

## Aging and Nutritional Metabolism Challenges



As our bodies age they undergo significant changes. All body organs and processes are affected. We have decreased motility, increased recovery times from injury and bodily insults, and many physiological changes. Changes in physiological changes include changes in body composition including sarcopenia, cognitive decline, declines in bone and joint health,

increase in chronic diseases and disease risk, and changes in gastrointestinal function.

Regarding the changes in our gastrointestinal tract, Rémond, et al.<sup>(1)</sup>, have an extensive review of those changes, which are summarized as follows: Starting in the mouth, there seems to be a decrease in saliva production. From there to

the stomach, there does not seem to be a decrease in acid production, but there is an increase in the incidence of stomach infections which do decrease stomach acid production. Decreased stomach acid can affect bioavailability of nutrients. From the stomach into the intestine, there does not appear to be a change in the normal turnover of mucosal cells and the integrity of the intestinal barrier. However, there are decreases in the production of digestive enzymes resulting in decreased nutrient availability and changes in the endocrine system that impacts how we feel about food and satiety. These physiological changes also have the potential to be modulated by use of medicinal drugs.

With these gastrointestinal tract changes, as you might expect, there are associated consequences to the absorption of nutrients that we ingest. Aging populations are at risk for many nutrient deficiencies. According to one review<sup>(2)</sup> those shortfall nutrients include **omega-3 fatty acids, protein, zinc, magnesium, fiber, and several vitamins**. The review further states that lack

of these nutrients can be associated with many of health problems among the aging population.

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## Calcium

Loss of bone mineralization and concurrent increased risk of catastrophic bone fracture is a major concern in the elderly. Adequate calcium nutrition is still of vital importance to bone mineralization. Analysis of NHANES data from the elderly population showed that more than 50% of them failed to consume adequate calcium<sup>(1)</sup>. Additionally, in a double isotopic study, researchers found years ago that as both men and women age, the fractional intestinal absorption of calcium decreases<sup>(3)</sup>. They showed that there was a significant inverse relationship between age and calcium absorption. The data suggests that there may be a 2-3-fold decrease in calcium absorption<sup>(3)</sup>. While the decrease in calcium absorption may be secondary to decreased intestinal sensitivity to 1,25-dihydroxyvitamin D, changes in hormonal levels, or other reasons<sup>(4)</sup>, the net result is lower absorption of calcium. Studies over the years have been summarized that suggest that dairy products with their high calcium content not only provide a good source of calcium, but they can also provide other nutrients that are beneficial to calcium nutrition

and physiological processes<sup>(1)</sup>. An additional nutritional strategy would be to choose calcium sources that are highly bioavailable such as calcium bisglycinate<sup>(5)</sup>.

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## Iron

Iron deficiency anemia is commonly thought of as the most prevalent nutritional disease in the world. This is common through all ages of life, and the risk can increase in the elderly. In the United States, it is approximated that 10% of the population ages 65 and older are anemic, and this percentage doubles at age 85<sup>(6)</sup>. There are variable causes of the iron deficiency anemia that are incident with aging. In one study of over 600 subjects ages 21-94 with iron deficiency anemia, researchers found that 51% of the subjects had gastrointestinal diseases that were not associated with bleeding<sup>(7)</sup>. They also determined the diseases common in the older subjects included hernia, gastric and colon cancer, and colonic vascular ectasia. Hypochloridria perhaps due to stomach infections may also be a factor in developing iron deficiency anemia as pH is an important factor in its absorption<sup>(1,6)</sup>. Finally, institutionalization may be another significant risk factor for developing iron deficiency anemia. In a study conducted with 252 institutionalized elderly, it was found that prevalence

of anemia was 25.4% coupled with a high incidence of inflammation as determined by C-reactive protein values<sup>(8)</sup>. Determining iron deficiency in elderly is difficult because there is often chronic inflammation.

Some consequences of iron deficiency in the elderly include clear associations with disability and declining physical performance, possible increased risk of ischemic heart disease, and increase risk of symptoms of depression<sup>(6)</sup>. The potential consequences of iron deficiency combined with the afore mentioned changes in the gastrointestinal tract may warrant paying close attention to iron status as we age.

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## Zinc

Zinc is an essential mineral that has many functions in the body including cell replication, active centers of metalloenzymes, proper maintenance of neuronal processes, and supporting the immune function. In the elderly, the immune system has a gradual decline, particularly in adaptive response. These are complicated by the physiological changes associated with aging, increased oxidative stress, and other lifestyle factors<sup>(9)</sup>. To combat oxidative stress, a steady supply of antioxidants, including zinc, are needed. Zinc deficiency can lead to disruption of several immune pathways. It

can result in a reduction in thymus activity and its hormones, a reduction in effectiveness of T helper cells, detrimental changes in interleukins, and deterioration of innate immune cell function<sup>(10)</sup>.

Zinc may also play a role in cognitive neuronal processes. In an update on zinc and depression, Nowak, et al, suggested that there is benefit to zinc supplementation in antidepressant therapy through action upon the N-methyl-D-aspartate (NMDA) receptor<sup>(11)</sup>. Other studies have indicated that there is a zinc deficiency increases neuronal apoptosis, causing deficiency in learning and memory<sup>(10)</sup>. Links have been made between zinc and Parkinson's disease and Alzheimer's disease, with attention to the role of a zinc-copper interaction with the latter<sup>(10)</sup>.

Accordingly, zinc is a nutrient that is of concern for developing deficiency in the elderly through inadequate consumption and inadequate absorption. It has been suggested that in adults ages 60-65 zinc intake is below 50% of the recommended daily allowance<sup>(12)</sup>. Some factors that might lead to inadequate intake include avoiding zinc rich foods that might elevate cholesterol levels, increased consumption of refined wheat products, and increased consumption of high fiber foods also rich in phytates<sup>(10)</sup>. These studies and reviews indicated

that zinc supplementation particularly in the elderly, may be beneficial to supporting immune function, cognitive function, and lowering risk of age-related diseases<sup>(10-12)</sup>.

In conclusion, our bodies will inexorably undergo significant changes as we age. As shown by the examples of zinc, iron and calcium above, there are metabolic challenges to ensure that we get adequate nutrition to support healthy aging. Solutions may include the use of dietary supplements for key nutrients depending on personal circumstances. For minerals, highly bioavailable and tolerable forms such as chelates offered by Albion® Minerals can be beneficial in helping to meet these challenges.

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