

Nutrition Close-Up

Egg Nutrition Center



Summer 2013

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NUTRIENT DENSITY

Eggs May Protect Against Metabolic Syndrome by Raising HDLs and by Increasing Circulating Carotenoid Levels

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Metabolic syndrome (MetS) is a cluster of metabolic alterations characterized by central obesity, dyslipidemias (elevated plasma triglycerides and low HDL), high fasting glucose, and hypertension. MetS increases by two-fold the risk for cardiovascular disease and by five-fold the risk for type-2 diabetes. MetS is also characterized by low grade inflammation and oxidative stress. There are several dietary strategies that have been proposed to treat MetS including the Mediterranean diet, low fat diets, antioxidant-rich diets, and carbohydrate-restricted diets.

Lutein and zeaxanthin are lipid soluble carotenoids that, in addition to accumulating in the macula and protecting against age-related macular degeneration, also possess anti-inflammatory and anti-oxidative properties⁽¹⁾. These carotenoids are absorbed into the intestinal lumen using similar pathways as dietary cholesterol⁽²⁾. Eggs are a source of highly bioavailable lutein and zeaxanthin because of their incorporation into the lipid matrix, which results in a more efficient carotenoid absorption from eggs than from other dietary sources including green leafy vegetables⁽³⁾.

In this article, eggs are discussed as a food that supports resolution of MetS by increasing both the concentrations of plasma HDL cholesterol and the number of large HDL particles, which in turn contributes to the more efficient transport of carotenoids in circulation, allowing them to exert their protective functions.

In our laboratory at the University of Connecticut, we conducted a study to evaluate the effects of a moderate carbohydrate-restricted diet (30-35% of total energy) in individuals with MetS. As a part of the dietary treatment, subjects were assigned to consume either 3 eggs per day (550 mg dietary cholesterol, 427 mg lutein, 265 mg zeaxanthin) (n = 20) or the equivalent amount of egg substitute (0 mg dietary cholesterol, 64 mg lutein and 13 mg zeaxanthin) (n = 17) for 12 weeks. Although total intake of lutein and zeaxanthin during the intervention period was not different between groups (as assessed by 5-day dietary records), individuals in the egg group had significantly higher concentrations of these plasma carotenoids⁽⁴⁾ than the egg substitute group. Egg intake also resulted in larger LDL and HDL particles⁽⁵⁾ and higher concentrations of lutein in these lipoproteins compared to baseline or to individuals who consumed the egg substitute⁽⁵⁾. Further, individuals in the egg group had greater reductions in the atherogenic, large VLDL particle and in plasma insulin and insulin resistance⁽⁵⁾, as well as in the inflammatory markers tumor necrosis factor-alpha (TNF- α) and serum amyloid after 12 weeks, compared to those who

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Fighting Back Against Sarcopenia

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Sarcopenia was first defined in 1989 as age-related muscle loss. A group of geriatricians and scientists from academia and industry subsequently met in Rome, Italy, on November 18, 2009 to arrive at a consensus definition. The current consensus definition was approved unanimously by the meeting participants and is as follows: Sarcopenia is the age-associated loss of skeletal muscle mass and function⁽¹⁾. The loss of skeletal muscle mass associated with sarcopenia results in a loss of muscle strength, rate of force development and muscle power. Consequently, sarcopenia contributes to functional deficits in mobility and overall functional capacity. Sarcopenia is a known precursor to late life disability and is associated with increased risk of falls.

“The loss of skeletal muscle mass associated with sarcopenia results in a loss of muscle strength, rate of force development and muscle power.”

Sarcopenia is believed to be present when there is evidence, via dual energy x-ray absorptiometry, of muscle loss based on muscle density that is two or more standard deviations below values expected for young adults. Approximately 22% of all men and women older than 70 years of age are believed to have sarcopenia. This increases to about 50% of those over the age of 80 and is even higher among men. The causes of sarcopenia are multifactorial and can include disuse, altered endocrine function, chronic diseases, inflammation, insulin resistance and nutritional deficiencies. Although cachexia may be a component of sarcopenia, the two conditions are not the same. Sarcopenia is amenable to treatment with diet and exercise, while cachexic muscle will not respond to exercise.

