

Healthy Living Guide 2021 / 2022

A DIGEST ON HEALTHY EATING AND HEALTHY LIVING

From the Department of Nutrition at the Harvard T.H. Chan School of Public Health



EAT

- Anti-inflammatory diets
- The science of cravings
- Exploring aquatic foods



MOVE

- Workout supplement review
- Spotlight on yoga and HIIT



SLEEP

- Sleep and dementia risk
- Do sleep supplements work?



PLUS

Highlighting 5 key factors that contribute to not only a longer but also healthier lifespan.



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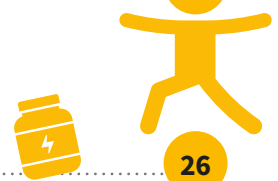
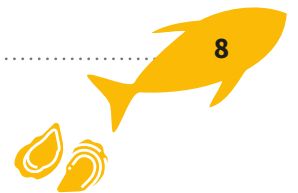
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A Note From the Editorial Team

Happy New Year, and welcome to the second edition of the *Healthy Living Guide*!

Over the course of 2021, many of us continued to adapt to a “new normal,” characterized by a return to some pre-pandemic activities mixed with hobbies or habits that have emerged since 2020’s lockdowns. On the topic of food and eating, according to one U.S. consumer survey¹ the year marked a decrease in certain behaviors that had changed abruptly during 2020. For example, fewer Americans reported that they were “snacking more” (18% in 2021 vs. 32% in 2020) or “eating more in general” (11% in 2021 vs. 20% in 2020). However, consumers also signaled a decrease in cooking at home (47% in 2021 vs. 60% in 2020); while other survey findings underscored significant disparities in food security. Beyond food, the COVID-19 pandemic continues to generate a wide range of unique and individual impacts, and the emergence of new disease variants is a sobering reminder of the urgency for increased vaccination globally, especially in low- and lower-middle-income countries.

As we all continue to navigate the twists and turns of this pandemic, we once again invite you to do what you can to incorporate healthy behaviors into your daily life. This year’s edition revisits the core themes of eating well, being active, and getting enough sleep with selected research highlights, as well as a closer look at some popular nutrition and lifestyle topics. We hope that you find it useful, and we wish you a very healthy and fulfilling 2022.

1. International Food Information Council. 2021 Food & Health Survey. 2021.

Explore The Nutrition Source website for more evidence-based guidance for healthy eating and healthy living:
hsp.hme/nut21



click on the link

scan QR code with smartphone camera

ACCESS ADDITIONAL CONTENT

Throughout the guide you will find these callouts to related content on *The Nutrition Source* website. If you’re already reading digitally, simply click the hyperlink. If you have a printed copy, point your smartphone’s camera at the QR code until the prompt appears to access the webpage.



A Longer and Healthier Lifespan

Evidence behind key factors that contribute to not only a longer but also healthier life.

In 2018, Harvard researchers looked at factors that may increase our chances of a longer life. Through data collected from men and women who were followed for up to 34 years from the Nurses' Health Study and Health Professionals Follow-up Study, researchers examined five low-risk lifestyle factors: healthy diet, regular exercise (at least 30 minutes daily of moderate to vigorous activity), healthy weight (as defined by a body mass index of 18.5-24.9), no smoking, and moderate alcohol intake (up to 1 drink daily for women, and up to 2 daily for men). Compared with those who did not incorporate any of these lifestyle factors, those with all five factors lived up to 14 years longer.¹ But were these extra years healthy ones, or were they burdened by illness?

In a 2020 follow-up study, the research group looked at how these factors might contribute to not only a longer but also healthier life. They found that women at age 50 who practiced four or five of the healthy habits listed above lived about 34 more years free of diabetes, cardiovascular diseases, and cancer, compared with 24 more disease-free years in women who practiced none of these healthy habits. Men practicing four or five healthy habits at age 50 lived about 31 years free of chronic disease, compared with 24 years among men who practiced none. Men who



5 Lifestyle Factors

-  Eating a **healthy and balanced diet**
-  **Regular exercise** of at least 30 minutes daily of moderate to vigorous activity
-  Maintaining a **healthy weight** (as defined by a body mass index of 18.5-24.9)
-  **Not smoking**
-  If consuming **alcohol**, limiting intake (up to 1 drink daily for women, up to 2 daily for men)

were current heavy smokers, and men and women with obesity, had the lowest disease-free life expectancy.²

While these studies don't account for other diseases, including neurodegenerative diseases like Alzheimer's, identifying additional factors that improve and extend our "healthspans" is an active area of scientific

inquiry. In the meantime, these study findings are encouraging, and underscore the importance of following healthy lifestyle habits throughout one's life course. That said, sticking to these behaviors is easier said than done, and public policies must support and promote these habits by improving the food and physical environments that surround us.

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HEALTHY EATING PLATE

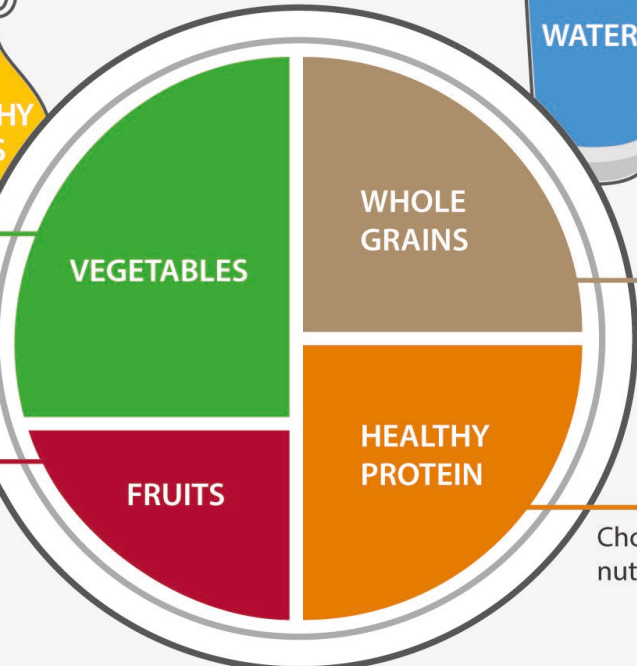
Use healthy oils (like olive and canola oil) for cooking, on salad, and at the table. Limit butter. Avoid trans fat.



HEALTHY OILS

The more veggies – and the greater the variety – the better. Potatoes and French fries don't count.

Eat plenty of fruits of all colors.



WATER

Drink water, tea, or coffee (with little or no sugar). Limit milk/dairy (1-2 servings/day) and juice (1 small glass/day). Avoid sugary drinks.

Eat a variety of whole grains (like whole-wheat bread, whole-grain pasta, and brown rice). Limit refined grains (like white rice and white bread).

Choose fish, poultry, beans, and nuts; limit red meat and cheese; avoid bacon, cold cuts, and other processed meats.



STAY ACTIVE!

© Harvard University

Build a Healthy Meal

Kid's Healthy Eating Plate

Eating a variety of foods keeps our meals interesting and flavorful. It's also the key to a balanced diet because each food has a unique mix of nutrients. At a glance, the Healthy Eating Plate and Kid's Healthy Eating Plate provide a blueprint to creating healthy meals—whether served at the table or packed in a lunch box.

Learn more about these resources and access other downloadable tools, including a Kid's Plate coloring page, and over 25 translations of the Healthy Eating Plate: hsph.me/hep21





Updates: Diet and COVID-19

HOW COMMON WAS COVID-19-RELATED WEIGHT GAIN IN ADULTS?

Throughout 2020, “COVID-15” became a popular term based on reports of people gaining weight due to quarantining indoors, moving less, and changing their eating habits.

One study of 269 adult participants from the Health eHeart Study found an average 1.5-pound weight gain per month.¹ An American Psychological Association poll of more than 3,000 American adults found that 61% experienced unintended weight changes (either gain or loss) since the start of the pandemic; 42% reported gaining an average of 29 pounds, and 18% reported losing an average of 26 pounds.²

However, these reports had limited samples and it wasn't clear if weight changes were widespread across the U.S. population. A more recent publication of weight data on 19,573,285 adult patients in 49 states collected from Epic, a large healthcare database, did not show significant weight changes of gain or loss in most patients when comparing their pre-pandemic weights in 2019 and 2020 with weights taken in March 2021.³ A smaller percentage of up to 10% did show weight gain of more than 10 pounds, but about the same percentage of people also lost that amount of weight during this period of the pandemic.

COVID-related weight gain may have stemmed from altered eating routines, less physical activity, increased stress, and disrupted sleep. Weight loss may have occurred from poor appetite related to anxiety or depression, or decreased muscle mass from less activity; other people may have lost weight in a healthy manner by adapting their eating and exercise habits, such as learning to cook healthy meals at home instead of relying on takeout, discovering home-based or outdoor exercise options, and establishing a set sleep schedule.



CAN CERTAIN DIETARY PATTERNS REDUCE THE SEVERITY OF COVID-19?

Although getting vaccinated and other precautions like mask-wearing remain the best defense against COVID-19, researchers have been interested in the role of diet in reducing risk and severity of COVID symptoms.

Researchers at Massachusetts General Hospital looked at data from March to December 2020 of more than 592,000 participants in the U.S. and United Kingdom. Their self-reported diets were assessed using a healthful Plant-Based Diet Score that scored higher marks for healthy plant foods like fruits, vegetables, and whole grains. Participants with the highest diet scores had a 9% lower risk of contracting the virus, and a 41% lower risk of developing severe COVID-19 symptoms compared with those who had the lowest scores.⁴ The beneficial effects seemed especially relevant in individuals living in areas of high socioeconomic deprivation, underlining the need for public health strategies that improve access to healthy foods and address other social determinants that may help reduce the burden of the pandemic.

