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Women'sHealthREPORT
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MICRONUTRIENTS AND THE OLDER ADULT – Part 1: Micronutrients of Importance to Older Adults

By Vijaya Jain, MS, MSc, RD, CDN

Note from Chair: *Collaboration is essential to the success of both individuals and organizations. It is has been a personal goal of mine to see the Women's Health DPG work with other DPGs and related health organizations. In recent years, we have enhanced our mission to cover women's health across the lifespan. Given this expanded mission, there is, in my opinion, no more relevant topic to consider than healthy aging.*

At FNCE® 2012, I began a dialogue with the leadership and editorial team of the Healthy Aging DPG. This issue is the result of that conversation, and I am thrilled to celebrate the work of RDNs in this area of nutrition. I am grateful to our author and to the editorial teams of both Women's Health Report and The Spectrum for working tirelessly to bring this issue and a subsequent part 2 to light. I hope that we continue to work together on the topic of nutrients of concern to the older adult, as well as other topics that are relevant to women as they age.

in this issue

ABSTRACT

The aging population continues to increase worldwide, and many older adults now live longer and healthier lives. The process of aging is accompanied by a variety of physiological, economical, and psychological changes that can compromise nutritional status and increase the risk for poor nutrient intake among older adults. A decreased energy intake associated with advancing age has important implications in terms of nutrient intake among older adults, including protein and micronutrients. Suboptimal intake for several micronutrients is prevalent among older adults.

INTRODUCTION

Increasing life expectancy has led to a steady rise in the number of older persons globally. In 2012, the number of older Americans aged 65 years and older had reached 43.1 million (1). As many of these older Americans continue to remain healthy and active well into their eighties and even nineties, and have better medical management of chronic diseases and their comorbidities, the size of the older population is projected to double between 2000 and 2030 (2). According to the US Bureau of the Census, the size of the population age 85 and over is projected to be 7 million by 2020 (1). The baby-boomer generation will reach age 65 between 2010 and 2030, meaning that by 2030, one in five American citizens will be older adults (1), and two out of every three older Americans will have multiple chronic conditions (3). The number of older persons worldwide is expected to reach more than 1.2 billion by 2030, with 840 million living in developing countries. Given that there will be a steady increase in the number of older adults in the population, there will also be an increase in chronic health and nutrition-related problems, including malnutrition and micronutrient deficiencies typically seen in the aging population.

Decreased energy intake and the numerous changes occurring during the aging process are among the main reasons for an increase in nutritional deficiencies and chronic medical conditions. Marian and Sacks report that 87% of older adults have one or more medical conditions and metabolic risks (such as hypertension, diabetes, or dyslipidemia) (2). The most frequently occurring conditions among the older people were uncontrolled diabetes (34%), diagnosed arthritis (50%), all types of heart disease (32%), any cancer (23%), and diabetes (19%) (3). Nutrition plays a central role in the management of these and other chronic diseases, the prevention of disease, and the maintenance of a healthy life.

CHANGES IN NUTRITIONAL REQUIREMENTS ASSOCIATED WITH AGING

Numerous changes affecting nutritional status and utilization of essential nutrients occur as part of the normal aging process, including:

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Women'sHealthREPORT

Please send any questions or comments to
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The Women's Health Report (ISSN-3233) is an online quarterly publication of the Women's Health Dietetic Practice Group (WH DPG) of the Academy of Nutrition and Dietetics. The WH Report features articles, as well as information on programs, materials, positions, and products for use of its readers. News of members, book reviews, announcements of future meetings, requests for information, or other items of interest to women and reproductive nutrition dietetics practitioners should be sent to the Newsletter Editor by the next published deadline date.

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FROM THE CHAIR **Kathleen Pellechia,** RD

Hello, WH DPG members! It's amazing that this is my last letter as your Chair. It seems as if the year has flown by. My new baby is six months old, and my "first" baby will be graduating kindergarten. I have been honored to serve as the leader of this passionate and hard-working group. As I transition to Past-Chair, I will continue to work on my priority project – a redesign of our group Web site. I am excited to share a screenshot of the new homepage in this issue, and look forward to launching this summer.

I am especially proud of this issue as it is the result of efforts to collaborate with our fellow dietetic practice groups. In this case, we have worked with the Healthy Aging DPG to bring you the first part of a two-part series on nutrients and aging. I am incredibly grateful to the editorial team and leadership of the Healthy Aging DPG, as well as our editorial team who have worked so hard to make this happen. To celebrate this joint effort, we are featuring interviews with one WH DPG member and one Healthy Aging DPG member who have expertise in this area.

As this membership year winds to close, I want to thank my outstanding leadership team who work tirelessly to bring you the newsletters, webinars, and other resources that are key to the success of this DPG. I encourage you to consider leadership within this group. Complete our member survey to give us feedback on how we are doing and to express your interest in getting involved in leadership or mentoring opportunities. I look forward to continuing to work with our incoming Chair, Lisa Akers. Lisa is an RD and IBCLC, and thus brings a unique and important perspective to our group.

Thank you for your membership and support, and I wish you a beautiful, fun-filled summer!

FROM THE EDITOR **Heather A. Goesch,** MPH, RDN, LDN

I don't know about you, but I love the "oldest living person" news stories. The individuals are typically pushing 100 or better, with a rich and rewarding life attributed to some particular "healthy" habit. Whatever the slant, it leaves me with a smile.

Continued advances in science and medicine have been instrumental to increasing average life expectancy. Though, as the older population grows, so does increased incidence of age-related health issues; not to mention the subsequent rise in healthcare costs. As dietetic practitioners, we are poised to be leaders in mitigating many nutrition-related issues to keep us healthy longer, and hopefully offset some of the financial burden as well.

To set you thinking more on the topic, I'm excited to share this issue – the first in a two-part series as a result of collaborating with the Healthy Aging (HA) DPG. It's thus far been a rewarding experience, and I want to take this opportunity to thank Robin Dahm, RDN, LDN, Editor of *The Spectrum*, and her wonderful editorial team, as well as our own team, for their hard work and dedication!

Our feature article, written by Vijaya Jain, MS, MSc, RD, CDN of HA, discusses micronutrients of importance for older adults. We also put the spotlight on a member from both DPGs with experience in this area of nutrition practice. Other highlights include a review of Elisa Zied's *Younger Next Week*, a Public Policy Workshop recap, and updates on the WH DPG website redesign.

It's hard to believe we're entering a new membership year. By the time you read this, I will be transitioning into the role of WH Chair-Elect. While it's sad to write my final letter as Editor, this new adventure is one I'm most excited to begin. Now I ask each of you to reflect on your interests and strengths, and consider volunteering for one of the available positions within the DPG. Explore the openings listed on page 15, or head over to the website for more information. All the best to you!

Cheers,
Heather

Feel free to contact me at info@womenshealthdpg.org with questions or concerns.

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- Changes in body composition (such as an increase in the fat percentage and a decrease in muscle mass [sarcopenia]) pose significant risks, including a reduction in resting metabolic rate and reduced muscle strength.
- Changes in sensory abilities (such as a loss of smell and taste, decreased saliva production, and deterioration in the ability to identify food flavors) can lead to a decrease in appetite, which in turn can result in a poor intake of foods, weight loss, and increased morbidity.
- Changes in physiological functions (such as reduced kidney and liver function, lowered cardiac output, decreased gastric motility, and decreased vitamin absorption).
- Changes in immune function and decreased immunological functions can increase the risk of infections, malignancy, and autoimmune disorders. Aging also reduces the ability to combat inflammation and increases wound-healing time.
- Decreased functional capacity and mobility of some organs and systems (such as dentition changes, dysphagia, achlorhydria, gastric dismotility, metabolic disorders, drug-nutrient interactions resulting from prescribed medications, and a host of other factors that affect nutrition intake and health status).
- Cultural and psychosocial issues (such as the death of a spouse, living alone, depression, religious beliefs, and food insecurity) also impact the nutritional status of older adults, often resulting in chronic malnutrition and micronutrient deficiencies.

In particular, physical conditions commonly present among older people, whether part of the normal aging process or not, can affect nutritional intake and metabolic demand. All these changes play a key role in determining the nutritional needs of older adults.

MICRONUTRIENT REQUIREMENTS AND NUTRITIONAL STATUS

The aging process increases the nutritional vulnerability of older adults, even under affluent circumstances. Additionally, diet as well as genetic and environmental factors has a major effect on longevity. Chernoff points out that "there are uncertainties about actual nutrient requirements of older adults due to the difficulties associated with conducting studies on patients who have multiple comorbidities" (4).

