Information Sheet 6: Selenium

Key Points

- Selenium may protect against prostate cancer in men with low selenium status
- Selenium supplementation should be taken with caution because high selenium intake can cause toxicity

Introduction

Selenium is an essential trace mineral found in food [1]. It is important for general health and has been suggested to reduce prostate cancer risk, particularly in men with a low selenium status [2, 3].

In the 1996 Nutritional Prevention of Cancer (NPC) trial, selenium supplementation was associated with a reduced risk of prostate cancer. This relationship was further studied in two large well-designed clinical trials, but no significant associations were found. However, the study populations in both of these trials had a moderate to high selenium status while the NPC trial population had a low selenium status [3]. It is now suggested that selenium supplementation may protect against cancer in populations with a low selenium status.

Nutritional Requirements for Selenium

The recommended dietary allowance for males over 25 years old is 70µg/day [4]. Although selenium is important for general health, both too much and too little intake can lead to health problems. Selenium deficiency symptoms include reduced immune function, increased viral infections, male infertility, depression or/and anxiety [1, 2]. On the other hand, selenium intake of 400µg/day or above is toxic to the body. Toxicity symptoms include garlic breath, hair loss, brittle nails, gastrointestinal symptoms, skin rash, fatigue and irritability [2].

Selenium Status in NZ

The amount of selenium in foods depends on the selenium content in soil and varies between countries [2]. Most New Zealand soils contain low concentrations of selenium, increasing the risk of selenium deficiency. However, the selenium status of New Zealanders has improved over the past years due to imported wheat and cereals from Australia, which contain higher selenium levels, and farming animals are fed with foods with higher selenium levels [5]. From the 2009 New Zealand Total Diet Survey, selenium intake in New Zealand males over 25 was 78µg/day, which is above the estimated average requirement of 60µg/day) [6].

Sources of Selenium

Dietary Sources

Adequate selenium status is usually achieved by selenium intake from dietary sources. Although the benefits of selenium intake for prostate cancer are unclear, maintaining an adequate selenium status is beneficial to general health [1].

Major sources of selenium include [1, 2]:

- Brazil nuts
- Organ meat – eg. liver, kidney
- Seafood – eg. crab, shellfish, fish
- Egg
- Imported cereals

Minor sources of selenium include [1, 2]:

- Cruciferous vegetables – eg. broccoli, cabbage, cauliflower
- Garlic
- Mushrooms

Selenium Supplements

Selenium is also available in the form of supplements [2]. Currently, selenium supplementation is not clinically recommended for men with prostate cancer. High levels of selenium supplementation may also have toxic effects, supported by an increased risk of diabetes as shown in the selenium supplementation trials [3].

NB: Due to the risk of toxicity, selenium supplements should be taken with caution and as advised by your doctor.

Summary of Research

Results from the Nutritional Prevention Cancer (NPC) trial suggested that 200µg/day selenium supplementation significantly reduced prostate cancer risk by 50% [7]. The potential for selenium supplementation to protect against prostate cancer was then further investigated in two large well-designed clinical trials: the Selenium Vitamin E Cancer Prevention Trial (SELECT) and the Phase III trial of selenium to prevent prostate cancer in men with high-grade prostatic intraepithelial neoplasia (HGPIN trial). In both trials, selenium supplementation of 200µg/day did not significantly reduce the risk of prostate cancer [8, 9].

Several explanations are given for the lack of association seen in SELECT and the HGPIN trial. One explanation is the difference in selenium status between the study populations. While the NPC trial included men with low to moderate selenium levels (median 113ng/mL), SELECT and HGPIN trial included men with moderate to high selenium levels (median >130ng/mL) [8, 9]. Furthermore, in the NPC trial, significant reduction in prostate cancer risk was only seen in men with blood selenium concentrations <123.2 ng/mL. 78% of men in SELECT were over this threshold [9]. Therefore, it is now suggested that selenium supplementation only has a protective effect in men with low selenium status. A recent study in a low-selenium population supports this. In this study, higher toenail selenium, which reflects higher selenium intake, was associated with up to 76% reduction in prostate cancer risk [10]. However, further studies in low-selenium populations are required to investigate this relationship.

Another explanation for the discrepancy in results is the type of selenium supplements used. The NPC trial used selenized yeast while SELECT and the HGPIN trial used pure selenomethionine [8, 9]. Although, the main component of selenized yeast is thought to be selenomethionine, there are other selenium compounds present which may play a role in prostate cancer risk [2, 8].

References

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