Nutrition Overview: Part III

What are the "Right" Things to Eat?

Erin wants your advice regarding what to eat.

In general, it helps to think of nutrients in terms of two general categories:

- Macronutrients are the energy-providing nutrients we need in large quantities: carbohydrates, fats, and proteins.
- Micronutrients are the compounds we need in smaller quantities: vitamins, minerals, and phytonutrients.

This section reviews some important macro- and micronutrient tips you can incorporate into health plans. After that is a discussion of other topics related to eating patterns, including the use of food pyramids, eating to reduce inflammation, and descriptions of some of the other popular diets that inspire patient questions.

Macronutrients: Some key recommendations you can make

One of the important ways to distinguish between different diets is by the proportions of macronutrients they recommend. For example, the Atkins diet promotes, especially in its first phase, very low carbohydrate intake. The South Beach diet focuses, in part, on "sensible" carbohydrates. You will learn more below about eating with close attention to glycemic index and load, which equates to consuming the "best" carbohydrates. And, of course, for better or worse, an entire branch of the food industry has sprung up since the last few decades because we have placed great value on eating low-fat foods.

The 2015-2020 Dietary Guidelines suggests the following when it comes to macronutrients.[1]

- "Choose a variety of nutrient-dense foods across and within all food groups in recommended amounts."
- Follow an eating pattern that is low in saturated fats, sodium, and added sugars.
- Consume less than 10% of calories daily from added sugar.
- Similarly, consume less than 10% of calories daily from saturated fats.
- Keep sodium intake to less than 2,300 mg.

Mindful Awareness Moment: Your Own Diet

Take a moment to consider the quality of your own diet based on what you have eaten in the past week.

- How many of the "World's Healthiest Foods" have you eaten? How do you do with eating a Mediterranean diet, or a whole foods, plant-based eating pattern?
- Did you eat vegetables daily?
- How many servings of whole grains did you eat?
- How many different colors of fruits and vegetables have you eaten?

The following sections will provide some specific suggestions about carbohydrates, fats, and proteins for you to incorporate into PHPs.

Carbohydrate tips

Most of the calories in the American diet come from carbohydrates. In plant-based foods, such as fruits, vegetables, grains, cereals, legumes, and beans, 90%-95% of the calories come from carbohydrates. Carbohydrates include the following:

- Simple sugars such as fructose and glucose
- Oligosaccharides including fructo-oligosaccharides (which are "food" for the good bacteria in our intestines)
- Starches (which are energy storage molecules for plants)
- Dietary fiber. Fiber is a carbohydrate, but our bodies cannot digest it. Fiber adds volume—but not calories—to food and it may increase satiety as well.

The United States Department of Agriculture (USDA) recommends that half of all grain intake come from whole grains. [2] In terms of how they affect satiety, carbohydrates fall between protein and fat, with protein being the most satiating of the three macronutrients. [3] Carbohydrates provide 4 kcal/gm in energy. This is roughly equal to the energy of protein, but less than fats, which contain 9 kcal/g. Consumption guidelines include the following recommendations.

Pay attention to fructose. Fructose is a simple sugar found in fruit, honey, and some vegetables. It is the sweetest of the simple sugars, and one form, high-fructose corn syrup (HFCS), is under considerable scrutiny these days. Fructose, on its own and in small quantities, may be a better carbohydrate choice than glucose in patients with prediabetes or diabetes due to its attenuating effects on blood sugar[4] (think of a serving of fruit, not a serving of juice drink, as the source). This is not true for high-fructose corn syrup, which typically is 50% fructose and 50% glucose, similar to sucrose or table sugar, which is not an ideal combination.[5]

Most Americans consume about 40 gm of fructose daily, mostly in the form of HFCS. Whether HFCS is worse than pure fructose or sucrose remains to be seen; evidence is conflicting. We do know that fructose consumption from processed foods has significant effects on, for example, all the components of metabolic syndrome.[6] (For more information, refer to the "Endocrine Health" Whole Health overview, and the "Hypertension" and "Lipids," Whole Health tools; these topics are the main components of metabolic syndrome.) It is important to keep in mind that fruit is an important source of fructose (hence the similarity in their names), but the fructose in fruit—even though it may be in higher quantities—is accompanied by fiber, which is known to attenuate rises in blood sugar. In contrast, HFCS is rarely consumed with fiber. In fact, it is often consumed as a carbohydrate in isolation; for instance, it is practically the only ingredient in soda and other sugar-sweetened beverages.

Do not get too bogged down in simple versus complex carbohydrates. It is frequently suggested that complex carbohydrates are better than simple ones. Many experts tell patients to eat complex carbohydrates, because they believe they are better for overall health. By definition, simple carbohydrates are composed of mono- or disaccharides (they have just one or two sugar molecule groups in them). Complex carbohydrates are polysaccharides (they have many simple molecules linked up). In short, whether or not carbohydrates are simple or complex is less important than focusing on which foods the carbohydrates come from. It is best to advise patients to eat whole grains and products made from them, as well as fruits, vegetables, and legumes, while minimizing foods with made with sugar or refined white flour. This is especially important because most Americans do not eat enough whole grains (see figure below).