Since energy requirements decrease with age, meeting recommended allowances for micronutrients becomes a challenge for many older adults. Inadequate nutritional intake is highly prevalent among the elderly, affecting nearly 44% of otherwise healthy community dwellers in developed countries (5). The declining energy intake associated with advancing age creates an increased need for several other nutrients, including vitamins (such as vitamins C, D, and the B vitamins) and certain minerals (calcium, magnesium, and zinc) to maintain organ systems whose functionality is declining (such as alterations in digestion, absorption, metabolism, and excretion). In the United States, total energy intake decreases substantially with age, by 1,000 to 1,200 calories daily for men and 600 to 800 calories daily for women. This decrease can result in a lowered intake of several nutrients, including calcium, iron, zinc, the B vitamins, and vitamin E. Older adults therefore face the challenge of selecting nutrient-dense foods without exceeding energy requirements.

Inadequate intake of these specific micronutrients among older adults, even in the most developed countries, is common and has been linked to the risk of chronic diseases (6). The social changes that accompany urbanization in many developing countries (such as increased consumption of high-energy and high-fat foods, reduced availability of fresh fruits and vegetables, increased food costs, and higher risks of food insecurity) also contribute to increased nutritional risks for the older population (6). More recent evidence about the dietary trends of older adults indicates increasing intakes of nutritionally sparse foods. More than 90% of older adults who are 51–70 years of age, and 80% of those above 71 years of age, had high intakes of empty-energy foods that exceeded the discretionary allowances (7). These dietary changes can escalate the rates of chronic diseases among older adults, such as diabetes, heart disease, and obesity.

The Food and Nutrition Board of the Institute of Medicine (IOM) compiles the Recommended Dietary Allowances (RDAs) (8-10). The RDA is the average daily dietary intake level, sufficient to meet the nutritional needs of 97.5% of healthy people. Whenever compelling research indicates that a current RDA is not accurate, the IOM revises it. For example, the IOM lowered the calcium requirements for men ages 50 to 71 from 1,200 mg daily to 1,000 mg daily, based on studies that showed an increase in prostate cancer risk for men who exceeded this daily intake.

The RDAs are just one measurement for determining daily vitamin and mineral allowances. The Dietary Reference Intakes (DRIs) include three different values:

- Adequate intake (AI) is the amount needed to prevent deficiency when a Reference Dietary Intake (RDI) cannot be established. (The RDI being a daily requirement set by the US Food and Drug Administration (FDA) for use in nutrition labeling.)
- The Estimated Average Requirement (EAR) is the amount that would sustain health in 50% of people.
- The tolerable upper-intake level (UL) is the maximum daily amount that would not cause harm.

The aging process and the numerous changes that occur during aging have a large effect on the nutrient needs of older adults. Table 1 shows the vitamin and mineral requirements of men and women ages 51 and older.

Table 1: Vitamin and Mineral DRIs, RDAs, and AIs for Older Adults

Vitamins	Males 51–70 Years	Males >70 Years	Females 51–70 Years	Females >70 Years
Vitamin A (µ g/d)[a]	**900**	**900**	**700**	**700**
Vitamin D (µ g/d)[b, c]	15	**20**	15	**20**
Vitamin E (mg/d)[d]	15	15	15	15
Vitamin K (µ g/d)	120*	120*	90*	90*
Thiamin (mg/d)	1.2	1.2	1.1	1.1
Riboflavin (mg/d)	1.3	1.3	1.1	1.1
Niacin (mg/d)[e]	16	16	14	14
Pantothenic acid (mg/d)	5*	5*	5*	5*

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Vitamins	Males 51–70 Years	Males >70 Years	Females 51–70 Years	Females >70 Years
Biotin (µ g/d)	30*	30*	30*	30*
Vitamin B6 (mg/d)	1.7	1.7	1.5	1.5
Folate (µ g/d)[f]	**400**	**400**	**400**	**400**
Vitamin B12 (µ g/d)	2.4[h]	2.4[h]	2.4[h]	2.4[h]
Vitamin C (mg/d)	90	90	70	70
Choline (mg/d)[g]	550*	550*	425*	425*
Minerals				
Calcium (mg/d)	**1,000***	**1,200***	**1,200***	**1,200***
Phosphorus (mg/d)	700	700	700	700
Magnesium (mg/d)	**420**	**420**	**320**	**320**
Iron (mg/d)	**8**	**8**	**8**	**8**
Zinc (mg/d)	**11**	**11**	**8**	**8**
Selenium (µ g/d)	**55**	**55**	**55**	**55**
Iodine (µ g/d)	**150**	**150**	**150**	**150**
Copper (µ g/d)	**900**	**900**	**900**	**900**
Manganese (µ g/d)	2.3*	2.3*	1.8*	1.8*
Fluoride (µ g/d)	4*	4*	3*	3*
Chromium (µ g/d)	30*	30*	20*	20*
Molybdenum (µ g/d)	45	45	45	45

Note: This table, taken from the DRI reports (http://www.nap.edu), presents RDAs in bold type and AIs in ordinary type followed by an asterisk (*). The RDA is calculated from the EAR value. If sufficient scientific evidence is not available to establish an EAR, an AI is usually developed.

VITAMINS

Vitamins are complex organic compounds – very different from fats, carbohydrates and proteins. They occur naturally in a variety of foods and are essential for normal physiological functions in the body. Vitamins, also known as micronutrients, are required in small amounts (micrograms and milligrams), and are divided into two groups based on their solubility in fat solvents or water.

Water-soluble vitamins consist of the eight B vitamins and vitamin C. The fat-soluble vitamins (vitamins A, D, E, and K) are stored in the liver and adipose (fat) tissue when not used, and pose a risk for toxicity when consumed in excess amounts. Additionally, fat-malabsorption disorders have an adverse effect on fat-soluble vitamins.

Vitamin A

Vitamin A includes a group of compounds known as retinoids. The three preformed retinoid compounds that have metabolic activity are retinal, retinol, and retinoic acid. Vitamin A is essential for vision, maintaining healthy cells, bone health, and regulation of the immune systems for older adults. In addition, vitamin A may play a role in prevention of cancer and chronic diseases. Although vitamin A deficiency is rare in the United States, it is the most significant cause of blindness in developing countries. Night blindness and dry skin may also indicate a vitamin A deficiency. Older adults diagnosed with liver disease and alcoholism are at risk for this deficiency, because their damaged livers may be incapable of storing vitamin A. Additionally, older adults who suffer from chronic diarrhea and/or fat-malabsorption syndromes may develop a vitamin A deficiency over time. Vitamin A toxicity occurs infrequently but is a concern among older adults who consume large doses of vitamin supplements. Symptoms of toxicity include fatigue, vomiting, loss of appetite, blurred or double vision, and jaundice caused by liver damage.

Older adults need smaller amounts of vitamin A than do younger adults because of compromised hepatic function, which may contribute to an increased risk of toxicity (11,12). Consumption of high levels of vitamin A can increase the risk of toxicity, resulting in changes in the skin and mucous membranes, as well as fractures in the older population. Sebastian, et al. measured nutrient intake adequacy of vitamin/mineral supplement users, non-users, and infrequent users among 4,384 adults aged 51 years and older residing in households in the United States (13). They report that the UL for vitamin A was exceeded by older women taking vitamin supplements – 9% of women aged 51 to 70 years, and 5% of women aged 71 years and older. They comment that this finding is of concern because long-term daily vitamin A intake of 3,000 µg or more has been associated with hip fractures in postmenopausal women (14).

Vitamin A is found as retinol in animal foods, and as carotenoids, beta-carotenes, lycopene, zeaxanthine, and lutein in plant foods. Some of the best sources of vitamin A are liver, orange and deep yellow vegetables, and dark green leafy vegetables. The IOM encourages consumption of all carotenoid-rich fruits and vegetables for their health-promoting benefits (1).

Vitamin D

Vitamin D is commonly referred to as the sunshine vitamin because the body can synthesize it from adequate exposure to sunlight. Of the 10 vitamin D compounds (vitamins D_1 through D_{10}), those most important to human nutrition are D_2 (ergocalciferol) and D_3 (cholecalciferol). The active form of vitamin D is like a hormone because it is made in one part of the body and regulates activities in other parts. Vitamin D plays a critical role in the body's use of calcium and phosphorus. It is essential for bone health and helps prevent osteoporosis and fractures in older adults. Vitamin D also regulates blood calcium levels.

Inadequate intake of vitamin D increases the risk for several medical conditions, including osteoporosis, hypertension, heart disease, certain types of cancers, musculoskeletal pain, and alterations in glucose and lipid metabolism (15). Vitamin D deficiency is increasing worldwide and is particularly high among homebound and institutionalized older adults, as they are more likely to stay indoors and be inadequately exposed to sunlight. Even in developing countries with abundant sunlight, older people have less exposure to sunlight than do younger adults. Furthermore, advancing age decreases the ability for skin exposed to UV light to form provitamin D3 (16). Vitamin D toxicity, which occurs from excessive consumption of supplements, results in hypercalcemia, loss of bone mass, nausea, vomiting, and loss of appetite.

