Probiotic & Cultured Food

Contents

Dairy

Fermentation acts to stabilise milk, transforming it form a highly perishable substance into something which can be safely stored. In addition, because the microorganisms present in the cultures consume and break down lactose and milk proteins, fermented dairy products are much more easily digested by the human body than fresh milk.

A wide variety of cultured milk products exist in the world, as humans have a long tradition of domesticating animals for their milk. Variations depend on the animal species, wild microorganisms, the vessel used to ferment in (leather bag, wooden barrel, clay crock, …) and tradition.

Yoghurt

Yoghurt is produced using a culture of *Lactobacillus delbrueckii* subsp. *Bulgaricus* and *Streptococcus salivarius* subsp. *Thermophilus* bacteria. In addition, other lactobacilli and bifidobacteria are also sometimes added during or after culturing yogurt. Analysis of the *L. delbrueckii subsp. bulgaricus* genome indicates that the bacteria may have originated on the surface of a plant. Milk may have become spontaneously and unintentionally infected through contact with plants, or bacteria may have been transferred via the udder of domestic milk-producing animals.



How to Make Yoghurt

- You will need to use about 1 Tbs of yoghurt starter per 500ml – 1 L milk. It is possible to use non-dairy milk (e.g. coconut milk, rice milk, almond milk).
- Heat the milk gently to 83 degrees C (pasteurisation point).
- Allow the temperature of the milk to come down to 44 degrees C, and stir in the yoghurt starter culture. Make sure the yoghurt is at room temperature so it doesn't reduce the temperature of the milk.
- Pour the milk mixture into a sterilised jar or thermos flask. Put the lid on and place the jar or flask in a warm place. The bacteria responsible for making yoghurt thick thrive in warmer temperatures, so the longer you keep your yoghurt warm the better.
- The yoghurt should be ready in 6 – 8 hours, although it may take longer in cooler weather. If it looks nice and thick then it's ready; if not then leave it longer to set. The longer you leave it at room temperature, the sourer it will be.


The Yoghurt Starter

Any store-bought yoghurt containing live cultures will work as a yoghurt starter. Plain yoghurt is better than flavoured yoghurts, as the added sugar can encourage mould or putrefying bacteria.

Even the best quality store-bought yoghurt will not continue to work for multiple successive batches. The typical store-bought yogurt only carries a few strains of bacteria that have been isolated by scientists, and do not contain a full suite of microorganisms to allow them to continue indefinitely as self-sustaining cultures.

There are still some traditional yoghurt cultures which have never gone through the industrial food development process, and which still contain diverse ecologies of multiple different microorganisms – and the ability to multiply indefinitely. These cultures are sold, generally in freeze-dried form, as "heirloom yoghurt cultures". Cultures for Health sells heirloom cultures from Scandinavia, Eastern Europe and Western Asia, along with sourdough starters and other live food-making products. There is no evidence that the extra bacteria in an heirloom culture will give you better texture, flavour or health benefits, but they do allow the culture to be maintained indefinitely.

Make-Your-Own Starter Culture

You can also try to make your own heirloom yoghurt culture. There are many ways to do this, including using ant eggs, but this is one:

- Scald and cool your milk as for a normal batch of yoghurt.
- Briefly rinse some fresh, organic chilli peppers in chlorine-free water.
- Cut the stems off the chillis, and mix them into the milk.
- Keep the milk warm for 24 hours. With luck, the milk will have gelled and formed curds. The curds should smell of yoghurt, and taste yoghurty, spicy and slightly sour.
- Use a spoonful of the curds as a starter for your next batch of yoghurt.

Kefir

Kefir is a cultured-milk beverage which originated in the northern slopes of the Caucasus Mountains, believed to date back at least 1,000 years. Kefir has a uniform, slightly creamy consistency, a sour refreshing flavour, with a slight subtle aroma of fresh yeast, or a very subtle beer-like aroma. Kefir also has a hint of a natural effervescent zesty tang.

Traditional, authentic kefir can only be prepared by culturing fresh milk with kefir grains. The natural mother-culture is referred to as grains due to its granular structure and appearance. The biological structure or each grain is created through a dynamic association and symbiosis between a mixture of friendly Lactic acid bacteria, vinegar-producing bacteria, and yeast strains.

Kefir grains consist of many individual white to bone-coloured mostly self-enclosed bodies made up of a soft, gelatinous biological mass somewhat resembling cooked cauliflower rosettes. The kefir grain is made up of a mixture of proteins, amino acids, lipids, and polysaccharides. The bacteria and yeasts create the bio-matrix structure (the grains), which then serves as a habitat for them.

There is an assortment of some 40 aromatic compounds contributing to the unique flavour and distinctive pleasant aroma of kefir. Kefir also contains between 0.08% to 2% alcohol; about 0.08 to 0.1% alcohol is average for 1-day cultured kefir, whereas kefir stored for a number of days after separating the kefir grains contains up to 2% alcohol, and possibly 3% alcohol, depending on the type of milk and ripening conditions.

Preparation

Fresh, pasteurised or non-pasteurised full-cream, low fat or non-fat milk[1] is put in a clean suitable container with the addition of a small portion of kefir grains. 1 Tbs of kefir grains will culture approximately 500ml of fresh milk. The milk may be cold or warm, but should not be heated above room temperature.

Cover the mouth of the jar or bottle with a clean cloth (e.g. a double layer of muslin) or a loosely screwed on lid (to allow the release of gas). Leave it at room temperature (18 - 28ºC is good; 22ºC is optimal) for 12 - 48 hours. The longer you leave it, the sourer your kefir will be. 6 hours will produce a lightly soured drink.

Strain the kefir grains out of the liquid kefir, and add them to fresh milk to repeat the process. This procedure can be performed on an indefinite basis.

Using porous containers to ferment kefir (e.g., leather bags, terracotta or wooden barrels) may reduce the risk of contamination, because the container itself is colonised by the kefir organisms. This gives the beneficial microorganisms a competitive advantage, increasing the chances of them outcompeting other organisms in the milk.

[1] Kefir grains can also be put into non-dairy (soy, seed or nut) milk, although they may cease to grow and become unpropagable. It is best to maintain your base kefire culture in dairy milk, and only use excess grains in non-dairy milk.

Secondary Fermentation

Strained liquid kefir may be consumed fresh, refrigerated for later use, or matured at room temperature over a period of days in a secondary fermentation process.

This process reduces the lactose in the kefir, improves the overall flavour, and increases the levels of vitamins B1, B6, and B9, as well as carbon dioxide and alcohol. Through fermentation calcium and other minerals are rendered more biologically available.

Flavourings can be added to the kefir before the secondary fermentation process, such as orange peel (which provides vitamin C and calcium) or cinnamon (which is a digestive aid and general tonic). Other ingredients could be used, such as liquorice root, ginger, burdock root, mint, goji, pomegranate, etc.

Historical Preparation Process

Traditionally in a region of the Caucasus Mountains, kefir was prepared with raw, full-cream goat or cow's milk. Fresh milk with the addition of kefir grains stored in a goatskin leather bag was left for 24 hours to ferment at room temperature. This initiated the fermentation process. Separation of the grains was achieved by forcing the contents to a corner of the leather bag by hand, where most of the grains were retained. The liquid kefir was separated from most of the grains by pouring the contents into a container.

This kefir had a moderate sour taste, creamy texture and consistency, and an alcohol content of around 0.5% by volume. During cold conditions, the goatskin bag was kept in the sun during sunny cold days, or hung near a fireplace. Apparently, it was a custom to hang the bag near a door way, where by anyone passing by would shake the leather bag.