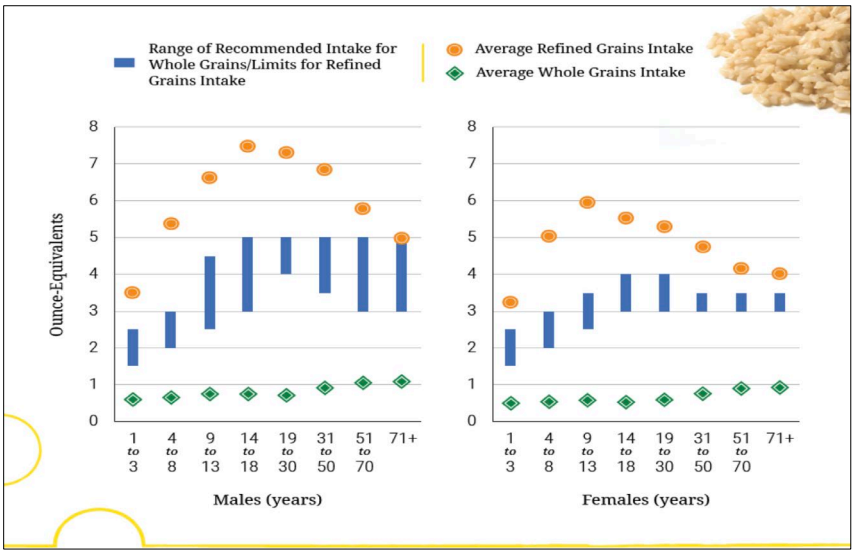

Figure 11. Recommended Grain Intake
Note: Recommended daily intake of whole grains is to be at least half of total grain consumption, and the limit for refined grain is to be no more than half of the total grain consumption. The blue vertical bars on this graph represent one half of the total grain recommendations for each age-sex group, and therefore indicate recommendations for the minimum amounts to consume of whole grains or maximum amounts of refined grains. To meet recommendations, whole grain intake should be within or above the blue bars and refined grain intake within or below the bars.

For more information on eating whole grains, refer to USDA Make Half Your Grains Whole.

Choose carbohydrates based on glycemic index and glycemic load. Rather than focusing on whether a carbohydrate is simple or complex, it may be more helpful to choose which carbohydrates to eat based on how they are metabolized. Glycemic index and glycemic load take into account how much a given food raises blood sugar levels. Glycemic index (GI) compares how much a particular food that contains 50gm of carbohydrates will raise blood glucose levels 2 hours after eating, relative to an equivalent amount of glucose (or white bread). The problem with the GI is that different foods have different amounts of carbohydrate by weight. For example, in order to get 50 gm of carbohydrates from carrots, you would have to eat at least 5 cups of them. To allow for more realistic comparisons, glycemic load (GL) is used instead. Glycemic loads are like GIs, but they account for serving size.[7] GL is ultimately the GI multiplied by the amount of carbohydrate per serving of a given food. For more information, see the "Glycemic Index" tool.

High glycemic index and load are clearly associated with increased risk of type 2 diabetes. In a 2014 pooled study that included 3.8 million person-years of follow- up, the quintile of patients with the highest food measures of GI and GL had a 33% higher risk of developing the disease.[8] There is also a correlation between high-GL diet and ischemic (but not hemorrhagic) stroke risk,[9] obesity,[10] and chronic inflammation.[11] A 2008 meta-analysis found that high GI and GL diets correlated with higher risks of certain cancers, including colon and ovarian cancer (but not pancreatic or breast cancers).[12] A low GI/GL diet also reduces gallbladder and coronary artery disease risk.[13]

An interesting area of recent research on glucose tolerance is the "second meal effect." If you eat a low GI/GL breakfast, your blood sugar will not climb as high after eating lunch. The same thing occurs after you eat a low GI/GL dinner; your blood sugar will not be as high at breakfast the next morning.[14,15] It is in part because of the second meal effect that people with diabetes are encouraged to eat fewer small meals during the day. Carbohydrates are absorbed more slowly and sugars stay lower on average if multiple small meals are eaten, rather than just a few large ones.[16]

Avoid refined carbohydrates. Because of their high glycemic load, cutting refined carbohydrates out of your diet can sometimes result in dramatic improvements in health. Common refined carbohydrates include the following:

Corn chips	White rice	Sugar
Potato chips	Pasta	Soda
Pizza crusts	Pies	Breadcrumbs
Most flours	Bagels	Cereal bars
Pastries	Bread	Granola
Cookies	Buns	Toffee
Biscuits	Muffins	

For a more comprehensive list, go to the Diagnosis Diet website.