The primary sources of vitamin D are milk and other dairy products fortified with vitamin D. It is also found naturally in oily fish (such as salmon, sardines, and herring), cod liver oil, and other fish oils. Egg

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yolks, butter, and liver also provide vitamin D; the amount varies because it depends on the vitamin D content of the foods consumed by the source animal. Plants are a poor source of vitamin D, and strict vegetarians and vegans need to obtain this nutrient via supplements. Recently, newer sources of vitamin D shown to be bioavailable and safe are UVB-irradiated yeast and mushrooms (17,18) and may be good options for vegetarians. Sunshine is the most dependable source, depending on geographic location.

Vitamin E

Vitamin E is an antioxidant, and its activity is enhanced by other nutrients also involved in antioxidant pathways, such as vitamin C and selenium. Alpha-tocopherol is the only form of vitamin E that meets the daily intake requirement. It is involved in the synthesis of blood coagulation factors. Vitamin E may be required for bone metabolism to facilitate carboxylation of proteins and to reduce urinary calcium excretion. As an antioxidant, vitamin E may reduce the risk of some degenerative diseases, such as cancer and heart diseases. Besides functioning as an antioxidant, vitamin E is involved in immune function in *in vitro* studies of cells, and other metabolic processes (19). Fat-malabsorption disorders resulting in vitamin E deficiency usually cause neurological problems in older adults. Large doses of vitamin E interfere with blood clotting.

The decline in physical function that occurs with aging was determined by Bartali, et al. in Italy, with 698 independently-living persons age 65 and older (20). They concluded that a low serum level of vitamin E is associated with a decline in physical activity.

Vegetable oils and products made from vegetable oil (margarine and salad dressings) are the best sources of vitamin E. Fruits and vegetables, grains, nuts (almonds and hazelnuts), seeds (sunflower), and fortified cereals are good sources. Animal products are medium to poor sources of vitamin E, as the content depends on the fat composition of the source animal. Cooking, processing, and storage can reduce the vitamin E content of foods.

Vitamin K

Vitamin K plays a crucial role as a cofactor involved in the synthesis of blood coagulation factors for bone metabolism. It also facilitates carboxylation of proteins, such as osteocalcin, involved in bone formation, and reduces urinary calcium excretion. Some vitamin K is produced by colonic bacteria and is absorbed in the colon.

Vitamin K deficiency is characterized by hemorrhage manifested by an increase in clotting time. Older adults taking antibiotics for long periods of time may become deficient in vitamin K, because the antibiotics sometimes kill intestinal bacteria. Although no UL has been established for vitamin K, excess amounts can cause the breakdown of red blood cells and initiate liver damage. People taking blood-thinning drugs or anticoagulants need to moderate their intake of foods containing vitamin K, because excess vitamin K can alter clotting times.

Vitamin K is mainly obtained from two sources: food (mostly plant food) and bacteria present in the colon. Phylloquinone is the primary form of dietary vitamin K, from sources such as fruits and dark green leafy vegetables. Vegetable oils (soybean, cottonseed, canola, and olive) are good sources of vitamin K; however, exposure to light and length of storage affect an oil's vitamin K level. Animal products contain small amounts of vitamin K. Eggs yolks, butter, and various cheeses contain small amounts of melaquinones, another form of vitamin K. Vitamin K_2 is found in fermented dairy and soy products, fish, meat, liver, and eggs. Vitamin K requirements for older adults are similar to that of other adults.

B Vitamins

All B vitamins are water-soluble. The more significant B vitamins are thiamin, riboflavin, niacin, B_6, folate, and B_{12}. The other B vitamins (such as pantothenic acid and biotin) are available in a wide variety of foods, and their dietary deficiencies are not an issue among older Americans. B vitamins act as coenzymes or as parts of coenzymes in several metabolic pathways in cells. All B vitamins function in energy-producing metabolic reactions, and some play a role in other aspects of cellular metabolism. The milling and processing of cereal grains removes most of the B vitamins, along with the germ, bran, and husk. However, the United States and several other countries mandate vitamin-B enrichment of cereals and other grain products to restore some of the lost vitamins and minerals.

Thiamin

Thiamin, also known as vitamin B_1, plays an important role in many energy reactions. It is the vitamin portion of the coenzyme thiamin pyrophosphate (TPP). TPP participates in a vital reaction known as decarboxylation, which removes a carboxyl group and releases it as carbon dioxide. During glucose metabolism, for example, decarboxylation removes one carbon from the three-carbon substance pyruvate to form the two-carbon molecule acetyl CoA. TPP is also involved in a decarboxylation step in the citric acid cycle, and it also plays a role in nerve function. Thiamin is easily destroyed by heat.

Thiamin deficiency is usually related to heavy alcohol consumption and often seen along with limited food consumption. Older adults may be at risk for thiamin deficiency due to inadequate energy intake or consumption of nutrient-poor foods. Beriberi, a thiamin deficiency disease, occurs among people whose major source of energy is polished rice. Polishing removes the rice hulls and therefore the thiamin. Inadequate intake of thiamin also affects the cardiovascular, muscular, nervous, and gastrointestinal systems, which depend on thiamin to fuel their activities. The brain and nervous system rely on glucose for energy, and thiamin as part of TPP is vital in glucose metabolism. Because thiamin and several other B vitamins are present in the same foods, thiamin deficiency and other B vitamin deficiencies occur together. Wernicke-Korsakoff Syndrome, often a result of chronic alcohol abuse or malnutrition, also results in thiamin deficiency. Thiamin toxicity has not been reported. Excess intakes are excreted rapidly by the kidneys.

Thiamin is found in many foods. Pork is a very rich source, and legumes and some nuts and seeds are good sources. In the United States, most of our dietary thiamin is obtained from enriched or whole-grain products such as rice, bread, pasta, and ready-to-eat cereals.

Riboflavin

Riboflavin, also known as vitamin B_2, is part of two coenzymes: flavin mononucleotide (FMN) and flavin adenine dinucleotide (FAD). These coenzymes participate in several metabolic pathways, including the citric acid cycle and the beta-oxidation pathway that breaks down

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fatty acids. Both of these enzymes are crucial for energy metabolism. Riboflavin-containing coenzymes also participate in reactions that involve the removal of ammonia during the deamination of some amino acids. Riboflavin deficiencies are unknown. Alcoholism along with a poor diet can be a risk factor for riboflavin deficiency. Long-term use of barbiturate drugs and repeated exposure to these drugs accelerate riboflavin metabolism. Chronic conditions such as cancer, heart disease, and diabetes may worsen a riboflavin deficiency. Toxicity of riboflavin has not been reported.

Milk, milk products, breads, and ready-to-eat cereals provide most of our riboflavin. This vitamin (along with thiamin, niacin, folic acid, and iron) are added to enriched products. Organ meats are good sources of riboflavin. Mushrooms, spinach, and tomato paste are also good sources of this vitamin.

Niacin

Niacin, also known as vitamin B_3, is the name for two similarly functioning compounds: nicotinic acid and nicotinamide (also known as niacinamide). Like the other B vitamins, it is a coenzyme and participates in various metabolic pathways. The coenzymes of niacin, namely nicotinamide adenine dinucleotide (NAD–) and nicotinamide adenine dinucleotide phosphate (NADP+), play vital roles in oxidation-reduction reactions. They also play a key role in glycolysis (extracting energy from carbohydrate and glucose), fatty-acid synthesis, and the deamination of amino acids. Niacin also is known to help lower blood cholesterol (LDL) levels and reduce blood pressure. Resistant to the effects of heat, light, air, acid, and alkali, niacin is one of the most stable B vitamins. Because the amino acid tryptophan is a niacin precursor, the body can produce niacin in the presence of adequate dietary tryptophan. Adequate riboflavin, vitamin B_6, and iron are also needed for this conversion.

The niacin deficiency disease pellagra, which can lead to death, is best described by its classic symptoms: dementia, diarrhea, and dermatitis. Pellagra was widely prevalent in those parts of the world where corn was a dietary staple. A protein in corn tightly binds niacin, thereby reducing its bioavailability. Nixtamalization is an ancient practice that helps to release the maize's niacin and involves alkaline steeping, soaking, draining, and washing whole-kernel maize before grinding it. A modernized version of this method is now widely used in countries where corn is a staple food. Deficiencies of iron and vitamin B_6 may also contribute to pellagra. Consumption of large doses of niacin supplements can cause flushing, nausea, and blurred vision.

The best food sources of niacin are organ meats, beef, poultry, fish, sunflower seeds, and peanuts. Foods that contain tryptophan, including red meats, poultry, eggs, and dairy products, are also good sources of niacin. Fortified foods such as breads and ready-to-eat cereals are common sources of niacin.