After the first fermentation was completed, the kefir was collected and stored in sealed wooden barrels or clay crocks, where secondary fermentation preserved the beverage as the beneficial kefir ripened over several days. Ripened kefir was enjoyed over an extensive period as it matured, as the fermentation process preserved the milk product without the need for refrigeration. As portions of liquid kefir were removed from the barrel or crock for immediate consumption, more freshly strained kefir was added to replenish the vessel.

Growing More Grains

Kefir grains increase in overall volume, numbers, and weight over time. To prevent overcrowding of kefir grains it becomes essential to remove a portion of kefir grains from the batch.

Traditionally, excess or spare kefir grains were either eaten, dehydrated and stored as a back-up source, shared among family members, or traded amongst the people of the Caucasus for other basic essentials.

Non-Continuity

If you need to stop producing kefir for a while (for example, if you go on holiday) you can either find a baby-sitter for your culture, or you can store it.

The simplest method to preserve milk kefir grains is to place the kefir grains in fresh milk, cover the container with a snug lid and place the jar in the fridge. Kefir grains will generally keep for up to a month in this manner. Keep in mind that when you remove the kefir grains from the fridge, it can take a few batches for the grains to come out of their hibernated state and begin reliably making kefir again (you may have to toss a few batches which do not kefir properly).

Kefir grains can also be frozen for up to 2 months. Wash the grains with pre-boiled cooled water. Pat the grains dry with a clean cloth, then place them in a sealed jar or bag with some dry powdered milk to protect against freezer burn.

For longer-term breaks, milk kefir grains can be dried. Rinse the milk kefir grains thoroughly and place them on a piece of unbleached parchment paper. Leave the kefir grains in a warm safe place to dry where the temperature will not exceed 32°C. Depending on temperature and humidity, it will generally take several days for the grains to dry thoroughly. Once dry, place the kefir grains in a zip lock bag with a bit of dry milk powder. Keep the bag in a cool dry place or ideally the refrigerator. Dried kefir grains will generally keep for at least a year.

Reactivation: Frozen Kefir Grains

To reactivate frozen kefir grains, thaw by placing the grains in a glass filled with cold water for a few minutes. Place the grains into a strainer and wash off any powdered milk that's adhered to the grains with cold water. Add fresh milk to the grains with a ratio of 1 : 3 grains-to-milk by volume (e.g. 1/2 cup of milk to 2 Tbs of grains).

Strain off the milk every 24 hours, whether or not the milk has coagulated or soured, then place the grains back in the jar with more fresh milk. When full coagulation of milk occurs within 24 hours of fermentation, your kefir grains have re-established themselves. At this point in time the milk should smell sour but clean, with a possible aroma of fresh yeast. This could take up to one week and in some cases longer.

The quantity of milk may be increased to one cup, and again by another 1/2 cup after every other batches, until you're happy with the amount of kefir produced. After an increase in milk volume, do not increase again until the grains are able to ferment the previous increase within 24 hours. This may take between two to seven batches, depending on many factors e.g., how much you increased milk by, the ambient temperature and the activity of the grains themselves.

Reactivation: Dehydrated Kefir Grains

To reactivate dehydrated kefir grains, place the dehydrated kefir grains in one cup of fresh milk and leave in a partially sealed container for 24 hours at room temperature. Do not use coconut milk, soy, nut milk, or any alternative varieties of milk. If using pasteurized milk, do not use milk that is close to the “use by” date. If using raw milk, do not use milk that is more than a few days old due to rising bacteria counts which can conflict with bacteria and yeast present in the kefir grains.

After 24 hours, strain the kefir grains out of the milk and place them into fresh milk. Renew the milk daily after straining that batch, whether the milk has coagulated or not. Do not drink this milk until it produces a clean, sour aroma. Reconstituting dry grains takes around 4 days, but may take up to 2 weeks. The first few days may yield an overgrowth of yeast or a layer or froth or foam on the surface of the milk. Within 5-7 days, the bacterial balance should stabilize and the kefir will begin to smell clean, sour and possibly of fresh yeast. Once the milk is reliably turning to pleasant tasting and pleasant smelling kefir within 24-48 hours, your kefir grains are ready to generate regular batches of kefir.

The grains should become whiter in colour after each consecutive batch. Any yellow or yellow-pink-brown grains that don't have an elastic property should be removed from the batch after the forth week. These are non propagable grains (do not grow), the portion of which is determined by length and storage conditions and dehydration method.

Problems

Unless kefir acquires an odour of rotten eggs, or shows signs of discoloration, it should be fine. Both conditions are very rare, and usually due to poor practices such as:

- Unsanitary conditions, including the use of contaminated media (milk, water, fruit juice, etc.).
- Over heating the grains with hot water or letting the kefir reach above 35ºC. Fermenting continuously at this high temperature for long periods may damage or kill the organisms of kefir grains.
- If using a pouch (not recommended), leaving kefir grains in the pouch, floating – and therefore not covered by the medium – for longer than 2 -3 days may cause contamination. Under these conditions the pouch may grow contaminating organisms. This is more likely to occur with soy, seed or nut milk kefir than with dairy kefir.

  When storing kefir grains for longer than 3 day periods in the same media, it is strongly recommended to avoid the use of a pouch or bag and instead use the kefir grains naked.
- Using a pouch or a container which was previously used for sprouting seeds, grains or legumes. If such utensils are not sterilised before using for kefir, the kefir may produce an unusual ammonia-like or musty odour.

It is important to keep the inner area of lids used on jars clean. Lids with an inner lining, may have small crevices, where weed-microbes may flourish. So please keep lids of culturing jars clean at all times.

It is advisable for individuals taking kefir for the first time to begin with small amounts. There have been cases of Candidiasis in people who consumed larger amounts of kefir for the first time, and cases where symptoms of nausea or abdominal discomfort followed shortly after taking the milk-kefir. This may be due to an underlying issue or condition involving the gastro-intestinal tract.

Kefir is known to increase peristalsis, and a sluggish or inflamed gastro-intestinal tract may respond with nausea, abdominal discomfort, or diarrhoea. To avoid this, a small amount of kefir (less than half a cup; in some cases as little as 1 Tbs mixed with fresh water or juice if there is a high possibility of adverse reactions) should be taken the first time, and watch out for any reaction over the next few hours. Increase the amount by one tablespoon or so each day, until one cup of kefir can be tolerated on its own, at one sitting.

Uses & Recipes

Milk kefir can be consumed as-is as a drink, or used almost anywhere you would normally use fresh milk, buttermilk or yoghurt (on cereal, in smoothies, to make ice-cream, in baking, etc.). Kefir will not respond the same way as fresh milk when heated; using it in sauces or custards may require lower heat and some experimentation.

Cultured (Sour) Cream

A rich creamy fresh sour cream with a taste and texture similar to Italian mascarpone, or smetana (a Russian sour cream product like *crème fraîche*). This recipe prepares about 400g of sour cream. It should keep for at least one month refrigerated in a sealed container.

2 - 3 cups fresh non thickened natural dairy cream (or replace 1 – 2 cups of cream with fresh whole milk)
2 – 4 Tbs milk kefir-grains OR ¼ cup freshly strained ready-to-drink liquid kefir
(optional) ½ tsp sea salt

- Mix fresh cream and milk together, then place in a jar with the kefir grains or freshly strained kefir.
- Let stand at room temperature for 12 to 48 hours.
  - An 8 – 12 hour fermentation produces a lightly flavoured sour cream suitable for dessert use, while a 24 – 48 hour fermentation produces a robust flavoured sour cream more suitable to serve with Mexican food.
- Strain the kefir cream to separate the kefir grains out.