Eat your fiber. The metabolic fate of carbohydrates is determined largely by the company they keep. Fiber, which is composed of carbohydrates the body cannot digest, influences

carbohydrate absorption in the gut, decreasing the rise in blood levels of glucose, insulin, and lipids that normally occurs after eating.[17-19] There are two main kinds of fiber. Soluble fiber has beneficial effects on absorption of glucose, insulin, and lipids. Insoluble fiber acts as a laxative and bulking agent. Few Americans consume the recommended daily intake of fiber, which is 14 gm/1,000 kcal, or roughly 25 gm for women and 38 gm for men. Some argue that fiber intake should perhaps be as high as 50 gm a day for those with diabetes.[20] Because fiber has important health benefits but is often neglected in the American diet, a discussion about fiber can be another potentially good starting point for the "Food and Drink" section of a PHP. High fiber intake significantly improves health. Fiber intake is associated with reduced all-cause mortality after myocardial infarction.[21] Intake is inversely associated with esophageal cancer incidence,[22] stroke risk,[23] and cardiovascular disease.[24] Fiber should be used with caution in people with functional bowel problems, such as irritable bowel syndrome, because it can exacerbate bloating, constipation, and diarrhea.[25]

When checking nutrition labels, aim for foods with a favorable sugar-to-fiber ratio. This means that there should be no more than five times as much sugar as there is fiber. Avoid foods with higher sugar-to-fiber ratios.

For more information, refer to the two VA Nutrition and Food Services Patient Education Handouts "Types of Fiber" and "Tips to Increase Fiber Intake"

DIETARY FAT tips

The types of fats you eat make a difference. For quite some time (roughly 1980-2015, in terms of Dietary Guidelines for Americans), the popular belief was that fats are "bad" for us in any form. Fat-free foods have been touted commercially as the solution to all our nutritional ills. However, fat-free eating requires that the calories be replaced with calories in another form. If this "other form" is carbohydrates, eating them may not be as helpful as we assume.[26] When large quantities of carbohydrates are eaten, those that are unneeded are stored as fat.

In excess, certain types of fats can contribute to health problems, but they are essential to healthy functioning, providing us the necessary building blocks for cell membranes, myelin sheaths around nerves, and steroid hormones. Fats are also essential for absorption of the fat-soluble vitamins, A, D, E, and K. Many people's bodies are genetically programmed to hold on to fat; for our ancestors, this could be an advantage during times when food was scarce.

There are a few main categories of fats,[27] and knowing more about them can help patients make good food choices:

- **Saturated fats (SFAs)** are those without any double bonds in their carbon chain. They are solid at room temperature and include animal fat, butterfat, coconut oil, palm oil, and kernel oils. Most experts recommend keeping saturated fat intake to a minimum.
- **Monounsaturated fats (MUFAs)** are liquid at room temperature and found in avocado, peanut, olive, and canola oils. They have one double bond in their carbon chain.
- **Polyunsaturated fatty acids (PUFAs)** are also liquid at room temperature. They have more than one double bond and include fish, sesame, sunflower, walnut and corn oils. The PUFAs linoleic acid (LA) and alpha-linolenic acid (ALA) are essential; that is, they

are necessary but the body cannot synthesize them and therefore they must be obtained through the diet.

- Essential PUFAs are in vegetables such as dark, leafy greens and purslane. They also come from animals that consumed LA- or ALA-rich algae and plant foods.
- **Omega-6 fatty acids** have a double bond at position 6 of their carbon chain. They play an important role in inflammation. Inflammation is important to an organism's survival, but chronic inflammation can be harmful. Omega-6s rev up the chemical reactions that we normally attempt to suppress with medications such as nonsteroidal anti-inflammatories. Linoleic acid is an omega-6 fat, which is plentiful in most diets. It is in many nuts and seeds and in the fat of some animals, like pigs. Red meats and other animal products lead to creation of proportionally more omega-6 fatty acids than other foods.
- **Omega-3 fatty acids** have a double bond at position 3 in their carbon chain. They contribute to the reduction of inflammation, based on how they influence various chemical pathways in the body. The most important omega-3s to know about are docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). Omega-3s are not commonly consumed as part of the standard American diet. They are in fish, as well as walnuts, leafy greens, and many seeds.
- **The essential omega-3, ALA,** is found in walnuts, flaxseeds, chia seeds, hemp seeds, pumpkin seeds, and canola oil. It can be metabolized to DHA and EPA, but the process by which humans convert ALA to DHA and EPA is inefficient; therefore, it is best to get DHA and EPA directly from the diet, rather than relying on conversion of ALA.
- **DHA and EPA** are found mainly in fatty, deep-sea fish, krill, and algae. The acronym SMASH can help patients remember fish that are good sources of DHA and EPA: **s**almon, **m**ackerel, **a**nchovies, **s**ardines, and **h**erring.
- ***Trans*-fats** replace the *cis*-double bonds in MUFAs and PUFAs with *trans*- bonds. Found in processed food sources,[28] *trans*-fats were created to allow foods to have a longer shelf life. Unfortunately, they may decrease the duration of human life, because they are known to increase cholesterol levels and coronary artery disease.[29,30] It is best to avoid all foods made with *trans*-fats and partially hydrogenated oils of any kind. The United States now bans use of trans-fats in all foods offered in restaurants and grocery stores.
- ***Ensure you get enough omega-3s.*** The essential PUFAs are precursors to prostaglandins, leukotrienes, and other compounds that control levels of inflammation in the body. With the increased consumption of highly processed foods, the ratio of proinflammatory omega-6 fats to anti-inflammatory omega-3 fats in the diet has steadily increased, increasing the number of people whose bodies are in a state of chronic inflammation. Current ratios of omega-6s to omega-3s range from 15:1 to 25:1. The ideal ratio is the subject of some debate, but most sources suggest it should be more in the 2:1 or 4:1[31] range. Inflammation has an important physiological role, but a system of checks and balances is needed; many of today's chronic diseases are associated in some way with chronic inflammation.[32] It is worth discussing whether or not to recommend omega-3 supplements for many patients.