Vitamin B_6

Vitamin B_6 is also known as pyridoxine. It is a group of six compounds with vitamin B_6 activity: pyridoxine (an alcohol), pyridoxal (an aldehyde), pyridoxamine (which contains an amino group), and their respective 5-phosphate esters. Pyridoxal 5 phosphate (PLP) and pyridoxamine 5 phosphate (PMP) are the active forms of vitamin B_6 (21,22). Vitamin B_6 as a coenzyme is involved in more than 100 enzyme reactions, most involved with protein metabolism. Both PLP and PMP are involved in amino-acid metabolism. PLP is also involved in the metabolism of one-carbon units, carbohydrates, and lipids (23). Vitamin B_6 also plays a role in cognitive development through the biosynthesis of neurotransmitters, and in the maintenance of normal homocysteine in the blood. It is also involved in immune functions and hemoglobin formation (23).

Although deficiency of vitamin B_6 is rare, inadequate vitamin B_6 status can occur along with low levels of vitamins B_{12} and folic acid. Vitamin B_6 deficiency is associated with microcytic anemia, depression, confusion, and weakened immune function. Malabsorption syndromes, ulcerative colitis, and kidney diseases can result in vitamin B_6 deficiency. Alcoholism increases the risk for vitamin B_{12} deficiency because alcohol decreases absorption of the vitamin and interferes with the synthesis of the coenzyme PLP.

In the United States the primary source of B_6 is from fortified foods, such as cereals. Other foods rich in this vitamin are meats, bananas, carrots, and potatoes. Vitamin B_6 is not stable when heated, resulting in significant losses when foods are cooked.

Vitamin B_{12}

Vitamin B_{12} exists in several forms and contains the mineral cobalt. Cobalamin is part of a group of cobalt-containing compounds. Methylcobalamin and 5-deoxyadenosylcobalamin are the forms of vitamin B_{12} active in human metabolism. Vitamin B_{12} is necessary for proper red blood cell formation, neurological function, and DNA synthesis. It also functions as a cofactor for methionine synthase. Symptoms of vitamin B_{12} deficiency include fatigue, weakness, weight loss, constipation, neurological changes, depression, dementia, poor memory, and megaloblastic anemia. Atrophic gastritis, a condition affecting 10–30% of older adults, decreases secretion of hydrochloric acid in the stomach, resulting in decreased absorption of vitamin B_{12} (24). The decrease in hydrochloric acid levels can also lead to an increase in the growth of normal intestinal bacteria that use vitamin B_{12}, thus reducing the amount of vitamin B_{12} available to the body. Older adults with atrophic gastritis, gastrointestinal disorders, or gastrointestinal surgery are unable to absorb the vitamin B_{12} that is naturally present in food. Because dietary sources of vitamin B_{12} are limited, strict vegetarians and vegans are at greater risk for vitamin B_{12} deficiency than are lacto-ovo vegetarians and non-vegetarians.

Vitamin B_{12} plays a key role in folate metabolism. Methionine synthase, which is an enzyme dependent on vitamin B_{12}, functions in the methylation cycle. This cycle is necessary to maintain the supply of the methyl donor S-adenosylmethionine, and if interrupted it results in a reduction of a wide range of methylated products. One such important methylation process is the reduction of myelin basic protein, as seen in pernicious anemia (PA). The relationship between impairment of the methylation cycle and anemia is explained by the "methyl trap" hypothesis. It suggests that when the folate cofactor 5-methyltetrahydrofolate (THF) is formed, the enzyme 5,10-methyleneTHF reductase that forms the cofactor cannot use it in the back reaction *in vivo*. Thus the only way for this folate cofactor to be recycled to THF is through the methionine-synthase enzyme, which is dependent on vitamin B_{12} (25). When the activity of the enzyme is compromised, as it is with PA, the cellular folate is trapped as 5-methylTHF, which results in neuropathy and/or anemia. Treatment with vitamin B_{12} reactivates methionine synthase, allowing the

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trapped folate to be released and resumes regeneration of erythrocytes (26). Vitamin B_{12} enzymes also work with tetrahydrofolic acid (THFA) to convert homocysteine to methionine, thus reducing the homocysteine blood levels and decreasing the risk of heart disease.

Vitamin B_{12} deficiency affects about 30% of adults over 60 years of age (27). Deficiencies of vitamin B_6, B_{12}, and folate have been associated with a risk of vascular disease. Homocysteine blood levels are influenced by dietary intake of B_6, folate, and vitamin B_{12}. Low intakes of B_6 or folate can result in high homocysteine levels. Other recent studies have also demonstrated a connection between low levels of B vitamins and cognitive decline. Age-related cognitive abilities ranging from benign memory loss to progressive dementia may be affected by deficiencies of folate and vitamin B_{12}, resulting in elevated homocysteine levels among the elderly population. An interesting study conducted in Scotland (28) with healthy, community-based older adults over 70 years of age, concluded that concentrations of folate and vitamin B_{12} were positively associated with cognitive ability after control for childhood IQ. Von-Arnim, et al. (28) determined the effect of daily micronutrient supplementation for a two-month period on blood and tissue levels and on general nutritional status among 58 patients, aged 61 to 81 years, living independently in Germany. They concluded that daily micronutrient supplementation improved serum micronutrient status, with improved metabolic markers for B vitamins but not for intracellular antioxidant status. More recently, Qi, et al. (29) assessed the prevalence of vitamin B_{12} deficiency in the absence of anemia and macrocytosis, before and after fortification among nationally representative Americans older than 50 years of age, using cross-sectional data from the NHANES 1991–1994 (prefortification) and 2001–2006 (postfortification). Their results suggest that the prevalence of low serum vitamin B_{12} status in the absence of anemia and macrocytosis among older adults did not increase after fortification.

Vitamin B_{12} is found naturally only in foods from animal sources, such as meats, liver, and milk. Fortified foods such as cereals are good sources of vitamin B_{12}.

Folate

Folate (also known as folic acid or folacin) is a generic term for naturally occurring food folate and folic acid; the latter is the fully oxidized monoglutamate form found in dietary supplements and fortified foods (30). Folate functions as a coenzyme and plays a role in the metabolism of amino acids and the synthesis of nucleic acids. One of the most important folate-dependent reactions is the conversion of homocysteine to methionine in the synthesis of S-adenosylmethionine. Another important folate-dependent reaction is the methylation of deoxyuridylate to thymidylate in the formation of DNA, which is required for proper cell division. An impairment of this reaction can result in megaloblastic anemia, a hallmark of folate deficiency (21,31). Isolated folate deficiency is uncommon, and it usually coexists with other nutritional deficiencies. Alcoholism, poor diet, and malabsorption disorders can result in folate deficiency. Older adults with alcohol dependency along with a poor diet that does not provide adequate amounts of folate can become folate deficient. Alcohol interferes with folate absorption and metabolism and accelerates its breakdown. Several medical conditions, such as malabsorption disorders, inflammatory bowel disease, atrophic gastritis, and gastric surgery can also reduce folate absorption. Folate along with vitamin B_{12} is known to lower homocysteine levels, thereby reducing the risk for cardiovascular disease and stroke.

In 1998 the U.S. Food and Drug Administration mandated that all grain products be fortified with folic acid to reduce neural-tube defects in infants (32). This fortification has led to improvements in the folate status of all age groups, including the older population. In fact, older adults exhibited the highest red blood cell (RBC) folate levels in the most recent NHANES survey (16).

Enriched grains and cereals, a variety of vegetables (including leafy greens), lentils, enriched orange juice, and liver are sources of dietary folate. Folate is highly sensitive to heat, ultraviolet light, and exposure to oxygen. Approximately 50 to 90% of folate present in foods is destroyed during cooking, processing, and other preparation methods. Folate-rich foods such as fruits and vegetables should be consumed raw, or cooked quickly in minimal amounts of water via steaming, stir-frying, or microwaving to reduce cooking losses. Vitamin C functions in changing folate to its active form.

Vitamin C

Vitamin C is also known as ascorbic acid. Humans are unable to synthesize vitamin C, so it must be obtained from dietary sources. An antioxidant that minimizes free-radical damage in cells and boosts immunity, vitamin C is required for the synthesis of collagen, the neurotransmitter norepinephrine, and the mitochondrial lipid-transporter carnitine. Vitamin C also functions in oxidative-reduction reactions.

Collagen is an essential component of connective tissue, which plays an important role in wound healing. As an antioxidant, vitamin C has been shown to regenerate other antioxidants within the body, including alpha-tocopherol (vitamin E) (33). Additionally, vitamin C is important for immune function and improves the absorption of dietary iron. High levels of vitamin C are stored in cells and tissues, with the highest present in leukocytes (white blood cells), the eyes, the adrenal glands, the pituitary gland, and the brain. Low levels are found in extracellular fluids such as saliva, plasma, and red blood cells. The intestinal absorption of vitamin C is regulated by at least one dose-dependent active transporter. Oxidized vitamin C (dehydroascorbic acid) enters cells via some facilitated glucose transporters and is then reduced internally to ascorbic acid.