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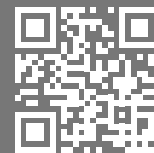
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Nutrition Research Highlights



SODIUM, POTASSIUM, AND CARDIOVASCULAR DISEASE

Assessing people's sodium intakes can be tricky, and the most accurate method known is to measure 24-urine samples over several days. This is the method Harvard researchers used when pooling data from 10,709 generally healthy adults from six prospective cohorts including the Nurses Health Studies I and II, the Health Professionals Follow-up Study, the Prevention of Renal and Vascular End-Stage Disease study, and the Trials of Hypertension Prevention Follow-up studies. They looked at both sodium and potassium intakes in relation to cardiovascular disease (CVD) risk (as noted by a heart attack, stroke, or procedure or surgery needed to repair heart damage), and measured two or more urine samples per participant. After controlling for CVD risk factors, they found that a higher sodium intake was associated with higher CVD risk. For every 1,000 mg increase of urinary sodium per day, there was an 18% increased risk of CVD. But for every 1,000 mg increase of potassium, there was an 18% lower risk of CVD. They also found that a higher sodium-to-potassium ratio was associated with higher CVD risk, that is, eating a higher proportion of salty foods to potassium-rich foods such as fruits, vegetables, legumes, and low-fat dairy.¹



Learn more about sodium, potassium and health:
hsph.me/sdm21



MICROBIOME AND THE MEDITERRANEAN DIET

Researchers studied the microbiome's role as an intermediary between one's food intake and cardiovascular disease risk. They followed 307 men from the Health Professionals Follow-up Study, looking at their diets and blood levels of markers that show higher cardiovascular risk. They found that a healthy eating pattern such as the Mediterranean Diet and lower cardiovascular disease risk were more strongly associated when participants had low levels of a gut bacterial species called *Prevotella copri*. Some research has shown that a high level of this bacteria type is associated with inflammation. However more research is needed because the *Prevotella* species can have different effects in different people, sometimes even offering health benefits.²



Learn more about the microbiome:
hsph.me/ome21



HARNESSING THE POTENTIAL OF METABOLOMICS

Large epidemiological studies that associate diet with human health often rely on food frequency questionnaires to estimate people's usual food intakes and dietary patterns. Yet, these tools can carry errors, such as recalling inaccurate portion sizes or types of foods eaten. Another tool used is a detailed food journal, but which can be cumbersome for participants to record daily. The term "metabolomics" refers to an emerging tool that measures markers in the body, or biomarkers, that are related to eating specific foods and dietary patterns. Researchers in this review discuss the limitations of self-reported dietary data and how metabolomics can improve its accuracy, and the potential role of metabolomics in the field of precision nutrition, which focuses on highly individualized nutrition strategies based on one's genes, microbiome, and metabolism.³



Learn more about the broader field of precision nutrition:
hsph.me/pnu21

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Exploring Aquatic Foods

A deep-dive into the diversity and potential of water-sourced foods for both human and planetary health.

Foods like salmon, lobster, and shrimp, are often categorized as “seafood.” But how might you classify these foods when including a freshwater fish, such as trout? Consider the term *aquatic foods* (also called *blue foods*), which include any animals, plants, and microorganisms that originate in bodies of water.

Aquatic foods can be farmed or wild-caught, and are sourced from inland waters like lakes, rivers, and

wetlands; coastal areas like estuaries, mangroves, or near-shore; and marine or ocean waters. Despite currently being an important contribution to healthy diets for billions of people globally, aquatic foods are often undervalued nutritionally because their diversity tends to be restricted to protein or energy value, or framed as a monolithic category of “seafood or fish.”¹ However, there is a broad diversity of aquatic foods produced throughout the world and available during every season. Currently, wild fisheries harvest over 2,370 species and aquaculture growers farm approximately 624 species.²

Because aquatic foods are so nutrient-rich, food technologists have in-

novated methods to create processed fish products, including fish powders for infants, fish wafers as a snack, and fish chutneys.¹

AQUATIC FOODS AND HEALTH

Despite the diversity of aquatic plants and algae, this review will primarily focus on aquatic animal foods.

These foods are good sources of a range of nutrients, including protein, zinc, iron, magnesium, selenium, iodine, copper, and vitamins A, B6, B12, and D. Notably, certain aquatic animal foods are a major dietary source of two polyunsaturated omega-3 fatty acids (PUFAs)—docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). These fatty acids are initially

EXAMPLES OF AQUATIC FOODS

Finfish—small pelagic fish (herring, sardines, anchovies), medium pelagic fish (bonito, mahi-mahi), large pelagic fish (tuna, swordfish), salmonids (salmon, trout), carps, cichlids (tilapia), cods (cod, haddock, pollock), and demersal fish (flounder)

Cephalopods—octopus, squid

Crustaceans—crabs, shrimp, krill, prawns, lobster

Mollusks—clams, cockles, sea snails, mussels, scallops

Other aquatic animals—insects, sea cucumbers, mammals (although not consumed in the U.S., seals and other aquatic mammals can be a culturally and nutritionally important food source in subsistence and indigenous populations)

Aquatic plants—water spinach (*Ipomoea aquatica*)

Algae—seaweed



produced by certain types of algae, which are then eaten by aquatic animals so that the fats accumulate in their tissues or organs. Omega-3s are found in all aquatic foods, but particularly in the fatty tissue of oily fish like salmon and mackerel, the liver of lean white fish like cod and halibut, and the blubber or thick layer of fat under the skin of marine mammals like seals and whales. Smaller amounts are also found in crustaceans, bivalves, and cephalopods.³ Supplements of fish oil, algal oil, and krill oil also contain DHA and/or EPA. Much of the research on aquatic foods and human health—including cardiovascular health, cognitive health, and fetal development—focuses on these omega-3s.

Research has also found that swapping red and processed meat with fish and seafood can lower the risk of diseases and premature death. One reason may be differences in types of fat: mostly saturated fat in red meat versus unsaturated fat in seafood. Data from 6 U.S. cohort studies found that higher intakes of red meat and processed meat were associated with an increased risk of cardiovascular disease and early death, whereas fish was not.⁴ Research from a large Dan-

NUTRITION COMPARISON: AQUATIC VS. LAND-BASED ANIMALS
From abalone to zebra tilapia, the diversity of aquatic foods outsize the limited variety of land-based animal foods available to most consumers. But how do they compare nutritionally? To explore this question, researchers created the first-ever Aquatic Foods Composition Database, capturing individual nutrient profiles (including minerals, vitamins, and fatty acids) for over 3,750 species. Their analysis found that the top 6 categories of nutrient-rich animal-source foods were all aquatic, with large and small pelagic fish, shellfish, salmonids, carps, and other aquatic mammals ranking higher than land-based foods including beef, lamb, veal, goat, chicken, and pork.¹

ish cohort study found that replacing red and/or processed red meat with fish or poultry lowered the risk of type 2 diabetes and early death.^{5,6}

CONCERNS OVER CONTAMINANTS

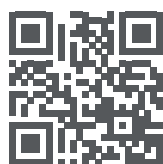
Certain species can carry small amounts of neurotoxic compounds like methylmercury, dioxins, and polychlorinated biphenyls (PCBs). It is believed that these chemicals can delay brain development in infants and modestly increase the risk of cardiovascular disease.⁷ Those most at-risk for these exposures are pregnant and nursing women, breast-fed infants, and young children.

As concerning as this sounds, it is important to weigh the risk versus benefit. A report from an FAO and WHO Expert Committee outlining the risks and benefits of fish consumption found that the benefits of dietary omega-3s outweighed the risks of

mercury exposure in childbearing women. Eating fish during pregnancy lowered the risk of delayed fetal brain development compared with pregnant women who did not eat fish.^{7,8} Studies have found dioxins and PCB levels in fish to be typically very low, and small exposures to these compounds in pregnant woman will not harm the fetus. Consider that more than 90% of the PCBs and dioxins in the U.S. food supply come not from aquatic foods but from land-based meats, dairy, eggs, and vegetables. There is also limited evidence from epidemiological studies showing an association with higher mercury intake (obtained mostly from aquatic foods) and increased cardiovascular disease. The small exposures to mercury may be offset by the several heart-protective nutrients found in fish and other aquatic species.

Those who eat aquatic foods very

Explore more research on aquatic foods and health outcomes, such as heart disease and cognition: hsph.me/aqf21





“In an effort to formulate food systems that will nourish the world while staying within the ecological limits of our planetary boundaries, aquatic food production is a sensible path forward.”



—**Dr. Christopher Golden**, assistant professor of nutrition and planetary health. Golden and his team found that increasing global production and availability of aquatic foods could help reduce their cost by 26% and increase their consumption, which may then reduce consumption of red and processed meats that are associated with diet-related chronic diseases.¹ It is also estimated that this shift to aquatic foods may prevent about 166 million micronutrient deficiencies that place people at increased risk for communicable diseases (e.g., bacterial infections, viruses) due to a weakened immune system. Learn more at hsph.me/gld21.

frequently (5 or more servings a week) and vulnerable populations (pregnant/nursing women, infants, and toddlers) may limit intake of species highest in mercury (swordfish, shark, bluefin tuna, yellowfin or ahi tuna, canned white albacore tuna, king mackerel, marlin, golden bass). Good choices are cod, catfish, shellfish, oysters, mussels, shrimp, sardines, and scallops. Also check local advisories on levels of contaminants in freshwater fish from lakes and reservoirs, as these types tend to be higher in mercury and PCBs. If no specific guidelines are available, consume up to 6 ounces a week of fish from local waters but limit eating any other aquatic foods during that week.

FOR YOUR HEALTH AND THE PLANET’S HEALTH

Modern production of aquatic foods can be split into two different sectors: *wild capture* (harvesting wild fish and other aquatic species from the ocean and freshwater sources) and *aquaculture* (farming aquatic plants and animals).

Compared to land-based animal foods, the production of aquatic foods (through both wild capture and aquaculture) produces fewer greenhouse gas emissions and uses less land than red meat production;

and many aquatic animal foods also have less environmental impact than poultry production.⁹ That said, beyond emissions and land use, it is important to consider where and how aquatic foods are produced, since environmental as well as social and economic impacts can vary widely in both wild capture and aquaculture sectors.¹ The percentage of wild marine fisheries classified as “overfished” has steadily increased over the past few decades. According to an FAO assessment, the fraction of fish stocks that are within “biologically sustainable” levels decreased from 90% in 1974 to just under 66% in 2017.² Commercial fishing at current scales can also contribute to: Habitat destruction from *trawling* (a fishing method that indiscriminately captures sea creatures with a dragging net on the ocean floor); bycatch and discards (marine species caught unintentionally while targeting other species and sizes of fish); illegal, unreported and unregulated fishing; and issues around unfair distribution of trade benefits and food access.

Aquaculture is emerging to fill gaps in seafood supply from reductions in existing wild fish stocks. However despite its promise, aquaculture must be done respon-

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sibly. For example, insufficiently regulated aquaculture can result in both environmental stressors—such as freshwater use and nitrogen and phosphorus emissions—as well as negative interactions with wild fishery populations through the spread of disease, overuse of antibiotics, and escaped species.⁹

In summary, sustainably and equitably achieving the human health benefits of increased aquaculture production will require policies and

technologies that minimize impacts on surrounding ecosystems, industries, and communities.