For more information on fats and oils in the diet, patients can see the article "Why is it Important to Consume Oils?" Another useful patient education handout is "Common Oils and Fats," available through the VA Nutrition and Food Services website.

Note: Supplements are not regulated with the same degree of oversight as medications, and it is important that clinicians keep this in mind. Products vary greatly in terms of accuracy of labeling, presence of adulterants, and the legitimacy of claims made by the manufacturer.

Eat to improve your cholesterol panel. Many people have abnormal lipid panels and struggle to improve them. A few general points to consider include the following:

- Triglyceride levels increase primarily due to eating foods with a high GI; that is, they are closely linked to carbohydrate intake. People with diabetes and/or thyroid disorders often have elevated triglycerides.[33,34]
- High-density lipoproteins (HDLs) transport excess triglycerides and cholesterol back to the liver from outlying cells, and low-density lipoproteins do the reverse. For this reason, HDL often is labeled "good cholesterol," and LDL labeled as "bad."
- Foods that raise LDL cholesterol levels most are: (1) those high in saturated fats, and (2) those with a high GI. These foods have a much more significant impact than foods that are high in dietary cholesterol, such as eggs, shrimp, shellfish, and caviar.

More information is available in the "Lipids" Whole Health tool.

Guidance with eating protein

Get enough protein (but not too much) each day, from healthy sources. Adults are encouraged to obtain 10%-35% of their daily calories from protein. That equates to 56 gm for men and 46 gm for women.[35] Eating 2-3 servings of protein-rich foods a day seems to cover needs. Examples of protein serving include[35] the following:

- A 3-oz piece of meat, which has about 21 gm of protein; a typical 8-oz serving has over 50 gm
- 8 oz of yogurt, which has about 11 gm, or 8 oz of milk with 8 gm
- One cup of cooked beans contains roughly 16 gm of proteins.

Animal protein is a source of significant amounts of protein. However, many meats contain a fair amount of saturated fat and are sources of trimethylamine N-Oxide (especially for red meats and processed meats), which increases risk for cardiovascular events and cancer; they are best eaten with less frequency. Calorie for calorie, protein is the most satiating or filling of the macronutrients.[36] The average American consumes roughly 100 gm of protein daily, despite the fact that recommendations encourage a lower quantity.[37] A diet high in animal protein can be taxing for the liver and kidneys.[38,39]

Eat all of your essential amino acids. There are certain amino acids that must come from the diet; our bodies cannot synthesize them. These amino acids have critical antioxidant and anti-inflammatory properties and are key chemical ingredients for many of the body's chemical reactions. It helps to vary protein sources in your diet. Bring in meat, fish, legumes (beans, lentils), eggs, nuts, seeds, and whole grains such as quinoa to add variety.

Vegetarians can get the full spectrum of amino acids in the diet if they eat a variety of the foods listed above. Bacteria that live in our digestive tract also serve as a protein source. Epidemiologic studies show that those who eat a nutritious, primarily vegetarian diet derive

health benefits from doing so.[40] Of course, "vegetarian" is not synonymous with "healthy." A diet of sports drinks and corn chips may even be vegan, but it is not nutritious.

