

Tips to Safely Ferment Food at Home

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Fermenting foods is perhaps the oldest food preservation method and has grown in popularity in recent years due to their touted “gut,” probiotic, and other additional health benefits. Fermenting at home is an inexpensive way to control what goes inside your food. Many are finding emotional satisfaction from making their food at home and feel a connection to their ancestors by making things the way they did.

Fermentation is the process of “good” microorganisms fermenting sugars and nutrients in food to produce byproducts (acids) that usually preserve the food in some manner. For example, milk is fermented to produce acids that create cheese, yogurt, and other products. In most cases, fermentation alone cannot produce a shelf-stable (room temperature) food product. Nearly all fermented foods require canning to preserve or refrigeration. Do-it-yourself blog posts have erupted all over the internet with varying methods that can lead to potential exposure to harmful pathogens due to a lack of proper pH, temperature, and time monitoring. Below are specific ways to control the fermentation process to ensure a safe, healthy, and delicious product (EUFIC, 2017; Gilliland, 1989).

Importance of Measuring pH Levels

The pH scale measures how acidic or basic a substance is and ranges from 0 to 14. A pH less than 7 is acidic and greater than 7 is basic. For fermentation to be successful at eliminating all potential pathogens, the pH level must drop below an acidity of 4.6. Foods can NOT be guaranteed safe and free from harmful potential pathogens unless it is verified using a pH meter or test strip. Foods that “appear” to be safe can still contain harmful pathogens. This is very concerning for the novel and inexperienced home fermenter following do-it-yourself blog fermenting guidelines. It is recommended to use a digital pH meter or pH test strip that can measure to at least 1 decimal point. Test strips are less accurate as the color of the food can alter the result, and many test strips don't test to the accuracy of at least one decimal point. For instructions on using test strips and meters, follow these links:

- pH test strips
<https://extension.usu.edu/utahwaterwatch/monitoring/field-instructions/ph/>.
- Electronic pH meter
<https://www.youtube.com/watch?v=QNq2X XUxFO8>.

Maintaining Proper Temperature

To successfully ferment food, the proper temperature must be maintained throughout the entire process. Fermenting on your counter is NOT safe as temperatures vary with weather conditions and heating/cooling fluctuations in the home. It is recommended to use a controlled water bath incubator to maintain a proper temperature. The proper temperature to maintain the “good” microorganisms will be listed on the starter culture packet. Follow instructions on the incubator manual to properly prepare for fermentation.

Monitoring Time

Fermented foods must maintain proper temperature throughout the entire fermentation and reach a pH

of 4.6 or less within the allotted time to be considered safe and free from harmful pathogens. The specific temperature and allotted time safety interval your food requires will be listed on your starter culture packet. Dairy products must reach a pH of 4.6 or less within 48 hours to be considered pathogen-free.

Purchasing Starter Cultures

A starter culture is a packet or pouch containing the certain “good” microorganisms that will ferment the sugars and nutrients in the food to produce the desired byproduct acids to ferment the food. A starter culture packet can be purchased online through most grocery retail stores or in person at a local health food store. Starter cultures cannot be made at home, but after fermenting a food, some foods can be re-cultured using a reserved portion. Proper re-culturing needs to occur at least weekly for the “good” microorganisms to thrive and continue to produce.

Popular Foods to Ferment

This section explains the types of foods to ferment. If you'd like to try your own hand at fermentation, recipes follow.

Acidophilus Milk

Acidophilus milk is a great alternative for lactose-intolerant individuals. It is normal milk that has been cultured with live lactobacillus acidophilus bacterium. Research has shown that acidophilus milk has the potential to help prevent or control intestinal infections, improve lactose digestion in lactose-intolerant individuals, help control serum cholesterol levels, and exert anticarcinogenic activity. It can be used in place of milk, or if the product ends up thicker, then it can be used as a yogurt substitute (Gilliand, 1989).

Buttermilk

Cultured buttermilk is milk that has been incubated with *S. lactis* and *L. bulgaricus*. It is a good source of

protein, riboflavin, calcium, and several other nutrients. Research has shown that buttermilk may help improve oral, bone, and heart health. Heart health is improved by reduced cholesterol and blood pressure levels. Some lactose-intolerant individuals may tolerate this better than normal milk.