Optional Steps:

- Mix in the salt, if using, and pour the rich kefir into a pre-moistened white cotton or linen cloth placed in a strainer. Tie ends of cloth with string to form a bag, then tie to hang bag onto something suitable. Place a container underneath the bag to catch the dripping whey. Alternatively, place the cloth into a colander or sieve over a container to catch the whey.
- Drain for about 12 to 24 hours, depending on how thick or rich you prefer your sour cream – the longer it drains, the thicker it becomes.
- Open the cloth bag and remove the sour cream with a spatula or a spoon. Transfer to an clean container, seal airtight and refrigerate.
- To extend the keeping time, gently mix the sour cream on a weekly basis, reseal the container and refrigerate.

Cultured Butter

Cultured butter is prepared using cultured sour cream. This is best prepared with the simplified version made without milk, using only cream.

Hand beat cultured sour cream with a spatula until the butter begins to form as granules of butterfat which separate from the buttermilk. The fat granules are then further beaten until they form a thick mass.

The butter is drained, then washed with the addition of iced water and the liquid poured or drained off. More icy cold water is added, and the butter is folded and cut with a spatula with the cold water to further wash the butter of any buttermilk, which is again poured off.



A little salt to taste may be added at this point and folded into the butter. The butter is placed on a wooden board put on a slant to let any water left in the butter drain away, as the butter is worked by folding and flattening with a flat spatula to force as much water out of the butter as possible. It is worked to form a block of fresh butter. Alternately, the butter may be put in a rectangular wooden form and pressed with a weight to form a block of butter. Wrap the butter in waxed paper and refrigerate. It should keep fresh for at least 4 weeks.

Kefir Labneh

The process of draining ready-to-drink kefir through cloth for a day produces a fresh sour-curd cheese similar to the Labneh (yoghurt cheese) of the Middle East, pannier of India, or German quark (including tvorog of Russia). It can be used to make dips, and substituted in recipes calling for sour cream, cottage cheese, cream cheese, cream cheese, etc.





4 cups mIlk-kefir (not too sour)
White cotton, linen or silk cloth with a tight weave[2]
About 60cm strong string
large (1 – 2 L capacity) bowl to collect whey as it drains from the kefir

- Place pre-moistened cloth in a large bowl or strainer or a colander.
- Pour 4 cups kefir into the cloth.
- Gather ends of cloth and tie with string to create a bag, and hang the bag, or leave the cloth in the colander to drain. Place a suitable container beneath it, to collect the dripping whey.
- Allow to drain for 24 hours.
- Open up bag and transfer the curds to a clean bowl. If still too wet and sloppy, fold the curds in the bowl. Wash the cloth, and then return the curds back to the cloth. Tie cloth and hang to drain for another 24 hours.
- Remove the labneh and transfer to clean, sealable container. The labneh can be consumed fresh, or refrigerated in a sealed container. Leban may also be pressed in a suitable cheese form for 24 to 36 hours, from which a variety of semi-mature or mature cheese can be prepared.

It is usually best to begin with a mild kefir, one that is not overly sour for preparing labneh for kefir cheese making in general. This produces labneh with a mild flavour, from which a variety of semi-mature/mature cheese with a mild flavour are prepared. However, wonderful variations of cheese can also be prepared with an excessively sour kefir. An overly sour kefir may occur if kefir is accumulated and stored in the fridge while adding more kefir regularly to the container. However, preparing labneh with an overly sour kefir, and maturing the labneh in a sealed container in the fridge for 2 to 3 months, reduces the sourness of the cheese. This is due to the action of yeasts.

[2] Loose woven material such as cheesecloth is not suitable. A pillow case or handkerchief type material is good.

Kefir Cottage Cheese / Kefir Ricotta

Similar to traditional cottage-style fresh cheese, this is a fresh sweet curd prepared with fresh milk coagulated with kefir.

2 to 4 L fresh milk
1 to 2 cups kefir[3]

- Heat milk to about 60°C.
- While gently stirring the milk, pour the kefir into the milk as a slow steady stream. The curds should begin separating from the whey. Do not stir too fast or too vigorously or for too long or the curds will break apart. The whey should be reasonably clear and not milky; if the whey is still milky, either increase the heat, or add a little extra kefir while very gently stirring for a short time only until the whey becomes reasonably clear.
- Let sit for 2 minutes.
- Remove curds by skimming with a strainer.
- Place curds in either a pre-moistened cheesecloth lined colander, or in a suitable mesh-type strainer.
- Let curds drain for about 15 minutes.

For proper coagulation to take place, add the kefir to raw milk and leave it to culture for 6 or so hours at room temperature (about 22°C). Very slowly begin to raise the temperature by heating the milk to 42°C over a 15 minute period.

The process is to make the soft curd firm enough so that the small curds do not break apart when skimming. Curds should form firm without breaking apart into a mush or fall through the sieve when sieved out from the whey. If the curds break apart with a gentle stir, slowly raise the temperature of the milk a little, while stirring very gently. Then follow the steps above for draining the curds.

A little sea salt to taste may be added to the fresh cheese. You can add sea salt to the fresh milk prior adding kefir, or, fold a little sea salt into the fresh curd.

Aged Cheeses

The first step for preparing most kefir-based cheeses is to prepare labneh, or cottage cheese. Then the curds are pressed in a cheese form, which gives shape and form to the pressed fresh curd.

A suitable size cheese form is lined with moistened cheese cloth, and then the cloth-lined steamer is filled with labneh. The fresh curd is then wrapped with the remaining cheese cloth to seal the curd. A wooden disk or board is placed over the cloth-wrapped curd. Then the cheese form is placed in a suitable large wide container. A heavy weight is placed on top of the board, and the curd is pressed for 24 to 48 hours. The pressing procedure must be done with a sufficient heavy weight. It is the most important step. This is what makes the disk of fresh curd hold its shape and not fall apart and crumble. This is why rennet is used for common cheese making, for a rennet produced curd readily holds its shape with less weight and pressing.

The pressed curd is then removed from the cloth; at this point it should be able to hold its shape and form. It is then placed on a wooden board. Before turning the curd over each day, the top and side surfaces of the curd are first gently rubbed (buffed) with a clean piece of white cotton cloth, dipped in olive oil, or, salt solution, or in fact, diluted vinegar or any mixture of these. After turning the curd over on the wooden board, any non-buffed exposed surface of the curd is buffed as above.

[3] A 2-day refrigerated kefir or an extra sour kefir brewed for 2 days is best, although freshly strained kefir will do

Finally, the semi-dry curds are dipped in melted beeswax to seal the curd and prevent further drying. The sealed cheese is matured at room temperature, or in the fridge or root cellar for an appropriate amount of time, depending on the type of cheese one wishes to prepare.

Blue, Brie or Camembert Moulded Types of Kefir Cheeses

Blue, Brie and Camembert cheese types (including crosses between these types) made from kefir are quite simple. They can be prepared with labneh curds, or with cottage cheese style sweet curds for a less sharp final cheese, which are pressed, inoculated and incubated to mature the cheese. The mould breaks down the more complex molecules of protein and fats, and impart the characteristic sharp taste to Blue cheese.