BOTTOM LINE

Aquatic foods are a diverse category of nutrient-dense, protein-rich foods that can also be a healthful animal-based alternative when looking to cut down on red meat or other land-sourced animal foods. Misconceptions exist, such as having a strong off-putting odor (fresh fish should not

smell!) or higher cost than other animal protein foods, which may deter people from choosing aquatic foods. However, many aquatic foods are a major source of omega-3 fatty acids and various nutrients that are helpful in the prevention and treatment of cardiovascular disease, and that are vital for normal fetal development. They can also be delicious and satisfying, and incorporated into many meals like salads, stews, sandwiches, and main courses.



CRISPY PAN SEARED WHITE FISH WITH WALNUT ROMESCO AND PEA SHOOT SALAD

INGREDIENTS

- 4 (4- to 6-ounce) skin-on white fish fillets, 1 to 1½ inches thick
- Vegetable oil
- Extra-virgin olive oil
- Kosher salt and pepper
- 1 (12-ounce) jar roasted red peppers, drained
- 1 Tbsp. sherry vinegar
- 1 clove garlic
- 1 tsp. smoked paprika
- ½ tsp. cayenne pepper
- ½ cup (2 ounces) toasted walnuts
- 1 small shallot, minced
- 2 tsp. lemon juice
- 2 cups pea shoots, cut into 2-inch pieces
- ½ cup (2 ounces) toasted walnuts, chopped
- 2 tablespoons mint leaves, torn

PREPARATION

1. For the Fish: Using sharp knife score skin lengthwise at ½-inch intervals, making ¼-inch-deep cuts, stopping ½ inch from top and bottom of filet. Season both sides of filets evenly with 2 tsp. salt and place skin side up on wire rack set in rimmed baking sheet. Refrigerate for at least 45 minutes or up to 1½ hours.
2. For the Sauce: Place peppers, vinegar, garlic, 2 tsp. salt, smoked paprika, and cayenne in blender and blend on high speed until smooth, about 30 seconds. With blender running, slowly drizzle in ¼ cup olive oil until smooth and creamy, about 1 minute. Add walnuts and blend on high speed until smooth, about 1 minute longer.
3. For the Salad: Whisk shallot, 2 Tbsp. olive oil, lemon juice, ½ tsp. salt, and ¼ tsp. pepper in large bowl until combined. Add pea shoots, walnuts, and mint and toss gently to combine.
4. Remove fish from refrigerator and pat skin dry with paper towels. Heat 2 Tbsp. vegetable oil in 12-inch nonstick skillet over high heat until just smoking. Carefully slide fillets, skin side down, into skillet. Immediately reduce heat to medium-low; using fish spatula, firmly press fillets down for 20 to 30 seconds to create good contact between skin and skillet. Continue to cook, tilting skillet occasionally to distribute oil, until skin is well browned and flesh is opaque except for top ¼ inch, 8 to 12 minutes. (If at any time during searing, oil starts to smoke or sides of fish start to brown, reduce heat so that oil is sizzling but not smoking.)
5. Turn off heat. Flip fish and continue cooking until fish registers 125 degrees F, about 30 seconds longer. Immediately transfer fish to large platter or wire rack set in rimmed baking sheet. Spoon dollops of sauce onto individual plates. Place fillets, skin side up, on top of sauce and serve with salad.

SERVES: 4

Recipe courtesy of Tim Chin



Are Anti-Nutrients Harmful?

Although these compounds in many healthful foods may block absorption of nutrients, the overall benefits of consuming such foods generally outweigh potential negative effects.

The term “anti-nutrients” suggests what they are. Whereas nutrients are substances that nourish plants and animals to grow and live, anti-nutrients can block the absorption of nutrients. Anti-nutrients are naturally found in animals and many plant-based foods. In plants, they are compounds designed to protect from bacterial infections and being eaten by insects.

It is not known how much nutrient loss occurs in our diets because of anti-nutrients, and the effects vary among individuals based on their metabolism and how the food is

cooked and prepared. Many anti-nutrients like phytates, lectins, and glucosinolates can be removed or deactivated by soaking, sprouting, or boiling the food before eating.

Another consideration is that these anti-nutrients affect the absorption of nutrients eaten at the same meal. Therefore to lower this risk, it is recommended to avoid eating large quantities of foods containing anti-nutrients at one meal, and to eat a balanced diet throughout the day with a variety of foods.¹ For example, instead of eating two cups of bran cereal with milk for breakfast, choose one cup of cereal with milk and one cup of fresh berries.

People who are at high risk for diseases related to mineral deficiencies, such as osteoporosis with calcium deficiency or anemia with iron deficiency, may wish to monitor their food choices for anti-nutrient content. Another strategy is altering the timing of eating foods with anti-nutrients. Examples are to drink tea between meals instead of with a meal to reduce the chances of iron being poorly absorbed, or taking a calcium supplement a few hours after eating a high-fiber wheat bran cereal that contains phytates.

THERE ARE SEVERAL COMPOUNDS IN FOODS CLASSIFIED AS ANTI-NUTRIENTS. EXAMPLES INCLUDE:

Lectins in legumes (beans, peanuts, soybeans), whole grains—can interfere with the absorption of calcium, iron, phosphorus, and zinc.

Oxalates in green leafy vegetables, beets, beans, certain nuts, rice bran, potatoes—can bind to calcium and prevent it from being absorbed.

Phytates (phytic acid) in whole grains, seeds, legumes, some nuts—can decrease the absorption of iron, zinc, magnesium, and calcium.

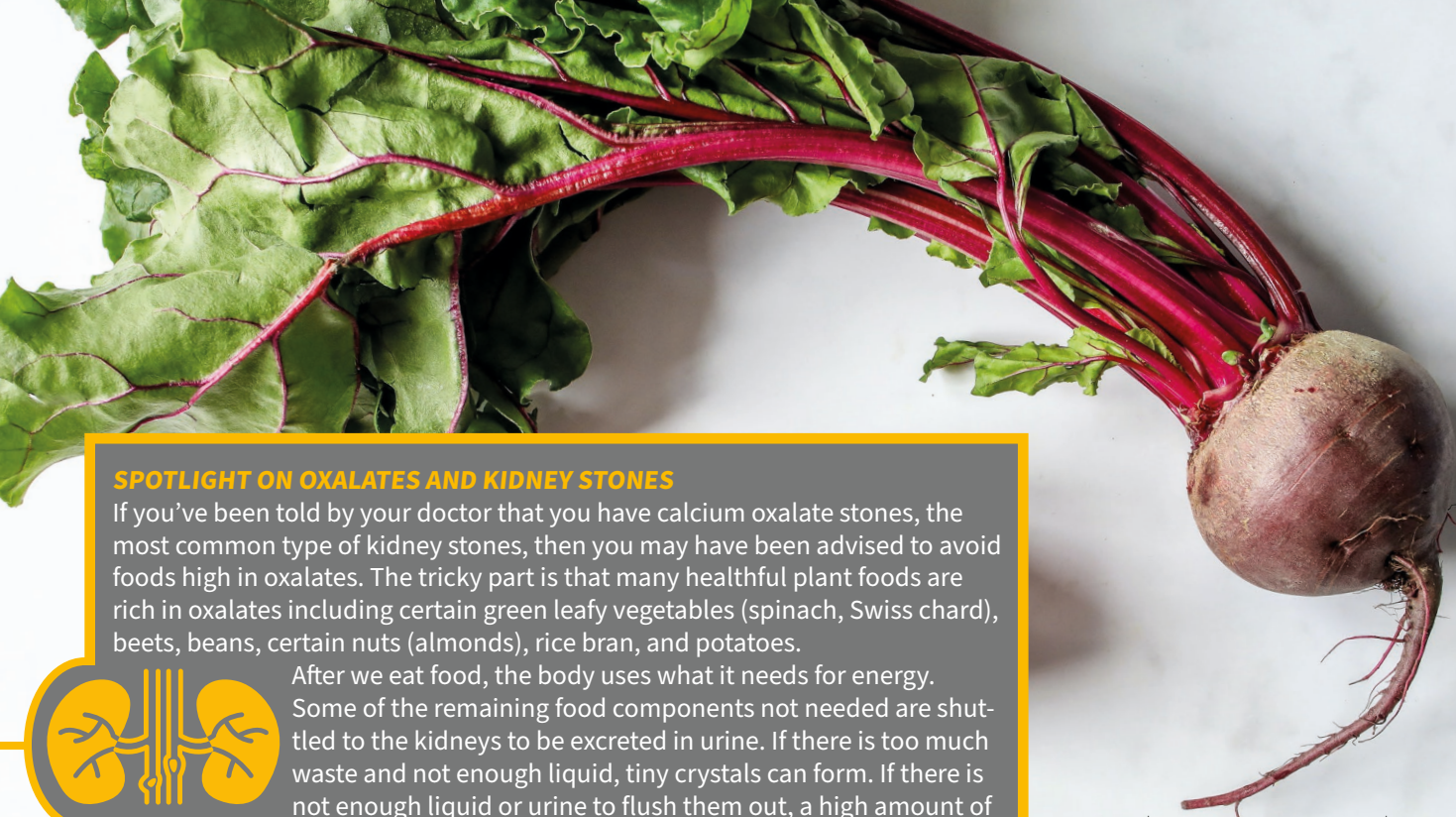
Saponins in legumes, whole grains—can interfere with normal nutrient absorption.

Tannins in tea, coffee, legumes—can decrease iron absorption.

Glucosinolates and goitrogens in cruciferous vegetables (broccoli, Brussels sprouts, cabbage, kale)—can prevent the absorption of iodine, which may then interfere with thyroid function and cause goiter. Those already with an iodine deficiency or a condition called hypothyroidism are most susceptible.

Learn more about specific compounds classified as anti-nutrients, including lectins and glucosinolates: hsph.me/ant21





SPOTLIGHT ON OXALATES AND KIDNEY STONES

If you've been told by your doctor that you have calcium oxalate stones, the most common type of kidney stones, then you may have been advised to avoid foods high in oxalates. The tricky part is that many healthful plant foods are rich in oxalates including certain green leafy vegetables (spinach, Swiss chard), beets, beans, certain nuts (almonds), rice bran, and potatoes.



After we eat food, the body uses what it needs for energy. Some of the remaining food components not needed are shuttled to the kidneys to be excreted in urine. If there is too much waste and not enough liquid, tiny crystals can form. If there is not enough liquid or urine to flush them out, a high amount of oxalates in the urine can form crystals by attaching to calcium. Sometimes the crystals clump together to form a stone that is painful when it moves to pass.

However, avoiding dietary oxalate is not the only or best way to avoid kidney stones. It is important to drink enough fluids, especially water, to dilute the urine so that substances like oxalates do not collect and stick together. Eating calcium-rich foods at the same time as oxalate-rich foods can also help, as the oxalates will bind to calcium in the stomach, preventing the oxalate from being absorbed into the body. An example is to drink calcium-fortified milk or plant milk with a meal or snack that contains beans, spinach, or nuts.