Micronutrients: vitamins and minerals

Micronutrients are essential for life. They serve many vital roles in our health and development including production of adenosine triphosphate (ATP), hormones, enzymes, and neurotransmitters. The multitude of biochemical reactions that happen throughout the body require micronutrients as cofactors. They include vitamins and minerals, as well as phytonutrients. One can become deficient in micronutrients in the absence of a well-balanced diet. Specific clinical findings related to various deficiencies, while beyond the scope of this overview, are available at the Public Health Reviews website.[41]

Eat your vitamins. Vitamins were discovered in the early 1900s and were originally called "vital amines" because it was initially thought that they all contained amino (nitrogen) compounds.[42] The name was changed to "vitamins" after it was discovered this wasn't true. Vitamins are classified as water-soluble (B vitamins, vitamin C) and fat-soluble (vitamins A, D, E, and K). Many people follow the recommended dietary allowance (RDA) created by the Institute of Medicine to ensure they are consuming the necessary amounts of vitamins each day. However, the RDA is the average daily level of intake sufficient to meet the nutrient requirements of nearly all (97-98%) of healthy people. The RDA of a given micronutrient depends on many things such as sex, age, overall health status, and, for women, whether or not they are pregnant or lactating. The Dietary Reference Intakes (DRI) are a set of recommendation levels for specific nutrients that consists of a number of different types of recommendations. The DRIs are not a minimum or maximum nutritional requirement and are not intended to fit everybody. They are intended to be used as guidelines for the majority of the healthy population.

Most people can get all of the vitamins they need through a balanced diet (this is difficult with vitamin D, however). Vitamin B12 is the only vitamin that is available solely through animal sources, putting vegans at risk for deficiency; for this reason, vegans should always be asked about B12 supplementation. If people have a very poor diet (e.g., they live in an urban "food desert") or they absolutely insist on taking a multivitamin supplement, it is important to be able to offer good advice on how to select an appropriate one.

Eat your minerals, too. There are approximately 18 minerals necessary for our physiologic functioning. Table 1 briefly summarizes information about several of the minerals that are most likely to be discussed in a clinic visit—iron, calcium, zinc, selenium, and magnesium.

Table 3. Micronutrients: Functions, Sources, and Clinical Tips[43-45]

Micronutrient	Main functions	Comments
Iron	• Part of hemoglobin and myoglobin • Necessary for red blood cell development	• Found in meat, and is more absorbable in this form, called heme iron • Plant sources (non-heme iron) include beans, spinach and other leafy greens, brewer's yeast, pumpkin seeds, blackstrap

Micronutrient	Main functions	Comments
	• Aids with immune function	molasses, sunflower seeds, almonds, and raisins • Bioavailability of non-heme iron is increased when consumed with vitamin C • Can increase daily intake by cooking with non-coated iron pans • If taking an iron sulfate supplement and constipation is a problem, try using a chelated iron (e.g., iron bisglycinate)
Calcium	• 99% of body calcium is in bones and teeth • The rest is used for muscle contractions, nervous system function, and blood clotting • Mean intake ranges from 870-1,270 mg daily for men and 750 -970 mg daily for women.[46,47] • If not, taking a supplement with added vitamin D can be helpful to bring levels up to the DRI.*	• Dairy is a major food source • Nondairy sources include dark leafy greens (collards, mustard greens, turnip greens, bok choy), sesame seeds, tahini, almonds, soybeans, tofu, and garbanzo beans. Sardines and mackerel (canned with bones), salmon with bones, and raw oysters also have it as do fortified fruit juices and soy milk • Ethanol, caffeine, and fiber can increase fecal excretion[48] • Aspartame, glucose, excess sodium, and excess protein increase urinary excretion • Recent trials indicate that calcium levels may modestly negatively influence cardiovascular risk and must be considered in advising patients.[49] Note that a 2014 prospective cohort study of data from the Nurses' Health Study (n=74,245) did not find a link between calcium supplement intake and cardiovascular risk in women.[50]
Zinc	• Critical to immune function, wound healing, and prostate health • Consider if symptoms of poor wound healing, frequent infections, inflammatory bowel disease (IBD), acne, or psoriasis exist	• Sources include oysters, beef, pork, chicken, and egg yolk. • Also found in legumes, nuts, seeds, and whole grains • If taking more than 30 mg daily, it is suggested to take zinc with a supplement that contains copper as well, as zinc and copper compete for absorption in the small intestine

Micronutrient	Main functions	Comments
	• Most experts recommend 8 mg daily for females and 11 mg daily for males	
Selenium	• Antioxidant that works with vitamin E • Important for thyroid and immune	• Found in seafood, meats, legumes, and whole grains, but also specifically in Brazil nuts. Eating two nuts daily is sufficient to maintain healthy selenium levels. The levels of selenium in nuts and grains depends on the levels of selenium found in the soil. • A Cochrane review of selenium and cancer prevention showed that those in the highest quartile of selenium intake compared to those in the lowest quartile of selenium intake had 31% lower cancer risk and 45% lower cancer mortality risk as well as a 33% lower risk of bladder cancer and, in men, 22% lower risk of prostate cancer.[51]
Magnesium	• Cofactor for over 300 different enzymatic reactions • Necessary for muscles and blood vessels, protein and fat synthesis, energy production, and the synthesis of urea • Inadequate magnesium intake is common in the United States	• Found in large amounts in green vegetables, but can also be found in whole grains, nuts, legumes, meat, fish, and dairy • In supplement form, magnesium citrate and magnesium glycinate are the most absorbable forms. • Toxicity may develop in patients taking high doses of magnesium-containing antacids and laxatives. The first sign of magnesium toxicity is diarrhea. • The maximum recommended amount of magnesium is 1,000 mg per day before patients develop symptoms of toxicity. • Can be taken to help patients with constipation, muscle cramps, headaches, anxiety, depression, kidney stones, and diabetes. It may also be helpful for patients with hypertension[52]