To inoculate the cheese with blue mould (*Penicillium roquenforte*), a convenient method is to use some commercial blue cheese. Or purchase the mould spores. This is also the case with Brie or Camembert types (*Penicillium candidum, Penicillium camemberti*).

Simply scrape some blue mould from the centre of a commercial brand of Blue cheese with a sterile knife. For a Brie or Camembert, scrape the rind of while mould with a sterile knife. In a clean cup, add 1 Tbs pre-boiled cold water, and mix the mould scrapings well with the sterile knife. This is your basic inoculant, or mould seed to inoculate the fresh curd, so that the correct mould strain will begin to grow on/in the cheese.

To inoculate a Blue cheese, dip the sharp tip of a bamboo or a sterile stainless steel kebab skewer into the liquid inoculant. Pierce the curd with the skewer to create air channels about a 2cm grid. Make sure to dip the skewer tip into the liquid inoculant before piercing each hole into the curd.

For a Brie or Camembert type cheese, simply prepare the inoculant as above, but scrape the surface of a commercial brand of your choice of Brie or Camembert cheese. However, with Brie or Camembert, the cheese is inoculated differently. The best procedure here is instead of piercing, evenly spread the inoculant over the entire surface of the pressed fresh curd with the sterile knife.

To incubate, you can use an oven stainless steel rack to place the inoculated cheese, and let the cheese mature in an empty cooking oven until mould forms. Another idea is a large bamboo steamer, placing the inoculated fresh curd on the rack of the steamer, and then put the lid on the steamer. This can be kept in an oven or in a cupboard.

Within about a week or so, mould growth should be found on the cheese. In the case with Brie or Camembert, a fine carpet of white mould should form over the surface. At this point, wrap the cheese in waxed paper, and keep in the fridge in a plastic bag. Before wrapping, pierce the waxed paper with a needle, make holes in a 1cm grid. Then wrap the moulded curd in the waxed paper and refrigerate. The cheese will be ready in about 2 weeks or possibly longer, depending on the mould type and the type of cheese you want to produce, including temperature and humidity.

If a cross between white and blue mould types is what you want, try both methods for inoculation, using the piercing technique for a blue, and the spreading of the inoculant over the surface of the fresh curd for the white mould such as Brie or Camembert. This produces interesting results, where the inner portion of the cheese is a blue cheese while the rind forms as a white Brie or Camembert mould.

Cheddar Style Hard Cheese

The first stage to prepare a kefir cheddar cheese is to prepare the kefir cottage cheese. After the curd is drained (for a few minutes only), the fresh warm or hot curd is salted to taste by folding or rubbing a little sea salt into the curd with a spatula or with clean hands.

The salted curd is placed in a suitable cloth and pressed in a cheese form with a heavy weight, pressing for about 2 days. The pressed fresh curd is placed on a wooden board and dried. Each day, the entire surface of the curd is gently rubbed (buffed) with a clean piece of white cotton cloth, first dipped in olive oil. The top surface of the curd is buffed first, before the curd is turned over, followed by buffing all surfaces. This is to prevent mould growth on the surface of the cheddar-type cheese as it dries.

Depending on thickness of the block of fresh cheese, temperature and humidity, after 1 to 2 weeks the entire surface of the curd should form a firm, yellow rind. The semi-dry cheese is dipped in melted beeswax to seal, to prevent further drying. The cheese is matured for some months (or years) in a temperature stable environment. An underground root cellar is best for this purpose, although a designated cupboard maintaining a reasonable constant temperature will suffice. The cheese may also be matured in the fridge.

Kefir for Baking

Kefir can be used wherever you would normally use milk or buttermilk in baking. Like traditional buttermilk, it brings a pleasant tang to cakes, breads, biscuits, pancakes, etc. and helps quick breads (scones, soda bread) to rise. It also helps tenderize the gluten in batter, giving baked goods a softer texture and more body.



Kefir can also be used to begin a sourdough starter. Mix 1 cup of kefir (milk kefir or water kefir) with 1 cup of unbleached organic flour (wheat, spelt, or rye). Mix ingredients together in a jar to form a smooth wet paste. Cover jar with cloth or paper napkin and leave at room temperature until the dough doubles in volume. This may take one to three days depending on temperature. Stir once daily. When ready it should be bubbly with a sweet-sour yeasty aroma. Do not let it get too sour, otherwise it will produce a very sour baked product, which some people may not enjoy.

If you wish, instead of preparing a sourdough starter, you may simply add 1 cup of ripe milk kefir or water kefir into the dough-making process, in place of some of the milk or water called for by the recipe.

Whey

Whey is the liquid remaining after milk proteins have been curdled. It is produced as a by-product of yoghurt or kefir production, specifically when the curds have been strained to produce labneh (yoghurt cheese) or to thicken yoghurt, kefir, or cultured sour cream. Liquid whey contains lactose[4], vitamins, protein, and minerals, along with traces of fat.

Whey produced from lacto-fermented dairy products also contains beneficial bacteria and yeasts, and can be used to inoculate other things, such as pickled vegetables and sauerkraut. It can also be diluted (I Tbs whey in 1 L water) and used to soak grains or legumes, to help break down hard to digest elements.

Cultured condiments can easily be made using whey to introduce beneficial probiotic bacteria.

Recipes

Cultured Fruit Spread

4 cups unsulphered, organic dried fruit (apricots, figs, dates, …)
3 tsp (15ml) sea salt or pickling salt (any non-iodised salt)
¼ cup whey
¼ - ½ cup raw honey

- Cook the dried fruit in filtered (or otherwise dechlorinated) water. Add any spices or flavourings that you wish to use (e.g. cinnamon, maple syrup, wine, …). Allow to cool.
- Blend the cooked / rehydrated fruit (but not the cooking liquid) with the remaining ingredients.
- Taste for sweetness, and add more honey if necessary.
- Place in a sterilised glass jar with a sealable lid, leaving 5cm air space at the top of the jar.
- Seal the jar, and leave it at room temperature for 1 – 2 days (depending on ambient temperature), then move it to the fridge.

Cultured Mayonnaise

1 whole egg, at room temperature
1 egg yolk, at room temperature
1 tsp Dijon mustard
1.5 tsp lemon juice
1 Tbs whey
¾ to 1 cup extra virgin olive oil
Generous pinch of sea salt

- Place the egg, egg yolk, mustard, lemon juice and whey in a food processor and blend until very well mixed.
- Add the olive oil very slowly while the motor is running. The mayonnaise should be nice and thick by the time you've used the last of the oil.
- Pour the mixture into a sterilised glass jar, and cover the mouth of the jar with a clean cloth.
- Leave the jar at room temperature for 7 hours, then seal and refrigerate.

The mayonnaise should keep for several months in the fridge (or about 2 weeks if made without whey).

[4] Note, however, that the whey produced from cultured milk products has a lower lactose content than whey produced during cheesemaking (either acid or rennet based cheese making) due to the microorganisms in the culture which break down the lactose to its component sugars (glucose & galactose).

Tibicos - Water Kefir

Water kefir is a refreshing effervescent beverage, commonly prepared with a variety of kefir grains, referred to as water kefir-grains, sugary kefir-grains (SGK), or tibicos. Tibicos are cultured in 3% to 10% sugar/water solution with a slice of citrus fruit, and/or dry fruits such as fig, apricot or raisins to provide flavour and increase nutritional value.