Some people at risk for kidney stones may “hyper-absorb” oxalates, so in these cases moderating intake of oxalate-rich foods may be particularly helpful.⁴ Cooking foods may also lower oxalate content. Oxalates dissolve in water, and some research indicates that boiling vegetables for 12 minutes can lower their oxalate content by 30-87%, with leafy greens like spinach and Swiss chard showing the greatest losses at about 85%. Steaming had less of an effect, showing about 45% loss of oxalates.⁴

Three large cohorts from the Health Professionals Follow-up study and Nurses' Health Studies I and II found an average 20% increased risk of forming kidney stones with high oxalate intakes in men and women.⁵ Men who had the lowest calcium intakes of less than 755 mg daily and the highest oxalate intakes had a 46% increased risk of developing stones. But higher calcium intakes in men were also found to be significantly protective from developing stones. A follow-up review confirmed that higher calcium intakes were protective from kidney stones in women.⁶ Other studies have found the DASH diet had a 40-50% lower risk of kidney stones, which may be due to the diet being rich in potassium and magnesium, minerals protective from kidney stones.⁷

Therefore, a dietary strategy to prevent kidney stones is more complex than just avoiding oxalates. For those at risk, drink plenty of water every day, eat enough calcium from foods, and eat low amounts of oxalate-rich foods taken with calcium-rich foods. Always inform your doctor about any dietary changes that are made for health reasons.

Studies on vegetarians who eat diets high in plant foods containing anti-nutrients do not generally show deficiencies in iron and zinc, so the body may be adapting by increasing the absorption of these minerals in the gut.¹

Keep in mind that anti-nutrients may also exert health benefits. Phytates, for example, have been found to lower cholesterol, slow digestion, and prevent sharp rises in blood sugar.² Many anti-nutrients have antioxidant and anticancer actions, so avoiding them entirely is not recommended.²⁻⁴

BOTTOM LINE

The pros and cons of anti-nutrients on long-term human health is an area of active research. Though certain foods may contain residual amounts of anti-nutrients after processing and cooking, the health benefits of eating these foods outweigh any potential negative nutritional effects. Eating a variety of nutritious foods daily and avoiding eating large amounts of a single food at one meal can help to offset minor losses in nutrient absorption caused by anti-nutrients.

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Navigating Food Packages

The information on food labels is intended to help consumers become savvy about their food choices. The front, back, and sides of a package are filled with information to inform us what the food contains and to provide guidance in making healthier selections of processed foods. However, all the numbers, percentages, and sometimes complex-sounding ingredients can lead to more confusion than clarity. Furthermore, certain claims and statements are not regulated by the U.S. Food and Drug Administration (FDA).

FRONT-OF-PACKAGE (FOP) LABELS

This is the section of a food label consumers see first, which within seconds can influence their purchase. Food manufacturers can choose to display FOP symbols or graphics that highlight nutritional aspects of the product if they are favorable to health, such as being lower in calories or added sugar, but may leave out less favorable information such as being high in sodium or saturated fat. These graphics promote a perception of healthfulness, which can be misleading if consumers rely only on these images without reading the Nutrition Facts panel for complete information. The FDA does not closely monitor these FOP graphics.

HEALTH CLAIMS

These are statements reviewed by the FDA and supported by scientific evidence that suggest certain foods or diets may lower the risk of a disease or health-related condition. The Nutrition Labeling and Education Act of 1990 regulates these health claims, which must undergo review by the FDA through a petition process. The FDA has approved 12 health claims on food labels such as the relationship between calcium and osteoporosis; sodium and hypertension; fiber-containing grains, fruits and vegetables and cancer; and folic acid and neural tube defects. However, just because a food contains a specific nutrient that is associated with a decreased risk of disease does not necessarily make the food healthy as a whole. An example would be a breakfast cereal high in soluble fiber for heart health but that is also high in added sugars.

NUTRIENT CONTENT CLAIMS

These statements describe the nutrients in a food beyond what is listed on the Nutrition Facts label, intended to showcase a health benefit of the food. An example is "Contains 100% Vitamin C." Most terms like "low sodium," "high fiber," "reduced fat," and "good source of" are regulated by the FDA, and the nutrient amounts must meet specific guidelines to make these claims. Also regulated are comparative terms like "less sugar" or "fewer calories" comparing two similar products. Some terms are not yet regulated by the FDA such as "natural" or "multigrain."



SELL-BY, BEST-BY, AND USE-BY DATES

These dates inform both the seller and consumer about the shelf-life and optimal quality of the product. They are determined by the food manufacturer's judgment for peak quality. Foods can still be eaten safely after these dates, with the exact amount of time dependent on the food product, but the flavor and texture may begin to deteriorate. These expiration dates are not required by federal law though some states may institute their own requirements.

- **Sell-by date:** The last date the seller should display the product on shelves for purchase.
- **Best-by date:** The last date recommended to use the product for best flavor and quality.
- **Use-by date:** The last date recommended to use the product for peak freshness; this date is important for highly perishable products like fresh meats, milk, poultry, and salad blends.

INGREDIENTS

The FDA oversees the ingredients listed on food labels. A packaged food must list the ingredients in order of predominance by weight. In other words, the ingredients that weigh the most are listed first. The list may contain unfamiliar terms alongside the common ingredient names. These may be added preservatives or colors (e.g., sodium bisulfite, caramel color), thickeners or emulsifiers (e.g., guar gum, carrageenan), or the scientific names of vitamins and minerals (e.g., ascorbic acid, alpha tocopherol). Ingredients like added sugars may carry many alternative names but are essentially varying combinations of fructose and glucose: evaporated cane juice, high fructose corn syrup, agave nectar, honey, brown sugar, coconut sugar, maple syrup, molasses, and turbinado sugar.

ALLERGY INFORMATION

Under the Food Allergen Labeling and Consumer Protection Act of 2004, eight major food allergens—milk, fish, tree nuts, peanuts, shellfish, wheat, eggs, and soybeans—are required to be listed in a “contains” statement near the Ingredients list if present in a food. An example would be “contains wheat and soy.” Advisory statements addressing cross-contamination may also be listed such as “may contain wheat” or “produced in a facility that also uses peanuts.” In 2021, the Food Allergy Safety, Treatment, Education, and Research Act became law, declaring sesame as the 9th major food allergen recognized in the US. Sesame will be a required allergen listing as of January 1, 2023. Other potential allergens include gluten and color additives such as FD&C Yellow No. 5. The FDA mandates that a product containing FD&C Yellow No. 5 must identify it on the food label. The term “gluten-free” can be listed if it meets a specific maximum amount of gluten as defined by the FDA.


NUTRITION FACTS PANEL

The Nutrition Facts panel is overseen by the FDA and was first mandated in 1990. It has undergone revisions, with the latest update released in 2016. Among the changes includes the addition of “Added Sugars” (for example, a strawberry yogurt may show 20 grams of Total Sugars of which 10 grams are Added Sugars [10 grams are naturally occurring from lactose and the other 10 grams are from an added sweetener]). An important element of the panel that may confuse consumers is the percent Daily Value (%DV), which shows how much of a nutrient in one serving of food contributes to one's approximate daily requirement for the nutrient. To best use the %DV, remember these simple guidelines:

- **5% DV or less of a nutrient per serving is considered low.** When following a heart-healthy diet, you might aim for this percentage for saturated fat, cholesterol, sodium, and added sugars.
- **20% DV or more of a nutrient per serving is high.** Use this amount for nutrients you want more of. If you are trying to eat more nutrients to support bone health, you may aim for this percentage amount (or higher) for calcium and vitamin D.
- **Use the %DV to quickly compare nutrients in similar products.** For example, if you are looking for a salad dressing or pasta sauce with less salt and added sugar, you can compare two different brands and choose the product with the lower %DV for sodium and added sugars.



Take a closer look at the new Nutrition Facts panel, and other package elements: hsph.me/nfp21



The Science of Cravings

Cravings can pop up at any moment, and aren't always fueled by hunger.

Most of us have experienced an intense urge to eat a certain food—ideally right away. More often than not, that food is likely to be sugary, salty, or fatty, or all three. You may feel increasingly excited as you imagine how it will taste and how you'll feel eating it. Maybe you last ate several hours ago, or maybe you're still digesting your last meal. These urges are called cravings, which can pop up at any moment, and aren't always fueled by hunger pangs.

WHAT CAUSES CRAVINGS?

The terms “sugar addict” or “chocoholic” are often used, and people may blame cravings on a sweet tooth, bad eating habits, or lack of self-control. These may be true to a degree, but cravings actually involve a complex interplay of factors: brain messages, behaviors that become habits over time, and having easy access to food. Animal and human studies have shown that foods that stimulate the reward regions of the brain influence

our food choices and eating behaviors.¹ When we eat certain foods, the neurons in the reward region become very active, creating highly positive feelings of pleasure so that we want to keep seeking these foods regularly. These foods are sometimes labeled hyperpalatable because they are easy to digest and have enjoyable qualities of sweetness, saltiness, or richness. Hyperpalatable foods can stimulate the release of metabolic, stress, and appetite hormones including insulin, cortisol, dopamine, leptin, and ghrelin, all of which play a role in cravings.¹

Normally when eating a meal, appetite hormones are released. Examples are glucagon-like peptide and cholecystokinin from the digestive tract, and leptin from fat cells, which cause feelings of fullness and communicate with the brain to stop eating. On the flipside, if the body hasn't received food for several hours, ghrelin is released from the stomach to signal hunger. Eating hyperpalatable foods too often might interfere with how the brain processes these hormonal signals so that one may feel continued cravings despite having eaten enough food.¹ Animal studies have shown that brain

WHAT IS THE REWARD REGION OF THE BRAIN? Different areas of the brain make up the reward system, but the key part of the brain related to cravings and regulating appetite is called the hypothalamus. It is a tiny pea-sized area that comprises less than 1% of the weight of the brain. It regulates the secretion of chemicals and hormones related to stress, pleasure, pain, and hunger. A neurotransmitter in the hypothalamus called dopamine, the “feel good” chemical, sends messages to other nerves to signal positive emotions that are associated with rewarding experiences. The expectation of receiving a reward, not necessarily the reward itself, stimulates higher dopamine activity. Dopamine release is even larger if the reward is greater than anticipated, which may stimulate a person to seek that experience or substance again and again. Eating certain foods repeatedly that stimulate the reward region is believed by some researchers to lead to addictive food behaviors or emotional overeating.⁴

signals can become disrupted when eating a very high sugar or high fat diet, which may trigger the release of hormones that reduce stressful emotions and therefore lead to a habitual desire for these “comforting” foods.² Interestingly, human studies have also found associations with strong cravings and artificially sweetened foods and beverages (i.e., diet soda), as their intensely sweet flavor may produce the same rewarding effects as sugar.³

CRAVING VERSUS ADDICTION

Although it's pretty clear that certain foods have the ability to keep us coming back for more, it is less clear if food can be “addictive” in the same manner as drugs and alcohol. A food craving is an intense and persistent desire for a food, but that craving isn't always for something delicious. It can also be caused by a nutritional



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deficiency, boredom, or self-imposed food restrictions.⁴ A food addiction is one step beyond, including not only intense cravings but also exhibiting a loss of control of eating behaviors and repeated excess consumption of food, especially hyperpalatable foods.⁵

Learn more about defining food addictions, as well as the ongoing research and debate over this condition:

hsph.me/cvg21



OTHER FACTORS AT PLAY

A snapshot of some additional factors that can affect our cravings:



Adequate sleep helps regulate metabolic functions; a **lack of sleep** is linked with imbalances in leptin and ghrelin levels.

