Serum Selenium in Institutionalized Elderly Subjects and Relation to Other Nutritional Markers

To the Editor:

Nowadays, there is growing interest in the possible relationship between selenium metabolism and the aging process [1]. Epidemiological studies show that selenium may have a preventive role in some degenerative diseases such as hepatic cirrhosis, cardiovascular diseases, and some types of cancer [2, 3]. However, information on the influence of selenium on aging is contradictory, apart from the fact that the process is not yet well understood.

We determined the serum concentrations of Se in 93 institutionalized elderly people in Granada (Spain) as a short-term indicator of human selenium status and its correlation with nutrient intake. In addition, taking into account the role of Se in oxidation, in metabolic changes in plasma lipids, and as a component of glutathione peroxidase, we examined other biochemical markers, e.g., total cholesterol, LDL-cholesterol, HDL-cholesterol, and triglycerides. We likewise studied leukocyte numbers in blood, as an indicator of risk of disease through infection, and established their correlation with serum Se concentrations.

To quantify serum selenium, we used the hydride generation atomic absorption spectrometry technique previously optimized [4]. Daily dietary intake was determined by the 7-day weighed food record, including a day off [5]. Unfortunately, determination of Se intakes was not possible because the software used to calculate the nutritional composition of the foodstuffs did not include Se.

The concentration of serum selenium in the institutionalized elderly people is shown in Table 1. No significant differences according to sex were noted. Depending on the age of the subjects in the two groups considered, the serum selenium decreased significantly in women (P < 0.05) but not in men (probably because of the low number of men examined in the study).

According to Campbell et al. [6], aging per se has very little effect on the status of selenium; that is, intercurrent illness and reduction in food intake are the most important factors in the reduction in the status of this element in old age. In a study comparing healthy elderly subjects (both institutionalized and noninstitutionalized) with a group of young adults, no statistically significant differences between the groups were found in selenium concentrations in plasma or in glutathione peroxidase activity [1]. The same was observed in this study, comparing serum selenium concentrations in institutionalized elderly subjects in Granada (Table 1) with those in younger adult subjects from coastal and mountain towns of the same province [4] (i.e., 74.9 ± 27.3 μg/L selenium). This result could be explained by the known influence of geographical origin on selenium concentrations in the food produced in the area and, ultimately, on the daily dietary intake of selenium [7]; this, in turn, affects the concentrations of this element in the subjects’ serum.

Several studies have found that Se concentrations in plasma [2, 6], and serum [8] of healthy elderly people were significantly lower than those in young adults. However, other researchers investigating people of ages >60 years have indicated that age does not affect the concentration of serum Se [9]. Nonetheless, with regard to the age of the institutionalized elderly people, the concentration of selenium was significantly lower (P < 0.05) in women older than 80 years. This result may be related to the highly heterogenic characteristics of the very elderly, along with a significant decrease in energy intake (from 1850 ± 254 kcal daily in women of <80 years to 1679±234 kcal daily in women of ≥80 years; P < 0.01).

We also correlated serum selenium concentrations with macronutrient intake. The only positive correlation (P < 0.05) was with the intakes of polyunsaturated fatty acids, both for all samples (r = 0.2627) and for samples from women only (r = 0.3637), as was previously found in serum [10] of healthy subjects. This finding could reflect the known positive influence of polyunsaturated fatty acids on selenium bioavailability [8].

Significant relationships (P < 0.05) were observed between the serum selenium concentrations and plasma total cholesterol (r = 0.2965 in all subjects; r = 0.3439 in women) as well as LDL-cholesterol (r = 0.2765 in all subjects; r = 0.3020 in women). The same statistical association between serum selenium and total cholesterol has been previously indicated [11]. The present study thus reinforces the important role of Se in prevention of cardiovascular disease [12].

Finally, we also found a statistically significant negative correlation (P < 0.05) between serum selenium concentrations in institutionalized elderly subjects and numbers of leukocytes in blood in all the subjects (r = −0.2316) and in women (r = −0.1727). However, we saw no statistical difference for the leukocytes in all subjects by sex or age groups. Therefore, the results obtained in the

Table 1. Mean Serum Selenium in Institutionalized Elderly Subjects by Sex and Age.

