INTRODUCTION

Part 1 of this article provided an overview of commonly researched phytochemicals and their proposed benefits related to aging and the brain, skin, and cancer. Phytochemicals are shown to have antioxidant, anti-inflammatory, and anti-cancer properties and are being explored by scientific researchers as an anti-aging strategy. Additionally, a plant-based diet provides antioxidants that not only protect against chronic-diseases, but also protect aging skin from free-radical damage. They may also promote collagen development.

Part 2 (published here) includes a more in-depth discussion of phytochemicals and inflammation, the risks associated with phytochemicals, and scientific research on the health benefits of plants.

OVERVIEW: PHYTOCHEMICALS AND INFLAMMATION

As previously discussed, it is known that genetic and epigenetic modifications can be altered and can contribute to disease. Oxidation and inflammation cause cell damage and lead to the modified epigenetic expression of cytokines, oncogenes, and tumor suppressor genes; and eventually the increased likelihood of chronic inflammation and cancer. Conversely, these detrimental modifications are potentially reversible, and phytochemicals provide a possible strategy for reducing the increased risk of chronic disease in an aging population.1

Inflammation is the body’s response and adaptation to a loss of cellular and tissue homeostasis resulting from an injury, and it is responsible for important biological processes, such as host defense, tissue remodeling and repair, and metabolism regulation.2 The acute inflammation process (see the graphic on page 2) protects against infection and begins with the inflammatory response, where mast cells, macrophages, lysosomes, and histamines are released. Next, mast cells and macrophages begin secreting from blood vessels pro-inflammatory cytokines, oxygen and nitrogen species, and eicosanoids. Once secreted, they travel to the damaged tissue.

This process starts a clotting cascade (see the graphic on page 3) where the damaged area is walled off from the rest of the body, isolating the bacteria (if there is bacteria) to the injured area. At the same time, leukocytes are traveling from blood vessels to the injury site.

While the leukocytes are involved in the initiation and maintenance of inflammation, the macrophages participate in the host defense, immunity, and inflammatory responses. This same process occurs whether bacteria are present in the wound or not. Chronic inflammation involves a different adaptive cascade of responses where inflammation becomes a systemic reaction. In this situation the brain raises the body’s temperature as a defense to inhibit bacteria.
Phytochemicals
continued from page 1

also involves continued production of lymphocytes, immune cells, and antibodies.²

The inflammatory response can have a negative impact on health in numerous ways. It can increase the sensitization to allergens and impact the stages of tumor growth. Additionally, inflammation promotes cancer because most cancers contain an inflammatory infiltrate that can be used by tumors for angiogenesis, tissue invasion, and cell proliferation. Obesity also plays a role in inflammation by stimulating the immune system, which over time switches to a chronic inflammatory state and increases the risk of cancer development.²

Phytochemicals, however, possess an array of healthful benefits that can reduce or reverse inflammation by altering epigenetic expression of inflammation and other noncommunicable diseases. Additionally, phytochemicals are found to be anti-inflammatory as well as protective against oxidation, cancer, and cardiovascular issues. However, according to Szarc vel Szic et al.² maternal nutrition intake begins to affect an individual’s epigenetic modifications in the womb, hence the theory of fetal programming. These modifications continue throughout a person’s lifetime and are possibly passed on to future generations. Furthermore, human studies suggest that risk for disease later in life can be related to nutritional deficiencies that occur during pregnancy.²

Moreover, a person’s phenotype is thought to be a unique production of current, past, and generational influences of one’s environment and lifestyle on their genetics. It has been called a “life long remodeling of our epigenomes”² because our epigenetics are constantly changing (mutating) over time. These epigenetic mutations can lead to the development of noncommunicable diseases such as inflammation, diabetes, cancer, cardiovascular disease (CVD), allergies, rheumatoid arthritis, and neurodegenerative diseases. Because phytochemicals are shown to reverse some of these epimutations, much research is focusing on preventing and possibly curing diseases, such as inflammatory disorders. In fact, the phrase “let food be your epigenetic medicine”² is a good way to describe potential future health benefits. This slogan becomes increasingly true as research on phytochemicals and their specific epigenetic targets grows, providing a personalized prevention plan for age-related diseases. Additionally, as indicated in Table 1, most of the research to date has been in vitro. As such, more human studies are needed to learn more about phytochemicals and their benefits for humans.

Table 1: Examples of phytochemicals that target inflammation.²

<table>
<thead>
<tr>
<th>Phytochemical</th>
<th>Food Source</th>
<th>Type of Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caffeic acid</td>
<td>Coffee</td>
<td>In vitro</td>
</tr>
<tr>
<td>Curcumin</td>
<td>Turmeric</td>
<td>In vitro/in vivo (mouse, rat)</td>
</tr>
<tr>
<td>Diallyl disulfide</td>
<td>Garlic</td>
<td>In vitro/in vivo (rat)</td>
</tr>
<tr>
<td>Epigallocatechin-3-gallate (EGCG)</td>
<td>Green tea</td>
<td>In vitro</td>
</tr>
<tr>
<td>Fistein</td>
<td>Strawberries</td>
<td>In vitro</td>
</tr>
<tr>
<td>Genistein</td>
<td>Soy</td>
<td>In vitro/in vivo</td>
</tr>
<tr>
<td>Quercetin</td>
<td>Citrus, apples, capers, berries, tea, wine</td>
<td>In vitro</td>
</tr>
<tr>
<td>Theophylline</td>
<td>Black tea, green tea</td>
<td>In vitro</td>
</tr>
</tbody>
</table>

(Continued on page 3)
Phytochemicals are categorized according to their actions. For example, some compounds modify inflammatory responses and immunological senescence by interfering with the enzymatic activity of certain genes, such as DNMT: class I, II, and IV HDAC; HAT; and class III HDAC sirtuins (SIRT) genes. Phytochemicals that are HDAC inhibitors include carboxylates, organosulfides, isothiocyanates, hydroamates, cyclic tetrapeptides, and macrocyclic depsipeptides. Conversely, flavonoids are activators of class III HDAC (SIRT) genes. SIRT activators such as resveratrol are associated with increased lifespan and healthy aging, and they are thought to reverse metabolic disease. However, there is still much research to be done, as it is uncertain which phytochemicals are genuine epigenetic modifiers and whether the modifications are stable over time. Additionally, Szarc vel Szic et al. suggest that studies on epigenetics are more realistic regarding the effects of diet accumulating over time. Table 2 (see page 4) provides some examples of phytochemicals targeting inflammation.

RISKS ASSOCIATED WITH PHYTOCHEMICALS
As previously mentioned, some researchers have concerns about promoting phytochemicals for the prevention of chronic disease and aging. For example, Mukherjee and Gogoi discuss the risk related to an increase in glycation-mediated protein damage from carbonyl stress and from the reaction between amino-acid residues and ROSs. It was further mentioned above that Rahal et al. also report on the antioxidant’s dual role as antioxidant and prooxidant. However, Rahal et al. suggest that the action an antioxidant takes is dependent on its cooxidant and the molecular conditions of the tissue.

In regard to the effects of carbonyl stress on protein, Mukherjee and Gogoi explain that glycation reactions have positive and negative results. Glycation can lower the bioavailability and digestibility of proteins through the formation of cross-links. Conversely, the production of glyoxidation antioxidants is enhanced by the oxidation damage of amino acids in proteins, and serves as protection from this damage by increasing the bioavailability of protein.

Another risk worth mentioning is the possible negative effects associated with brassica compounds found in brassicaceous plants. Björkman et al. report anti-nutritional activity related to the phytochemistry of these plants.
Furthermore, phytochemicals can cause food/drug interactions, some of which may cause health risks by interfering with drug metabolism. Two examples: The quercetin in grapefruit interacts with statin drugs, and phytochemicals such as phenolic compounds prevent the absorption of non-heme iron.  