Buttermilk is an acid typically used in a variety of recipes as a leavening agent and produces a light color and fine grain when added to baked goods. Buttermilk can be used in pancakes, biscuits, dressings, pies, ice cream, cornbread, vinaigrettes, or with your favorite meat or cooked vegetable dish (Panoff, 2019).



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Cultured Cream (Fraîche)

Cultured cream is a fermented dairy product with 10–45% fat content. It contains probiotics that are beneficial to the gastrointestinal tract. However, this beneficial source of probiotics is high in saturated fat and should be consumed in limited quantities. Commonly known as crème fraîche, this product is highly popular in much of Northern Europe and Central America. Crème fraîche is made from heavy cream which is then inoculated with a starter culture and allowed to ferment. It is like the United States' sour cream except that it is less sour and contains more fat. This thick, delicious treat can be added into savory dishes (curry, casseroles, soups), used as

a dip to your favorite fruit, or whipped to top your favorite dessert (Ipatenco, n.d.).

Kefir

Kefir is a drink originally fermented in animal hides made from cow's or goat's milk. It originated thousands of years ago from the Caucasus Mountains in the former Soviet Union. Kefir "grains" resemble small cauliflower the size of wheat kernels and contain colonies of yeast and lactic acid bacteria.

This fermentable drink is beneficial to the gastrointestinal tract, can help build immunity, improves bone health, has potential protective cancer properties, and may improve allergy and asthma symptoms. Kefir is a good source of calcium, amino acids, B-vitamins, and folic acid. Kefir is also a possible beverage option for lactose-intolerant individuals due to its low lactose content. Kefir contains more beneficial probiotic bacteria than yogurt, making it the powerhouse probiotic. You can use kefir in smoothies, salad dressings, salads, ice cream, spreadable cheese, soup, as a substitute for buttermilk or yogurt in baked goods, or as a beverage option (Leech, 2018b).

Kombucha

Kombucha is thought to have originated in China about two thousand years ago. It was originally thought to cure certain diseases, although further studies with humans have proven this untrue. Research has shown some positive correlations between the potential of kombucha to:

- Reduce heart disease risk.
- Destroy harmful bacteria.
- Aid in managing type 2 diabetes.
- Protect against cancer.

Kombucha also contains antioxidants and probiotics (Leech, 2018a). Kombucha is made by brewing sweet tea and then combining it with a scoby starter culture and water. The scoby then eats the sugar and ferments the tea. Homemade kombucha contains about 3% alcohol.

Kombucha was introduced to the United States in the 21st century. Since then, it has become widely marketed and popular, especially due to the wide variety of flavoring options. Flavor kombucha with your favorite juice, purees, fresh/dried herbs, fresh/frozen/canned/dried fruit pieces, or your favorite jam or preserves. Common flavors include honey lavender, raspberry lemon, blueberry vanilla, peach, strawberry, pineapple, hibiscus, mango ginger, and much more (You Brew Kombucha, 2020).



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Yogurt

Yogurt is thought to have originated many centuries ago among the nomadic tribes of Eastern Europe and Western Asia. Milk stored in animal skins would acidify and coagulate. The acid helped preserve the milk from further spoilage and the growth of pathogens (disease-causing microorganisms). Yogurt is a good source of calcium, phosphorous, vitamin B12, riboflavin, magnesium, and potassium. It is also high in protein, especially Greek yogurt. Due to the

high amount of protein in Greek yogurt, it is a beneficial appetite suppressant and aid in weight loss, as the extra protein leads to longer feelings of fullness—even more so than normal yogurt. Yogurt is also a good source of probiotics. Many commercial brands have been pasteurized, destroying the live bacteria. This is a good reason to make yogurt from home to enjoy the benefits of probiotics, which are shown to:

- Relieve symptoms of irritable bowel syndrome (IBS).
- Improve the overall digestive system by decreasing bloating, diarrhea, and constipation.
- Improve immunity.
- Reduce inflammation.
- Possibly reduce the duration of the common cold.

Yogurt also may help prevent osteoporosis and improve heart health (Elliott, 2017).

Choose plain, unsweetened yogurt with live cultures, or make homemade yogurt to obtain the most advantageous health benefits. Make yogurt parfaits, smoothies, or frozen yogurt. Yogurt is also making its way to the dinner table in marinades, salad dressings, as a replacement for mayo, swirled into soups, or topped on any of your favorite dishes (Roman, 2014).