In addition to the decline in muscle mass associated with sarcopenia, there is also a diminished ability to meet the extra demand of protein synthesis in older adults, especially following trauma or illness. This can then result in an exacerbation of the sarcopenia with further loss of muscle mass and function. Ultimately these changes result in frailty, a condition defined as having three out of the following five criteria: unintentional weight loss of 10 pounds or more in the past year, self-reported exhaustion, muscle weakness, slow walking speed, and low levels of activity.

Being Resilient and Overcoming Sarcopenia

By being resilient and optimizing the use of available muscle,

one can possibly overcome the progressive cycle from sarcopenia to frailty through exercise and diet⁽²⁾. An exercise program that overloads atrophied and weak muscle can enhance muscle size, strength and power. Thus resistance training is the most appropriate exercise intervention to prevent and manage sarcopenia. Resistance exercise can increase muscle and bone mass and improve muscle strength and function more so than is noted with aerobic activity. Consistently, research has shown that older adults exposed to resistance training can improve strength and function and reverse some of the negative muscle changes, such as increased fatty infiltration. Resistance exercise done even once a week at high intensity [70 to 80% of one repetition maximum (RM)] or three times per week at a more moderate intensity [50-60% RM] will result in positive muscle changes and functional gains. Ideally the resistance exercises should target primary muscles of the legs, trunk and arms and be repeated for 1 to 3 sets of approximately 8 to 15 repetitions of the same exercise. Older adults will need to “start low and go slow” with regard to resistance. Initially, the individual may only be able to work against gravity and increase the amount of resistance as tolerated over time. Equipment for resistance exercise can be inexpensively obtained through use of homemade weights such as water in milk or juice cartons or via the use of hand weights or elastic exercise bands.

Nutritional intake is another modifiable factor in the development of sarcopenia and subsequent frailty. In order for resistance exercise to stimulate muscle hypertrophy, there must be a positive energy balance and adequate protein intake. There is no consensus on the amount of protein intake that an older individual should consume. Generally, however, it is recommended that intake of 1.0 to 1.3 g/kg/day of protein may facilitate muscle protein anabolism⁽³⁾. All meals for older adults should include a moderate amount of protein such as 4 ounces of meat; two eggs and a half cup of cottage cheese; half a can (3 ounces) of tuna fish; or a half cup of tofu⁽⁴⁾.

Motivation to Fight Sarcopenia

With regard to management of sarcopenia, motivation is the central factor that can help individuals overcome this all-too-common consequence of aging. Motivation is the inner urge to accomplish an activity or achieve a goal. Our focus as health care providers should be to utilize known techniques to motivate older adults to engage in resistance exercise and make appropriate food choices. According to social cognitive theory⁽⁵⁾, human motivation and action are regulated by forethought. This cognitive control of behavior is based on two types of expectations: (1) self-efficacy expectations, which are the individuals’ beliefs in their capabilities to perform a

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Eggs May Protect Against Metabolic Syndrome by Raising HDLs and by Increasing Circulating Carotenoid Levels

were consuming the egg substitute⁽⁶⁾. This suggests that the higher concentrations of circulating lutein and zeaxanthin might have protected against oxidation and inflammation.

Individuals with central adiposity, as is the case with MetS, are characterized by lower concentrations of plasma carotenoids due to accumulation of these compounds in fat depots⁽⁷⁾. Although it has been reported that weight loss is associated with increased plasma carotenoids, presumably as a result of their release from adipose tissue as fat stores are depleted, this was not the case in individuals who were consuming the egg substitute in our study. These subjects demonstrated no increases in lutein and zeaxanthin compared to baseline. Therefore, based on these data, it is suggested that whole egg consumption impacted the observed decreases in oxidative stress and inflammation resulting from increased lutein and zeaxanthin in circulation.

“This study suggests that eggs may be a good food choice for people with MetS since they promote reductions in dyslipidemias, oxidative stress, and inflammation.”