* DRI = dietary reference intakes

Keep sodium (salt) and potassium balanced

In terms of electrolytes, potassium is mostly intracellular, and sodium and chloride (the electrolytes in table salt) are mostly extracellular. Sodium deficiency is rarely a problem in the United States, given that so much of our food is processed, pre-seasoned, and over-salted, but

it can occur with starvation, diarrhea, or vomiting. Most Americans exceed the tolerable upper intake level for sodium, with an average intake of 5-6 gm/day.[53] For more information on how to eat less sodium, see "The DASH Diet" tool in the "Heart Health" module. For more information on salt, refer to the USDA handout on salt and sodium, and several VA Nutrition and Food Services handouts on lowering sodium intake. Consider having people replace table salt with health-promoting spices, such as turmeric. For ideas, share the MOVE! patient education handout, "Spice It Up."

Potassium, in contrast to sodium, often is depleted. Depletion may be due to medications or for other reasons. Potassium is important for nerve transmission, muscle contraction, glycogen and glucose metabolism, and cellular integrity. Potassium is found in potatoes with skin, tomatoes, bananas, dairy, legumes, seafood, broccoli, almonds, raisins, and peanuts. Potassium deficiency can occur with diarrhea, vomiting, starvation, taking certain diuretics, and magnesium deficiency. Of course, it is important to remember that that for certain medical conditions (e.g., chronic kidney disease) there may be dietary restrictions for potassium. "Dietary Guidelines" offers more information on the potassium content of foods.

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References

1. U.S. Department of Agriculture, U.S. Department of Health and Human Services. Dietary guidelines for Americans 2015-2020. Accessed May 21, 2018, https://health.gov/dietaryguidelines/2015/resources/2015-2020_Dietary_Guidelines.pdf. Published December 2015.
2. United States Department of Agriculture. What foods are in the grains group? Accessed December 9, 2021, https://www.myplate.gov/eat-healthy/grains#:~:text=Any%20food%20made%20from%20wheat,included%20in%20the%20Grains%20Group.
3. Astrup A. The satiating power of protein--a key to obesity prevention? *Am J Clin Nutr*. Jul 2005;82(1):1-2.
4. Cozma AI, Sievenpiper JL, de Souza RJ, et al. Effect of fructose on glycemic control in diabetes: a systematic review and meta-analysis of controlled feeding trials. *Diabetes Care*. Jul 2012;35(7):1611-20. doi:10.2337/dc12-0073
5. Sundborn G, Thornley S, Merriman TR, et al. Are liquid sugars different from solid sugar in their ability to cause metabolic syndrome? *Obesity (Silver Spring, Md)*. Jun 2019;27(6):879-887. doi:10.1002/oby.22472
6. Kelishadi R, Mansourian M, Heidari-Beni M. Association of fructose consumption and components of metabolic syndrome in human studies: a systematic review and meta-analysis. *Nutrition*. May 2014;30(5):503-10. doi:10.1016/j.nut.2013.08.014

