

LETTER TO THE EDITOR

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Selenium supplementation in radiotherapy patients: do we need to measure selenium levels in serum or blood regularly prior radiotherapy?

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Abstract

Considering the review by Puspitasari and colleagues, an additional discussion of the endpoints of the Se supplementation studies described would be helpful. In our view, selenium can safely be given to selenium-deficient cancer patients prior to and during radiotherapy. Therefore, in order to help the radiation oncologist in decision making, we strongly advocate to determine the selenium status prior to and during a potential adjuvant selenium supplementation, e.g. when trying to ease the side-effects of radiation treatment or in the aftercare situation when the selenium status may become insufficient.

Keywords: Selenium, Supplementation, Clinical studies, Selenoproteins, Radiotherapy

We have read with great interest the review of Puspitasari et al. and would like to thank the authors for this interesting summary which shows the possible benefits of selenium supplementation in radiotherapy patients reducing side effects and thus improving quality of life without compromising the effectiveness of radiotherapy [1].

In the introduction, the authors point to the necessity of a guideline helping physicians and patients with their decisions concerning selenium supplementation. They correctly point to the lack of comprehensive data. Yet, if one enlarges the range of their systematic search, there are additional data which to our opinion could form the basis of practice rules concerning selenium in cancer care. In fact, there is a wealth of preclinical and clinical data pointing to the dose-dependency of health effects from selenium supplementation and the high mortality risk of selenium-deficient cancer patients [2].

According to recently published studies it seems most important for cancer patients to achieve and maintain a certain range of Se in the serum. Nutritional Se intake, plasma Se concentration and glutathione peroxidase (GPx) activity display a positive correlation up to a

certain threshold plasma Se concentration (70–100 µg/L), beyond which the GPx activity plateaus [3]. The limit at which selenoprotein P (SePP) concentrations may no longer increase with higher Se intake has been determined at levels of around 90–125 µg Se/l plasma [4-6]. Consequently, the optimal Se range in serum likely resides between 100 and 130 µg/l [7,8]. This is in accordance with epidemiological and clinical data which underline that cancer and mortality risks inversely correlate to Se concentrations at suboptimal levels <100 µg Se/l plasma as compared to higher Se status [9].

Considering the review by Puspitasari and colleagues, an additional discussion of the endpoints of the Se supplementation studies described would be helpful. In order to determine effects from selenium basic and follow-up levels need to be determined. Unfortunately, some well-known and frequently cited allegedly negative studies did not obey to these simple rules and it is thus difficult to interpret their findings [10,11].

Therefore, in order to help the radiation oncologist in decision making, we strongly advocate to determine the selenium status prior to and during a potential adjuvant selenium supplementation, e.g. when trying to ease the side-effects of radiation treatment or in the aftercare situation when the selenium status may become insufficient. The potential benefits for the cancer patient under radiotherapy are well-documented and undisputed [1,2].

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In our view, selenium can safely be given to selenium-deficient cancer patients prior to and during radiotherapy. Considering the known uncertainties around the appropriate Se dose and Se compound we would propose the inorganic form sodium selenite without un-specific incorporation into non-selenoenzymes and daily doses higher than in the above mentioned gynecological study of 500 µg since the patients with Se supplementation did not achieve Se levels in the serum higher than 75 µg/l [12]. Finally we want to point out that selenium is not a medication per se but rather an adjuvant treatment option supporting the biosynthesis of 25 human genes encoding the functionally active selenoproteins needed for limiting the side effect of radiation therapy and supporting a fast recovery.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All authors participated in the drafting and revising of the manuscript. All authors read and approved the final manuscript.

Authors' information

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References

1. Puspitasari IM, Abdulah R, Yamazaki C, Kameo S, Nakano T, Koyama H: Updates on clinical studies of selenium supplementation in radiotherapy. *Radiat Oncol* 2014, **9**:125.
2. Meyer HA, Endermann T, Stephan C, Stoedter M, Behrends T, Wolff I, Jung K, Schomburg L: Selenoprotein P Status Correlates to Cancer-Specific Mortality in Renal Cancer Patients. *PLoS One* 2012, **7**:e46644.
3. Xia Y, Hill KE, Byrne DW, Xu J, Burk RF: Effectiveness of selenium Supplements in a low-selenium area of China. *Am J Clin Nutr* 2005, **81**:829–834.
4. Burk RF, Norsworthy BK, Hill KE, Motley AK, Byrne DW: Effects of chemical form of selenium on plasma biomarkers in a high-dose human supplementation trial. *Cancer Epidemiol Biomarkers Prev* 2006, **15**:804–810.
5. Persson-Moschos M, Alfthan G, Akesson B: Plasma selenoprotein P levels of healthy males in different selenium status after oral supplementation with different forms of selenium. *Eur J Clin Nutr* 1998, **52**:363–367.
6. Hurst R, Armah CN, Dainty JR, Hart DJ, Teucher B, Goldson AJ, Broadley MR, Motley AK, Fairweather-Tait SJ: Establishing optimal selenium status: results of a randomized, double-blind, placebo-controlled trial. *Am J Clin Nutr* 2010, **91**:923–931.
7. Muecke R, Schomburg L, Buentzel J, Kisters K, Micke O: Blood selenium Status in tumor patients: Omnia sunt venena, nihil est sine veneno. *Sola dosis facit venenum. Trace Elem Electrolytes* 2010, **27**:181–182.

8. Muecke R, Schomburg L, Buentzel J, Kisters K, Micke O: Selenium or no selenium-that is the question in tumor patients: a new controversy. *Integr Cancer Ther* 2010, **9**:136–141.
9. Bleys J, Navas-Acien A, Guallar E: Serum selenium levels and all cause, cancer, and cardiovascular mortality among US adults. *Arch Intern Med* 2008, **168**:404–410.
10. Karp DD, Lee SJ, Keller SM, Wright GS, Aisner S, Belinsky SA, Johnson DH, Johnston MR, Goodman G, Clamon G, Okawara G, Marks R, Frechette E, McCaskill-Stevens W, Lippman SM, Ruckdeschel J, Khuri FR: Randomized, Double-Blind, Placebo-Controlled, Phase III Chemoprevention Trial of Selenium Supplementation in Patients With Resected Stage I Non-Small- Cell LungCancer: ECOG 5597. *J Clin Oncol* 2013, **31**(33):4179–4187.
11. Lippman SM, Klein EA, Goodman PJ, Lucia MS, Thompson IM, Ford LG, Parnes HL, Minasian LM, Gaziano JM, Hartline JA, Parsons JK, Bearden JD, Crawford ED, Goodman GE, Claudio J, Winquist E, Cook ED, Karp DD, Walther P, Lieber MM, Kristal AR, Darke AK, Arnold KB, Ganz PA, Santella RM, Albanes D, Taylor PR, Probstfield JL, Jagpal TJ, Crowley JJ, et al: Effect of selenium and vitamin E on risk of prostate cancer and other cancers: The selenium and vitamin E cancer prevention trial (SELECT). *JAMA* 2009, **301**:39–51.
12. Muecke R, Schomburg L, Glatzel M, Bernd-Skorra R, Baaske D, Reichl B, Buentzel J, Kundt G, Prott FJ, De Vries A, Stoll G, Kisters K, Bruns F, Schaefer U, Willich N, Micke O: Multicenter, phase III trial comparing selenium supplementation with observation in gynecologic radiation oncology. *Int J Radiat Oncol Biol Phys* 2010, **70**:828–835.

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