Longer-lasting **chronic stress** is associated with cravings for hyperpalatable high-fat calorie dense foods.⁶



Certain medications like antidepressants and antipsychotics can increase appetite and weight.⁷

Hormonal fluctuations during the menstrual cycle. When estrogen levels are low and progesterone is high, one may feel increased cravings.



Exposure to **food advertising**. Just watching a 30-second commercial of hyperpalatable foods may spark cravings.



Aim to eat nutritionally balanced meals. Foods with protein and fiber provide longer-lasting satisfaction.

Avoid long stretches of not eating. Eat a nutritious meal or snack every 3-4 hours during the day. Waiting too long to eat because you are busy or distracted may only lead to stronger hunger when you do eat and the risk of overeating. Also keep in mind that if your bedtime is more than 4 hours after you've finished dinner, you may feel hungry again; to avoid snacking late night which can disrupt sleep, try to go to bed earlier when possible.

Avoid choosing hyperpalatable or ultraprocessed snacks that are high in sodium, fat, sugar, and calories but low in nutrition. These are the types of foods that trigger the brain reward pathways and cause cravings to eat more. Choose satisfying, less-processed snacks like fresh fruit, a handful of nuts, or a cup of low-sugar yogurt.

Limit environmental cues to eat, such as scrolling through social media posts about food and watching television cooking shows. In an office setting, detour away from the candy bowls and platters of bagels and treats that may be sitting in the break room.

Food cravings are sometimes learned behaviors that are associated with an event or environment, such as craving potato chips while watching late-night television. If so, research suggests that it is possible to “unlearn” the behavior and reduce the craving by avoiding the food completely for an extended time.⁸ In addition, you can try changing the association by changing your evening routine with a different activity like listening to an audiobook or podcast.

Practice mindfulness when sensing a growing craving. Ask yourself if you are stressed, bored, angry? If so, try instead doing breathing exercises, talking a brisk 5-10 minute walk, listening to a meditation app or podcast, or playing a few favorite songs. If you can distract yourself from eating for about 5-7 minutes, the craving may subside.

Try other dopamine-inducing activities such as taking a walk in nature on a sunny day, dancing, or watching a funny video and laughing aloud!

Tips to Help Reduce Food Cravings

Review: Anti-Inflammatory Diets

A closer look at this popular dietary approach.

A common belief is that “inflammation” is always bad. Although it produces unpleasant side effects, inflammation is actually a healthy response by our immune system. When a foreign invader enters the body such as bacteria, viruses, or allergens, or an injury occurs, our immune cells act quickly. We may sneeze or cough to rid the body of an offending agent. We may feel pain and swelling at the site of a cut or injury to signal us to be gentle with this delicate area. Blood flows in rapidly, which may produce warmth or redness. These are signs that our immune system is repairing damaged tissue or fighting invaders. As healing takes place, inflammation gradually subsides.

Inflammation becomes harmful when it is prolonged and begins to damage healthy cells, creating a pro-inflammatory state. Another problem is due to genetic deviants causing the body’s immune system to constantly attack cells. This

sometimes occurs with autoimmune disorders like lupus, fibromyalgia, multiple sclerosis, rheumatoid arthritis, type 1 diabetes, and Crohn’s disease. Sometimes an unhealthy lifestyle from lack of exercise, high stress, and calorie-rich diets can trigger chronic low levels of inflammation throughout the entire body, termed metaflammation.^{1,2} This type of low-grade inflammation does not usually produce noticeable symptoms, but over time metaflammation can pave the pathway for chronic conditions like cardiovascular disease, non-alcoholic fatty liver disease, type 2 diabetes, Alzheimer’s disease, and certain cancers (e.g., breast, colon).

Anti-inflammatory diets may be promoted for these inflammatory conditions. They include several foods that are believed to interfere with the inflammatory process, though research on its exact mechanism is not conclusive, and there is no single anti-inflammatory diet plan.

HOW IT WORKS

An anti-inflammatory diet does not follow strict rules about calories or portion sizes. It suggests a variety of

anti-inflammatory foods to eat daily, rather than focusing on eating one or two specific foods or nutrients.

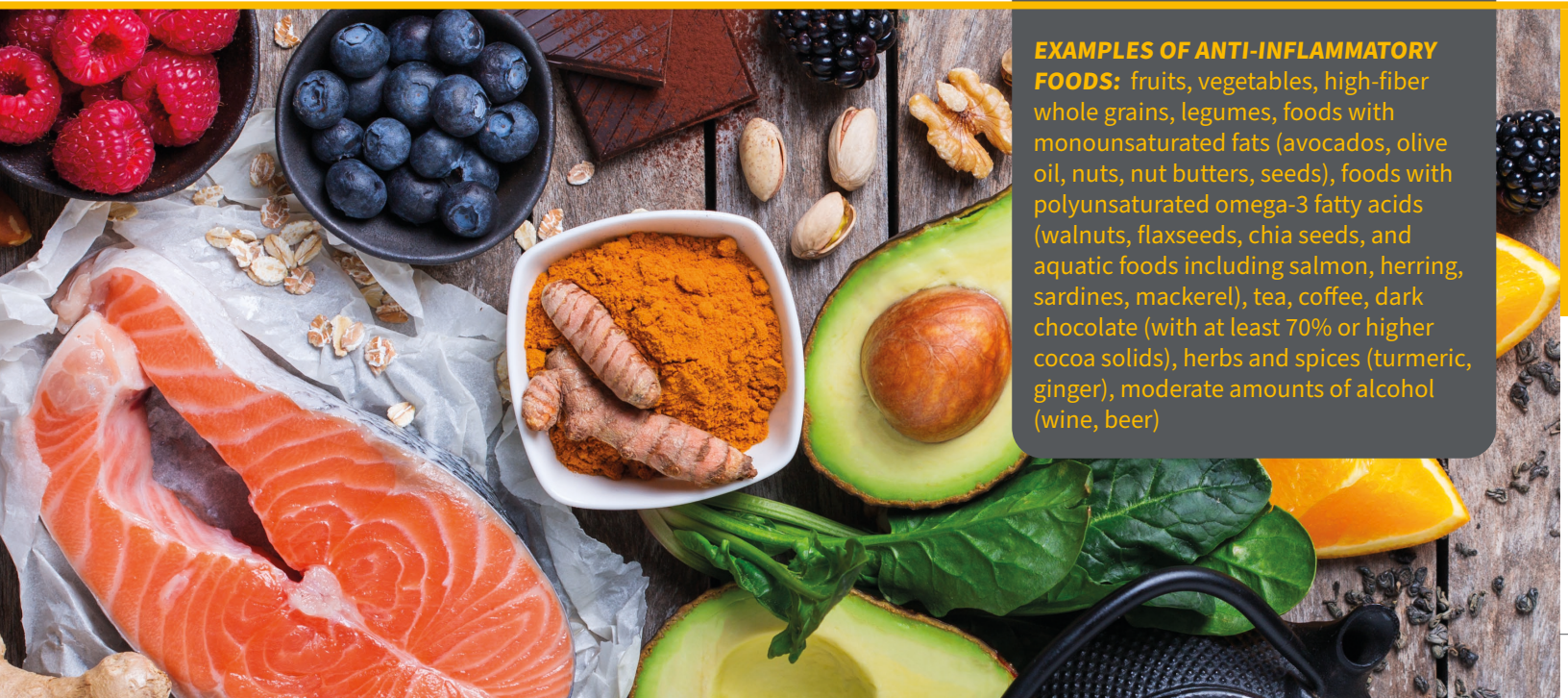
This ensures a greater variety of protective food components, some of which may work synergistically to boost immunity. These foods provide plant chemicals (phytochemicals), antioxidants, and fiber that prevent cellular stresses, inhibit inflammatory signals caused by the immune system, promote healthy gut microbiota, and slow down digestion to prevent surges in blood glucose.³ They may also favorably affect the composition of fat cells to further reduce inflammation. Other factors aside from diet may help to control inflammation, such as exercising regularly, controlling stress, and getting enough sleep.

EXAMPLES OF INFLAMMATORY FOODS

TO LIMIT: sweetened beverages (soda, juice drinks, iced tea), an excess of refined carbohydrate foods (white bread, rice, pasta), potato chips, fried foods, processed high-fat meats (bacon, sausage, hot dogs), foods high in saturated fats (full-fat dairy from cream and butter; fatty cuts of meat and poultry), partially hydrogenated oils, excess alcohol

EXAMPLES OF ANTI-INFLAMMATORY

FOODS: fruits, vegetables, high-fiber whole grains, legumes, foods with monounsaturated fats (avocados, olive oil, nuts, nut butters, seeds), foods with polyunsaturated omega-3 fatty acids (walnuts, flaxseeds, chia seeds, and aquatic foods including salmon, herring, sardines, mackerel), tea, coffee, dark chocolate (with at least 70% or higher cocoa solids), herbs and spices (turmeric, ginger), moderate amounts of alcohol (wine, beer)



A PREVIEW OF THE RESEARCH

Most available research focuses on foods and dietary patterns that are associated with metaflammation, which in turn helps to determine the components of an anti-inflammatory diet. Metaflammation is especially associated with Western-type dietary patterns high in processed meats, saturated fat, refined sugars, salt, and white flour while being low in fiber, nutrients, and phytochemicals.^{1,4} These diets also tend to be calorie-dense with a high glycemic load, potentially leading to blood sugar surges, insulin resistance, and excess weight gain. Studies have shown that Western diets are associated with increased blood markers of inflammation, though the connection may be due to a string of events rather than one direct action.¹ For example, exposure to air pollution and chronic mental stress can lead to an excess of free radicals produced in the body, which then oxidize and damage other molecules. Atherosclerosis is one condition in which these free radicals oxidize LDL cholesterol particles. The actions of both oxidized LDL cholesterol and several types of immune cells form lesions and plaque in the heart arteries that can lead to ischemic heart disease (a type of heart disease caused by narrowed or partially blocked arteries).⁵ A long-term diet that is high in saturated fat and cholesterol may raise LDL levels, increasing the risk of free radical action that may promote this immune response, which partially contributes to a chronic low-level proinflammatory state.