Finally, phytochemicals are thought to be more effective when consumed from whole foods than from supplements—that is, phytochemicals work best when they work in synergy with food, not in isolation.

### Table 2: Phytochemical food sources and the types of cancer they affect.

<table>
<thead>
<tr>
<th>Phytochemical</th>
<th>Subgroup</th>
<th>Food</th>
<th>Type of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenolics: coumarins</td>
<td>Curcumin</td>
<td>Turmeric</td>
<td>Pancreatic, prostate, lung, breast, colon</td>
</tr>
<tr>
<td>Phenolics: flavonoids</td>
<td>Catechins, methoxanthines,</td>
<td>Black tea, green tea</td>
<td>Prostate, breast, skin, pancreatic, gastric, colon, esophageal, oral, head and neck, ovarian</td>
</tr>
<tr>
<td>Phenolics: flavonoids, isoflavones</td>
<td>Quercetin</td>
<td>Citrus fruits, buckwheat</td>
<td>Colon cancer, leukemia, prostate</td>
</tr>
<tr>
<td>Phenolics: ellagitannins</td>
<td>Ellagic acid</td>
<td>Pomegranate, raspberries, almonds</td>
<td>Liver</td>
</tr>
<tr>
<td>Nitrogen-containing compounds: glucosinolates</td>
<td>Indole-3-carbinol, diindolylmethane, sulforaphane</td>
<td>Cruciferous vegetables: broccoli, Brussels sprouts, cabbage, kale, radish, rutabaga, turnip, cauliflower, watercress, wasabi</td>
<td>Colon, pancreatic, breast, lung, prostate, skin</td>
</tr>
<tr>
<td>Organosulfur compounds: isothiocyanate</td>
<td>Isothiocyanate</td>
<td>Cruciferous vegetables</td>
<td>Prostate, liver, lung</td>
</tr>
<tr>
<td>Organosulfur compounds: allyl sulfur compounds</td>
<td>Allium</td>
<td>Garlic</td>
<td>Stomach, colon, breast</td>
</tr>
<tr>
<td>Terpenoids: carotenoids</td>
<td>Lycopene</td>
<td>Tomato</td>
<td>Breast, colon, prostate, kidney, liver, lung</td>
</tr>
<tr>
<td>B-vitamins</td>
<td>Folic acid</td>
<td>Grains, beans, fortified cereals, green vegetables, pasta</td>
<td>Liver, brain, lung, breast, cervical, ovarian, colon</td>
</tr>
</tbody>
</table>

Phytochemicals are thought to be more effective when consumed from whole foods than from supplements—that is, phytochemicals work best when they work in synergy with food, not in isolation.

Finally, phytochemicals are thought to be more effective when consumed from whole foods than from supplements—that is, phytochemicals work best when they work in synergy with food, not in isolation. Additionally, because not enough information is known about phytochemicals and their toxic levels, supplements could pose a safety threat.

**HOW PHYTOCHEMICALS BENEFIT AN OLDER POPULATION**

Aging can be described as a physiological reaction to oxidative stress caused by an imbalance of oxidants and antioxidants. A diminished capacity to counteract the effects of this carbonyl stress leads to an increased susceptibility to disease. As previously mentioned, the repeated exposure to oxidative stress increases the risk for chronic diseases, such as CVD, diabetes, inflammation, hypertension, stroke, age-related macular degeneration, neurodegenerative disorders, asthma, and rheumatoid arthritis. Additionally, older adults have the highest prevalence of these chronic diseases, with the oldest old representing 87% of the disease burden in people over 65 years of age. It is anticipated that this “oldest-old” age segment of the population will expand exponentially over the next decade.

Consequently, phytochemicals are the subject of much research. Studies are showing promise in the benefits of phytochemicals as antioxidants and the prevention of many chronic diseases. It is this lowered risk of chronic disease that makes the consumption of phytochemicals so important to the aging population. Some reported benefits include prevention of aging skin, improved memory, prevention of...
Phytochemicals
continued from page 4

dementia, prevention of cataracts and age-related macular degeneration, and lowered risk of age-related functional decline.\(^9\)

Although research on the benefits of phytochemicals is ongoing and still inconclusive in many areas, a diet high in fruits, vegetables, and whole grains is necessary for the prevention of micronutrient deficiencies.\(^10\) In addition, the U.S. Department of Agriculture’s MyPlate\(^11\) recommends that half of every meal come from fruits and vegetables. The American Cancer Society\(^12\) recommends eating a balanced diet that includes at least 2.5 cups of vegetables and fruits a day. Therefore, a diet high in fruits and vegetables is needed for healthful aging, and the phytochemicals that abound in these foods will provide added protection. Furthermore, dietetics practitioners can help their older adult clients lower the risk of disease by first identifying their risks for chronic illness and then recommending foods associated with the prevention of those risks.

SCIENTIFIC RESEARCH
Scientists are on a quest to identify the health benefits of plant foods. As stated by Traka and Mithen,\(^7\) from the Institute of Food Research in the United Kingdom, “the world is facing an array of health problems related to micronutrient deficiencies, changes in diet and lifestyle, increased urbanization, and reductions in physical activity...[which] has led to an astonishing rise in noncommunicable diseases, such as type 2 diabetes, CVD, some cancers, and a range of inflammatory associated conditions.” Older adults have the highest prevalence of these chronic diseases. Enhancing the nutritional content of foods with phytochemicals and antioxidants could eventually reduce the burden of these diseases. It is, however, hugely important that nutrition research provides reliable and useful data. Nevertheless, there are many challenges to evaluating and assessing the benefits of phytochemicals, such as the limitations related to human research, the use of epidemiological studies, and animal-and cell-model studies.

Consequently, Traka and Mithen\(^7\) reviewed three major sources of evidence used in studies of phytochemicals: epidemiological studies, studies using animal and cell models, and human intervention studies. Of all the types of studies, the two most common research designs are epidemiological studies and animal and cell models. Yet the human model is most reliable and upon which human health claims must be based. However, human studies are difficult because of the ethics involved with modifying diets, a lack of valid biomarkers for health and disease, and a lack of categorized and contrasting plant food for testing health benefits.\(^7\)

Epidemiological studies typically include either retrospective case-control studies or prospective cohort studies.\(^7\) Some challenges identified with the use of epidemiological studies in phytochemical research are as follows:\(^7\)

- The use of food-frequency questionnaires commonly used in this type of study present a challenge because they depend on accurate recall, which is not always guaranteed.
- Biomarkers sometimes used in place of food-frequency questionnaires are useful in substantiating nutrient intake. However, the result is more likely a measurement of one’s diet at a point in time, rather than consumption over time.
- Case-control studies typically only provide an estimate of risk, not absolute risk, which can mislead interpretation.
- Control groups are difficult to select because of the possible confounders associated with a diet high in fruits and vegetables, lifestyle, and socioeconomic status.
- There is a risk of historical bias in the reporting of only studies with positive results.
- Interpretation of epidemiological studies can be difficult because they facilitate the cherry picking of studies that support the enhanced value of a particular food, making it difficult to determine the validity of the study. Consider the following example about lycopene studies. Eighteen

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studies were submitted to the Food and Drug Administration (FDA) in regard to the health claim that lycopene in tomatoes lowers the risk of prostate cancer. Five studies were invalidated, eight found no association between lycopene and prostate cancer risk, and five suggested a reduced risk. However, for the same studies that companies interpreted as supporting their claim, the FDA concluded there was “very little scientific evidence.” This demonstrates that claims made about studies are not always valid and that interpretations may be biased.