This study suggests that eggs may be a good food choice for people with MetS since they result in reductions in dyslipidemias, oxidative stress, and inflammation.

There are several studies that have shown significant increases in plasma lutein and zeaxanthin following egg consumption⁽⁹⁾. Increases in macular pigment density have also been reported after a dietary regime that includes eggs on a daily basis⁽¹⁰⁾. The increases in HDL cholesterol as a result of egg intake are very consistent and occur under all circumstances, whether it is weight maintenance studies⁽⁶⁾ or weight loss interventions⁽¹¹⁾. HDL is the main lipoprotein that delivers lutein and zeaxanthin to the retina, apparently through scavenger receptor B-1⁽⁸⁾. Therefore eggs not only increase the concentrations of these carotenoids in plasma but they also increase the concentrations of the “vehicle” (HDL particles) that transports these carotenoids in circulation, resulting in a process by which dietary carotenoids fulfill their protective role in plasma and in target tissues.

Further, although LDL cholesterol does not increase in all circumstances during egg intake (i.e weight loss interventions)⁽⁴⁾, LDL size consistently increases following

egg consumption, resulting in an LDL particle that can more efficiently transport lutein and zeaxanthin and protect LDL against oxidation⁽⁵⁾. From the data presented in these studies, we conclude that eggs are a good food choice for individuals with low HDL and with low grade inflammation such as is the case with MetS.

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MESSAGES

- Lutein and zeaxanthin are lipid soluble carotenoids that protect against age-related macular degeneration, as well as possess anti-inflammatory and anti-oxidative properties. Eggs increase concentrations of circulating lutein and zeaxanthin.
- Eggs raise the number and size of HDL particles, as well as the size of LDL particles resulting in an LDL particle that can more efficiently transport lutein and zeaxanthin and protect LDL against oxidation.

Pediatric Food Allergies

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Food allergies in children living in developed countries are extremely common. In the United States, approximately 4% of children have at least one food allergy, an increase of 18% from 1997-2007⁽¹⁾. The reasons for this increase are not completely understood, but are not thought to be simply a result of increased recognition⁽²⁾. However, in spite of the increasing number of food-allergic children and its effect on quality of life, there is still no active treatment for food allergy. Children with a food allergy are four times more likely to have asthma and twice as likely to have atopic dermatitis compared with children without food allergy⁽³⁾.

“Food allergies are extremely common in the United States, and recent studies on OIT show a lot of promise in their treatment.”

The most common food allergens in children (comprising about three-fourths of all food allergies) are cow's milk, hen's egg, and peanut, in that order, though the reactions to peanut are generally far more severe than the reactions to milk and egg⁽⁵⁾. Other common food allergens include wheat, fish, tree nuts, soy and shellfish⁽⁵⁾. Food allergies arise from an abnormal immune response to a specific food protein, and can be characterized as IgE-mediated, non-IgE-mediated, or a combination of both.

IgE-mediated food allergies, which are almost always caused by ingestion rather than skin contact or inhalation, typically display a rapid onset, often with urticaria and angioedema, with reactions beginning from seconds to hours from the time of ingestion⁽⁵⁾. Other IgE-mediated symptoms include oropharyngeal, respiratory, and gastrointestinal effects. The most severe reaction, anaphylaxis, can cause hypotension, airway narrowing and death if not treated. Non-IgE reactions are generally not as severe as IgE-mediated and may take hours to days to become apparent and may include atopic dermatitis and eosinophilic esophagitis.

Establishing an accurate diagnosis of food allergy can be challenging because non-allergic food reactions, such as food intolerance, are often confused with food allergies⁽⁶⁾. Skin prick testing and serum IgE measurements of specific proteins may help to identify foods that produce allergic reactions but are not diagnostic due to high false positivity rates⁽¹⁾. However, in spite of their poor positive predictive value, wide-ranging screening panels continue to be used.

The gold standard for diagnosing food allergy is an oral food challenge in a controlled (and emergency-equipped) setting^(3,6,7). Once a diagnosis of food allergy is made, counseling on label reading, hidden ingredients, and prevention of cross-contamination must be done.