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ACIDOPHILUS — MILK —

Activating Acidophilus Milk Starter Culture

- 1 liter whole milk
- 1 packet acidophilus starter culture

Heat milk to 185° F on the stove in a stockpot; hold for 10–20 minutes while stirring constantly. Hold longer to produce a thicker texture. Remove pot from the burner and allow milk to cool to 104–113° F. Once the milk has cooled, add the contents of the acidophilus starter culture packet; mix well. Place in pint jars, cover with lids, and place in an incubator or yogurt maker set at 40–45° C for 12–24 hours or until pH drops below 4.6. Refrigerate immediately for 3–6 hours before re-culturing.

Re-Culturing Acidophilus Milk

- 1 gallon whole milk
- 1 cup activated acidophilus milk or 1 cup commercial plain yogurt

Add milk to stockpot and heat to 185–200° F; hold for 10–20 minutes, stirring constantly. Hold longer for a thicker product. Remove pot from the burner and allow milk to cool to 104–113° F. Once cooled, remove 1 cup of milk and add 1 cup activated acidophilus starter culture (previous batch) or commercial plain yogurt; mix well. Combine with remaining milk mixture and then pour milk into sterilized pint jars. Place jars into an incubator set at 40–45° C for 5–8 hours. Once the milk has reached a pH of 4.6 or less, refrigerate immediately and use within 1 week; reserve 1 cup to re-culture weekly to maintain good microorganisms.

Use as a milk substitute or thicken to produce a delicious yogurt substitution.

Creamy Acidophilus Mac 'n' Cheese

- 2 cups uncooked macaroni noodles
- 2 1/2–3 cups acidophilus milk
- 1/4 teaspoon garlic powder
- 1/2 teaspoon onion powder
- 1 tablespoon butter
- 1/2 teaspoon pepper
- 1/4 cup water
- 2 tablespoons cream cheese
- 1 cup shredded cheddar cheese

In a saucepan, combine a pinch of salt, acidophilus milk, garlic powder, onion powder, butter, and water. Bring to a boil. Add in macaroni noodles and reduce heat to low. Continue to simmer, stirring frequently until noodles are cooked (about 20 minutes). Watch to make sure the liquid doesn't completely evaporate. You can add extra acidophilus milk 1/4 cup at a time if the liquid is low. Once the pasta is cooked, ensure the noodles are not dry. Pasta should be moist before adding cheese. Stir in cream cheese until melted. Remove from heat and stir in cheddar cheese.

Buttermilk **THE OLD** **FASHIONED WAY**



Activating Buttermilk Starter Culture

- 1 quart whole milk
- 1 packet buttermilk starter culture

Place milk into a mixing bowl. Add in 1 packet of buttermilk starter culture; mix well. Place into pint-sized jars and into a prepared incubator or yogurt maker set to 42.3° C. Ferment for 18–48 hours until buttermilk has reached a pH level of 4.6 or less. Must ferment within 48 hours, otherwise discard.

Re-Culturing Buttermilk

- 1 quart whole milk
- ¼ cup activated buttermilk

Combine milk and activated buttermilk into a mixing bowl. Place into pint-sized jars and incubate at 42.3° C for 8–12 hours until buttermilk has reached a pH level of 4.6 or less.

Use buttermilk in pancakes, biscuits, dressings, pies, ice cream, cornbread, vinaigrettes, or with your favorite meat or cooked vegetable dish.

Buttermilk Pancakes

- 2 cups all-purpose flour
- 2 teaspoons baking powder
- 1 teaspoon. baking soda
- ½ teaspoon salt
- 2 tablespoons granulated sugar
- 2 cups buttermilk
- 2 eggs lightly beaten
- 1 teaspoon vanilla

Mix dry ingredients in a large bowl and set aside. In another bowl, combine buttermilk, eggs, and vanilla. Let batter rest for 10 minutes. Heat a skillet over medium heat and spray with non-cooking spray. Place ½ cup of batter onto the griddle for each pancake. Flip the pancake when small bubbles appear and the opposite side is a nice golden brown. Serve immediately with butter and syrup.