In addition to epidemiological studies, cell models provide in vitro designs and are associated with epidemiological studies in determining the mechanisms of which phytochemicals provide health benefits. These models look at the pure compounds in terms of its potential effects within cells and animals. This is similar to how pharmaceutical research is accomplished, but it doesn’t answer the question of toxicity, which is a priority for human studies. There are, however, pros and cons to these models.

Advantages include:

- The fact that cell models provide an ethical alternative to animal studies.
- In vitro cell models are convenient, easy to use, and inexpensive.
- Cell models are easier to reproduce because observations are made in well-defined and controlled environments.
- Cell models are most useful for initial studies where the mechanisms of disease prevention are learned. For example, the mechanisms of the bioactivity of sulforaphane, a phytochemical found in broccoli, has been a topic of much research for many years. The use of different cells (such as cancer and macrophage cells) helped identify many mechanisms activated by sulforaphane, such as induction of apoptosis, cell-cycle arrest, and anti-inflammatory properties.7

Cell models have many limitations as well as advantages, and these limits need to be considered when assessing the validity of an in vitro study.7

- One limitation involves the exposure of tissues to metabolites that occur after plant consumption and are present in plasma, but to which cells in vitro would not be exposed. Consequently, measuring bioavailability and identifying targets of plant manipulation are difficult tasks.
- Health benefits are based on the in vitro actions and not the metabolites found in plasma.
- Concentrations of plant metabolites are often much higher than would be found in circulation, thereby resulting in outcomes unrealistic for normal plant consumption.7
- The in vitro cell-culture environment is much different than that of the in vivo environment, where original tissue is influenced by other nearby cells and interacts with them via paracrine signaling. Besides the abovementioned limitations, there are other problems related to the use of cell models, all of which affect how applicable in vitro studies are to predicting the performance of phytochemicals in the human body. Alternatively, Traka and Mithen7 recommend culturing whole tissues ex vivo through organ/tissue culture as an attempt to avoid such limitations.

In vivo studies often serve as a complimentary model for assessing the effects of phytochemicals in humans, and involve the study of animals. Animals, especially mice, are considered ideal for researching phytochemicals because their genes function similarly to those of humans and can be manipulated in ways not possible in humans.7 The feasibility of these studies is of short duration because the rodent life span is short.7 Therefore, in vivo studies are used for preclinical experiments that allow continual study of disease response to nutrition variables and the prediction of their effectiveness. Their limitations include:

- Only a few in vivo studies are actually replicated in human-subject randomized controlled studies.
- Although mice have very similar characteristics to humans, they are not identical to humans, and the absorption and metabolism of phytochemicals is different between mice and humans.

However, for studies on phytochemicals and their health benefits, various types of appropriate animal models are used based on the disease being studied.7

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Healthy Aging DPG
Member Benefits

The Healthy Aging DPG achieves success by supporting the success of its members.

Renewing your HA DPG membership when you renew your Academy membership will ensure your uninterrupted access to:

- Continuing-education credits through webinars as well as articles in The Spectrum.
- Networking and leadership opportunities.
Finally, human intervention studies provide a complement to the use of epidemiological data and cell and animal models in the study of phytochemicals. Additionally, there are two types of intervention studies typical of this research: A few large, prospective trials investigating the effects of antioxidant activity primarily on cancer and secondarily on CVD, and more-frequent studies of shorter duration focusing on interventions of phytochemicals and diet on CVD. The human intervention study design is complicated by the fact that ethics prevent the modification of diets; hence a typical double-blind random control trial is not possible. There have been some large intervention studies, such as the well-known Alpha-Tocopherol, Beta-Carotene Cancer Prevention (ATBC) Study, where the effects of beta-carotene and vitamin E in the prevention of lung cancer were assessed. However, several of these studies have not confirmed that antioxidants lower the risk of cancer. In fact, the ATBC study reported a higher risk of lung cancer. Traka and Mithen suggest that this lack of supporting evidence might be related to other variables, such as compound dosages, delivery method, biological activity, and population characteristics. Similarly, smaller interventional studies measuring clinical outcomes are very difficult to complete, especially those related to cancer. Some of the methodological problems found in studies to date include small sample sizes, which often do not achieve statistical significance, and poorly reported data from randomized controlled studies. Consequently, Hooper et al. (2008, as reported by Traka & Mithen, 2011) report that although these characteristics are often weaknesses, they are not necessarily ineffective. Typically these studies use biomarkers, such as inflammatory cytokines and blood pressure, to assess the effects of phytochemicals, and these biomarkers are then used in combination with algorithms to predict the risk of CVD. The largest body of work to exemplify the benefits of phytochemicals regards the phenolic flavonoids. Research using epidemiological studies and cell and animal studies provided the background evidence for a variety of beneficial flavonoid bioactivities. In addition, there have been many other interventional studies investigating the effects of phytochemicals, such as lycopene, lutein, and zeaxanthin on biomarkers for CVD risk, DNA damage, inflammation, and macular degeneration. Some human studies looked at the health benefits of cruciferous vegetables. In addition, human studies have failed to support the theory regarding the antioxidant behaviors of phytochemicals. For example, some in vitro studies indicate a diminished antioxidant activity when food is metabolized in humans. Similarly, few studies have demonstrated that phenolics significantly enhance plasma antioxidant activity. Consequently, some researchers speculate that the antioxidant activity of phenolics is too minimal to measure their health benefits, and according to human and cell model studies, the benefits of phytochemicals on disease risk are more likely related to complex changes to cell signaling pathways that in turn change the expression of inflammatory cytokines.

Further limitations in human intervention studies include a lack of biomarkers associated with chronic diseases other than CVD. Additionally, the collection of data on the effects of dietary interventions on diseases is limited by the size of the study required for power, the duration needed, and ethical issues with modifying diets. Consequently, Traka and Mithen suggest an alternative: Assess the impact phytochemicals have on the reoccurrence of some cancers and chronic diseases.

CONCLUSION
The challenges associated with human intervention studies force researchers to use epidemiological, animal, and cell model studies as background evidence in phytochemical research. This complement of study designs works well when quality research data is provided. However, the volume of research on phytochemicals is extensive, and it lacks organization and standardization. Researchers need professionally maintained phytochemical-research databases. In addition, an international collaboration of phytochemical research would lower the risk of chronic disease world-
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wide. This collaboration could be organized by the Centers for Disease Control (Public Health) in each country where available. The cost should be spread among all countries involved.

The plethora of research on phytochemicals is promising for everyone, but especially for the older adult population. Given that this population is most at risk for chronic disease, phytochemicals offer hope for a strategy that will help enhance quality of life throughout the aging process.

Moreover, dietetics practitioners can help their clients by identifying their risks for chronic disease and encouraging foods with phytochemicals most likely to offer them protection. Although the research on phytochemicals is still premature, the benefits of a diet high in fruits, vegetables, and whole grains are clear. Dietetics practitioners will benefit their clients by promoting a balanced diet that includes a wide variety of fruits and vegetables, which helps prevent nutrition deficiencies and is part of a healthful lifestyle.

The author of this article has no conflicts of interest to declare.

References
Click here to see the references for this article.

About the Author
Susan Karpiel, MS, RD, LD, is a certified wellness coach. She has earned her master’s degree in nutrition from Texas Woman’s University (TWU) and is currently pursuing her doctorate degree in health studies, with a minor in nutrition. Susan worked as director of food and nutrition for 23 years in both long-term care and acute care. Additionally, Susan has experience as a clinical dietitian and as a consultant for long-term-care facilities. Susan is very passionate about health and wellness and plans to teach in higher education and work in worksite wellness.