Scurvy is the most well-known manifestation of vitamin C deficiency. Symptoms include fatigue (possibly due to impaired carnitine biosynthesis), inflammation of the gums, and malaise. As deficiency progresses, connective tissue becomes weakened and collagen synthesis becomes impaired, resulting in joint pain, hyperkeratosis, poor wound healing, swollen and bleeding gums, loss of teeth, and capillary fragility. Iron-deficiency anemia can occur from reduced absorption resulting from low vitamin C intake. Smoking increases vitamin C requirements by 30–50% (35). People who consume a limited variety of foods are at risk for vitamin C deficiency. So are alcohol and drug abusers, because they may not obtain adequate amounts of vitamin C. The third National Health and Nutrition Examination Survey (NHANES 111; 1988–1994) found that 19% of older Americans ages 65 to 74 years old had vitamin C deficiency (34). Tan and Flood (35) indicate that increased intakes of vitamin C may reduce the risk of developing age-related cataracts.

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Although vitamin C toxicity is uncommon even when large doses are consumed, taking more than 2,000 milligrams per day for prolonged periods of time can cause nausea, abdominal cramps, and diarrhea. In older adults with kidney disease, excess vitamin C may contribute to oxalate-containing kidney stones. High vitamin C intakes can be a problem for people with hemochromatosis, a metabolic disease that causes excess iron accumulation.

Fruits and vegetables are the best sources of vitamin C. Citrus fruits and their juices, peppers, broccoli, tomatoes and tomato products, kiwifruit, strawberries, and Brussels sprouts are very good sources of vitamin C. Vitamin C is the most sensitive vitamin and is easily destroyed by exposure to air (oxidation), alkali, and overcooking. Since older adults generally prefer to eat overcooked vegetables or have difficulty chewing raw fruits and vegetables, their diets need to be planned well to ensure adequacy for vitamin C and suitable food choices.

MINERALS

Minerals are essential inorganic elements, unchanged by digestion or when the body uses them during biochemical processes. They also make up important structures in the body, such as bones, and are found in cells, tissues, and hormones. Like vitamins, minerals play a role in facilitating normal body functions, including energy production, metabolism, and cell repair. Minerals work in synergy with vitamins. The minerals required in larger amounts are classified as major minerals, and those needed in very small quantities are classified as trace minerals.

Calcium

Calcium is the most abundant mineral in the body. Ninety-nine percent of calcium is stored in the bones and teeth, where it supports their structures and functions. The remaining 1% supports vascular contraction and dilation, muscle function, nerve transmission, intracellular signaling, and hormonal secretion.

Calcium is essential for the formation of fibrin, the fibrous protein that makes up the blood-clotting structure. Serum calcium is tightly regulated and does not fluctuate with changes in dietary intakes (36). The body uses bone tissue as a reservoir to maintain constant concentrations of calcium in the blood, muscle, and intercellular fluids. Bone undergoes continuous remodeling, with constant resorption and deposition of calcium into new bone. There is a constant change in this balance depending on age. In older adults, especially among menopausal women, bone breakdown exceeds formation, resulting in bone loss and increasing the risk for osteoporosis (36).

Efficiency of calcium absorption decreases as calcium intake increases, and also as age increases, dropping to 15-20% in adulthood with continued decline during the aging process. Vitamin D improves calcium absorption. Phytic acid and oxalic acid, found in some plant foods, bind to calcium and inhibit its absorption. A high intake of protein and sodium increases calcium excretion. Alcohol intake reduces absorption of calcium. Several factors associated with aging contribute to altered calcium balance. A decrease in vitamin D absorption coupled with a decreased production of cholecalciferol in the skin, impaired formation of 1,25-dihydroxyvitamin D by the kidney, and a reduction of vitamin D receptors in the intestinal epithelium cause a decline in calcium absorption.

Inadequate intake of calcium is not evident in the short term, as circulating blood levels of calcium are tightly regulated. Hypocalcemia usually occurs from renal failure, surgical removal of the stomach, and use of certain medications such as diuretics. Symptoms of hypocalcemia include muscle cramps, convulsions, abnormal heart rhythms, and numbness. Over a longer period of time, an inadequate intake of calcium causes osteopenia, which, if not treated, can lead to osteoporosis. Older adults with calcium deficiency are faced with the risk of fractures. Postmenopausal women face more bone loss due to decreased estrogen production, increased bone resorption, and decreased calcium absorption. Lactose intolerant older adults are at risk of calcium inadequacy if they do not eat dairy products. Vegetarians might absorb less calcium because they consume more plant-based foods containing oxalic and phytic acids. Hypercalcemia (high levels of calcium in the blood) can cause renal insufficiency, vascular and soft-tissue calcification, hypercalcuria, and kidney stones.

The aging process leads to a decline in renal function, resulting in calcium malabsorption and accelerated bone loss. Hence the requirements for calcium and vitamin D increase with aging.

A review of 16 observational studies assessing hip fracture and calcium intake found that an increase in usual calcium intake of 1 gram per day was associated with a 24% reduction in the risk of hip fracture among postmenopausal women (37). Although calcium carbonate is well absorbed and tolerated by most people, Lanham-New recommends the use of calcium citrate for elderly patients with absorption problems, such as achlorhydria or inflammatory bowel disease (38).

Dairy products provide more than half of the calcium in the typical American diet. Tofu processed with calcium salt, canned fish with bones, and calcium-fortified foods are additional foods rich in calcium. Green leafy vegetables such as spinach have a high calcium content, but most of the calcium is bound to oxalate and therefore cannot be absorbed. Several brands of orange juice, cereal, bread, and yogurt are fortified with calcium.

Magnesium

Magnesium is the fourth most abundant cation in the body. About 50-60% is found in the bones, and the remainder is equally distributed between muscle and other soft tissue. Magnesium is a cofactor in more than 300 enzyme systems that regulate diverse biochemical reactions in the body, including protein synthesis, muscle and nerve function, blood glucose control, and blood pressure regulation (39). It is essential for the functions of the cardiac, neuromuscular, and central nervous systems. Magnesium is required for energy production, oxidative phosphorylation, and glycolysis. It also contributes to the structural development of bone. Magnesium plays a role in the active transport of calcium and potassium ions across cell membranes, a process important for muscle contraction, nerve impulse conduction, and normal heart rhythm (40).

Magnesium deficiency due to low dietary intake is uncommon, because the kidneys limit urinary excretion of magnesium. Hypomagnesemia occurs with a variety of diseases, including kidney disease, and is associated with chronic alcoholism and certain types of diuretics. Prolonged diarrhea and poor diet can also cause magnesium deficiency. Early signs of magnesium deficiency include loss of appetite, nausea, vomiting, fatigue, and weakness. As

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deficiency worsens, muscle contractions, seizures, abnormal heart rhythms, and coronary spasms can occur. Severe magnesium deficiency can result in hypocalcemia or hypokalemia, because mineral homeostasis is disrupted. Hypermagnesemia is uncommon in the absence of kidney disease. Too much magnesium from foods does not pose a risk in healthy adults, because the kidneys eliminate excess amounts in the urine.

Using elderly survivors from the original cohort of the Framingham Heart Study, Tucker, et al. investigated the relationship between dietary magnesium intake and bone mineral density at five hip sites and one forearm site (41). Over the four-year study period, they determined that greater intakes of magnesium were associated with significantly smaller losses of bone mineral density at two hip sites in men. No significant differences between bone loss and dietary mineral intake were identified in women after four years. In a more recent study, Odabasi, et al. identified a statistically significant difference between osteoporotic and healthy subjects in red blood cell magnesium concentration (42).

Magnesium is present in a variety of foods, namely legumes, whole grains, green leafy vegetables, fruits, nuts, seeds, fish, and dairy products. When whole grains are processed, the bran and germ are removed, which decreases the magnesium content.

Phosphorus

Phosphorus serves many roles in the biochemical reactions of cells, and has a crucial role in maintaining bone mineral density along with calcium. Deficiency of this mineral may serve as a marker of general nutritional inadequacy, similar to protein deficiency seen in the elderly, and could lead to an increased risk of fracture. It is important that the necessary ratio of phosphorus to calcium be maintained for the elderly.

A healthy diet that incudes adequate servings of fruits and vegetables, whole grains, nuts and other nutrient-dense foods can help to optimize the intake of phosphorus, magnesium, potassium, vitamin C, vitamin K, and other nutrients required for bone health.

