation among total plasma and dietary intake selenium

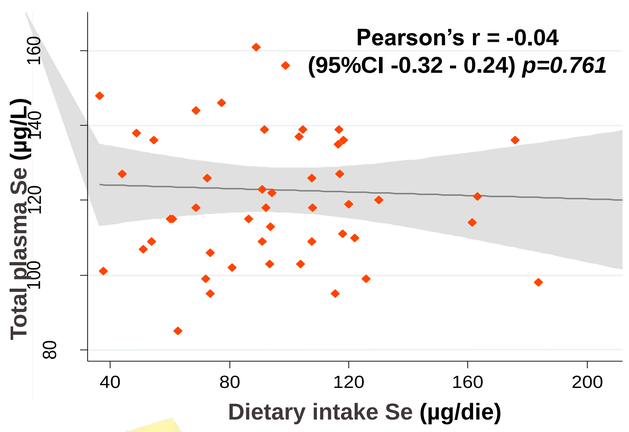
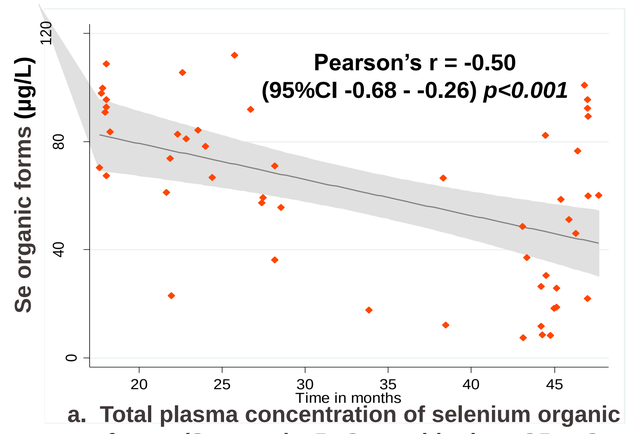


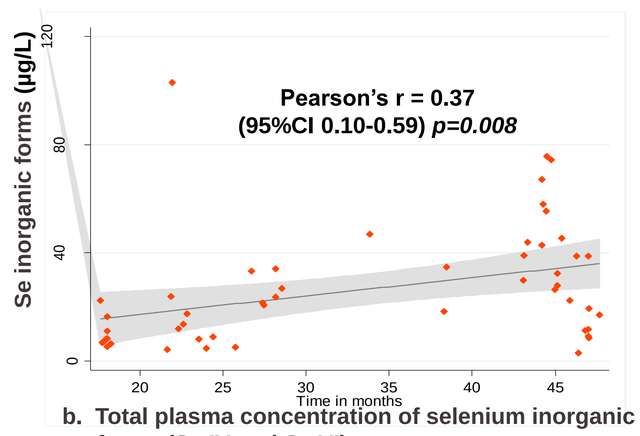
Table 1. Pearson correlation coefficients (95%CI) among selenium species, total plasma and dietary intake selenium, in the study sample.

	Total plasma Se	Dietary intake Se
Se-protein P	-0.19 (-0.44 - 0.09) *p=0.180*	-0.07 (-0.34 - 0.20) *p=0.602*
Se-methionine	-0.05 (-0.32 - 0.23) *p=0.753*	0.06 (-0.22 - 0.33) *p=0.666*
GPx	0.19 (-0.09 - 0.45) *p=0.173*	-0.24 (-0.48 - 0.04) *p=0.095*
Se-cystein	0.31 (0.03 - 0.54) *p=0.029*	0.00 (-0.28 - 0.27) *p=0.976*
Trx-Reductase	0.15 (-0.13 - 0.41) *p=0.279*	0.19 (-0.09 - 0.44) *p=0.174*
Se-HSA	0.51 (0.27 - 0.69) *p<0.001*	-0.06 (-0.33 - 0.22) *p=0.678*
Selenite (Se IV)	0.38 (0.11 - 0.60) *p=0.006*	0.13 (-0.15 - 0.39) *p=0.356*
Selenate (Se VI)	0.14 (-0.14 - 0.40) *p=0.312*	0.11 (-0.17 - 0.38) *p=0.425*
Unknow	0.29 (0.02 - 0.52) *p=0.038*	0.16 (-0.12 - 0.42) *p=0.268*

Figure 2. Relation between total plasma concentration of organic (a.) and inorganic (b.) forms of selenium and time between samples collection and laboratory analysis performance



a. Total plasma concentration of selenium organic forms (Se-protein P, Se-methionine, GPx, Se-cysteine and Trx-Reductase)



b. Total plasma concentration of selenium inorganic forms (Se IV and Se VI)

Conclusions

These results indicate the limited ability of total selenium intake and blood levels in predicting the circulating levels of most selenium compounds, particularly if plasma samples are stored for a long time before performing the speciation analysis.

Therefore, to avoid misclassification of environmental exposure to this element, studies on health effects of environmental selenium should focus on the assessment of dietary intake or blood levels of the single selenium species, and blood samples should be quickly analyzed after collection.

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