In recent years, several promising treatments for food allergies have emerged. Many studies have focused on oral immunotherapy (OIT), which involves ingestion of small, increasing amounts of a specific food allergen to desensitize patients and to possibly make them permanently tolerant of that food⁽¹⁾. Early trials of OIT, as well as sublingual immunotherapy (SLIT) have demonstrated safety and success in reducing sensitivity to peanut, milk, and egg allergens^(1,8-10). OIT has been effective in raising the threshold for clinical reactivity in most patients to levels far greater than would be encountered in most accidental ingestions so as to prevent anaphylaxis⁽²⁾.

The prevalence of egg allergy is less than 2% in the U.S., which is slightly less common than milk allergy, but more common than peanut allergy. Most children outgrow egg allergy by school age, although some egg allergies persist into the teenage years⁽¹¹⁾. A majority (75%) of egg-allergic children can tolerate baked eggs⁽¹¹⁾. Studies have shown that consumption of baked egg by egg-allergic children may desensitize them to egg and may actually help resolve their allergy⁽¹¹⁾. Other studies using egg OIT have been tremendously successful at increasing egg-allergic children's tolerance to eggs⁽⁸⁾.

Some studies show that vitamin D may have a protective effect on food allergy in infants. An Australian study showed that infants with vitamin D deficiency were three times more likely to have an egg allergy⁽¹²⁾. Furthermore, delaying introduction of egg, one of a breast-fed infant's richest sources of vitamin D, past 6 months of age tripled the odds of developing an egg allergy by 1 year of age. Koplin et al. determined that introduction of eggs prior to 6 months might even protect against egg allergy⁽¹³⁾.

Food allergies are extremely common in the United States and recent studies on OIT show a lot of promise in their treatment. However, it is important to note that these are still experimental therapies and must be conducted by experienced investigators in approved research settings⁽²⁾. Traditional cornerstones of food allergy treatment remain: correct diagnosis of food allergy, strict avoidance of the offending food through constant vigilance, ability to recognize a life threatening allergic reaction, available epinephrine auto-injector and knowledge of its use, and a willingness to use this life-saving epinephrine when needed^(1, 3, 5, 8,14).

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MESSAGES

- The most common food allergens in children are cow's milk, hen's egg, and peanut, with other common food allergens being wheat, fish, tree nuts, soy and shellfish.
- Many studies have focused on oral immunotherapy (OIT), which involves ingestion of small, increasing amounts of a specific food allergen to desensitize patients in order to possibly make them permanently tolerant of that food.
- Three ways to help resolve egg allergies include consuming baked eggs, OIT and early introduction of eggs in a baby's diet.

Fighting Back Against Sarcopenia

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course of action to attain a desired outcome; and (2) outcome expectancies, which are the beliefs that a certain consequence will be produced by personal action. Helping older adults believe in their ability to engage in these activities, and that adherence to exercise and diet will result in positive outcomes is an important first step to adhering to healthy behavior. Pleasant or unpleasant physical sensations experienced by older adults are particularly relevant to motivation. Conversely, pain associated with exercise, or even the belief that performing physical activities will result in pain, will decrease the older adults motivation to engage in the activity. Eliminating negative beliefs and the unpleasant sensations associated with exercise and diet are critical to strengthening motivation and engaging the individual in the given activity.

Other interventions to optimize motivation include verbal encouragement to engage in the activity and positive reinforcement for what is accomplished, individualized care, setting goals and a program relevant to the individual, social supports and a buddy to participate with, making the activities fun and pleasant, assuring that the environment supports the activity, and using humor. These interventions will help motivate individuals to engage in the activities needed to decrease the risk of becoming sarcopenic and preventing the possible progression to frailty and further functional decline.

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MESSAGES

- Sarcopenia is the age-associated loss of skeletal muscle mass and function which results in loss of muscle strength, rate of force development, and muscle power.
- Patients who have existing sarcopenia or are trying to prevent sarcopenia should participate in resistance training and consume an adequate diet.
- Motivating and helping older adults believe in their ability to adhere to an exercise plan and healthy diet can result in positive outcomes in fighting against sarcopenia.