Milk and milk products, meats, and eggs are very good sources of phosphorus. Other foods such as legumes and nuts are good sources of phosphorous. In general, foods rich in protein are also rich in phosphorus. Food additives, especially those used in processed meats and soft drinks, are high in phosphorus.

Iron

Iron has several vital functions in the body. It is necessary for growth, development, normal cellular functioning, and synthesis of some hormones and connective tissue (43). It is a component of the two heme proteins hemoglobin and myoglobin. Hemoglobin in red blood cells transports oxygen to the tissues, and myoglobin in muscle facilitates the movement of oxygen into muscle cells. Iron also serves as a cofactor in several enzyme reactions and in the synthesis of neurotransmitters. It is also essential for optimal immune function and as a transport medium for electrons within cells. Dietary iron has two forms: heme iron (from animal meat products) and non-heme (from plant foods). The bioavailability of heme iron is higher than that of nonheme iron, because it is not affected by inhibitory factors (44). The phytates, polyphenols, tannins, and fiber present in plant foods inhibit iron absorption, so the bioavailability of iron from plant foods is much lower than that from animal foods.

Iron deficiency is uncommon in the United States. Because iron deficiency is associated with poor diet, malabsorption disorders, and blood loss, older adults with iron deficiency usually have other nutrient deficiencies. Iron deficiency is more common among hospitalized, institutionalized, or chronically ill older adults (11). The main causes in people with cancer are chronic anemia and chemotherapy-induced anemia.

As discussed previously, two other types of anemia – caused by either a deficiency of folate or vitamin B_{12} – are megaloblastic anemia and pernicious anemia. Megaloblastic anemia is a blood disorder marked by the appearance of very large blood cells, whereas anemia resulting from a lack of intrinsic factor (IF) is called pernicious anemia. The body's inability to make IF may be the result of several factors, such as chronic gastritis, gastrectomy, or an autoimmune disease.

Data regarding the non-institutionalized, community-dwelling, older American population obtained in the NHANES III survey (1988–1994), reported by Guralnik, et al., indicates that for adults ages 65 years and older, the prevalence of anemia was 11% in men and 10.2% among women (45).

The richest sources of heme iron in the diet are red meats and seafood. Dietary sources of nonheme iron include legumes, nuts, beans, spinach, iron-enriched bread, cereals, and grains. Heme iron has higher bioavailability than nonheme iron does. Iron absorption from foods can be improved by including foods rich in vitamin C. Calcium might reduce the bioavailability of both nonheme and heme iron.

Zinc

Zinc is an essential trace element. It is required for the catalytic activity of approximately 100 enzymes. Zinc plays a role in immune function, protein synthesis, wound healing, DNA synthesis, and cell division (46). Zinc is required for proper sense of taste and smell.

Several factors including malabsorption, trauma, muscle wasting, physiologic stress, alcohol abuse, and medications contribute to poor zinc status among the elderly population. Adherence to a strict vegetarian or vegan diet also compromises zinc status, because the bioavailability of zinc from vegetarian diets is lower than with non-vegetarian diets. Beans and whole grains, which are commonly consumed by vegetarians, contain phytates that bind zinc and inhibit its absorption. Zinc deficiency can result in reduced immune function, dermatitis, impaired wound healing, and loss of taste acuity.

Results from NHANES II (1976–1980), reported by Briefel, et al. (47), identified women and men older than 70 years of age as having some of the lowest intakes of dietary zinc.

Zinc is present in protein-rich foods such as red meat, seafood, oysters, and clams. The availability of zinc from plant sources such as legumes, rice, grains, and cereals is reduced because of the phytate content of these foods.

SUMMARY

Older adults are living longer and will continue to become a significantly larger segment of the population. Undernutrition and micronutrient deficiencies are reportedly common, particularly among the hospitalized or institutionalized older adults. Adequate intake of several micronutrients is a challenge for older adults, including

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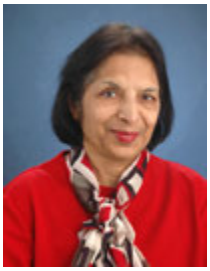
vitamins A, C, D, E and folate; and minerals such as calcium, magnesium, iron, and zinc (1). Appropriate nutritional intervention as part of total care can be vital for mitigating the burden of chronic disease and disability, thereby improving the quality of life for older adults.



Vijaya Jain *is currently a nutrition consultant in New York, and an active board member of the New York State Women, Infants and Children (WIC) Association. As a registered dietitian since 1979, she has over 30 years of experience in planning, directing, and coordinating nutrition programs in diverse settings. At the University of Illinois, Ms. Jain served as the director of the Graduate Internship Program and as a senior nutrition specialist. She has led the efforts to enhance school lunch programs with soy-protein foods in India and Central America, in partnership with the World Initiative for Soy in Human Health, the primary goal of which is to create sustainable solutions to the problem of protein malnutrition around the world. Ms. Jain also coordinated research and education efforts in Central America for the introduction of soy and whey-based multi-micronutrient supplements, and for the development of microenterprise projects for families afflicted with HIV/AIDS. She was actively involved with Illinois Soy, which aims to improve the nutritional profile of the Illinois elementary and secondary school lunches and reduce obesity among school-aged children. As a clinical nutritionist at the New York Presbyterian Hospital of Columbia and Cornell Universities, Ms. Jain provided nutrition counseling to nutritionally vulnerable groups and individuals. At the Ossining Open Door Health Center in New York, she was Director of the WIC program.*

She received her MS degree from the University of Illinois at Urbana-Champaign, her MSc degree from the University of Madras, and her BSc degree from the University of Bangalore. Ms. Jain is the recipient of Distinguished Service Awards from the New York State WIC Association (2005) and the New York State Metropolitan WIC Association (2000). She is also a certified cardiovascular nutritionist and has served as co-chair of the nutrition committee of the American Heart Association.

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MEMBER SPOTLIGHT By Heather A. Goesch, MPH, RDN, LDN

Elisa Zied, MS, RDN, CDN, has spent the majority of her career as a dietitian focusing on families, especially women and children. Inspired by the particular health and nutritional challenges women face in life, she wrote her latest book, *Younger Next Week*, published by Harlequin Nonfiction in January 2014. Elisa uses her media presence, blogs, books, and public speaking to spread her messages about nutrition, achieving and maintaining a healthy body weight, preventing diet-related diseases, and staying active and fit. A proud member of the Women's Health DPG, Elisa is a past chair and member of the WH DPG's nominating committee. She is also a past Academy spokesperson.

Tell us a little about your professional background and your career path. After receiving my BA in psychology from the University of Pennsylvania in 1991, I pursued a master's degree in counseling psychology at New York University. But after one semester in graduate school, I decided to switch my focus to clinical nutrition instead. Even though I took only two nutrition courses as an undergraduate—the only two offered at Penn—I really loved learning about nutrition. Luckily I was able to complete the prerequisite dietetics courses while pursuing my master's degree.

I graduated in 1995, practiced as a clinical dietitian at a local hospital for more than a year, and then opened my own nutrition-consulting firm. At the same time, I began to do some nutrition writing for free—writing letters to the editor published in *The New York Times* and other outlets, and articles for various nutrition newsletters. My first paid writing opportunity was for *Environmental Nutrition Newsletter*, and eventually I became a contributor to several magazines including *Seventeen, Redbook, Woman's Day, Weight Watchers*, and *Parents*. I also pursued book writing and landed a two-book deal with John Wiley and Sons, Inc. in 2005. I have now written a total of four consumer titles.

Besides writing, I became active in the media, granting interviews for print and web publications as well as television. I have also given lectures and talks to professional and consumer groups over the years. I was a media representative for the New York State Dietetic Association for four years, followed by an amazing six-year stint as a spokesperson for the Academy of Nutrition and Dietetics. As my writing and media opportunities increased, I decided to focus on that rather than private counseling—writing was and always has been my passion. I now write my own blog for www.parents.com called The Scoop on Food, and also blog as a contributor for www.USNews.com and www.Shape.com. In addition, I am a freelance writer for other publications, continue to contribute as an expert in print, online, and on-air formats for various media outlets, and work as a spokesperson and speaker for a variety of food and nutrition corporations.

Describe your current job and plans for the future. In 2010 I founded Zied Health Communications, LLC, in New York City. I use this food and nutrition communications company to write books, articles, and blogs, conduct spokesperson work, and give talks to professionals and consumers. Having counseled clients privately for more than a decade while raising my children, I eventually realized that my skills were better suited to communications. Because I've always tried to balance my professional and family life, moving away from one-on-one counseling has afforded me the time to enhance my writing and communication skills through writing, speaking and spokesperson opportunities to reach and motivate a much wider audience.