7. Buyken AE, Dettmann W, Kersting M, Kroke A. Glycaemic index and glycaemic load in the diet of healthy schoolchildren: trends from 1990 to 2002, contribution of different carbohydrate sources and relationships to dietary quality. *Br J Nutr*. Nov 2005;94(5):796-803.
8. Bhupathiraju SN, Tobias DK, Malik VS, et al. Glycemic index, glycemic load, and risk of type 2 diabetes: results from 3 large U.S. cohorts and an updated meta-analysis. *Am J Clin Nutr*. Apr 30 2014;100(1):218-232. doi:10.3945/ajcn.113.079533
9. Rossi M, Turati F, Lagiou P, Trichopoulos D, La Vecchia C, Trichopoulou A. Relation of dietary glycemic load with ischemic and hemorrhagic stroke: a cohort study in Greece and a meta-analysis. *Eur J Nutr*. Mar 2015;54(2):215-22. doi:10.1007/s00394-014-0702-3. Epub 2014 Apr 27
10. Livesey G. Low-glycaemic diets and health: implications for obesity. *Proc Nutr Soc*. Feb 2005;64(1):105-13.
11. Schwingshackl L, Hoffmann G. Long-term effects of low glycemic index/load vs. high glycemic index/load diets on parameters of obesity and obesity-associated risks: a systematic review and meta-analysis. *Nutr Metab Cardiovasc Dis*. Aug 2013;23(8):699-706. doi:10.1016/j.numecd.2013.04.008
12. Gnagnarella P, Gandini S, La Vecchia C, Maisonneuve P. Glycemic index, glycemic load, and cancer risk: a meta-analysis. *Am J Clin Nutr*. Jun 2008;87(6):1793-801.
13. Barclay AW, Petocz P, McMillan-Price J, et al. Glycemic index, glycemic load, and chronic disease risk--a meta-analysis of observational studies. *Am J Clin Nutr*. Mar 2008;87(3):627-37.
14. Chen MJ, Jovanovic A, Taylor R. Utilizing the second-meal effect in type 2 diabetes: practical use of a soya-yogurt snack. *Diabetes Care*. Dec 2010;33(12):2552-4. doi:10.2337/dc10-0552
15. Samra RA, Anderson GH. Insoluble cereal fiber reduces appetite and short-term food intake and glycemic response to food consumed 75 min later by healthy men. *Am J Clin Nutr*. Oct 2007;86(4):972-9.
16. Schafer RG, Bohannon B, Franz M, et al. Translation of the diabetes nutrition recommendations for health care institutions. *Diabetes Care*. Jan 1997;20(1):96-105.
17. McMillan-Price J, Petocz P, Atkinson F, et al. Comparison of 4 diets of varying glycemic load on weight loss and cardiovascular risk reduction in overweight and obese young adults: a randomized controlled trial. *Arch Intern Med*. Jul 24 2006;166(14):1466-75. doi:10.1001/archinte.166.14.1466
18. Wolf BW, Wolever TM, Lai CS, et al. Effects of a beverage containing an enzymatically induced-viscosity dietary fiber, with or without fructose, on the postprandial glycemic response to a high glycemic index food in humans. *Eur J Clin Nutr*. Sep 2003;57(9):1120-7. doi:10.1038/sj.ejcn.1601652
19. Dahl WJ, Lockert EA, Cammer AL, Whiting SJ. Effects of flax fiber on laxation and glycemic response in healthy volunteers. *J Med Food*. Winter 2005;8(4):508-11. doi:10.1089/jmf.2005.8.508
20. Chandalia M, Garg A, Lutjohann D, von Bergmann K, Grundy SM, Brinkley LJ. Beneficial effects of high dietary fiber intake in patients with type 2 diabetes mellitus. *N Engl J Med*. May 11 2000;342(19):1392-8. doi:10.1056/nejm200005113421903
21. Li S, Flint A, Pai JK, et al. Dietary fiber intake and mortality among survivors of myocardial infarction: prospective cohort study. *BMJ*. 2014;348:g2659. doi:10.1136/bmj.g2659
22. Coleman HG, Murray LJ, Hicks B, et al. Dietary fiber and the risk of precancerous lesions and cancer of the esophagus: a systematic review and meta-analysis. *Nutr Rev*. Jul 2013;71(7):474-82. doi:10.1111/nure.12032
23. Threapleton DE, Greenwood DC, Evans CE, et al. Dietary fiber intake and risk of first stroke: a systematic review and meta-analysis. *Stroke*. May 2013;44(5):1360-8. doi:10.1161/strokeaha.111.000151
24. Threapleton DE, Greenwood DC, Evans CE, et al. Dietary fibre intake and risk of cardiovascular disease: systematic review and meta-analysis. *BMJ*. 2013;347:f6879. doi:10.1136/bmj.f6879
25. Eswaran S, Muir J, Chey WD. Fiber and functional gastrointestinal disorders. *Am J Gastroenterol*. May 2013;108(5):718-27. doi:10.1038/ajg.2013.63
26. Bailes J. The "Fat-Free Fallacy:" Is it obesity's great enabler? Accessed May 27, 2014, https://liveahealthygoodlife.wordpress.com/2009/09/01/the-fat-free-fallacy-is-it-obesitys-great-enabler/