Nutrition Research Update:

The Nutrition Research Update (NRU) is a quarterly recap of current research. NRU is a great way to keep up with current research findings in a clear, concise manner. You can receive the NRU via email by logging onto www.enc-signup.org.

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Nutrition Research Update

Issue 7

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This edition of Nutrition Research Update highlights research from the Experimental Biology (EB) conference which took place this week in Boston. As always, it was fascinating to see the variety of nutrition research discussed at EB. In this issue, we have highlighted a few of the studies presented which examine the association between intake of eggs or egg nutrients and various indices of health and disease. We hope that you will find these topics interesting and applicable to your practice.

If you have any questions about the studies or concepts presented, do not hesitate to contact us at info@eggnutrition.org.

Regards,

Mitchell Kanter, PhD
Executive Director, The Egg Nutrition Center

SPECIAL FEATURE

Effects of egg intake on HDL composition and function in metabolic syndrome.

By: Catherine Andersen, PhD Candidate & Graduate Research Asst. University of Connecticut, Department of Nutritional Sciences

Metabolic syndrome (MetS) is a growing health concern that increases an individual's risk of cardiovascular disease and type II diabetes by 2- and 5-fold, respectively. Research studies have consistently demonstrated that carbohydrate-restricted diets effectively ameliorate atherogenic dyslipidemia, insulin resistance, and inflammation in MetS...[read full article](#).

BREAKING RESEARCH FROM EXPERIMENTAL BIOLOGY

Eggs Consumption in Older Adults has No Adverse Effect on Serum Lipids

A study involving 45 adults diagnosed with early age-related macular degeneration (AMD) investigated the effects of consuming 12 eggs per week (intervention group) for one year on blood lipids, lipoprotein cholesterol, apolipoprotein A-1 and B, lipoprotein a, and C-reactive protein. The control group did not consume eggs for one year. The investigators...[read full article](#).

Eggs as part of Nutrition Education for Low-Income Women

Investigators examined egg intake patterns among females in federally-funded nutrition education programs and determined amount, source and cost of eggs. Whole eggs alone, egg white alone, visual egg (where eggs were visible as part of a larger food item like an egg sandwich), and hidden egg sources...[read full article](#).

Focusing on Dietary Patterns Versus Specific Foods

Using the NHANES 2001-2008 database, researchers examined foods typically consumed with eggs and developed eight egg consumption patterns. The researchers then studied the differing effects of those egg consumption patterns on nutrient intake, diet quality, BMI, waist circumference...[read full article](#).

See ENC

Twitter Chat:

Join ENC and [Rebecca Scritchfield](#) for a Twitter Chat on the topic of recent protein research!
April 23, 2013
7:00-8:00 PM EST



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Webinar

Don't miss ENC's webinar with Advance for NPs and PAs:

"Dietary Patterns for Cardiometabolic Health: Unscrambling the Guidance"

[David Katz, MD, MPH, FACPM, FACP](#)

April 30, 2013
1:00-2:00 PM EST



Learn more and register for the webinar [here](#).

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To learn more about egg nutrition, the latest research and to download patient education materials, please visit the Egg Nutrition Center at www.eggnutritioncenter.org.

New Education Tool

ENC has partnered with Joslin Diabetes Center to create a set of new nutrition educational brochures, “Eating Well with Diabetes”, for health care professionals and patients. These brochures are available in downloadable form in the Health Professional/Client/Patient Education Materials section of eggnutritioncenter.org.