See an in-depth review of the available research on anti-inflammatory dietary approaches and health: hsph.me/aid21



Other Popular Diets

POTENTIAL PITFALLS

The anti-inflammatory diet is flexible in that it does not include rigid meal plans. However, this requires people to plan their own meals and find recipes incorporating foods on the plan. People who are not used to meal planning or cooking may need more specific guidance. Additionally, calorie levels and portion sizes are not highlighted on this plan, so it is possible to gain weight if excessive portions are consumed.

BOTTOM LINE

An anti-inflammatory diet is a healthful eating plan that may help to reduce chronic low levels of inflammation that otherwise might increase the risk of various chronic diseases. Although research is limited, it may also help to lower inflammatory markers in individuals with autoimmune-type inflammation such as with rheumatoid arthritis. Popular dietary patterns that are anti-inflammatory include the Mediterranean diet, DASH diet, and vegetarian diets. People may seek the guidance of a registered dietitian familiar with any of these dietary patterns to assist with meal planning and appropriate portion sizes. Along with the diet, it is important to incorporate other healthy lifestyle factors that positively affect the body's immune response, such as practicing stress reduction, exercising regularly, and getting adequate sleep.

From bookstores to social media to blogs, there's no shortage of information on diet. So how to differentiate what "works" from an overhyped fad?

It's important to remember that even if a particular diet may be successful for one person, it may not be effective for another due to individual differences in genes and lifestyle. Diets are also more likely to be successful when they are easier to follow, so tailoring a strategy to suit your own lifestyle is key.

Still, when faced with the seemingly endless promotion of weight-loss strategies and diet plans, it helps to see what evidence is supporting them. In this ongoing series, we take a look at some popular diets and approaches to eating—and review the research behind them.



Access the full popular diet review series: hsph.me/pdr21

Current reviews include:

- *DASH Diet*
- *Gluten-Free for Weight Loss*
- *Intermittent Fasting for Weight Loss*
- *Ketogenic Diet for Weight Loss*
- *Mediterranean Diet*
- *Mindful Eating*
- *Paleo Diet for Weight Loss*

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Soy and Health

Clearing up confusion about this widely studied and unique legume.

Soy is exalted as a health food by some, with claims of taming hot flashes, warding off osteoporosis, and protecting against hormonal cancers like breast and prostate. At the same time, soy is shunned by others for fear that it may cause breast cancer, thyroid problems, and dementia, though these claims have not been substantiated.

Whether published in a popular press article or a well-designed clinical study, some debate about soy remains. As a species within the legume family, nutrition scientists often label soy as a food with potential for significant health benefits. However, due to contrary research that suggests possible negative effects of soy in certain situations, there has been a hesitancy to wholeheartedly promote soy.

Part of the uncertainty is due to the intricacy of soy's effects on the body. Soy is unique in that it contains a high concentration of isoflavones, a type of plant estrogen (phytoestrogen) that is similar in function to human estrogen but with much weaker effects. Soy isoflavones can bind to estrogen receptors in the body and cause either weak estrogenic or anti-es-

Take an in-depth look at the research on soy and heart disease, cancer, cognitive function, and more: hsph.me/soy21



	Isoflavone content	Protein
UNFERMENTED SOY FOODS		
soy milk, 1 cup	6 mg	7 g
tofu (bean curd), soft, 3 oz	20 mg	8 g
soybeans, mature, ½ cup	55 mg	15 g
soybeans, dry roasted, 1 oz	40 mg	11 g
edamame, boiled, ½ cup	16 mg	11 g
soy cheese, 1 oz	2 mg	4 g
soy burger, 1 patty	5 mg	14 g
FERMENTED SOY FOODS		
miso, 3 oz	37 mg	10 g
natto, 3 oz	70 mg	14 g
tempeh, cooked, 3 oz	30 mg	13 g
soy sauce, 1 Tbsp	0.02 mg	0 g

trogenic activity. The two major soy isoflavones are called genistein and daidzein. Soy isoflavones and soy protein appear to have different actions in the body based on the following factors: type of study (in animals or humans); hormone levels (because soy can have estrogenic properties, its effects can vary depending on the existing level of hormones in the body); and what type of soy is being studied (whole soy foods such as soybeans, processed versions like soy protein powders, or soy-based veggie burgers? Fermented or unfermented soy foods? If supplements are used, do they contain isoflavones or soy protein?). Thus, there are many factors that make it difficult to construct blanket statements about the health effects of soy.

Aside from their isoflavone content, soy foods are rich in nutrients including B vitamins, fiber, potassium, magnesium, and high-quality protein. Unlike some plant proteins, soy protein is considered a complete protein, containing all nine essential amino acids that the body cannot make which must be obtained from

the diet. Soy foods are also classified as fermented or unfermented. Fermented means that the soy food has been cultured with beneficial bacteria, yeast, or mold. Some believe that fermenting soy improves its digestibility and absorption in the body, as this process partially breaks down soy's sugar and protein molecules.



BOTTOM LINE

Soy is a unique food that is widely studied for its estrogenic and anti-estrogenic effects on the body. Studies may seem to present conflicting conclusions about soy, but this is largely due to the wide variation in how soy is studied. Results of recent population studies suggest that soy has either a beneficial or neutral effect on various health conditions. Soy is a nutrient-dense source of protein that can safely be consumed several times a week, and probably more often, and is likely to provide health benefits—especially when eaten instead of red and processed meat.

Spotlight: Collagen

See an in-depth review on collagen and health, and more info on collagen supplementation: hsph.me/col21



Collagen is the most abundant protein in the body. Its fiber-like structure is used to make connective tissue. Like the name implies, this type of tissue connects other tissues and is a major component of bone, skin, muscles, tendons, and cartilage. It helps to make tissues strong and resilient, able to withstand stretching.

In food, collagen is naturally found in animal flesh like meat and fish that contain connective tissue. However, a variety of both animal and plant foods contain materials for collagen production in our own bodies.

Our bodies gradually make less collagen as we age, but collagen production drops most quickly due to excess sun exposure, smoking, excess alcohol, and lack of sleep and exercise. With aging, collagen in the deep skin layers changes from a tightly organized network of fibers to an unorganized maze.¹ Environmental exposures can damage collagen fibers, leading to wrinkles on the skin's surface.

CAN YOU EAT COLLAGEN?

There is a lack of research to show that eating collagen can directly benefit skin or joint health. When digested in the stomach, collagen is broken down into amino acids, which are then distributed wherever the body most needs protein. Still, many foods that support collagen production are generally recommended as part of a healthful eating plan.

- Several high-protein foods are believed to nurture collagen production because they contain the amino acids that make collagen—glycine, proline, and hydroxyproline. These include fish, poultry, meat, eggs, dairy, legumes, and soy.
- Collagen production also requires nutrients like zinc that is found in shellfish, legumes, meats, nuts, seeds, and whole grains; and vitamin C from citrus fruits, berries, leafy greens, bell peppers, and tomatoes.

IS BONE BROTH HEALTHY?

Bone broth is promoted as a health food rich in collagen. The process involves simmering animal bones in water and some vinegar (to help dissolve the bone and release collagen and minerals) anywhere from 4 to 24 hours. However, various factors can affect the amount of protein and minerals extracted in bone broth: the amount of acidity, cooking time, cooking temperature, and type of animal bone used.² Therefore it is likely that the nutritional value of bone broths will vary widely.



BOTTOM LINE

At this time, non-industry funded research on collagen supplements is lacking. Natural collagen production is supported through a healthy and balanced diet by eating enough protein foods, whole grains, fruits, and vegetables and reducing lifestyle risk factors such as excess sun exposure, smoking, excess alcohol consumption, and lack of sleep and exercise.

Despite its abundance in our bodies, collagen has become a top-selling supplement purported to improve hair, skin, and nails—key components of the fountain of youth. Most research on collagen supplements is related to joint and skin health. Human studies are lacking but some randomized controlled trials have found that collagen supplements improve skin elasticity.^{3,4} Other trials have found that the supplements can improve joint mobility and decrease joint pain such as with osteoarthritis or in athletes.⁵ However, potential conflicts of interest exist in this area because most if not all of the research on collagen supplements are funded or partially funded by related industries that could benefit from a positive study result, or one or more of the study authors have ties to those industries. This makes it difficult to determine how effective collagen supplements truly are and if they are worth their often hefty price. A downside of collagen supplements is the unknown of what exactly it contains or if the supplement will do what the label promotes. There are also concerns of collagen supplements containing heavy metals. In the U.S., the Food and Drug Administration does not review supplements for safety or effectiveness before they are sold to consumers. That said, the available research has not shown negative side effects in people given collagen supplements.^{3,4}



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Staying Active

Beyond weight management, exercise plays a key role in our overall well-being.

Although many people view exercise as a way to lose weight, it plays a key role in the well-being of the body beyond weight loss. Research strongly supports its benefits across a range of physical and mental health conditions for people of all ages. However, busy lifestyles and an environment that encourages being sedentary for many hours of the day have led to exercise ranking low as a priority for many people.

All exercises offer health benefits, and performing different types of exercises can expand the range of benefits even further. But it is important to remember that some exercise is better than none, and that most everyone can participate in some form of exercise safely.

Here are some factors to consider when choosing an exercise regimen:

- **Frequency:** How often will you do the activity—once a day, three times a week, twice a month?
- **Duration:** How long is the exercise session—20 minutes, 1 hour, 30 minutes split into two sessions in one day?
- **Intensity:** How much energy is needed—light versus vigorous activity?



TYPES OF EXERCISE

Aerobic/Cardiovascular physical activity—These are activities that are intense enough and performed long enough to maintain or improve one's heart and lung fitness. Examples: walking, jogging, dancing, bicycling, basketball, soccer, swimming.

Muscle-strengthening activity—This may be referred to as resistance training. These activities maintain or increase muscle strength, endurance, and power. Examples: weight machines, free weights, resistance elastic bands, Pilates, daily activities of living (lifting children, carrying groceries or laundry, climbing stairs).