As an active, goal-oriented, midlife woman, I am especially interested in nutrition, food, fitness, and lifestyle as it relates to managing stress, preserving vitality and vigor, and enhancing overall health—especially as we get older. In response to that, I trademarked the concept of Stressipes®—remedies for how stress affects your diet and lifestyle habits. I created a five-part Stressipes® video series. I also write a Stressipes® blog, create a bimonthly Stressipes® e-zine, and plan to create more content based on the brand in the future. I will continue to write and present about women's health and nutrition in various ways in years to come, and hope to someday have a web or TV show built on Stressipes®.

You recently published your fourth book, *Younger Next Week*. What inspired you to write it? Before I put pen to paper to write my latest book, I noticed how various stressors were taking their toll on many of my friends: marital, financial, and health problems; deaths in the family or among close friends; and even just day-to-day challenges at work or at home while raising children or caring for older parents. I realized that the stress was impacting how they cared for themselves, and subsequently how they looked and felt. Not long after I turned 40, I went through what I refer to as a "mid-life 40 crisis," including a painful wrist that eventually required surgery and even a few cancer scares. Normally an active and positive person, these personal health challenges, coupled with all the stress many close friends were experiencing, left me feeling sidelined and debilitated. While I didn't become depressed, I felt close to it and knew I had to do something to get back to feeling like myself again. I did extensive research on the link between stress and health. Then I wrote *Younger Next Week* to help women—singles, new moms, midlife, and older women—prioritize the care and nurturing of their minds, bodies, and spirits, no matter what's going on in their lives. The book helps women better manage stress, eat more nutritiously and enjoyably, sit less and live a more active lifestyle, and get the sleep they need. The result: a book that gave myself—and women everywhere—a permission slip and road map so that we could feel empowered to care for ourselves without guilt, in a way that helps us look and feel our absolute best, even while juggling a million things at once.

Has the book prompted you to modify your role as a registered dietitian nutritionist in any way? Since the book was published in January 2014, I've shared my personal messages and Stressipes® in personal and media appearances. While writing and then sharing the book with others, I found that I enjoy motivating and empowering people to tweak their lifestyles to support their end goals, particularly looking and feeling their best and aging in the best, most

Continued on page 12

healthful way possible. I love researching how different foods, nutrients, dietary patterns, and eating habits affect health, mood, and satiety. I enjoy staying up to date on research that relates to nutrition, food, stress, diet, and fitness. I also enjoy learning about the psychological aspects of motivation and behavior change; without that, all the education and information in the world won't matter much. Although my day-to-day job hasn't changed much, I always look for new opportunities and creative vehicles to share sensible, science-based messages that resonate with others.

What are your book's top take-away messages related to the nutrient needs of aging and older adults? One of the top messages for all adults is to focus not just on individual foods and nutrients but on an overall dietary pattern. When it comes to health and well-being, total intake throughout the day and week matters far more than one meal or one day of eating. Many adults, women in particular, get caught up on the latest fad pushing a few miracle foods that "help you lose weight" or "help you live longer," or diets that ban specific ingredients such as wheat because it "causes every health problem under the sun."

My philosophy is that all foods can fit into a basically healthy diet. Of course nutrient-rich, plant-based foods like produce, whole grains, and beans should comprise a big part of the diet. But in order to look and feel your best, it's more about finding your own personal balance in the dietary choices you make in the context of an active lifestyle. We should be able to enjoy food, not feel guilty when we eat, and learn how to eat enough—but not too much—so we can maintain a healthy body weight, optimize our health, and prevent disease. And when it comes to nutrient-poor foods and beverages, I would much rather someone learn to eat those things in small portions and less often, rather than eliminate them outright and subsequently feel deprived. In my opinion, the former approach is likely more realistic and sensible in the long run.

Are there specific issues you would like to see researchers address in the field of nutrition? I'd love to see more research that adequately addresses the link between different types of stress and the perception of stress with diet, exercise, sleep, mood, and overall health. There's so much we still need to uncover, and researchers have only recently scratched the surface. My hope is that in uncovering more data, we as dietetics practitioners can better help older adults learn how to adapt their intake and activity levels to meet the unique needs associated with aging, and have the science-based proof to back it up.

As a woman who is passionate about women's health, I also hope that future research sheds more light on how to best care for and nurture ourselves nutritionally, physically and emotionally to ease the hormonal and other changes that occur with age, ultimately helping us live our best, most vibrant lives.

Do you have any final words of wisdom for your fellow dietetics practitioners? Dietetics practitioners must consider the whole person and his or her overall lifestyle and circumstance, whether through one-on-one or group counseling, writing, public speaking, or some other role. There's no "one size fits all" approach to help people eat and live better, since no two individuals are alike. That's why I believe it's vital to consider the nutritional, physical and emotional status of each person; to be nonjudgmental when it comes to habits, attitudes, health, and lifestyle; and to understand readiness to adapt behaviors. It's also important to consider their unique goals when helping them create a sensible and sustainable eating plan as part of a comprehensive lifestyle. We need to consider the unique nutritional and psychological needs of women as they get older, and help them create a way of life that is empowering so they can continue it—and tweak as needed—for years to come.

NEW WEB SITE COMING SOON! The leadership team of the Women's Health DPG is excited to share that we are working on a brand new Web site for our practice group. The Web site will not only have a new design, but will have enhanced functionality and usability powered by WordPress. Current resources such as past newsletters and archived webinars will be easier to access, and we plan to add new tools such as a member marketplace and a member discussion forum. Take a sneak peek of the new look, and stay tuned over the next few months as we roll out the new site!

MEMBER SPOTLIGHT By Heather A. Goesch, MPH, RDN, LDN

Susan Saffel-Shrier, MS, RDN, CD, CSG, has focused her career on nutrition and aging. Her article, "Residency Redesign to Accommodate Trends in Geriatrics: An RC-FM Variance to Establish a Patient-Centered Medical Home in an Assisted Living Facility," was published in the February 2012 issue of *Family Medicine*. Susan is a member of the Healthy Aging DPG.

Tell us a little about your professional background and your career path. I received both my master's degree in nutrition and my graduate certification in gerontology from the University of Utah. I knew as an undergraduate that I wanted to work with older adults. After teaching several years in the Division of Nutrition at the University of Utah, I transferred to the Family Medicine Residency Program, Department of Family and Preventive Medicine, School of Medicine. My initial position was as an RDN/gerontologist with the geriatric team responsible for geriatric nutrition and gerontology clinical education. I am currently the director of geriatric education for Family Medicine Residency, and was recently promoted to full professor (clinical).

In addition to providing clinical training and managing the residency program, I have created multiple interprofessional teams to enhance the care of the older adult and encourage direct interactions between team members to include RDNs. The faculty portion of these teams consists of a geriatrician, physician assistant (PA), pharmacist, and dietitian; and learners include family medicine residents, PA students, pharmacy students, nutrition students, and sometimes a medical student.

Describe your current job and its focus on the micronutrient needs of a geriatric population. I have developed the residency's geriatric education program to focus on experiences spanning the continuum of care. These clinical services include senior centers, home visitations, an assisted-living facility, nursing homes, outpatient senior clinics, and hospice settings. I provide direct clinical education during home visits, as well as visits to the assisted-living facility and the outpatient senior clinics. I also provide didactics on geriatric nutrition.

I perform nutrition screening and assessment in all these settings. This includes evaluating the intake of micronutrients commonly deficient among older adults, including vitamins B_{12}, B_6, vitamin D, and calcium. Diet and supplements are reviewed for accuracy, which includes laboratory testing and treatment recommendations. Antioxidant intake is also evaluated based on fruit and vegetable intake, along with food-group consumption.

When working with a geriatric population, what are the most common nutrition concerns you see, and how do you address them? As one ages, numerous biological, social, and psychological changes can influence health and nutrition adequacy. In geriatrics, functional assessment is the cornerstone to evaluating health. Functional status refers to the ability to perform daily activities such as meal preparation, food shopping, transportation to grocery stores, cognition, continence, hydration, and feeding. Any deficits in these abilities can result in poor nutrition. Poor functionality in terms of daily-living activities is typically the first sign of a decline in health status, and is also an indicator of decreased life expectancy. Assessing function as a potential influence on nutrition can lead to identifying nutritional risk. As an example, a patient with mild to moderate dementia could have difficulties with all levels of meal preparation, including a limited ability to drive to and from grocery stores, select nutritious foods, and follow recipes.

From a biological perspective, we know that vitamin B_{12} deficiencies are common among older adults. This is due to an age-related change in gastrointestinal bioavailability of this vitamin. Therefore, a vitamin B_{12} laboratory test (methylmalonic acid) is ordered routinely. A vitamin B_{12} deficiency is related to cognition issues and anemia, which can have a significant negative impact on functional status.

How do you view the research conducted in these areas? Understanding the role of nutrition in maintaining function is important for maintaining older adults' independence and reducing health care costs. This patient-centered aspect of health care needs further investigation. As we begin to focus on outcome-based care and reimbursement, dietetics practitioners need a better understanding of how nutrition can prevent and/or slow the progression of disease. We need more research in the area of longevity and nutrition. These longitudinal-type studies can direct future care options.

