Differentiated thyroid cancer and selenium supplements for protection of salivary glands from ^{131}I treatment

Dear Editor,

I read with great interest the article by Son et al [1] about the radioprotective effect of selenium (Se) supplementation for the salivary glands from ^{131}I treatment in patients with differentiated thyroid cancer (DTC). In this study, 8 patients received 300μg of Se (as inorganic sodium selenite; selenase®) orally for 10 days, 3 days before to 6 days after ^{131}I treatment [1]. On the occasion of the use of Se among these patients, I want with this letter to remind the differences among the prescribed Se supplements in clinical practice, such as the possible health consequences of Brazil nut consumption as another choice for the preparation of DTC patients for radioactive iodine (RAI) therapy.

Selenium is an essential element with many pleiotropic effects that can be found in foods and supplements in organic form (as selenomethionine, selenocysteine, γ-glutamyl-Se-methylselenocysteine) or/and in inorganic form (as sodium selenate and sodium selenite) [2, 3]. Selenium in multivitamin/multimineral supplements or in a stand-alone supplement is often available in the forms of L-selenomethionine, Se-enriched yeast (grown in a high-Se medium), mustard seed-derived Se, or as sodium selenite or sodium selenate. Because these two (organic and inorganic) forms of Se are absorbed and metabolized differently, it is very important for the physicians, when prescribe a Se supplement, to know the contained form of Se. Inorganic forms of Se are easily absorbed through the intestine but poorly retained. Once they reach the blood, inorganic Se is quickly filtered out by the kidneys and excreted in the urine [3]. So, the consumption of supplements with inorganic forms of Se does not offer the maximum health benefits of the element. Conversely, Se-containing amino acids, such as selenomethionine and selenocysteine, are introduced directly into proteins, including muscle proteins [3]. These organic proteins-bound Se (selenoproteins) are better retained, utilized, and incorporated by the human body. About 90% of the received selenomethionine is actually absorbed in the intestinal tract, and about half of that remains in the body [3]. The higher degree of absorption of selenomethionine against selenite was described in a recently published systematic review and meta-analysis by Wichman et al. [4]. In this review, a significant decrease in serum thyroid peroxidase antibodies (TPO-Ab) levels was found among patients receiving 200μg selenomethionine, but not among those receiving 200μg sodium selenite [4]. In another investigation, 10 groups of Se-replete subjects were randomly assigned to receive a placebo or either 200 or 400 or 600μg/day Se as selenomethionine, sodium selenite, or high-selenium yeast (in which an estimated 75% of Se was in the form of selenomethionine) for 16 weeks [5]. Selenium bioavailability, based on urinary excretion, was greatest for selenomethionine and lowest for selenite. However, supplementation with any of these forms only affected plasma Se levels and not glutathione peroxidase activity or selenoprotein P concentration, suggesting that study participants were selenium replete before they began taking Se supplements [5]. Because the absorption of selenite was approximately two-thirds of the absorption of selenomethionine in this study [5], we can assume that the daily dose of 300μg of sodium selenite in the study of Son et al [1] corresponded to 200μg of selenomethionine which is the most frequently used dose in intervention trials. However, in our opinion, the prescription of supplements with organic forms of Se must be preferred, when required. It is also worth mentioning that the prescribed Se supplements should not contain iodine considering that for a successful RAI therapy after thyroidectomy, DTC patients must, not only increase their thyroid-stimulating hormone (TSH) levels, but also deplete the whole body iodine pool through a low-iodine diet (low-quality evidence) [6].

One of the richest known food sources of bioavailable Se, in the organic form of selenomethionine, are the Brazil nuts [2, 3]. Brazil nuts grow on massive tropical trees, the Bertholletia excelsa of the Lecythidaceae family, some reaching heights over 45m [2]. The average Se content of each Brazil nut in most elemental analyses varies ranging from 2.7 to 11μg Se/g, and the average weight of each nut varies between 3 and 4 g [2]. Their consumption can increase the likelihood of Se toxicity, regardless of the quantity of the nuts consumed [2], and thus is not be a safe dietary choice. Moreover, Brazil nuts may be infected externally by aflatoxins or can trigger allergic reactions in sensitive people [2]. However, raw Brazil nuts don't contain iodine [7] and thus their consumption would not undermine the dietary efforts of DTC patient in the framework of the required low-iodine diet. The consumption of 2-3 unshelled and raw (unsalted) Brazil nuts daily could be another choice for the post-thyroidectomy period up to 10 days after RAI therapy among DTC patients who do not want to receive supplements as source of Se. We must emphasize that some patients having DTC and also Hashimoto's thyroiditis may had previously received Se supplements or Brazil nuts for a long period of time before DTC was diagnosed and thyroidectomy had followed [8-10].

In conclusion, the prescription of supplements with organic forms of Se must be preferred against of supplements with inorganic forms of Se among DTC patients for the protection of their salivary glands from ^{131}I treatment and Brazil nuts could be another choice.

The author declares that he has no conflicts of interest.

Bibliography

1. Son H, Lee SM, Yoon RG et al. Effect of selenium supplementation for protection of salivary glands from iodine-131 radiation damage in pati-

ents with differentiated thyroid cancer. *Hell J Nucl Med* 2017; 20: 62-70.
2. Mazokopakis EE, Liontiris MI. Commentary: Health Concerns of Brazil Nut Consumption. *J Altern Complement* Med 2018; 24: 3-6.
3. Fairweather-Tait SJ, Collings R, Hurst R. Selenium bioavailability: current knowledge and future research requirements. *Am J Clin Nutr* 2010; 91: 1484S-91S.
4. Wichman J, Winther KH, Bonnema SJ, Hegedüs L. Selenium supplementation signicantly reduces thyroid autoantibody levels in patients with chronic autoimmune thyroiditis: a systematic review and meta-analysis. *Thyroid* 2016; 26: 1681-92.
5. Burk RF, Norsworthy BK, Hill KE et al. Effects of chemical form of selenium on plasma biomarkers in a high-dose human supplementation trial. *Cancer Epidemiol Biomarkers Prev* 2006; 15: 804-10.
6. Haugen BR, Alexander EK, Bible KC et al. 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer: The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. *Thyroid* 2016; 26: 1-133.
7. United States Department of Agriculture (USDA) Food Composition Databases. Online document at: https://ndb.nal.usda.gov/ndb (accessed September 2016).
8. Anand A, Singh KR, Kushwaha JK et al. Papillary thyroid cancer and Hashimoto's thyroiditis: An association less understood. *Indian J Surg Oncol* 2014; 5: 199-204.
9. Mazokopakis EE, Tzortzinis AA, Dalieraki-Ott EI et al. Coexistence of Hashimoto's thyroiditis with papillary thyroid carcinoma. A retrospective study. *Hormones (Athens)* 2010; 9: 312-7.
10. Liontiris MI, Mazokopakis EE. A concise review of Hashimoto thyroiditis (HT) and the importance of iodine, selenium, vitamin D and gluten on the autoimmunity and dietary management of HT patients. Points that need more investigation. *Hell J Nucl Med* 2017; 20: 51-6.

Elias E. Mazokopakis MD, PhD

1. Department of Internal Medicine, Naval Hospital of Crete, Souda 73 200, Chania, Crete, Greece, Tel.: (+30) 2821 0 82754, Fax: (+30) 2821 0 82510, E-mail: emazokopakis@yahoo.gr

Pierre-Auguste Renoir. Portrait de Mlle Jeanne Samary. Oil in canvas. 174x 105cm. 1878.