Call for Information: Conferences and Events

The Healthy Aging DPG calendar contains events of interest to RDNs and NDTRs who work with older adults.

If you would like to suggest a conference or event for our calendar, please e-mail Robin Dahm (dahmRD@gmail.com) with your information. The event must focus on the nutritional and physical health of older adults.

Need Continuing-Education Credits?

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The HA DPG offers its members two ways to earn CPEUs:

- Self-study webinars.
May 31 Is National Senior Health & Fitness Day®
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For more than 10,000 older Americans, May 31 will be a day of change and positive, health-related affirmations. During this year’s National Senior Health & Fitness Day, older Americans around the country will participate in health and fitness events tied to the winning theme of the theme contest (the contest was still running at the time of this writing). Sponsored activities will be held at over 1,000 locations—banks, malls, parks, and other venues—making this event one of the largest in the country. Interested in sponsoring an event in your area? The event website offers you videos of past events, press releases, and access to the event’s monthly e-newsletter. If you plan to sponsor an event, please let us know how it went (dahmRD@gmail.com), so we can share your experience with our members.

Author Opportunities

The Spectrum is searching for articles from RDNs and dietetics students. We may publish it as a self-study CPEU article. Topics include (but are not limited to):

- Integrative medicine and older adults
- Iron and zinc, dietary and supplemental
- How physical activity prevents age-related diseases
- Risky food-consumption practices and older adults
- Cost-cutting strategies for nutritious meals
- Supplementation safety and older adults
- A topic that you suggest

If you are interested in becoming an author, or would like to suggest a possible author or topic, please contact Robin Dahm (dahmRD@gmail.com). Author guidelines and a topics pick list are located on the HA DPG website.

Healthy Aging
Dietetic Practice Group

Our Mission
Empowering and supporting members to be food and nutrition leaders promoting life-long wellness.

Our Vision
Optimizing longevity and wellness in aging through food and nutrition.
The Healthy Aging Dietetics Practice Group (HA DPG) Executive Committee and our membership had a very eventful fall 2016, and we look forward to delivering even more member benefits in 2017! Here is a recap of our successes.

2016: Award-Winning CSG Study Cards, Great FNCE® Events
The summer of 2016 marked the launch of a unique member benefit: study cards for the CSG (Board Certification as a Specialist in Gerontological Nutrition) credential. This project was led by our terrific professional development director, Mary Herrstrom, RDN, LDN. This product won top honors as one of two Academy DPG/MIG Best Practice awards. Congratulations, Mary and our team of members who developed the cards!

FNCE® 2016 was full of great events and a special Healthy Aging spotlight session, “The MIND Diet: Dietary Patterns, Preventing Cognitive Decline and Counseling Techniques,” was superbly moderated by our DPG’s secretary, Melanie Betz, MS, RD, LDN, CSG.* Our presenters, Martha Morris, MS, Sc.D.; and Karen Chapman-Novakofski, RD, LDN, PhD (recipient of the Academy’s 2016 Excellence in Practice for Community Nutrition) described the dietary components that impact neurological health. Dr. Morris’ research, as well as scientific consensus, have demonstrated that supplements do not appear to impact cognitive health. Whole foods are complex delivery systems of myriad macro- and micronutrients. These combinations and synergies are not easily replicated by pills, and therefore a whole-diet approach is indicated. Dr. Chapman-Novakofski engaged the audience by outlining MIND diet-related SMART goals (Specific, Measurable, Achievable, Relevant, and Time-Based) for RDNs to create appropriate interventions for different stages of dietary-change client readiness.

The Oregon Raspberry & Blackberry Commission sponsored our member event at the Jean Mayer USDA Human Nutrition Research Center on Aging (HNRCA). The event featured esteemed researchers Alice Lichtenstein, D.Sc., Senior Scientist and Director, Cardiovascular Nutrition Laboratory; and Barbara Shukitt-Hale, PhD, Research Psychologist, USDA, Agri-
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Cultural Research Service Neurosciences and Aging Laboratory. Members were then treated with a fascinating tour of the HNRCA! The following day, the HA DPG welcomed members to enjoy a warm, 3K walk in the early evening to add energy and networking to their busy FNCE® schedules.

Coming Up in 2017: Elections, CSG Training, and Twitter Training
We’re swinging into 2017 with February Academy and DPG elections, and April 2017 will bring an opportunity for our second annual Student EC member application process (student applicants can apply by March 3). As we complete the 2016–2017 fiscal year, members will benefit from another great professional-development opportunity: a CSG training webinar series, as well as e-blast and newsletter features about using Twitter. Our student EC member Jacob Mey, PhD, has developed the Twitter learning series and also created a new podcast series you’ll be hearing more about shortly!

FNCE® Event at the HNRCA. From left to right: Judy Simon, MS, RD, LDN (Chair, HA DPG); Darcy Kochis (Food First Marketing); Barbara Shukitt-Hale, PhD; Alice Lichtenstein, D.Sc.; and Julie Rentsch (Food First Marketing).

Renewed Your Membership Yet?

We hope you have enjoyed the Healthy Aging DPG’s continuing-education opportunities, newsletter, and other member services this past year. When you renew your Academy membership, please remember to renew your membership with the Healthy Aging DPG at the same time.

To learn more about Academy and DPG membership, go to: http://www.eatrightpro.org/resources/membership/membership-types-and-criteria

To renew and expand your membership online, click the Join/Renew button at the top of the screen.

To renew by phone:
Call (800) 877–1600 ext. 5000, Monday through Friday, 8 AM–5 PM Central time to reach the Member Services Center.

Thanks to our members and DPG Executive Committee for a great 2016 and an even better 2017! Any comments or suggestions? Please contact me.
A Shifting Paradigm: Serum Albumin and Prealbumin Are Biomarkers for Inflammation, Not for Nutritional Status

Steven Ganem, BS

LEARNING OBJECTIVES

At the completion of this self-study article, the learner will be able to:

- Explain why serum albumin and prealbumin lab values were historically believed to be significant biomarkers of nutritional status
- Discuss the health complications associated with malnutrition
- Describe how the inflammatory response influences serum albumin and prealbumin lab values
- Identify the classifications of inflammation developed by the International Consensus Guideline Committee
- List the six physical examination parameters that registered dietitian nutritionists should use to identify malnutrition

ABSTRACT

Serum albumin (SAB) and prealbumin (PAB) are biomarkers traditionally used to detect the presence of protein malnutrition and assess its severity. However, recent evidence contends that these two serum tests are indicative of inflammation and should not be used as indicators of protein status. As a result, the Academy of Nutrition and Dietetics (the Academy) released a consensus statement in 2012 that renounces the application of these biomarkers as surrogate markers of protein status.

INTRODUCTION

A great deal of controversy surrounds the validity and reliability of serum albumin (SAB) and prealbumin (PAB) as biomarkers of protein status. Contrary to how these two tests have been used for decades, these serum hepatic proteins are not a reflection of nutritional status. They are surrogate markers of inflammation and severity of illness. The Academy published a joint consensus statement with the American Society for Parenteral and Enteral Nutrition (ASPEN) in 2012, stating that SAB and PAB indicate the presence and degree of inflammation and are inaccurate markers of nutritional status. It is imperative that registered dietitian nutritionists (RDNs) understand the utility of these two tests in order to avoid unnecessary health care expenditures and nutrition interventions, as well as to augment patient outcomes.

The objective of this article is to explain the implications of SAB and PAB as biomarkers of inflammation in light of emerging research and guidelines.