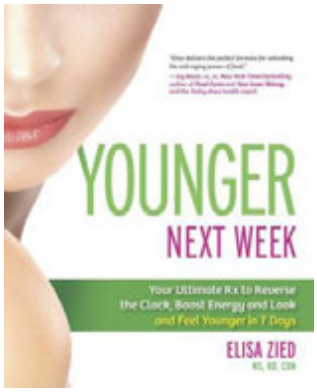
You recently coauthored an article about the importance of inter-professional teams in assisted-living facilities. How do you feel dietetics practitioners can improve quality of care and health outcomes? Team-based care has been a constant in geriatrics. In many settings the team is multidisciplinary. An interprofessional team takes this approach one step further by meeting face to face with the patient. We investigated how an interprofessional team utilizing a comprehensive geriatric assessment improves overall evaluation of functional status. One of these functions was nutritional status: sensory deficits, weight, dentition, protein, calorie, vitamin D status, and vitamin B_{12} status. We also found that when part of an interprofessional team included an RDN, the family-medicine residents and physician-assistant students improved in assessing nutritional status. Although there was an improvement in the learners' skills, the results were not statistically significant. I believe that this in part reflects the providers' familiarity and clinical skills in nutrition screening.

These results are not surprising to me, as nutrition is often inadequately addressed in medical training. In fact, recent medical schools' curriculum evaluations have shown a decrease in nutrition education from the minimum 25 hours. Training physicians to conduct accurate, thorough nutritional assessments is particularly important, since physicians are typically the first point of patient contact. Knowledge of nutritional screening is essential to ensure appropriate referrals. Interprofessional teams can also address appropriate nutrition screening and assessment when an RDN is a core team member and present at the point of care.

Any take-home messages for our readers? I feel dietetics practitioners need to play an active role in interprofessional geriatric teams. Research has shown that health professionals frequently know very little about the scope of their colleagues' expertise. It is important that we demonstrate our knowledge of nutrition and how to translate evidence-based nutrition into dietary recommendations. We need to emphasize food first and supplements (if needed) second.

The exciting news is that these opportunities are increasing as we move toward patient-centered medical homes, which emphasize outcome-based care. As dietetics practitioners, we also need to demonstrate our knowledge of micronutrient metabolism, appropriate laboratory testing, and dietary recommendations. We must be assertive in recommending lifestyle changes as a livable treatment option, one that can be complementary to other treatments.

BOOK REVIEW By Wendy Baier, RDN



In reading the catchy title, *Younger Next Week* seems like it may belong to the run-of-the-mill, quick-fix genre of diet books on the market. However, after the introduction it was apparent that this book is no fad, but rather a solid lifestyle guide.

The goals of this book are multifaceted. The author wants her readers to feel younger, more energized, empowered and have improved vitality – a key buzzword appearing throughout the publication. This may involve weight management, but doesn't have to. She also discusses ways to improve skin, hair, nails and other aspects of our appearance. This holistic approach to health through diet is refreshing; emphasizing that even trim folks can improve their health and wellbeing dramatically through eating. In addition to diet, she discusses the recommendations for sleep, exercise, general stress reduction, alcohol use, and the value of laughter.

The bulk of the book is exploring food composition, working its way from macronutrients down to vitamins, minerals and phytochemicals. Each chapter discusses the primary functions, consequences of deficiency, as well as practical foods to include in the diet. These chapters are rich with scientific studies, explanations, and effectively describe the science without dumbing it down. It does assume some nutrition knowledge on the reader's part (or at minimum, a handy dictionary!).

The "Vitality Diet Plan" appears in the final chapter, allowing the author to explain all the benefits of wholesome, real food, before giving the final takeaway. This gives the reader motivation to get through the details rather than simply skimming to the final plan.

Overall, her guidance is very nutritionally sound. She promotes all of the food groups (offering alternatives when necessary) with a particular emphasis on vegetables, dairy, peas/beans and "healthy" starchy carbohydrates. A wonderful feature of the book is that it includes charts describing the nutritional features of a wide range of foods, grouped into sections. This is easy for the reader to skim at first, but additionally serves as a guide for practically integrating these foods into the daily diet. She offers a great deal of flexibility, the true hallmark of a successful plan in my mind. In addition, there are 30 recipes at the end, and practical preparation tips sprinkled throughout.

As a Registered Dietitian, I enjoyed reading this book. It was a quick refresher course on micronutrients' function, and offered practical tips I know I will use in my practice. I would recommend this book to fellow RDs, as well as clients looking for the self-guided way to a fitter, younger and of course, more vital life.

PUBLIC POLICY WORKSHOP 2014 – My Perspective: No Longer a Rookie By Dawn Ballosingh, MPA, RD, LMNT

From L to R: Rita Batheja, MS, RDN, CDN, Dawn, and Denise Andersen, MS, RDN, LD, CLC

As the Legislative and Public Policy Coordinator for the WH DPG, I had the opportunity to attend the Public Policy Workshop (PPW) in Washington, D.C. in 2013 and again this year. It began with the pre-workshop Boot Camp, designed specifically for Beginner and Intermediate delegates. PPW Boot Camp attendees completed at least three webinars beforehand so they were better prepared to engage in discussion, ask questions, role-play, and meet with our representatives. This format allowed for more time to discuss complex issues affecting dietetics, the future health of vulnerable populations, and the surrounding political environment.

At the opening ceremonies, attendees were treated to the D.C. Color Guard and U.S. Navy Band for the "National Anthem" sung by the Academy's ANDPAC Chair, Brenda Richardson, as well as a tribute to the dietetics professionals in uniform. This year's workshop highlighted "focused messaging" and speaking with one voice, not only on issues impacting RDs, RDNs and DTRs, but also those that impact the individuals and families that we serve. Nutrition policy experts covered important legislative issues, including the Treat and Reduce Obesity Act, the Preventive Healthcare Savings Act, and the Reauthorization of the Older Americans Act. Overall, the speakers were engaging and the panels very informative.

Especially significant for me was a panel of four dietitians who are current or former public office holders. The panel members shared examples of issues and questions that they hear from their constituents, and how they typically prioritize issues of importance. This discussion was the perfect segue into the presentation that followed on the role and benefits of ANDPAC as it relates to Public Policy. Another significant aspect for me was a role-playing activity. It proved essential for our group of Nebraska delegates, as we had a new RDN with little work experience. When she took the lead to speak to her representative as both constituent and professional, we were able to provide relevant statistics and examples, and share our professional experiences, which facilitated a successful encounter with her representative. I was privileged to have participated in a legislative breakfast that featured every one of my state representatives in each of the houses of Congress. The event allowed me to bond informally with an aide I knew from Omaha, but did not know was a congressional aide. He was willing to give a listening ear to the professional issues in a more social setting.

Thanks to what I learned and took away from the previous PPW, I went in to this year's Workshop with greater confidence, both in speaking to my representatives and taking the lead if called upon to do so. I came armed with statistics and personal stories from my state on women's health issues, and how they could be negatively or positively impacted by the pieces of legislation that we were to discuss. Because I kept in touch with my representatives and their aides throughout the year, and kept them apprised of our state affiliate activities and the professional issues, I was recognized immediately and we were able to converse as friends. I learned the importance of this connectedness at last year's PPW and it certainly paid off. The longer I used my active listening skills, the more I learned of the intricacies in the process and the managed chaos inherent to passing legislative bills. I was also able to better identify points in the process where we best can advocate for our profession and specialties.

The PPW was once again exhilarating, and I very much appreciated the new structured preparation provided at the Boot Camp and Workshop itself. I even managed to have a little fun representing the WH DPG, when Academy President, Glenna McCollum asked me to play piano for the Public Policy Coordinator and Policy Ad Legislative MIG and DPG representatives' reception. And as will probably always be the case, the symbols and monuments that surrounded me in our nation's capital left me in childlike awe. So I leave you with the mantra that we shared: *"If dietetics is your profession then policy MUST be your passion."*

"It was inspiring to see Academy members and leaders at PPW 2014 fighting for programs and legislation that bring nutrition to the forefront in optimizing not only women's health, but the health of the entire nation."

– Jeanne Blankenship, *MS, RDN, Vice President of Policy Initiatives and Advocacy for the Academy and a past Chair-WH DPG*

CALL FOR VOLUNTEERS

The Women's Health DPG is looking for volunteers to fill the following positions for the 2014-2015 membership year:

Newsletter Editor
Newsletter Assistant Editor
Volunteer Coordinator
Mentoring Coordinator

If you are interested in volunteering or would like to learn more about any of these positions, please send an email to info@womenshealthdpg.org.

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