Kitchen Science

The process of fermentation uses bacteria, yeast and other beneficial microorganisms to produce foods that support a healthy gut—and body.

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Fermented foods are preserved using an age-old process that not only boosts the food's shelf life and nutritional value but also gives your body a dose of probiotics that may be good for your health. These live microorganisms can aid digestion by promoting a healthy balance between good and bad bacteria in the gut.

"Food fermentation has been practiced all over the world, and knowledge about fermenting specific foods has been passed down through generations with no knowledge of the microorganisms involved in the process or the health benefits of these foods," says Los Angeles–based registered dietitian Sofia Norton. "Nowadays, we know exactly what is involved in the fermentation of foods and what, if any, benefits there are to this."

Almost all food groups can be fermented, but grains, dairy, vegetables, meat and fish are the most common. Popular fermented foods include yogurt, kefir, kimchi, kombucha, sourdough bread and vinegary sauerkraut.

Some studies have shown that probiotics may have an advantageous effect not only in the gut but also in other organs, such as the brain. In addition, they defend against bad bacteria and possibly aid in the prevention of certain diseases.

Many fermented foods "contain probiotic bacteria, such as lactobacilli and bifidobacteria, which are said to improve the health and balance of gut flora and can treat and manage irritable bowel syndrome, gastric reflux, constipation and other GI [gastrointestinal] disorders," Norton explains.

"Studies show that probiotics in food can reach the intestines, where their effect is transient but beneficial," she continues. "For example, they can complement the action of the gut microbiome, inhibit pathogenic bacteria [bacteria that can cause disease, such as salmonella and E. coli] and stimulate the production of short-chain fatty acids, which cells in the gut lining use to make energy."

The fermentation process employs the help of microbes, such as bacteria, yeasts and mycelial fungi, as well as their enzymes. "These microorganisms are either naturally present in a food or the environment or are added to food as a starter culture," Norton explains. "Sometimes

environmental conditions like pH, temperature and moisture content are tightly controlled to help with fermentation."

Most foods are fermented via the process of lacto-fermentation, in which probiotics break down carbohydrates, such as sugar and starch, and convert them into lactic acid. This acidic environment acts as a natural preservative, inhibiting the growth of harmful bacteria while also increasing a food's shelf life.

"Fermented dairy and vegetables frequently contain probiotics—live bacteria and yeast that improve gut health," Norton says. "These microorganisms produce short-chain fatty acids and butyrate—a type of fatty acid—which protect the lining of your intestines." They also improve glycemic control, reduce inflammation and contribute to better brain functioning via the gut-brain axis, the two-directional interaction between the gastrointestinal tract and the central nervous system.

"Some fermented foods are easier to digest than their unfermented counterparts, which helps reduce GI discomfort and boosts the capacity to absorb nutrients," Norton adds.

Fermented grains are easier to digest than unfermented grains and may have a higher nutritional value because they contain a lesser amount of phytic acid. This substance can interfere with the absorption of minerals such as iron and magnesium. "Sourdough reduces the concentration of fermentable carbs in a food, which can be helpful for people with irritable bowel syndrome," Norton says. "Yogurt and kefir contain less lactose and a high concentration of bacteria that hydrolyzes lactose, making them easier to digest for people with lactose intolerance."

Jennifer Singh, a registered dietitian based in Raleigh, North Carolina, suggests that fermented foods may also lower insulin resistance, improve cholesterol levels, reduce blood pressure, boost immunity and reduce cancer risk. "Also, because of the benefit to gut health, fermented foods may help with mental health," she says. "The research is young but promising that anything beneficial for the gut may in turn reduce mental disorders such as anxiety and depression."

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"There are several ways fermented foods are likely to have a positive impact on mental health, such as improving the gut mucosal barrier, which protects us from environmental toxins, food antigens and bacterial secretions, such as lipopolysaccharide (LPS) endotoxins," Singh adds. "LPS can increase symptoms of depression and inflammatory response and increase the risk of alcoholic hepatitis [a type of liver disease] and insulin resistance. Another way a healthy gut supports mental health is via beneficial bacteria that produce most of the body's neurotransmitters, such as serotonin and dopamine, which both aid in boosting mood."