ABOUT SAB AND PAB

Albumin and prealbumin are negative-acute phase proteins produced by the liver. Historically, measures of serum hepatic proteins have been used to assess nutritional status, as they were believed to correlate with the protein status of a patient. Furhman et al. suggests that this confusion arises from the discovery of kwashiorkor, a prolonged protein-deprived state seen in people living in third-world countries. The common hypoalbuminemic profile among patients with kwashiorkor led to the misconception of SAB as representative of protein status. Furthermore, infection, injury, and trauma all result in decreased SAB and PAB levels, which then normalize with recovery. These conditions indirectly impact nutritional status by reducing appetite, affecting gastrointestinal motility, and inducing hemorrhagic instability. This physiological disruption has likely perpetuated the misinterpretation of SAB and PAB biomarkers.

MALNUTRITION

Malnutrition as discussed in this article refers to over- or undernutrition that may be concomitant with inflammation, and is characterized by a degradation of lean muscle mass and/or subcutaneous tissue. The loss of lean muscle mass and subcutaneous tissue is assessed with a comprehensive evaluation of patient history, physical signs, laboratory values, and anthropometric measurements.

The overall cost of malnutrition in today’s health care system is substantial. An estimated annual burden of $157 billion is attributed to malnutrition. Malnutrition results in an estimated reduction of 670,000 quality-adjusted life years annually in the United States. Moreover, lengths of stay and health care costs are nearly three times greater among malnourished and hospitalized patients. Malnutrition also leads to longer postsurgical recovery periods, along with increased hospital readmission, infection, and mortality rates. The costliest treatments associated with malnutrition-related complications include acute respiratory infections, falls and fractures, pressure ulcers, and urinary-tract infections. Malnutrition is also continued on page 13

Health Complications Associated with Malnutrition

- Declined functional status
- Impaired muscle and cognitive functioning
- Attenuated bone mass
- Immune dysfunction
- Falls and fractures
- Anemia
- Poor wound healing
- Higher infection rates
- Pressure ulcers
A Shifting Paradigm
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more frequently diagnosed in older adults than in any other age group.9

A number of health complications of malnutrition are listed in the sidebar.

Malnutrition manifests as an insidious condition largely due to the lack of universal agreement on a standardized definition of malnutrition.2,9,12

Inappropriate use of SAB and PAB also contribute to the problem. SAB and PAB have historically been utilized as biomarkers by health care professionals to assess the nutritional status of a patient, and therefore have been used to diagnose malnutrition. However, emerging evidence repudiates the application of SAB and PAB as diagnostic markers of malnutrition. These biomarkers are not indicative of nutritional status, but rather of inflammatory states.1,2

ACADEMY AND ASPEN CONSENSUS STATEMENT

The joint 2012 Academy/ASPEN statement “Consensus Statement: Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition)” renounced the efficacy of SAB and PAB as representative of nutritional status.1 The paper states that SAB and PAB are useful in representing the severity of inflammation, but are inadequate in reflecting poor nutritional status. Furthermore, these two tests are inaccurate measures in predicting decreased weight, energy restriction, and nitrogen balance. The lab values of these serum hepatic proteins appear decreased in the presence of inflammation, infection, and trauma. Therefore, SAB and PAB levels will be unresponsive to certain nutritional therapies, such as enteral and parenteral feedings. The paper argues that alleviating inflammation is the only surefire way to restore normal serum levels of PAB and SAB.

HOW INFLAMMATION ALTERS SAB AND PAB

Malnutrition is often present in disease-related inflammatory states.1 Herein lies the root cause of misinterpretation of SAB and PAB biomarkers. In general, the inflammatory process significantly alters serum hepatic proteins by affecting normal hepatic protein metabolism. The increased activity of inflammatory mediators (cytokines) causes a decrease in SAB and PAB levels, hence the term “negative-acute phase proteins.”5,13

Inflammatory cytokines are cell-signaling proteins that serve an integral function in immunoregulation. They are also closely involved in the anabolic and catabolic functions of skeletal muscle cells. Cytokines impair the regulation of skeletal muscle protein turnover, thus playing a catabolic role on muscle tissue by promoting muscle wasting. Therefore, systemic inflammation can mask the beneficial effects of nutritional interventions.14

The biological interplay between inflammation and serum hepatic proteins means that SAB and PAB are unreliable indicators of malnutrition. This fact warrants particular consideration in acute health care settings, because of the increased prevalence of infectious and inflammatory states in these environments.15 SAB levels may even appear normal in malnourished patients, further supporting the indirect effect of nutritional status on serum hepatic protein lab values. Moreover, the lab values of SAB and PAB may appear remarkably low in acute inflammation during the first twenty-four hours of the onset of injury or illness.2,15

SAB AND PAB CORRELATES IN RENAL DISEASE AND DIALYSIS

Inflammation is common among patients with end-stage renal disease (ESRD), and its subsequent effect on SAB and PAB varies across dialytic methods.17 One prospective cohort study, conducted by Dalrymple et al., examined SAB and PAB among dialytic patients with ESRD. The investigators discovered that over time, SAB levels increase while serum PAB levels stay fairly consistent. Findings also suggest that peritoneal dialysis (PD) and hemodialysis (HD) with a catheter are significantly correlated with decreased SAB levels. Furthermore, catheterized PD and HD are significantly associated.

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Some Definitions

Negative-acute phase proteins:
In the presence of inflammation, the plasma concentration of negative-acute phase proteins will decrease by more than 25%, either rapidly or over the course of days.6

Hemodynamic instability:
An abnormality in blood pressure and/or cardiac output (the amount of blood the heart pumps to the organs).7

Classifications of Inflammation

The International Consensus Guideline Committee developed classifications16 to distinguish several types of malnutrition based on inflammatory conditions:

- Pure chronic starvation without inflammation (conditions such as anorexia nervosa)
- Chronic diseases or conditions that impose sustained inflammation of a mild to moderate degree (such as organ failure, pancreatic cancer, rheumatoid arthritis, or sarcopenic obesity)
- Acute disease or injury states with marked inflammatory response (such as a major infection, burns, trauma, or closed head injury)
A Shifting Paradigm
continued from page 13
ated with lower SAB concentrations in comparison to HD with arteriovenous-fistula and arteriovenous-graft modalities.\textsuperscript{17}

The kidneys degrade PAB under renal-stable conditions, and therefore the PAB concentrations will appear elevated in renal dysfunction.\textsuperscript{15} This means that when renal dysfunction is present, PAB may only be representative of the degree of injury to the kidneys. Additionally, hypoalbuminemia concurrent with ESRD is largely attributed to non-dietary influences, such as metabolic acidosis and other inflammatory conditions.\textsuperscript{18} Due to the great variability among serum hepatic protein levels in patients with renal dysfunction, cautious interpretation of SAB and PAB biomarkers is recommended.

OTHER FACTORS AFFECTING PAB
Although SAB values appear low in malnutrition, PAB is affected under other circumstances. Infections and liver failure lower PAB concentration, whereas renal failure elicits increased PAB concentration.\textsuperscript{15} Due to PAB’s role as a transport protein for the thyroid hormone thyroxine, it appears high in hyperthyroidism and low in hypothyroidism.\textsuperscript{15} Since PAB concentration varies in response to a number of conditions, it must be carefully interpreted to accurately assess inflammation.

ABOUT MORTALITY PREDICTION
SAB is a strong predictor of mortality for patients on both HD and PD.\textsuperscript{19,20} A meta-analysis of prospective cohort studies of patients on maintenance HD discovered a significant negative correlation between SAB and all-cause mortality.\textsuperscript{19} In contrast, the investigators did not find a notable relationship between PAB and all-cause mortality.\textsuperscript{19} PAB is not always an accurate measure of overall health status, because it is elevated in renal disease.\textsuperscript{15} Additionally, PAB concentrations may be normal in patients with elevated SAB.\textsuperscript{17} In summary, mortality risk increases independently of changes in PAB concentration.