Cultured **CREAM**

Cultured Cream (Fraîche)

- 4 cups whipping cream
- 1 cup buttermilk, acidophilus milk, yogurt, or 1 packet cream fraiche starter culture

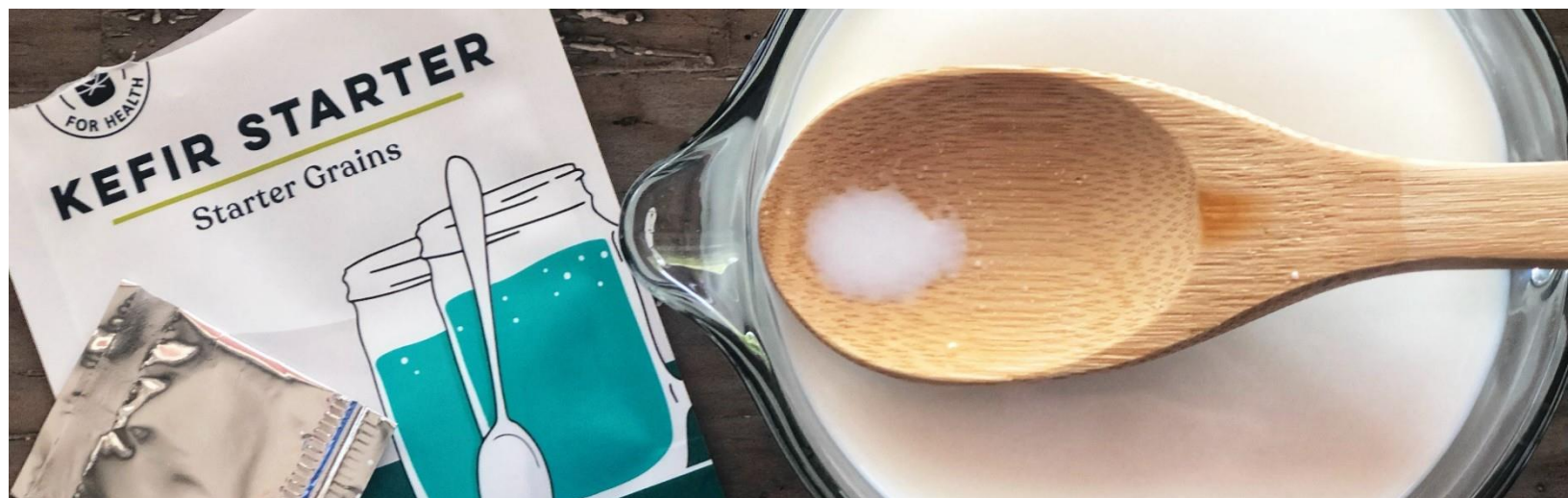
Heat whipping cream slowly to 185–200° F, hold for 2–5 minutes while stirring constantly. Cool milk to 104–113° F. Add buttermilk, acidophilus milk, yogurt, or 1 packet cream fraiche starter culture packet. Place into clean and sanitized jars. Incubate at 42.3° C until cultured cream reaches a pH of 4.6 or less.

This thick, delicious treat can be added into savory dishes (curry, casseroles, soups), used as a dip to your favorite fruit, in a vinaigrette, or whipped to top your favorite dessert.

Cultured Cream (Fraîche) Vinaigrette

- 3 tablespoons crème fraîche
- 4 tablespoons apple cider vinegar
- 1 egg yolk
- 2 teaspoons mustard
- ½ cup olive oil
- Salt and pepper to taste

Using a whisk, blend the crème fraîche, apple cider vinegar, egg yolk, mustard, salt, and pepper. Begin adding the oil very slowly, continuing to stir as it thickens. Use immediately.



Activating Kefir Starter Grains

- 1 quart whole milk
- 1 packet kefir starter culture

Place milk into a mixing bowl. Add in 1 packet of kefir starter culture; mix well. Place into pint-sized jars and prepared incubator set at 43.3° C for 18 hours or until kefir has reached a pH level of 4.6 or less.

Re-Culturing Kefir

- 1 quart whole milk
- ¼ cup kefir

Combine milk and kefir into a mixing bowl. Place in pint-size jars and incubate at 26.6° C until kefir has reached a pH of 4.6 or less. Re-culture up to seven times within a week. To re-culture, buy dehydrated milk kefir grains instead of a kefir starter culture.

Use kefir in smoothies, salad dressings, salads, ice cream, spreadable cheese, soup, as a substitute for buttermilk or yogurt in baked goods, or as a beverage option.