Tibicos are found around the world, with no two cultures being exactly the same. The tibicos grains consist of a polysaccharide (a linked or chained dextran) and a number of species of bacteria and yeasts which colonise the polysaccharide. Typical tibicos have a mix of *Lactobacillus*, *Streptococcus*, *Pediococcus* and *Leuconostoc* bacteria with yeasts from *Saccharomyces*, *Candida*, *Kloeckera* and possibly others. *Lactobacillus brevis* has been identified as the species responsible for the production of the polysaccharide that forms the grains.

Traditional tibicos grains are firm, transparent and fragile; they are not gel-like or slimy, and easily break apart with little applied force. The unique property of tibicos is produced by *Lactobacillus casei*, which is believed to condense the polysaccharide into a non-soluble form (as opposed to the polysaccharide of milk kefir grains, which is water soluble).



Growth factors for Water Kefir

Sugar

Tibicos are cultured in are cultured in a 3% to 10% sugar/water solution. You may also use maple syrup, or honey which has been heat treated – raw honey has antimicrobial properties and will damage your tibicos grains or delay their proliferation. Agave nectar contains a high percentage of fructose, and will not provide a good growth medium for tibicos grains (which require sucrose and/or glucose to grow). Non-calorific sweeteners (stevia, xylitol, etc.) should not be used.

White, refined sugar produces clear, opaque tibicos grains without any colour. Less refined sugar types such as brown, raw, demerara, jaggery, rapadura, muscovado, sucanat and Chinese red sugar produce tibicos with a light brown colour. Tibicos grains grow better when cultured with non refined sugar-type, or with the addition of 1 tsp blackstrap molasses added to each 1/2-cup refined sugar preparations.

Water

Tibicos have been frequently observed to cease propagation, and remain non-propagable, when cultured in water with low mineral content, including and especially water filtered using an activated charcoal filter. The outcome is mostly observed as a slow deterioration in growth over time. After a while, the tibicos acquire a light brown film over the surface of each grain, the grains lose the typical transparency of good growing (propagable) grains, and the deterioration becomes irreversible.

Hard water (water with high mineral content) such as natural spring water seems to provide the best growth medium. If such water is not available, the addition of 1/8 teaspoon of sodium bicarbonate per 2 L of purified water assists with good grain growth. Tibicos also appear to prefer water with a slightly alkaline pH (7.2 to 7.5).

Other Ingredients

Traditionally, a slice of citrus fruit and a piece of dried fruit such as fig, apricot or a few raisins were added to the water kefir brew to provide flavour and increase nutritional value. A piece of fresh banana or a slice of fresh ginger root can also be used.

It seems important not to add lemon juice or other acidic fruit juices, and to only add a whole slice of citrus fruit. Citric acid does not appear to be used up by organisms of water kefir. As amounts of citric acid are leached into the water kefir from the citrus, citric acid concentration increases in solution over time. If citric acid concentration reaches high enough levels, it may cause problems in regards to propagation of the culture. Juices and other flavourings can be added in a secondary fermentation.

The addition of a piece of eggshell, coarsely ground oceanic coral, or limestone is also recommended to help provide mineral nutrients. Only 1/8 to 1/4 tsp per 6 to 7 cups sugar/water is needed; too much of any of these ingredients may produce a slimy water kefir. These raw ingredients are mostly made up of calcium and magnesium carbonate. This gives a very slight pH adjustment as amounts of calcium carbonate is slowly dissolved in solution due to the reaction between the organic acids, such as lactic acid produced during fermentation, and the mineral calcium and magnesium of oceanic coral, limestone or egg shell. Not only do tibicos grow more efficiently with the addition of these mineral-rich raw ingredients, the water kefir contains a highly bio-available form of the minerals found in those ingredients.

The beverage should not be stored in metal containers, as these may leach into it over time. Instead, use stainless steel, plastic, non-lead-glazed ceramic or glass containers. Culturing grains in a glass jar with tight-fitting lid and using clean stainless steel or plastic utensils when handling the grains is recommended.

Adding Fruit Juices and Herbs

tibicos do not grow well if a concentration of fruit juice (grape, apple, pineapple, etc.) is included as an ingredient. With the addition of most acidic fruit juice, tibicos reach a point where the grains never grow again. The reason for this is unknown.

If one wishes to brew fruit juice, this is best achieved through secondary fermentation. Prepare a traditional water kefir, and then add the preferred fruit juice to the strained water kefir after separating out the tibicos. Secondary fermentation can be carried out over a number of days at room temperature, or under cold storage, such as refrigeration. The latter will simply slow the process down, so it will take longer to brew.

Cold storage fermentation also produces a fruit juice ferment with a different flavour and acidity. Also, secondary fermentation is best performed under airlock. This can produce quite an alcoholic beverage.

Dry Korean Ginseng (*Panax quinquefolius*) or Chinese Angelica root *(Angelica sinensis*) may be added to strained water kefir after the tibicos have been removed, and brewed for 48 hours in a secondary fermentation. The resulting beverage may have mild psychoactive properties.

Ginger

Ginger root juice does not negatively affect the tibicos, and may increase their growth.

The addition of 1 to 2 tablespoons of fresh ginger root juice per litre of sugar solution produces a good ginger beer. It has been suggested that tibicos were brought back by English solders on their return from the Crimean War, and the mother-culture was originally referred to as a Ginger Beer Plant.

Fermentation Time

Leaving tibicos in the same sugar solution for longer than 3 days over many batches and in warmer conditions has an adverse effect on the growth of the tibicos. Lack of essential nutrients and energy source due to over fermentation is a cause for problems if starvation happens over an excessive number of proceeding batches.

tibicos are best cultured for no longer than 2 days in the same solution, with the occasional three-day fermentation being acceptable, especially in cooler conditions. During warmer conditions, it may be best to culture for no longer than 2 days. Three-day brews are best avoided over ongoing batches especially in

warmer conditions, otherwise the organisms starve and may become non-propagable. This is evident by taste-testing a small amount of tibicos – tibicos which have been starving acquire an acidic flavour with a distinctive effervescent tang left on the tongue, with no sign of growth of the culture. Propagable tibicos have a slightly sweet, neutral flavour with no sign of effervescence on the tongue when a grain is chewed. Non-propagable grains also lose the typical translucent quality, and early signs of this can be observed by breaking apart a grain and checking for translucence, or a clear, see-through quality, especially on the surface of the grain.

Extra Tibicos Grains

After your first few batches you will notice that your kefir grains grow rapidly (if you take good care of them). You can eat the excess grains, or add them to smoothies; they are very nutritious, packed with many beneficial probiotic bacteria. You may also give away the excess grains, so that other people can start their own cultures.

Taking a Break

For short-term storage, you can store water kefir grains in sugary water in the refrigerator. The cold temperature will slow down their growth, so you can leave them like this for a week. You will need to rinse them and change their water on weekly basis.

For longer term storage, you can freeze or dehydrate them just as you would for milk kefir grains. Frozen, they will last for around 6 months.

Problems

Slimy water kefir or slimy tibicos

In some cases, tibicos may become slimy, losing their typical firm texture, and producing a murky white, slimy water kefir. This may occur if too much oceanic coral, limestone or eggshell is included as part ingredient, or if herbs are included in the initial fermentation with tibicos. It can also occur if any solid ingredient is contaminated.

Herbs are best fermented in a secondary fermentation, that is after straining the water kefir, adding the herbs to the strained solution, and brewing for a given number of days.

If the cause is too much coral, eggshell or limestone, then use less of these. Resting tibicos in sugar/water stored in the fridge for 3 days, then reverting back to regular room temperature fermentation with regular ingredients, should remedy slimy tibicos or slimy water kefir production. This resting process may have to be repeated.