<table>
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<tr>
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<th>n</th>
<th>Age, years</th>
<th>Se concn, μg/L</th>
<th>Range</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean ± SD</td>
<td></td>
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<tr>
<td>Total</td>
<td>93</td>
<td>63–97</td>
<td>76.02 ± 20.54</td>
<td>21.15–137.90</td>
</tr>
<tr>
<td>Men</td>
<td>24</td>
<td>63–93</td>
<td>77.15 ± 20.56</td>
<td>27.64–105.52</td>
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<tr>
<td></td>
<td>8</td>
<td>&lt;80</td>
<td>77.38 ± 19.11</td>
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<tr>
<td></td>
<td>16</td>
<td>≥80</td>
<td>76.60 ± 21.01</td>
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<tr>
<td>Women</td>
<td>69</td>
<td>63–97</td>
<td>75.73 ± 20.54</td>
<td>21.15–137.90</td>
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<tr>
<td></td>
<td>24</td>
<td>&lt;80</td>
<td>83.67 ± 19.48</td>
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<tr>
<td></td>
<td>45</td>
<td>≥80</td>
<td>70.79 ± 21.29a</td>
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* Significantly different from younger age group (P < 0.05).
present study lead us to suggest that this probably reflects the role of Se in leukocyte synthesis and activity, although the mechanism and manner in which Se concentrations regulate blood leukocytes are unclear and require further research. Nevertheless, this result establishes the importance of the conservation of an appropriate selenium status, especially in the elderly, to avoid a reduction of the immunological reaction and an increase of infection-related morbidity associated with aging [13].

We did not observe a clear correlation in the biochemical markers under consideration (serum selenium, total cholesterol, LDL-cholesterol, HDL-cholesterol, triglycerides, and leukocytes) between the two age groups (<80 years; ≥80 years) and so could establish no relation between serum Se concentrations and cellular aging in the institutionalized elderly subjects under consideration. The fact that most of the experimental studies on influences of Se status in aging have not been able to decisively determine at what concentrations and in what way the influence is established in the degenerative diseases associated with old age suggests that more research is needed in this area.

References


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More on Renin

To the Editor:

In an editorial comment [1] on our paper [2], Sealey and Laragh erroneously conclude that the IRMA is a step backward from the traditional enzyme-kinetic plasma renin activity (PRA) assay, and that the new IRMA is not suitable for measuring renin because it comes measures 1–2% of prorenin.

They regard the traditional PRA assay as an accurate measure of the in vivo production of angiotensin (Ang II), the physiologically relevant end product of the renin–angiotensin cascade. In fact, the PRA assay measures the concentration of Ang I that is generated in plasma in vitro after a long incubation period (up to 18 h) under artificial conditions. The PRA assay is an indirect assay of renin and is complicated by the fact that Ang I is usually converted to Ang II and degraded into smaller inactive peptides. Ang I-to-II conversion and Ang I degradation are prevented by lowering the pH of plasma and by adding peptidase inhibitors before the incubation step. Whether this is 100% successful, particularly with such long incubation times, has not been formally tested. These difficulties are not encountered in the direct assay of renin by IRMA.

The prorenin concentration in plasma is higher than the renin concentration, and measurement of even a small percentage of prorenin may therefore lead to a sizable overestimation of renin. The important question is: What is the true magnitude of this problem? Our study was designed to address precisely this question, and the answer is simple: The problem is not important enough to render the IRMA unsuitable for clinical use. In contrast to what is stated in the editorial comment, our study demonstrates that the the new assay can readily distinguish low-, normal-, and high-renin hypertension. There was good agreement with the enzyme-kinetic assay not only in the normal- and high-renin ranges but also in the low-renin range, where overestimation would be the most troublesome. Our study also specifically addressed the possibility, suggested in the editorial comment, that comeasurement of prorenin may lead to an unacceptably high variability of IRMA results. Between-patient variability in the low-, normal-, and high-renin subjects was similar for IRMA and the enzyme-kinetic assay.

Figure 1 (left) compares the results of the PRA assay according to the method of Sealey [3], obtained after 3 h of incubation, with the results of the same assay after 18 h of incubation in plasma from 16 hypertensive patients with PRA concentrations within the low to low-normal range of Sealey’s method. The 18-h results were 39% (20–59%) [mean (range)], lower than the 3-h results. To determine the recovery of Ang I in these