Kefir Blueberry Banana Smoothie

- ¾ cup kefir
- ½ cup of orange juice
- 1 cup blueberries
- 1 banana

Combine in blender and mix until smooth. Serve immediately or freeze for later use.



Homemade Kombucha

- 1 activated kombucha and scoby starter culture
- 12 cups of filtered water
- 6 black or green tea bags
- 1 cup of cane sugar

Boil 2 cups of water and remove from heat. Add tea bags and steep for 10 minutes. Remove tea bags. Add sugar and mix until dissolved. Add sweetened tea to gallon jar and then fill the remainder with water, leaving 4 inches of headspace at the top. Add the kombucha starter culture and scoby; mix well. Take a pH reading to ensure the pH is below 4.5. If not, add 1 tablespoon of white vinegar and test again.

Cover with a coffee filter and rubber band. Allow to ferment for 7–10 days at 75–85° F. Temperature can easily be maintained by placing the jar on top of a heating pad set on high. Buy a specific kombucha heating pad or use a regular medical heating pad you might have lying around the house. Keep the heating pad plugged in and on throughout the entire fermentation process. Ferment for a minimum of seven days and up to 21 days until the desired flavor is achieved. Take pH reading to ensure pH is less than 4.5. Reserve 2 cups kombucha and the scoby to act as your starter culture for your next fermentation. Then, bottle the remaining kombucha and add desired flavorings, fruits, and spices, leaving about 1–2 inches of headspace. Let ferment for 1–3 days. Pop the lid once a day to release carbon dioxide pressure. When desired fizziness and flavor are achieved, refrigerate and enjoy!

Flavor kombucha with your favorite juice, purees, fresh/frozen/canned/dried fruit pieces, fresh/dried herbs, or your favorite jam or preserves. Common flavors include honey lavender, raspberry lemon, blueberry vanilla, peach, strawberry, pineapple, hibiscus, mango ginger, and much more.

Mango Strawberry Kombucha

- Unflavored kombucha
- 5–6 (16 oz.) bottles
- ½ cup mangos
- ¼ cup strawberries

After kombucha has finished fermenting and before the final fermentation, pour the kombucha into bottles, leaving 3 inches of headspace. Then, add fruit into a blender and mix until smooth. Evenly distribute blended fruit into bottles. Let ferment for an additional 1–3 days. Pop the lid once a day to release carbon dioxide pressure. When desired fizziness and flavor are achieved, refrigerate and enjoy!



Homemade *Fermented* **YOGURT**

Activating Yogurt Starter Culture

- 1 cup whole milk
- 1 packet yogurt starter culture

Whisk milk and yogurt starter culture in mixing bowl until evenly distributed.

Re-culturing Yogurt

- 1 gallon whole milk
- 1 cup activated yogurt or 1 cup commercial plain yogurt with live cultures
- 1 1/3 cups nonfat dry milk powder (optional for thicker texture)

Combine milk and nonfat dry milk in a small pot on the stove. Heat to 185–200° F; hold for 10–20 minutes while stirring constantly. Holding longer will produce a thicker texture. Cool milk to 112–115° F. Remove 1 cup of milk and mix in activated yogurt or commercial plain yogurt. Combine with remaining milk and pour into pint jars, cover with lids, and place in the yogurt maker for 4–8 hours until a pH of 4.6 or less is achieved. Refrigerate immediately. Re-culture infinitely by saving 1 cup of yogurt and making at least once a week to ensure cultures stay active and healthy to produce subsequent batches.

Tips for thicker Greek-like yogurt:

- Use whole-fat milk instead of reduced-fat milk.
- Add nonfat dry milk powder.
- Heat milk for greater lengths of time up to 20–30 minutes at 185° F.

Strain the yogurt to remove excess whey by using a cotton bag, muslin cloth, or tight-weave cloth; the longer you strain the yogurt the thicker it will be.

Hearty Yogurt Avocado Toast

- 1 whole-wheat slice of bread
- ½ avocado, sliced
- 2 tablespoons yogurt
- 1 teaspoon honey

Toast bread for 2.5 minutes in the toaster. Spread yogurt and avocado slices on top of the bread. Top with honey. Serve immediately for a hearty protein appetite-suppressor breakfast.

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