Flexibility training—This may be referred to as stretching. It lengthens or flexes a skeletal muscle to the point of tension, and holds for several seconds to increase elasticity and range of motion around a joint. Improving flexibility can enhance the overall physical performance of other types of exercise. Examples: dynamic stretches performed with movement (yoga, tai chi), static stretches without movement (holding a pose for several seconds or longer), passive stretching (using an external force like a strap or wall to hold an elongated pose), and active stretching (holding a pose without an external force).

Balance training—These activities are intended to throw off one's balance to improve body control and stability. They can help to prevent falls and other injuries. Examples: standing on one foot, walking heel-to-toe in a perfectly straight line, standing on a balance or wobble board.



Visit the full staying active section on *The Nutrition Source* for more information on exercise types, measures of activity intensity, safety tips, and more: hsph.me/sa21



Research Highlights

IS THERE A BEST TIME TO EXERCISE?

For many people, the challenge of getting enough exercise during the week is greater than trying to exercise at a specific time. Yet the question is often asked—is there a best time of day to work out? In some cases, maybe. A small clinical trial of men at risk for or diagnosed with type 2 diabetes participated in a 12-week exercise program. They exercised in the morning between 8:00-10:00 am (2-3 hours after breakfast), or afternoon between 3:00-6:00 pm (2-3 hours after lunch). Compared with the morning exercisers, the men who exercised later in the day showed improved insulin sensitivity, lower fasting blood glucose, decreased fat mass, and better exercise performance. The authors did not speculate on reasons why the afternoon time produced significantly greater benefits, other than a major role our body clocks, or circadian rhythms, may have on metabolism. Circadian rhythms are regulated by light and darkness and affect energy levels, sleep, alertness, and hormone levels.¹



WHY DO WE LACK MOTIVATION TO EXERCISE?

Daniel Lieberman, a professor of Biological Sciences at Harvard University discusses in his new book, *Exercised: Why Something We Never Evolved to Do Is Healthy and Rewarding*, why people have such difficulty exercising when they know it is healthy and even prescribed by their doctors. One reason may be that exercising by choice is a fairly modern concept within the wealthy, industrialized Western world. Unlike societies of hunters and gatherers and for most of the rest of the world and throughout human history, people exercised out of necessity such as through daily chores or work, or because it was rewarding for them (e.g., dancing). He explains how exercise stresses the body, in a good way, by causing increased blood flow and greater antioxidant and anti-inflammatory activity due to the repair of cartilage and muscle after exercising. These mechanisms can lower the risk of diabetes, obesity, cancer, and even COVID-19. He discusses how, even though we have never evolved to exercise, exercise can be a rewarding and enjoyable activity.²



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Learn more about different types of yoga, as well as the research on this popular physical activity: hsph.me/yog21



Yoga for Exercise



POPULAR TYPES OF YOGA

There are more than a dozen types of yoga. Here are a few formats popular in the U.S.

Hatha - Includes a mix of styles that focuses on balance, strength, flexibility, breathing, and meditation; tends to be less vigorous, so that beginners to yoga might start here.

Vinyasa - Also referred to as “flow yoga” or “vinyasa flow,” this more vigorous style emphasizes breathing in a specific way that matches the flowing movements of the poses. The movements are continuous, moving from one sequence to the next, and therefore it can raise the heart rate and body temperature.

Ashtanga - Highly structured, with specific poses taught in six rounds with increasing difficulty. It is vigorous with one pose flowing into the next, and may include a spiritual component. Music is not typically used and the class can last from 90 minutes to 2 hours.

Kundalini - This type means “life force energy,” also referred to as “prana” or the Chinese term “chi.” It includes movements that stimulate energy to reduce stress and negative thoughts. A mantra is introduced, followed by breathing exercises and progressive poses. Meditation and chanting or singing are sometimes included.



Yoga began not as a form of physical exercise, but as a practice to achieve spiritual enlightenment and mental discipline. The word yoga comes from the Sanskrit “Yuj,” meaning “to yoke” or “to unite,” which conveys the goal of connecting the mind, body, and spirit through breathing, meditation, and poses. Yoga did not appear in the U.S. until the late 1800s, where it evolved to place greater emphasis on physical fitness through poses and postures (asanas) and breathing techniques (pranayama) than on spirituality. Aside from over a dozen popular types of yoga, the activity has evolved to include additional variations, including power, aerial, and acro yoga, as well as classes that incorporate a high intensity interval training format.

YOGA AND HEALTH

The Physical Activity Guidelines for Americans recommends that adults, including those with chronic conditions, aim for 150-300 minutes of moderate-intensity aerobic physical activity weekly.¹ More vigorous forms of yoga can reach an aerobic level by increasing the heart rate, but all yoga forms can provide physical and mental health benefits.

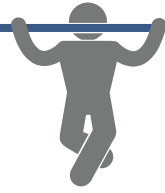
It may complement other exercise formats, as the poses and postures increase flexibility, balance, and strength, all of which can help reduce the risk of injury. The focus on breathing and relaxation helps to lower anxiety and depression, and to increase mental clarity and focus. About half of American yoga practitioners (estimated 13 million) reported starting yoga to improve their health.² Another 14 million American adults said that yoga had been recommended to them by a physician or therapist.³

Research has shown a beneficial effect of yoga for many chronic diseases, but most of the studies are of low quality so it is hard to make definitive conclusions. Yet because of the varying levels of yoga available that can accommodate beginners and those with injuries, yoga may be an exercise option for those who have not been able to follow other recommended physical activity regimens. If you are new to yoga, always start with a beginner-level class. If the description does not specify this, ask the instructor or studio before you sign up. A beginner class will introduce the most common yoga movements and how to execute them properly. This will prepare you for more advanced styles.



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HIIT Overview



See more research on high intensity interval training, plus tips for planning a safe workout: hsph.me/hit21



High Intensity Interval Training (HIIT) incorporates multiple rounds of exercise that alternate between several minutes of high intensity movements to significantly increase the heart rate to at least 80% of one's maximum heart rate, followed by short periods of lower intensity movements.

Body weight can be used as the main form of resistance so that additional equipment is not needed. HIIT workouts also generally do not require a large amount of space, making the format ideal for a home workout. HIIT workouts can be integrated into various exercise formats, such as running (outdoors or on a treadmill), dancing, rowing machines, stationary bicycles, or stair climbers.¹ The interval durations can be timed by using one to five-minute music tracks.

HIIT can help to decrease body fat, increase strength and endurance, and improve health outcomes, but it is not necessarily better than other exercise formats. Its main appeal is that it can achieve similar fitness and health benefits in a shorter duration, and that it includes periods of rest.

SOME RESEARCH ON HIIT

HIIT is a well-researched exercise format, showing benefits for a range of medical conditions across a broad age range, from adolescents to older adults.² In research studies, HIIT is typically compared with moderate intensity continuous training (MICT), which incorporates lower intensity movements at a constant pace without interval breaks. Whereas



EXAMPLE OF A BEGINNER HIIT WORKOUT

This workout can be performed at home using just an exercise mat and a timer or clock.³ The speed of each exercise can be faster or slower, depending on one's fitness level, but encourages the participant to work to their maximum ability. A 5-minute warm-up of walking or marching in place should be performed beforehand, and a 5-10-minute cool-down of slower movements allowing the heart rate to gradually decrease, along with stretches, should be included to end the workout. Each set includes the first exercise for 30 seconds (s), followed by a second exercise for 15s.

-  30s - side lunges
-  30s - squats
-  30s - push-ups on the floor
-  30s - jumping jacks
-  30s - triceps dips using a chair
-  30s - alternating high knees
-  30s - sit-ups
-  Rest for 60s and repeat the session two more times.
- 15s - slow marches in place
- 15s - slow marches in place
- 15s - slow marches in place
- 15s - slow marches in place

HIIT causes individuals to reach 80-85% of their maximum heart rate, MICT reaches about 55-70% of their maximum heart rate.

When energy expenditure remains the same for HIIT versus MICT workouts, some studies show a greater benefit with HIIT because it achieves greater aerobic capacity (the body's ability to use more oxygen).³ Although initially applied to athletes to improve their performance, HIIT is now included as a potential exercise option for

individuals with chronic diseases. It can help to improve their physical functioning, exercise tolerance, and quality of life. Importantly, because of the higher intensity format, it is advised to consult with a physician if you have any medical conditions before starting a HIIT program. Furthermore, all participants new to HIIT should choose a program that is facilitated by an exercise professional.



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Workout Supplement Review

A look at some common ingredients in workout supplements.

Fitness gurus touting workout supplements as crucial for peak performance, fat loss, and explosive muscle growth might have you believing you can't effectively exercise without them. But do these supplements live up to the hype, and are they even necessary—or in some cases, safe? Like other dietary supplements in the U.S., the Food and Drug Administration (FDA) does not review workout supplements for safety or effectiveness before they are sold to consumers. It's a good idea to research their effects and ingredients and consult with your physician before adding them to your fitness routine.

PRE-WORKOUT SUPPLEMENTS

Pre-workout supplements are designed to provide energy and aid endurance throughout a workout. Although the ingredients below have been highlighted as having evidence-based uses in sports nutrition,¹ it is still important to consult a physician or dietitian before use. They also may not be necessary for a typical workout routine, as sports nutrition research and recommendations generally target high-intensity athletes.

- **Beta-Alanine.** An amino acid that

is produced in the liver and also found in fish, poultry, and meat. When dosed at 4–6g/day for 2–4 weeks, this supplement has been shown to improve exercise performance, particularly for high-intensity exercise lasting 1–4 minutes, such as short sprints. It has also been shown to reduce neuromuscular fatigue, particularly in older adults.²

- **Caffeine.** A stimulant that has been shown to benefit athletic performance for short-term high-intensity exercise and endurance-based activities.³ It is important to note these studies have been conducted with Olympic and competition athletes. The FDA considers 400mg of caffeine to be a safe amount for daily consumption, but some supplements may exceed this amount in a single serving or fail to

disclose the amount they contain. Caffeine powder is also marketed as a stand-alone supplement, but the FDA has advised against using this product, as even very small amounts may cause accidental overdose. Powdered caffeine has been linked to numerous deaths—a single tablespoon (10g) is a lethal dose for an adult, but the product is often sold in 100g packages.⁴

- **Creatine.** A naturally occurring compound in skeletal muscle that is synthesized in the body from amino acids and can be obtained from red meat and seafood. In the body, it helps produce adenosine triphosphate, which provides energy for muscles. Creatine is a popular workout supplement marketed to increase athletic performance, especially for weight training. Research suggests that creatine



See an in-depth review of the research on these and other supplements: hsph.me/sup21



supplementation increases muscle availability of creatine, which in turn can enhance exercise capacity and training adaptations in adolescents, younger adults, and older adults.⁵ While the scientific literature has generally found supplementation to be safe at certain levels,⁶ creatine may not be appropriate for people with kidney disease or those with bipolar disorder. It is important to consult a doctor before taking this supplement.