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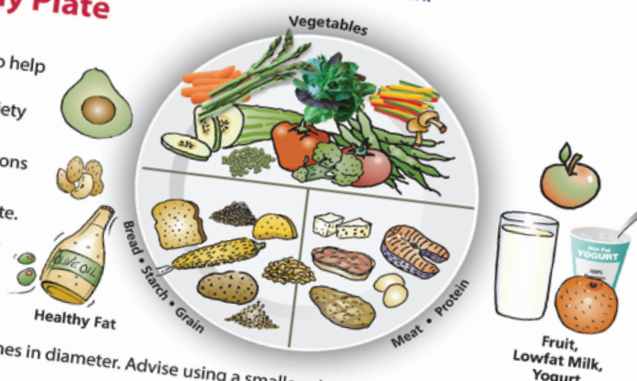
Eating Well with Diabetes: A Teaching Guide for Healthcare Professionals

This Guide is designed to help you, whether you're a dietitian, a diabetes educator or other healthcare provider, as you work with adults with type 2 diabetes. The Guide is a companion to the patient handout, "Eating Well with Diabetes." Both the Guide and the patient handout are divided into four sections: *Getting Started: Joslin's Healthy Plate*; *Carbohydrate Counting 101*; *Heart-Healthy Eating*; and *Eating Out, Eating Right*. This Guide features Teaching Tips and Learning Activities to enhance your education sessions. We suggest that you review only one section with your patients at a time and that you refer to the patient handout during the education session.

Get Started: Joslin's Healthy Plate

Patient Learning Objectives

1. Describe how Joslin's Healthy Plate is a tool to help people control food portions, calories and carbohydrate (carb) intake, while eating a variety and balance of foods.
2. State how commonly-eaten foods fit into sections on and around the plate.
3. List examples of foods that contain carbohydrate.
4. Discuss ways of including nutrient-dense foods, such as those with high-quality protein, healthy fats, and vitamins and minerals, at each meal.



Teaching Tips

- The average size of a dinner plate today is 13 inches in diameter. Advise using a smaller plate or even a salad plate to help reduce portions.
- Explain how to build a healthy plate: fill half the plate with colorful nonstarchy vegetables like broccoli and/or salad. Fill one quarter of the plate with a whole-grain carb like brown rice or a starchy vegetable, such as peas. Fill the other quarter of the plate with lean meat, eggs, tofu or lower-fat cheese. Add a small amount of heart-healthy fat such as canola or olive oil, trans-fat-free margarine, nuts or avocado. Add one or two more carb choices, such as a piece of fruit and/or a small cup of lowfat, light-style yogurt.
- Discuss meals that include a combination of foods, such as casseroles, stews, a burrito or a chicken stir-fry dish. Help patients visualize what these meals would look like on the plate if each of the ingredients were separated.
- Emphasize that Joslin's Healthy Plate can be used by the whole family. Diabetes meal planning is similar to nutritional recommendations for everyone—the goal is for all family members to eat as healthfully as possible.
- Discuss breakfast and snacks; they don't fit easily onto the plate, but the messages of portion and carb control, balance and variety still apply.

Learning Activities

- Give patients a paper plate with the divisions of the Joslin Plate drawn in. Ask them to write in each section the names of healthy foods that they might like to eat within the next month.
- Using paper food models, ask patients to create a plate based on the foods they usually eat. Then, after discussing more healthful foods, ask patients if they would make any changes in food choices or portions, and have them show you with the food models.

Content in this brochure regarding diabetes, nutrition and nutrition education was provided by Joslin Diabetes Center (www.joslin.org), a nonprofit teaching and research affiliate of Harvard Medical School. Joslin does not endorse the products or services of any company.

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September 19

Gerontological Advanced Practice Nurses Association

Presentation: Sarcopenia by Barbara Resnick PhD, CRNP

Chicago, IL

October 19-22

Academy of Nutrition and Dietetics FNCE

October 20

Breakfast Presentation:

Weight Management, Healthy Aging, Women's Health and
Diabetes Care and Education DPGs

Presenter TBD

Houston, TX

ENC Mission Statement:

ENC is a credible source of nutrition and health science information and the acknowledged leader in research and education related to eggs.

Nutrition Close-Up is a quarterly publication written and produced by the Egg Nutrition Center.

Nutrition Close-Up presents up-to-date reviews, summaries and commentaries focused on the role of diet in health promotion and disease prevention, including the contributions of eggs to a nutritious and healthful diet.

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