Off Flavours

If the brew begins to acquire an off flavour, adding 1 Tbs lemon juice per 6 cups sugar-solution, and adding the juice over a few consecutive batches only, may remedy the problem. The option to store tibicos in the fridge in just sugar/water for a few days is also a possible remedy for tibicos that produce water kefir with an off-flavour, or a slimy consistency.

Pickles

Lactic acid fermentation is an anaerobic fermentation process by which starches and sugars in fruit and vegetables are converted into cellular energy and the lactic acid by the many species of lactic-acid-producing bacteria. This process is used in many areas of the world to produce foods that cannot be produced through other methods. The most commercially important genus of lactic acid-fermenting bacteria is *Lactobacillus*, though other bacteria and even yeast are sometimes used. These lactobacilli are ubiquitous, present on the surface of all living things and especially numerous on leaves and roots of plants growing in or near the ground.

Most of the microorganisms which are used for lactic acid fermentation of foods are salt tolerant, and the combination of salt and the lactic acid produced by these organisms inhibits the growth and proliferation of most other microorganisms, including putrefying bacteria.

In stage one of lacto-fermentation, vegetables or fruit are submerged in a brine that is salty enough to kill off harmful bacteria. The desirable lactic acid bacteria survive this stage and begin stage two. In stage two of lacto-fermentation, the organisms begin converting lactose and other sugars present in the food into lactic acid. This creates an acidic environment that safely preserves the vegetables or fruit, and gives lacto-fermented foods their classic tangy flavour.

Dangers and Cautions

Some lacto-fermented recipes seem to work best in the range of 15 - 25°C, though some work better at higher temperatures. If your kitchen/brewing room gets over 30°C for any length of time then you may find that some recipes ferment too quickly and that undesirable organisms may have an opportunity to proliferate.

Acidity is also important. Most regulatory agencies consider a pH of 4.4 or 4.5 to be the cutoff point for safety of lactic acid fermented foods: if a food has a final equilibrium pH below 4.4, then it is considered to be in a very safe category of foods. Generally lacto fermented beverages have a pH around pH 3.7, but you need to ensure that the pH drops as rapidly as possible to prevent the growth of undesirable microorganisms during the first days of fermentation.

Brine and Whey

There is nothing quite like a good pickle. Traditionally foods were pickled without vinegar and were pickled with brine instead.

A 10 percent brine (by volume) is the strongest used in food processing. It is made by adding 1.5 cups of salt to 4 L (16 cups) of water, or 5 Tbs[5] of salt to 1 L of water. Brines are often made weaker, at 3 – 6% by volume.

- For a 3% brine, use 1.5 Tbs (30ml) salt to 1 L of water.
- For a 6% brine, use 3 Tbs salt (60ml) salt to 1 L of water.

To make brine: Measure your salt and water. Add the salt to the water. Bring to a boil, and boil until the salt has dissolved.

Use pickling salt, or pure sea salt, which contains no additives that could interfere with the fermentation. Use filtered water, rainwater, or well water if possible; if you live in town and don't have a well, or access to filtered water, boil your tap water before using it, to remove the chlorine. Distilled water does not contain the necessary mineral nutrients for the microorganisms, and may not produce a good ferment. Brine can also be made using fruit or vegetable juice instead of water.

If you wish, you may add whey (from yoghurt or milk kefir) or active water kefir to your brine, to act as a starter culture and introduce lactic acid bacteria. This is unnecessary for the fermentation to take place, nor is it traditional. Traditional lacto-fermented pickles were made using salt or brine, and relying on naturally occurring (wild) lactic acid bacteria and yeasts for the fermentation.

[5] 5 Australian Tbs = 100g. If using British or American Tbs, use 6 Tbs (90g) instead.

Using whey to replace the brine entirely is also possible, but is not recommended, as using salt extends the safe shelf-life of the pickles.

Once fermentation is complete, the pickled vegetables may be packed in a flavoured syrup or sweet vinegar mixture (1 C sugar per L vinegar) and canned.

Pickling Process

Pickled Vegetables

Choose small, crunchy vegetables, or cut the vegetables (or fruit) into small pieces, to facilitate fermentation. The pickles will be their crispiest when pickled the day they have been picked.

Wash your vegetables or fruit thoroughly using a vegetable brush. Take special care to clean between all the little bumps as dirt could lead to spoilage. Trim the ends (the blossom end of a cucumber contains the enzymes that promote softening).

Wash your fermenting crock or mason jar in hot, soapy water and rinse well. Pack your vegetables tightly into the crock or a mason jar, along with whatever spices and flavouring agents you are using, and grape leaves for tannins. For pickled cucumbers, whole garlic cloves, lots and lots of whole peppercorns, and whole dill stalks (stems and all) are good. Note that all of the above ingredients should be thoroughly washed as well.

Pour the boiling brine over the contents of your crock or jar(s). Weigh the contents down to insure that everything is submerged, hence creating the anaerobic environment conducive to the growth of lactobacilli.

Do not seal your jars. Place a clean, moistened cloth over your jar or crock instead, securing with a rubber band or a piece of twine. Leave your jars on the counter at room temperature (it doesn’t matter whether or not the jars are next to a window) for 3 days. Remove any scum that rises to the top of the ferment every day for the best results. Many people may miss this step, or feel that it doesn't matter, but that scum is a waste product of the fermentation process.

In 3 days, remove the cloth, taste your pickles, and if you like the taste, screw on a lid and transfer them into the fridge. If you feel that your pickles could use some more acidity, however, feel free to leave them on the counter for another day or until the desired flavour has been achieved.



Note that the brine will turn milky/cloudy and may develop white foam on top, the bottom, or the contents. It may also appear slightly slimy, and will grow increasingly so after you’ve transferred your jars to the fridge. These are a normal part of the fermentation and need not be a reason for concern.

Once refrigerated, the pickles will last for a couple of weeks, but their acidity level will increase with time as they continue to ferment slowly in the fridge (hence the increasingly cloudy brine). Because of their short life, don’t make more than your family can consume within that time frame.

Sauerkraut, Kimchi, etc.

Sauerkraut, kimchi, and all the other variations from various cultures are made by fermenting shredded vegetables. Cabbage is the most common ingredient, but many variations include radish, carrots, beets, onions or apples, and other fruit and vegetables may be used.

- First, shred your vegetables, or chop (roughly or finely). Weigh the cut vegetables, as the amount of salt to add is determined by a percentage of the weight of vegetables to ferment.
- You will need between a 0.6% and 3% salt concentration, which equals 1.25 – 6 tsp of salt per kg of vegetables[6]. Add the salt to the vegetables and stir it in. Massaging (or knead or pound) the mixture for a few minutes to start to draw the liquid out of the vegetables.
- Put the salted vegetable mix into the crock one handful at a time, mashing it down as you go to get the juice to rise and cover the vegetables. It's important to pack it as tightly as you can, so that a good anaerobic environment is achieved and fermentation can occur.
- Fill the crock, leaving a (minimum) 5cm air gap at the top. Find a weight (a plate or jar) that sits snugly inside the crock to allow the juice to rise up while keeping the vegetables submerged.
- Cover the crock with either a towel or several layers of cheesecloth to keep dust and insects out, and use a large rubber band to keep the cloth tightly in place. If the vegetable mix is exposed to the air, scum or mould will grow on it.
- Check on it several times over the first day to make sure the liquid is above the vegetables. If it isn't, then push down on the weight to allow it to rise further. The salt will continue to extract moisture from the cabbage for about 24 hours; if after this time you don't have enough juice to cover all of the shredded cabbage, top it up with a 1% brine solution.
- Fermentation will usually be visible within a day or so after starting. The warmer the air in the room, the faster the fermentation will start, and the sooner it will be done. You can tell that your sauerkraut is fermenting when bubbles start coming up around the weight. The gas which is released normally smells bad; this is normal. Don't panic.
- After a few days you may start to see a "bloom" of bacteria or mould forming on top of the juice. This is normal, so don't get upset. Remove and discard what you can with a spoon or spatula every few days. It does no harm, it just looks bad.
- Leave the pickle out until it becomes tangy and sour. When this happens, put a lid on it and store it in the fridge. Fermentation can take 4 - 6 weeks depending on temperature.
- When fermentation is nearly complete, bubbling will slow to nearly nothing. When this happens, the sauerkraut is ready to eat or can.