POST-WORKOUT SUPPLEMENTS

A variety of post-workout supplements are marketed to increase muscle mass through enhanced muscle repair, recovery, and growth. Carbohydrates and protein are generally key ingredients in these supplements, since replenishing glycogen stores after a workout with sufficient carbohydrate intake is important for muscle recovery. However, normal dietary intake of carbohydrates is typically sufficient to restore muscle glycogen

stores after low- and moderate-intensity exercises, and recommended levels of daily protein intake for the general population (about 7g of protein for every 20 pounds of body weight) are estimated to be sufficient to meet the needs of nearly all healthy adults. Post-workout supplementation with carbohydrates and protein within 24-36 hours is only recommended following strenuous physical activity, which includes an hour or more of vigorous exercise.

Other common post-workout supplement ingredients include:

- **Branched-Chain Amino Acids (BCAAs).** These amino acids can be obtained from protein-rich foods and are also sold in powdered supplement form. BCAAs are key components of muscle protein synthesis, however longer-term trials do not support BCAAs as useful workout supplements.⁷
- **Electrolytes.** The body loses electrolytes through sweating, so sports drinks (which typically

contain carbohydrates/sugar and electrolytes) and other electrolyte supplements are often marketed as being necessary after a workout. However, these are generally only appropriate for people exercising vigorously for more than an hour, especially if sweating heavily.

BOTTOM LINE

Some workout supplements may help enhance exercise performance for high-intensity, strenuous physical activity, such as training to run a marathon or power lifting. However, a healthy diet with adequate amounts of healthy carbohydrates, protein, and water is sufficient to fuel the body for moderate amounts of physical activity, such as an hour of jogging or bicycling. As workout supplements are not reviewed by the FDA for safety or effectiveness, consult with a doctor before incorporating them into your routine and discuss any potential contraindications if you have existing medical conditions.



SPOTLIGHT ON PROTEIN POWDER

Powdered protein can come from a variety of sources, including eggs, milk (e.g., casein, whey), and plants (e.g., soybeans, peas, hemp). Some protein powders contain protein from multiple sources; for instance, a vegan option might include protein derived from peas, pumpkin seeds, sunflower seeds, and alfalfa.



Protein powders are also dietary supplements and are not reviewed by the FDA for safety or effectiveness. They can often contain non-protein ingredients, including vitamins and minerals, thickeners, added sugars, non-caloric sweeteners, and artificial flavoring. Therefore, it is important to read the nutrition and ingredient labels beforehand so you know what you're buying.

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Sleep

Sleep is as essential to our daily needs as food and water.

Sleep plays a critical role in brain as well as physical functioning. Although we may feel that sleep simply rests our tired bodies, our brains remain active throughout the night.

HOW MUCH SLEEP DO I NEED?

Sleep needs change as we age, with the average person generally requiring less sleep at older ages. However, specific sleep amounts vary by individual. According to the National Sleep Foundation and American Academy of Sleep Medicine (AASM), newborns need the most sleep, at

14-17 hours a day, followed by infants at 12-16 hours a day including naps. Toddlers need about 10-14 hours a day. Preteens and teenagers need about 8-12 hours a day, and adults about 7-8 hours a day.¹ A consensus by the AASM and Sleep Research Society recommends that adults should sleep 7 or more hours a night to promote optimal health.²

Despite these general recommendations on sleep duration, individual differences in sleep requirements exist. In most epidemiologic studies, increased risk of adverse health outcomes such as obesity, diabetes, and cardiovascular disease has been observed among those who reported sleeping 5 hours or less per day, and 9 hours or more per day. Thus, a range of sleep hours (more than 5 and less than 9) is considered appropriate for most healthy adults.

Other factors such as quality of sleep are important, because just meeting the total recommended

sleep hours may not be enough if one wakes up frequently in the night. A common belief is that lost sleep from a late night out or studying can be recovered by “sleeping in” another day or taking naps. However, both of these methods disrupt the body’s circadian rhythms and may deprive the body of deeper sleep stages. Although some epidemiologic studies have shown that taking a short nap during the day may reduce risk of cardiovascular disease, increased variability in how much sleep we get from night to night is associated with an increased risk of developing metabolic and heart diseases.³ It is important to respond, whenever possible, to the body’s natural signals of sleepiness.

Visit the full sleep section on *The Nutrition Source* for more information about sleep and health, and tips for sleeping well: hsph.me/sle21



IS THERE EVIDENCE SUPPORTING SUPPLEMENTS FOR SLEEP?

Two popular herbal supplements, melatonin and valerian, are often promoted as sleep aids. But does the available research support their effectiveness?

- **Melatonin** has been shown to quicken time to sleep and have modest benefits on sleep duration and quality, but can cause daytime drowsiness. It is well tolerated in adults with few reported adverse events in doses up to 10 mg. The AASM recommends the judicious use of melatonin for certain sleep and circadian disorders such as shift work disorder or jet lag.⁴
- **Valerian** contains small amounts of GABA, a sleep-promoting neurotransmitter, and some studies have shown that valerian can improve sleep. However, other studies have found no difference in sleep when taking valerian compared with placebo, and there appears to be minimal benefit in those who have diagnosed insomnia. The AASM does not recommend valerian for insomnia disorder.⁴

It is important to note that supplements are not reviewed by the U.S. Food and Drug Administration for safety or effectiveness. Therefore doses and preparations of these herbs can vary widely. A study of 31 melatonin products found that the melatonin levels in the pills ranged between 83%-478% of the dose reported on the label.⁴ More than 70% of the products varied from the labeled dose by more than 10%. If supplements are used, look for a label verifying its quality from a third-party, such as from the U.S. Pharmacopeia.

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SOME TIPS FOR GETTING A GOOD NIGHT'S REST

- ★ Set a sleep schedule and stick to it. Try to go to bed at night and awaken in the morning around the same times, even on weekends. This helps to regulate the body's sleep cycles and circadian rhythms.
- ★ Stop using electronic devices an hour before bed, especially those emitting blue light such as smartphones, tablets, and televisions.
- ★ Create a quiet, dark, relaxing environment in your bedroom. Dim the lights and turn off your cell phone's sound and vibration modes if possible.

2021 RESEARCH HIGHLIGHT: SLEEP AND DEMENTIA RISK

Authors of a cohort study sought to tease out the association of early brain changes and sleep changes by including younger patients 50 years of age. They followed 7,959 participants for up to 25 years and found that participants who were between the ages of 50-70 years and slept 6 hours or less a night showed a 30% higher risk of developing dementia in later life, compared with those who slept 7 hours. The association was only slightly weaker when authors controlled for various factors independently associated with dementia like cardiometabolic status (high blood pressure, diabetes mellitus, body mass index, cardiovascular disease), sociodemographic variables (age, sex, ethnicity, education, marital status), health behaviors (smoking, alcohol, exercise, intake of fruits and vegetables), and mental health factors (depression). The authors did not find an association with longer sleep durations (8 or more hours) and dementia, though this may have been due to the low number of participants who slept longer durations.⁵





The U.S. Food and Drug Administration considers 400 milligrams a safe amount of caffeine for healthy adults to consume daily. Roughly how much caffeine does one 8-ounce cup of brewed coffee contain?

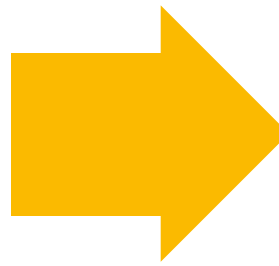
A 15 milligrams of caffeine

B 45 milligrams of caffeine

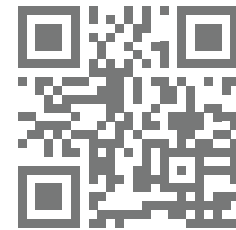
C 95 milligrams of caffeine

D 135 milligrams of caffeine

Think you know the answer? Follow the link below to test your healthy living knowledge with this 10 question quiz.

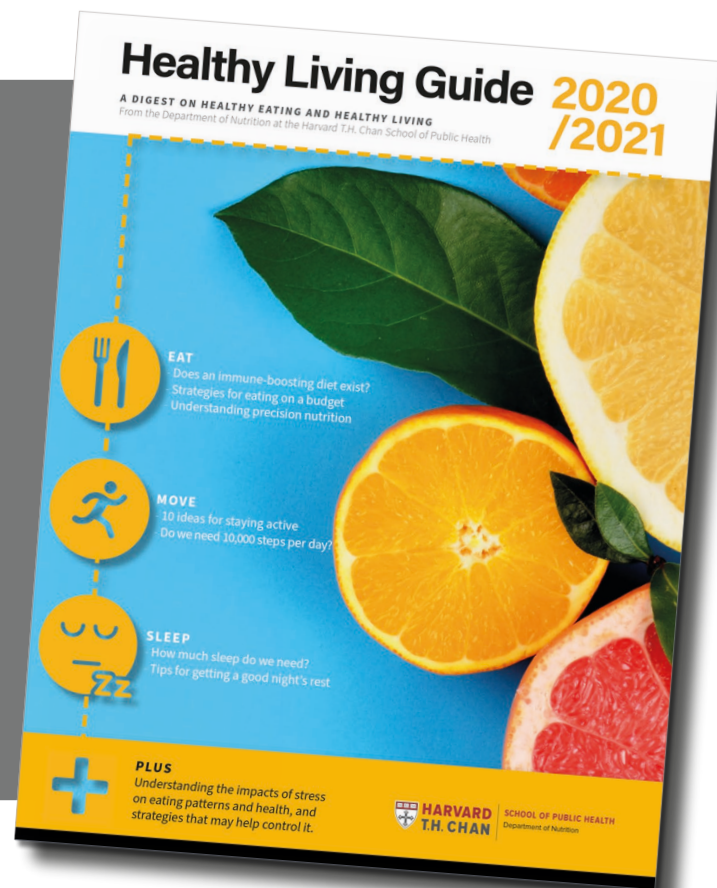
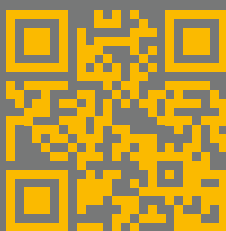


hsph.me/hlq1



Hint: The answers to the quiz can be found throughout the 2020/2021 Healthy Living Guide. Download the full edition here if you haven't checked it out!

hsph.me/hl1



Test your healthy living knowledge!