But are foods created by a process that utilizes bacteria, yeasts and molds, safe to eat—not just once but every day? Singh believes the answer is yes. "Eating fermented foods daily should not necessarily cause any issues in healthy individuals," she says. "I would be concerned if someone

was drinking a large amount of kombucha every day because they are following a detox diet. Yet eating a six-ounce cup of yogurt daily is considered perfectly normal and healthy in addition to being associated with reduced cancer rates."

Due to the reputed health benefits of these foods, Singh recommends eating a variety of them but advises doing so in moderation.

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"I would note that some people who recommend avoiding fermented foods might be trying to sell you on their 'proprietary' probiotics, so be mindful of motive," Singh advises. "Often, their product lacks the support of scientific research so be mindful of their sources of information.

"While there may be some less-than-beneficial bacteria and yeasts present in these foods, any properly fermented food will have killed off and crowded out large numbers of these microbes," she adds. "I say 'properly fermented' because precautionary measures do need to be followed to avoid the risk of contaminating foods with harmful microbes, as well as taking the right steps during the fermentation process to allow the right microbes to thrive. Also, keep in mind that we are constantly exposed to all sorts of microbes in our food and environment. They can be hard to avoid! So not eating fermented foods is not necessarily going to limit exposure."

Certain people, however, should avoid or limit consumption of fermented foods. For example, Singh cautions those with an active bowel infection, especially SIBO (small intestinal bacterial overgrowth) to avoid fermented foods until their problem resolves. In addition, those with esophageal tears, ulcers or varicose veins and histamine intolerance (fermented foods are high in histamines) and those living with irritable bowel syndrome should also avoid these foods. The same goes for people with compromised immune systems—such as people with AIDS, individuals undergoing chemotherapy or radiation therapy, recent recipients of an organ transplant or those with severe burns—who should avoid such foods due to the risk of contamination, Singh explains.

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In the case of certain fermented foods and drinks, such as beer and wine and store-bought items like sauerkraut and sourdough bread, pasteurization, baking or filtration may render live bacteria inactive. Not all foods claiming to have live and active cultures contain the strains of bacteria known to have probiotic health benefits. However, fermentation also adds nutrients, such as omega-3 fatty acids and B vitamins, to foods.

When buying fermented foods from the refrigerated section in a store, look for labels that say "naturally fermented" and "probiotic." The active cultures they contain should also be listed. Additionally, if you are buying kombucha, the water, yeast, tea and sugar (ideally less than 10 grams) that the beverage contains should be organic, naturally fermented—never force carbonated—and raw.

But why not try conducting your own marvelous experiment with fermentation? Check out our

convenient do-it-yourself guide below.

Home Economics

Fermenting food is super cheap and relatively easy. Here’s how to do it:

First, use only tested recipes for your fermentation challenge. Check out the book Fermented Vegetables, by Kristin K. Shockley and Christopher Shockley, and visit their website, Ferment.Works. In addition, be sure to read Sandor Ellix Katz’s comprehensive work The Art of Fermentation. You can also find recipes at his website, WildFermentation.com.

Before fermenting foods, sanitize all surfaces, containers and utensils you will be using by washing them with hot, sudsy water. Then rinse them with hot water, and wipe everything down with a clean cloth. Don’t let fermented foods come into contact with contaminated materials. (For example, don’t use cutting boards on which raw meat is prepared.)

Choose containers made of the right materials. Avoid using most metals, which can react with acid that can leach into food and create an off flavor. (Stainless steel is fine.) If using plastic, make sure it’s food grade, with no scratches or cracks that can harbor harmful bacteria and other germs.

Start with fresh vegetables—preferably organic ones—or at least those grown under good food safety guidelines.

For recipes, use a starter brine that contains a culture (called a starter culture) or a mixture of salt, water and whey. Completely cover the vegetables with the brine.

Begin the fermentation process within 24 hours of buying or harvesting veggies.

Follow the recipe to the letter. For example, it’s essential to use the correct amount of salt.

Store fermenting vegetables in a sealable container (such as a mason jar) at 70 to 75 degrees. To reduce the amount of oxygen reaching the vegetables, don’t disturb the jar or mold could develop.

Once fermenting is done—typically when bubbles form and the food smells vinegary or like a pickle—refrigerate the container.