A study examining over 130,000 patients on PD determined that SAB is a significant predictor of all-cause mortality.\textsuperscript{20} Moreover, the investigators discovered that a small decline of 0.2 g/dL SAB, independent of baseline SAB level, was strongly associated with an increased risk of death.\textsuperscript{20} Conversely, the investigators found that marginal increases of 0.3 g/dL SAB from baseline also predicted a decreased risk of death.\textsuperscript{20} These findings explain the great sensitivity of SAB as a predictor of mortality.

Another study, conducted by Xie et al., examined the ratios of various serum hepatic protein markers of patients with acute kidney injury.\textsuperscript{21} The results suggest that a high ratio of C-reactive protein (CRP) to SAB and CRP to PAB is significantly associated with increased mortality among patients with acute kidney injury.\textsuperscript{21}

DIAGNOSIS AND TREATMENT
The Academy and ASPEN provide evidence-based guidelines to diagnose and treat patients with malnutrition.\textsuperscript{1} Because malnutrition is a multifaceted condition, healthcare practitioners must be sure to use more than one parameter to identify and diagnose it.

The patient’s history and chief complaint should be considered in making an appropriate diagnosis, particularly in assessing recent and unexpected weight loss or gain. Additionally, a physical examination of the patient should be conducted. The characteristic clinical signs of malnutrition include unintended and recent weight loss or gain, decreased muscle or fat mass, and fluid retention. The clinical signs of inflammation include fever or hypothermia, tachycardia, and hyperglycemia.\textsuperscript{1}

The Academy offers nutrition-focused physical-exam workshops for RDNs. The workshop aims to educate RDNs in the identification and diagnosis of malnutrition in pediatric and adult patients. The participants will learn how to perform a comprehensive, evidence-based physical assessment and identify hallmark signs and symptoms of malnutrition. The hands-on workshop is offered in various locations across the country.

As discussed previously, laboratory values should be used with caution. Inflammatory biomarkers such as SAB and PAB will be decreased in a malnourished patient, unless renal dysfunction is present, wherein PAB concentrations will appear elevated. CRP, white blood cell count, and blood glucose levels will be elevated in malnourished patients.\textsuperscript{1}

The clinician must also evaluate the patient’s food and nutrient intake, either by administering a 24-hour dietary recall or a diet history. Lastly, handgrip strength test should be assessed in order to evaluate muscular strength.\textsuperscript{1}

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Implications for Practice
Serum hepatic proteins, such as SAB and PAB, are influenced by inflammatory states. Inflammation often presents in tandem with malnutrition, which has led many health care providers to conflate SAB and PAB values as significant markers of nutritional status. However, this is an inaccurate application of these lab values. As mentioned, SAB and PAB concentrations are affected by inflammatory responses, and therefore do not directly and accurately reflect the nutritional status of a patient.

SAB and PAB should only be used to assess the presence and/or degree of inflammation, as well as the severity of illness or disease. These lab values should not be used as the sole determinants of nutritional status and should be interpreted with caution. A comprehensive assessment of nutritional status that incorporates laboratory values, patient history, physical examination, and functional assessment is the best approach for accurately diagnosing malnutrition in patients.

The author of this article has no conflicts of interest to declare.

References
Click here to see the references for this article.

CPE Credit
This article is anticipated to be approved for 1 hour of CPE credit upon successful completion of a quiz. At the conclusion of each month, the quizzes are reviewed and those successfully scoring 80% will receive their CPE certificate via email.

This free CPE credit is available for all Healthy Aging DPG members until February 22, 2020.

Click here to take the quiz.

About the Author
Steven Ganem, BS, graduated from the University of New Hampshire with a bachelor’s degree in nutrition and wellness. He is currently completing prerequisite courses at the University of Massachusetts Boston before applying to medical school. Steven intends on applying his passion for writing and research in his future medical career.

March Is National Nutrition Month
The Academy created the annual National Nutrition Month® (NNM) campaign, which has been running since 1973, to focus on the importance of:

- Making informed food choices,
- Developing sound eating patterns, and
- Being physically active.

The theme for this year’s NNM: “Put Your Best Fork Forward.”

Need ideas? Visit the Academy’s website and toolkit for promotional information, products, and activities related to this campaign.

Want to see past HA DPG events for NNM? Visit our website’s archive of NNM activities conducted by HA DPG members.

Need NNM-branded products? The Academy’s store offers a variety of NNM-branded items, including educational materials, food and drink containers, and t-shirts.

What are you doing for NNM? We would love to learn about your successful NNM program, activity, or event! Submit your info here by April 8 and you will be entered into a drawing for a $25 gift card.
Thank You, Behind-the-Scenes Volunteers of The Spectrum!

As with any peer-reviewed publication, The Spectrum depends on a dedicated group of volunteer contributors, many of whom perform tasks that are invisible to our readership. Some of our volunteers peer-review the newsletter’s columns, standard articles, and continuing-education articles. Others write the objectives and test questions for the continuing-education articles. All generously find time in their busy schedules to ensure the quality of the newsletters we present to you. Once a year the editor in chief, on behalf of the entire newsletter team, has the pleasure of recognizing these “behind the scenes” people for their hard work. Thank you!

—Robin Dahm, RDN, LDN; Editor in Chief, The Spectrum

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Do you enjoy using Facebook, LinkedIn, and Twitter? Are you interested in becoming a communications volunteer for the Healthy Aging Dietetic Practice Group (HA DPG)?

The HA DPG is looking for members who can create daily tweets and posts about the latest research, hot topics, and other evidence-based information for our DPG’s social media subscribers.

If you are interested in joining our social media team, please click here. We’ll be in touch soon.
“BEST OF” STORIES
Thank you to the Healthy Aging Dietetic Practice Group members who submitted captivating best-of stories as we further explore the Mega Issue of Wellness and Prevention by applying Appreciative Inquiry. For our next step, we will be asking members to participate in virtual “open-space sessions.” These sessions will create a collaborative environment for developing pilot projects about wellness and prevention; this kind of collaborative effort will bring us closer to a shared ideal future for RDNs and NDTRs. We anticipate that the synergy of like-minded professionals will generate a wealth of great ideas that can be shared at the spring House of Delegates (HOD) meeting in April. Keep an eye open for an e-mail invitation to participate in one of these virtual sessions.

One great “best of” story was submitted by HA member, Helen Rasmussen, PhD, RD, LDN, FAND, of Tufts University:

“Fresh out of [my] internship and school, I was hired to work on a research project that had a nutritional intervention component for a well-known physician in the field of peripheral vascular medicine. Yep, I was nervous. One of my first participants was an overweight Italian chef, who was enrolled in the study; he had type 2 diabetes and very poor leg circulation; amputation had been suggested to him. He spoke very little English, I spoke no Italian. I asked the chef if he would write down what he ate for the next three days and we could review the list. (In Italian! Yikes!) I went to the library and checked out Italian recipe books that had plenty of pictures, and bought an Italian-English language book. Very slowly, my patient started to understand portion sizes and nutrients of concern relevant to his diabetes. He lost weight, and his circulation improved. He kept both legs. I began to learn a new language, and he was so very happy that he didn’t feel bad anymore. My new boss told me that I passed my three-months’ job probation!”

Be sure to check out this edition’s “Spotlight on Your Colleagues” interview, which describes how one of our members has successfully used diet and exercise to rise above her numerous debilitating medical conditions.

OTHER NEWS

Associate-Membership Changes
The Member Services Advisory Committee (MSAC) has recommended to the House of Delegates that the qualifications for membership in the Academy of Nutrition and Dietetics’s Associate category be updated. Membership at the Associate level is open to practitioners who do not have dietetics credentials but work in fields related to health care, food, culinary, school nutrition, sports and fitness. The Academy currently has 42 Associate members. Voting on this motion will have concluded on February 17, 2017.