Kefir Lacto-Fermented Pickles

Sauerkraut is traditionally prepared by the fermentation of fresh, shredded cabbage (and other vegetables) with spices and salt. It normally takes 3 to 6 weeks to culture. Using kefir grains (milk kefir or water kefir grains) as a starter allows the fermentation process to proceed much more rapidly.

Kefir grains may be left in the pickle at all times if they are used whole, and any kefir grains which are removed with a portion of the pickle can simply be consumed. There is also the option to remove kefir grains, if used whole, by transferring the ingredients to a separate container just prior to cold storage, fishing out any kefir grains as you find them. These may be eaten, used in baking sourdough goods, composted, fed to pets or livestock or discarded.

Alternatively, you can blend a few kefir grains to prepare a smooth mash, which is added to the vegetables to be pickled as a starter.

[6] Bonnie Wykman suggests using 1% by weight of salt to vegetables (i.e. the weight of salt is 1% of the total weight of vegetables).

Spices & Flavours

Spices such as cinnamon, cloves, nutmeg, juniper berries, caraway, dill and celery seeds, fresh or dry ginger root and chili peppers or fresh garlic may be included to enhance both flavour and fermentation. Mix any seeds or spice powders together with the vegetable ingredients prior filing the fermentation vessel. As a general guide, 1 teaspoon to 1/2 tablespoon of each seed spice per whole head of cabbage (about 1kg) is a reasonable measure. Spices may be ground to enhance flavour and encourage growth of the friendly microorganisms.

Fresh ginger root, garlic and chili peppers provide an exotic zesty flavour to pickles. However, garlic can produce quite a strong aroma, so be forewarned and make certain to cover the fermentation vessel well, with a plastic bag. Pound fresh ginger root, garlic and chili peppers together with the kefir grains in a mortar with a pestle to form a chunky paste, mixing the paste with all the pounded cabbage just prior filling the fermentation vessel. Up to 15 small garlic cloves, 60g fresh ginger root and 5 or so fresh chilli peppers to each 3kg of ingredients produces a good, spicy sauerkraut or kimchi.

Tannins for Firm Pickles

Tannin-rich grape vine leaves can be used to keep pickled vegetables crisp and firm. Pressed grape skins can also be used (usually in combination with grape vine leaves), or oak or blackcurrant leaves. Add the leaves and/or grape skins to the bottom of the fermentation vessel, or layer them through the ferment.

Recipes

Garlic and Dill Carrots

From Delicious Obsessions. Makes approx. 2 L

16 large carrots, chopped into coins (about 6mm thick) or sliced into carrot sticks
5 cloves fresh garlic, sliced, diced, or crushed (your choice)
1 bunch fresh dill (more or less to taste)
2 – 4 fresh grape leaves
1 L of 2% brine (19 g salt to 4 cups of water)
1 extra carrot for your weight (more about this below)

1. Place the garlic, dill, and grape leaves in the bottom of your pickling jar or crock.
2. Pack the carrots into the jar, as tightly as you can. If you do sticks, you can stack them to make a snug fit. If you use the coins, then just pack them as best you can. Only fill the jar to the shoulder and never above. You need to leave some expansion room. Really pack them in there. Use your fist to press the carrots firmly into the jar.
3. Take your extra carrot and make some very thin slices, about 7cm long and about 3mm thick. You will need about 8 of these slices.
4. Place your carrot slices across the top of the carrots that are being fermented. This will create a type of “floor”, where your weight can sit. It will help keep all of the carrot submerged and help them ferment completely. Place your weight on this “floor”.


5. Pour your brine over your carrots. You want the brine to cover the bottom of the weight, but not be too much higher than the shoulder of the jar or crock. You need a good 2 – 3cm of expansion space. Press down on the weight firmly to remove any air bubbles that may have gotten caught. Do this carefully, as not to dislodge your “floor”.
6. Move your jar or crock to a spot in your house where it will can be undisturbed for about a week. Wrap the jar in a towel to keep out any UV light, which damages the bacteria.
7. Let the carrots go for 2-3 days and then check them. You should see bubbles on the inside of the jar. This means there is active fermentation happening. The carrots will be done when there are no more bubbles rising to the top (around 7 days). You can tap the jar to see if there are any bubbles. When there are no more, you can move to the fridge and let chill completely before eating.

Lactofermented garlic

From Delicious Obsessions.

16 large carrots, chopped into coins (about 6mm thick) or sliced into carrot sticks
5 cloves fresh garlic, sliced, diced, or crushed (your choice)
1 bunch fresh dill (more or less to taste)
2 – 4 fresh grape leaves
1 L of 2% brine (19 g salt to 4 cups of water)
1 extra carrot for your weight (more about this below)

1. Determine how much garlic you want. Because the number of cloves in a head of garlic varies so much, it’s hard to tell you exactly how many heads you’ll need. Sart with about 12-16 heads and see how far that gets you (usually about a 1 L jar).
2. Remove and separate all of the cloves from the root end of the head.
3. Prepare a 2% brine (20g of salt per 4 cups of water).
4. Peel the garlic cloves. Once all of the skins have been removed, place the cloves in your pickling jar. Don’t pack past the shoulder of the jar.
5. Add your weight. Top with your 2% brine, up to the shoulder of the jar.
6. Leave at room temperature for one month.
7. Move to cold storage to continue aging for two more months. You can use the garlic right away, although the flavour improves with aging. It will keep upwards of a year in the fridge.

Sourdough

When flour and water are combined, the wild yeasts under the surface of the bran of the grain begin to proliferate. They begin the fermentation of the grain, which in turn rises the dough. The lactobacilli and wild yeasts create an acidic environment that makes it difficult for other organisms to contaminate the starter, thus making it very difficult to kill.

Rye flour is the best to use for a starter, as it ferments more easily than most other flours. Try to source the best quality flour that you can, preferably organic.

Sourdough Starter

Making a Sourdough Starter From Scratch

- Mix organic wholegrain rye flour with dechlorinated water[7] in a wide mouthed jar. 2 cups of each will make a batter consistency.
- Cover the mouth of the jar with cheesecloth, so that air can circulate but the flour mixture is protected from dust and insects.
- Each day, give the batter a vigorous stir to distribute yeast through the batter. If you think of it more often, do it twice a day.
- After 3 – 5 days (depending on the temperature) you will notice bubbles beginning to release. The stirring action may create some bubbles, but these are not what you are looking for. You want the bubbles produced when air is not introduced into the batter. These bubbles mean that the starter is active.
- Once the starter is active, you can add 1 – 2 Tbs of flour to the batter each day for 3 – 4 days, and continue stirring daily. If the batter becomes solid, then add a bit more water to keep maintain a more liquid / batter consistency.
- Once your batter is thick and bubbly, it's ready to use.