27. Kohatsu W. The Anti Inflammatory Diet. In: Rakel D, ed. *Integr Med*. 3rd ed. Saunders, an imprint of Elsevier, Inc; 2012:795-802.
28. Valenzuela A, Morgado N. Trans fatty acid isomers in human health and in the food industry. *Biol Res*. 1999;32(4):273-87.
29. Ascherio A, Katan MB, Zock PL, Stampfer MJ, Willett WC. Trans fatty acids and coronary heart disease. *N Engl J Med*. Jun 24 1999;340(25):1994-8. doi:10.1056/nejm199906243402511
30. Oomen CM, Ocke MC, Feskens EJ, van Erp-Baart MA, Kok FJ, Kromhout D. Association between trans fatty acid intake and 10-year risk of coronary heart disease in the Zutphen Elderly Study: a prospective population-based study. *Lancet*. Mar 10 2001;357(9258):746-51.
31. Simopoulos AP. The importance of the ratio of omega-6/omega-3 essential fatty acids. *Biomed Pharmacother*. Oct 2002;56(8):365-79.
32. Rangel-Huerta OD, Aguilera CM, Mesa MD, Gil A. Omega-3 long-chain polyunsaturated fatty acids supplementation on inflammatory biomakers: a systematic review of randomised clinical trials. *Br J Nutr*. Jun 2012;107 Suppl 2:S159-70. doi:10.1017/s0007114512001559
33. Moro E, Gallina P, Pais M, Cazzolato G, Alessandrini P, Bittolo-Bon G. Hypertriglyceridemia is associated with increased insulin resistance in subjects with normal glucose tolerance: evaluation in a large cohort of subjects assessed with the 1999 World Health Organization criteria for the classification of diabetes. *Metabolism*. May 2003;52(5):616-9. doi:10.1053/meta.2003.50102
34. Al-Mahmood A, Ismail A, Rashid F, Mohamed W. Isolated hypertriglyceridemia: an insulin-resistant state with or without low HDL cholesterol. *J Atheroscler Thromb*. Jun 2006;13(3):143-8.
35. Protein and amino acids. In: Institute of Medicine Panel on Macronutrients, Institute of Medicine Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, eds. *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. National Academies Press; 2005:589-768.
36. Anderson GH, Moore SE. Dietary proteins in the regulation of food intake and body weight in humans. *J Nutr*. Apr 2004;134(4):974s-9s.
37. Matthews D. Proteins and amino acids. In: Shils ME, Shike M, eds. *Modern Nutrition in Health and Disease*. Lippincott Williams & Wilkins; 2006:23-61.
38. Jhee JH, Kee YK, Park S, et al. High-protein diet with renal hyperfiltration is associated with rapid decline rate of renal function: a community-based prospective cohort study. *Nephrol Dial Transplant*. Jan 1 2020;35(1):98-106. doi:10.1093/ndt/gfz115
39. Ko GJ, Rhee CM, Kalantar-Zadeh K, Joshi S. The Effects of High-Protein Diets on Kidney Health and Longevity. *J Am Soc Nephrol*. Aug 2020;31(8):1667-1679. doi:10.1681/asn.2020010028
40. Hart J. The Health Benefits of a Vegetarian Diet. *Altern Complement Ther*. 2009;15(2):64-68.
41. Tulchinsky TH. Micronutrient deficiency conditions: global health issues. *Public Health Rev*. 2010;32(1):243-255.
42. Spedding S. Vitamins are more funky than Casimir thought. *Australas Med J*. 2013;6(2):104-6. doi:10.4066/amj.2013.1588
43. Garrison RH, Somer E. *The Nutrition Desk Reference*. Keats Pub; 1995.
44. Appel LJ, Moore TJ, Obarzanek E, et al. A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. *N Engl J Med*. Apr 17 1997;336(16):1117-24. doi:10.1056/nejm199704173361601
45. Pfab F, Hammes M, Backer M, et al. Preventive effect of acupuncture on histamine-induced itch: a blinded, randomized, placebo-controlled, crossover trial. *J Allergy Clin Immunol*. Dec 2005;116(6):1386-8. doi:10.1016/j.jaci.2005.08.055
46. Mangano KM, Walsh SJ, Insogna KL, Kenny AM, Kerstetter JE. Calcium intake in the United States from dietary and supplemental sources across adult age groups: new estimates from the National Health and Nutrition Examination Survey 2003-2006. *J Am Diet Assoc*. May 2011;111(5):687-95. doi:10.1016/j.jada.2011.02.014
47. National Institute for Health (Office of Dietary Supplements). Calcium. Accessed Sepetemebr 4, 2020. https://ods.od.nih.gov/factsheets/Calcium-HealthProfessional/

48. Nguyen UN, Dumoulin G, Henriet M-Trs, Regnard J. Aspartame ingestion increases urinary calcium, but not oxalate excretion, in healthy subjects. *The journal of clinical endocrinology and metabolism*. 1998;83(1):165-168.
49. Bolland MJ, Barber PA, Doughty RN, et al. Vascular events in healthy older women receiving calcium supplementation: randomised controlled trial. *BMJ*. Feb 2 2008;336(7638):262-6. doi:10.1136/bmj.39440.525752.BE
50. Paik JM, Curhan GC, Sun Q, et al. Calcium supplement intake and risk of cardiovascular disease in women. *Osteoporosis international* May 7 2014;doi:10.1007/s00198-014-2732-3
51. Dennert G, Zwahlen M, Brinkman M, Vinceti M, Zeegers MP, Horneber M. Selenium for preventing cancer. *Cochrane Database Syst Rev*. 2011;(5):Cd005195. doi:10.1002/14651858.CD005195.pub2
52. Kisters K, Grober U. Lowered magnesium in hypertension. *Hypertension*. Oct 2013;62(4):e19. doi:10.1161/hypertensionaha.113.02060
53. Gaby A. *Nutritional Medicine*. Fritz Perlberg Publishing; 2011.