The MSAC recommended updates include:

• Educational parity. Individuals with some specific certifications qualify for Associate membership if they hold only an associate degree (granted by a regionally accredited American college or university), as long as that degree is related to the training, certification, or license under which they are applying. These certifications include: certified dietary managers, certified professionals - food safety, certified culinary professionals, dental hygienists, registered nurses, school nutrition specialists, and those who are certified in sports medicine.

• Alignment. This recommendation would add four new professional types who work alongside dietitians and seven new degree areas for Associate membership eligibility. MSAC recommends that the following trades/professions now qualify: individuals certified in comprehensive food safety, clinical psychologists, clinical social workers, and nurse practitioners. MSAC also recommends that those with at least a bachelor’s degree in the following educational degree areas to qualify: agriculture, biochemistry, microbiology, computer science, family and consumer science, home economics, hospitality and tourism, hotel management, restaurant management, and institutional management.

• Reducing the annual dues rate. This drop from $232 to $170 for the Associate category would be commensurate with the Academy’s other membership options. In this case, the lower rate mirrors the International category, as both categories offer members limited privileges and limited benefits.

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The Diversity Leaders Program Is Accepting Applicants
In accordance with the Academy’s strategic mission and vision, the Diversity Leaders Program supports Active members from underrepresented groups within the dietetics profession. Four members are selected to participate in a two-year leadership program that provides mentorship, leadership training, and networking. Applications are due March 1, 2017. The Academy’s website discusses its diversity-related awards and grants.

Transforming Vision into Action Award
The Council on Future Practice’s Transforming Vision into Action Award is given in recognition of outstanding collaborative contributions of Academy members and their teams. The purpose of this new award is to recognize innovative programs or products that transform a vision into nutrition and dietetics practice and/or education with outcomes relevant to the future. The deadline to apply is March 1, 2017.

ACEND’s Draft Future Education Model Standards
The public comment period on the proposed Future Education Model Accreditation Standards closed December 30, 2016. A copy of the January Standards Update is posted on the ACEND Standards website. If you have questions, please send them to acend@eatright.org or call 312-899-4872.

Under Development: New Academy Position Paper
A new position paper concept about interprofessional education and practice in nutrition was approved by the Academy Positions Committee. The comment period closed on January 25, 2017. Comments are being reviewed and changes will be made to the proposal as needed.

Updated Academy Position Paper on Vegetarian Diets
Legislative Update
Are You Professionally Engaged?
Candace S. Johnson, RDN, CSG, FAND; Policy and Advocacy Leader

**WE WORKING PROFESSIONALS** have busy lives, which can make it difficult to familiarize ourselves with public policies concerning nutrition and health. However, as dietetics practitioners, we are all affected when Congress passes acts that are related to our profession. Are there any nutrition-related jobs not affected by federal nutrition policies? The answer is no: All nutrition-related jobs are affected. Appropriations, reauthorizations, passages of new bills, and the statements to repeal long-standing nutrition programs all require that we have a basic understanding of what they are. Are you familiar with the legislative priorities of the Academy of Nutrition and Dietetics and want to be engaged at some level? Now is a good time to look at them and learn about them; this column provides a brief overview of them.

The current 115th Congress will introduce bills from the 114th Congress. Many federal representatives heard from Academy members and made note of our grass-roots voices. To stay involved and affect movement of these important priorities, Academy members need to be engaged with timely responses and the availability to act as necessary.

The Academy’s legislative and public-policy priorities focus on four areas:

- **Disease prevention and treatment.** The focus is on prevention as an affordable and effective way to reduce risk and severity of chronic disease. Among many initiatives, the following are active as they pertain to members of the Healthy Aging DPG:
  - Preventing Diabetes in Medicare Act of 2015 (formerly H.R. 1686): Allows Medicare to cover medical nutrition-therapy services performed by a registered dietitian nutritionist (RDN) to patients with prediabetes.
  - National Clinical Care Commission Act (formerly H.R. 1192, S. 586). Establishes a commission to make recommendations to coordinate federal programs that relate to clinical care for prediabetes and diabetes. This bill passed the House during the 114th Congress.
  - Treat and Reduce Obesity Act of 2015 (H.R. 2404). Allows enhanced beneficiary access for intensive behavioral therapy as provided by an RDN.
  - Prevention and Public Health Fund. RDNs play a critical role for planning and implementation of a variety of programs funded by the Prevention and Public Health Fund.

- **Lifecycle nutrition.** Growing older increases malnutrition risk, and nutrition interventions help support functionality and quality of life for older adults. Highlighting older adults is the following: The Older Americans Act Reauthorization Act of 2016 (S. 192). Passed in May 2016, it funds nutritionally balanced meals to this vulnerable population, with cost savings to prevent hospital stays and fractures from falls, and decrease infections requiring intravenous treatment.

- **Healthy food systems and access.** All Americans have a right to access a healthful and safe food supply.
  - The Farm Bill Program, which includes the Commodity Supplemental Food Program, provides food distribution to home-bound seniors; the Emergency Food Assistance Program supplements diets through food banks and pantries; the Supplemental Nutrition Assistance Program (SNAP) provides assistance to alleviate hunger and malnutrition.
  - Food-systems management to support science-based authority to regulate a safe food supply, to collaborate with state and local agencies for data sharing, and to support means to reduce foodborne illness as recommended in the Dietary Guidelines for Americans 2010. The Academy supports the FDA Food Safety Modernization Act (FSMA) to ensure a safe and secure food supply.
  - Quality health care. Optimal health can be achievable when nutrition services are an essential part of comprehensive health care. Forty-six states have statutory provisions for professional regulation of dietitians providing access to nutrition care.
  - The HITECH (Health Information Technology for Economic and Clinical Health) Act addresses health-information technology in health-care settings.

Participation in various food programs ensures that older adults have this via the following:
  - The Farm Bill Program, which includes the Commodity Supplemental Food Program, provides food distribution to home-bound seniors; the Emergency Food Assistance Program supplements diets through food banks and pantries; the Supplemental Nutrition Assistance Program (SNAP) provides assistance to alleviate hunger and malnutrition.
  - Food-systems management to support science-based authority to regulate a safe food supply, to collaborate with state and local agencies for data sharing, and to support means to reduce foodborne illness as recommended in the Dietary Guidelines for Americans 2010. The Academy supports the FDA Food Safety Modernization Act (FSMA) to ensure a safe and secure food supply.
  - Quality health care. Optimal health can be achievable when nutrition services are an essential part of comprehensive health care. Forty-six states have statutory provisions for professional regulation of dietitians providing access to nutrition care.
  - The HITECH (Health Information Technology for Economic and Clinical Health) Act addresses health-information technology in health-care settings.

Comment and Content Reviewers Needed

We need people for these volunteer roles:

- Respond to legislative reviews
- Call for comments
- Serve as an expert reviewer

If you would like to provide your expertise, please contact me.
Legislative Update  
continued from page 19

care, and efforts have been ongoing to include RDNs and NDTRs, among other health care workers, to be included using standardized language, coverage, and informatics to promote a solid foundation for integration into health care infrastructure.

• Other information regarding access to health care workers in underserved areas, research regarding the health and nutrition status of Americans via the National Health and Nutrition Examination Survey (NHANES), continuing work on the Dietary Guidelines for Americans 2015-2020, and Centers for Medicare and Medicaid Services rules for therapeutic diet orders are some areas the Academy notes among its priority initiatives.

The Academy recently held the fall advocacy day on September 26, 2016 with partner organization Defeat Malnutrition Today coalition. As a result, the Centers for Medicare & Medicaid Services accepted for consideration the malnutrition measures proposed by the work of the two organizations. The second advocacy day is scheduled for February 27, 2017, in collaboration with the Obesity Care and Advocacy Network. The event is held in Washington, D.C.

HOW TO INCREASE YOUR LEVEL OF ENGAGEMENT

- Vote in your local, state, and federal elections. Study the issues and be informed.
- Respond to the Academy Action Alerts: Your voice is counted and makes a difference! Currently the membership response rate is very low — less than 6% overall.
- Respond to requests to be an expert resource when legislative issues are sent. You may have excellent experience to share.
- Know your representatives, email them, and call them. Attend a town meeting. Many strong RDN relationships started with a simple introduction. The representative may remember the RDN or NDTR who asked a question and showed interest.

Someone once said, “It does not matter what we do, [government people] will do whatever they want.” My response was, “Then you have no reason to complain about the laws making you pay taxes, the condition of the roads, and your retirement benefits.” With a surprised look, she said, “I guess you have a point.” Commenting on regulations and policy and voicing concerns can make a difference.

ACTION STARTS WITH ONE PERSON, ONE VOICE, ONE CONCERN, OR ONE QUESTION

Taking action is very important. More than ever in recent years, the political landscape is predicted to change, and involvement in state and federal issues is keen. For more information, contact your state policy leader, your practice group policy leader, and stay alert for information. For more information visit the Academy’s advocacy website.

Intensive Behavioral Therapy for Obesity: Putting It into Practice

Successfully align with primary care providers to deliver the Intensive Behavioral Therapy (IBT) for Obesity benefit under Medicare Part B with this new toolkit.

Includes:

- Understanding the basics of the IBT benefit
- Case studies from RDNs who successfully provide IBT for Obesity
- Toolbox of resources to start IBT for Obesity at your site
- Many more examples, tips, and tools to help you implement IBT successfully

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Click anywhere inside this graphic to visit the website.
On your Colleagues

Interview by Kelly Barton-Ort, MS, RDN, CSG, LDN

Spotlighting: Fiona McKiernan, MS, RDN, CSG

I am so inspired by Fiona McKiernan, MS, RDN, CSG. Her story shows us yet again how nutrition and physical activity can help us overcome a complex and debilitating illness. Fiona shares her story with us below. I hope you find it as uplifting as I do.

KO: Fiona, would you share some of your story with us?

FM: In 2002, in my second year of studying human nutrition and dietetics at college, my health spiraled down into a dark hole. Over a few months, I went from being full of life to being lifeless and drained of energy. I could barely hold myself up straight. I was forced to drop out of college and return home to live with my parents. I spent months lying in bed, in darkness, barely able to lift my head off the pillow. My father carried me in his arms to numerous doctor appointments, and I would spend days recovering from such activities. Even simple things that I had taken for granted, such as the ability to take a shower or watch T.V., became daunting and on some days were out of my reach. A specialist told me I would never finish college and that I had to learn to cope with my physical and emotional pain and situation.

Fifteen years later, I am a registered dietitian nutritionist with a master’s degree, a Board Certified Specialist in Gerontological Nutrition (CSG), a peer-reviewed nutrition-publication author, and a long-distance runner. I have recently been honored as part of the Aramark Ring of Stars program, which recognizes only 250 of Aramark’s 270,000 employees for being a top front-line leader in the foodservice industry. I have completed four half marathons and traveled the world to see and do things I had once thought impossible for myself. Over the fifteen years, I was diagnosed with celiac disease, interstitial cystitis, urinary retention, and histamine intolerance. There were many misdiagnoses along the way, though, and at one point I was only able to eat only about ten foods! For years I wanted to “trade in” my body for one that worked.

KO: What did you do that significantly improved your health?

FM: I utilized five key pillars to manage my conditions and transform my life:

• A high-quality diet that is gluten free and histamine balanced, one that focuses mainly on local, non-processed foods
• A resistance training and aerobic exercise program
• A meditation/yoga program
• A Medtronic InterStim neurostimulator device implanted in my spine to help with urinary retention.
• A strong support network from my family and friends

KO: Fiona, would you share some of your story with us?

FM: In 2002, in my second year of studying human nutrition and dietetics at college, my health spiraled down into a dark hole. Over a few months, I went from being full of life to being lifeless and drained of energy. I could barely hold myself up straight. I was forced to drop out of college and return home to live with my parents. I spent months lying in bed, in darkness, barely able to lift my head off the pillow. My father carried me in his arms to numerous doctor appointments, and I would spend days recovering from such activities. Even simple things that I had taken for granted, such as the ability to take a shower or watch T.V., became daunting and on some days were out of my reach. A specialist told me I would never finish college and that I had to learn to cope with my physical and emotional pain and situation.

Fifteen years later, I am a registered dietitian nutritionist with a master’s degree, a Board Certified Specialist in Gerontological Nutrition (CSG), a peer-reviewed nutrition-publication author, and a long-distance runner. I have recently been honored with a Medtronic Global Hero award, for making extraordinary accomplishments with the help of medical technology. I have also recently been

Help Us Shine the Spotlight!

We are searching for HA DPG members to interview for The Spectrum’s “Spotlight on Your Colleagues” column. Have you or a colleague walked an interesting career path? Is your practice innovating solutions for older adult clients? Do you or a colleague perform ground-breaking research?

We need your help to discover individuals whose work is quietly having a positive impact on our field. Please e-mail Robin Dahm the name and contact information of one or more individuals you would like to see spotlighted. Thank you!
Spotlight
continued from page 22

A diagnosis of celiac disease (for which I adopted my gluten-free diet) and the Medtronic InterStim neurostimulator device that eliminated my dependence on catheters made a world of difference to my quality of life. Together they allow me to transform my pain into passion for living a no-barriers life and to achieve the unexpected.

While I am still trying to achieve my optimal health, I am determined to keep searching for answers and to heal my body from the inside out. I live by the philosophy of “let food be thy medicine and medicine be thy food (Hippocrates),” and I am passionate about helping others try to transform their health with diet, exercise, and lifestyle behaviors.

KO: How have your personal experiences affected your career and professional practice?

FM: My first professional position was as a hospital clinical dietitian, and over a six-year period, I was able to attain additional managerial responsibilities and eventually became a nutrition services director. I think my inner struggles with my chronic conditions helped me become an engaged and compassionate leader. Recently, I transitioned from working in corporate healthcare to private practice, with specialties in celiac disease, food sensitivities, healthy aging, long-term weight management, histamine intolerance, and interstitial cystitis. Diet is a cornerstone for treatment of interstitial cystitis, and I am seeking to raise awareness of the condition and help those patients, specifically. When I was diagnosed, my doctor’s office handed me a one-page diet sheet. Fortunately, I was already an RDN and able to research the condition and help myself. I am passionate about using what I have learned to help others regain their health and realize their full potential.

HEALTH PROFESSIONALS have a new resource in assessing the health needs of their older adult patients, “Older Americans 2016: Key Indicators of Well-Being.” The 179-page report from the Federal Interagency Forum on Aging-Related Statistics includes 41 indicators of health for the population aged 65 years and older, provides resources for health professionals and policy makers, and identifies areas that require additional support.

This publication groups the indicators into six categories: population, economics, health status, health risks and behavior, health care, and environment. It also includes a special section dedicated to informal caregiving.

The full report is available for download as an 8MB PDF. In addition, spreadsheets containing data from individual sections of the report can be downloaded as Excel files, and charts used in the report are available to download in a PowerPoint file.

The report is the seventh from the forum, which is comprised of 16 federal agencies, and included insights from the Department of Agriculture.