Maintaining a Sourdough Starter

To maintain your starter, make sure you keep some aside every time you make bread.

Add 100g of flour and 100g of dechlorinated water to your leftover starter culture. Allow it to stand at room temperature with a cloth over the top until bubbles appear in the starter, the refrigerate until your next use. Alternatively, you can leave your starter out of the fridge, and feed it a little flour and water every day.

The day before you want to make bread, take the starter out of the fridge and 'feed' it with the same proportions of water and flour so it's active by the time you want to start making your loaf.

If your starter forms a layer of clear fluid, it generally means that it's dormant, unhappy or starving. Take it out of the fridge if it is refrigerated, feed it, and leave it at room temperature for a few hours.

[7] If you don't have a water filter, or access to spring water or rainwater, boil tap water and allow it to cool.

Recipes

Crumpet Loaf

440g whole wheat organic flour (wheat, rye, spelt, or a mixture)
1.5 tsp non-iodised salt
¾ cup of active starter culture
2 cups of dechlorinated water*
(optional) 1 – 2 Tbs raw sugar

** You can add 2 Tbs whey in the water.*

- Combine the flour, salt, and sugar and mix well.
- Stir the starter into the water and mix.
- Pour this into the flour mixture, and stir vigorously to form a wet, sticky dough. It should be just off batter consistency.
- Let the mixture rest for 15 minutes.
- Stir vigorously until you start to see long strands of dough sticking to the spoon and sides of the mixing bowl.
- Pour the mix into a large, well-greased baking tin, and leave to rise for 6 – 12 hours. The dough will at least double in volume, and may overflow.
- Bake in a preheated oven at 190 - 200 degrees C for 40 – 45 minutes.[8]
- Un-tin the loaf immediately, and turn off the oven.
- When you knock on the bread, the loaf should sound hollow. If it doesn't, place it back in the oven (no tin) and leave for a further 10 minutes in the residual heat of the oven.

Sourdough Pancakes

2 cups sourdough starter, room temperature
2 tablespoons granulated sugar
1 egg
4 tablespoons olive oil
1/2 teaspoon salt
1 teaspoon baking soda
1 tablespoon warm water

- In a large bowl, add sourdough starter, sugar, egg, olive oil, and salt; mix well; set aside.
- In a small bowl, dilute 1 teaspoon baking soda in 1 tablespoon of warm water.
- When ready to cook your sourdough pancakes, fold the baking soda/water mixture gently into the prepared pancake batter (do not beat). This will cause a gentle foaming and rising action in the batter. Let the mixture bubble and foam a minute or two before using. **DO NOT** add the baking soda / water mixture to the pancake batter until just before you are ready to cook the pancakes. Cook the pancakes 1 to 2 minutes on each side or until golden brown and bubbly. Remove from heat and serve.


[8] Note that the original recipe calls for the loaf to be baked at 235 degrees C for 15 min, then the temperature reduced to 210 degrees C and the loaf baked for an additional 30 minutes. The important point is that the oven is hot.

Bourke St Bakery Fruit Loaf

½ cup sourdough starter
270g (2 cups & 1 Tbs) flour, in a combination of white, spelt, and rye
120 ml dechlorinated water
5g (1 tsp) salt
½ tsp ground cinnamon
¼ tsp ground ginger
¼ tsp ground nutmeg
½ cup dried fruit (raisins, currants, chopped dried figs, ..)
(optional) 1 Tbs honey or raw sugar

- Mix the starter into the water, then mix into the flour.
- Knead for ten minutes.
- Rest at room temperature for 20 minutes.
- Make the fruit soak: mix 2 Tbs dechlorinated water with the dried fruit and honey or sugar (if using). Leave to soak.
- Sprinkle the salt and spices onto the dough, and knead for another 10 minutes.
- Rest at room temperature for 10 minutes.
- Knead for 5 minutes, or until the dough can be pressed out to a think translucent layer before tearing to form a 'window'.
- Add the fruit soak to the dough and knead until well combined.
- Prove for 1 hour (put the dough in a warm, humid place, lightly covered with plastic or a damp tea towel).
- Knock back the dough: press it out into a rectangle about 1.5 cm thick. Fold 1 third in onto itself, then fold the remaining third on. Turn the dough 90 degrees, and repeat, folding one third and then the other third.
- Prove for 1 hour.
- Place into a well greased baking tin, or form into a loaf shape. Place in the fridge, lightly covered with plastic or a damp tea towel, and leave for 8 – 12 hours.
- Remove the dough form the fridge and leave it in a warm humid place until it has doubled in size (1 – 4 hours).
- Preheat the oven. Spray the inside of it with water, or place a tray of water in the oven (to create steam, which assists with crust formation).
- Bake in a very hot oven for 20 – 40 minutes, or until the loaf sounds hollow when tapped..

Vinigar & Kombucha

Vinegar

Vinegar is a liquid substance consisting mainly of acetic acid (CH_3CO_2H) and water, the acetic acid being produced through the fermentation of ethanol by acetic acid bacteria (bacteria that derive their energy from the oxidation of ethanol to acetic acid during fermentation). The acetic acid bacteria are usually airborne and are ubiquitous in nature. They are actively present in environment where ethanol is being formed as a result of fermentation of sugars. They can be isolated from the nectar of flowers and from damaged fruit. Other good sources are fresh apple cider and unpasteurized beer that has not been filter sterilized. In these liquids, they grow as a surface film due to their aerobic nature and active motility.

Mother of vinegar – also called Mycoderma aceti – is a substance composed of a cellulose film and acetic acid bacteria that develops on fermenting alcoholic liquids. It is added to wine, cider, or other alcoholic liquids to produce vinegar. Vinegar mother likes to be kept warm. It probably won't die if it's too cold, but it certainly won't turn the wine into vinegar, and you take the chance of mould growing before it can convert. There will almost always be leftover "mother" when making a new batch of vinegar. Feed it to your animals, toss it on your compost bin, or bury it in the flower garden for added nutrients and soil acidification.

Vinegar is one of the easiest culture-products that can be prepared at home. It can be prepared from wine, apple juice or apple cider, beer or ale, diluted spirits, coconut water, sugar cane juice, or from virtually any alcoholic beverage, or fresh fruit or vegetable juice. Traditional vinegar is commonly produced by inoculating the starting medium (wine, fruit juice, etc.) with a small amount (around 5% by volume) of non-pasteurized vinegar (active mother culture), or allowing it to age and ferment naturally with wild yeasts and bacteria until it naturally turns into vinegar.

The ideal container should keep light out and have a large opening at the top in order to allow plenty of oxygen in but not so big as to allow excessive evaporation. Oak barrels provide the best conditions for making vinegar. The mouth of the fermentation container should be covered with a very fine screen (a cotton ball or very fine mesh like nylon stockings), to allow air through but prevent dust or insects form getting to your vinegar. Fruit flies are particularly attracted to vinegar and vinegar starters.

After some weeks, a film should form on the surface of the brew if enough air is let in; this is the mother of vinegar. Undisturbed, the film will remain afloat in the forming vinegar, and grow gradually thicker. However, the film may sink in the liquid if the container is agitated even slightly. If this occurs, a new mother of vinegar film should form, replacing the previous submerged colony. The new film will again form floating on the surface of the vinegar where there is ample freely available oxygen. This process may occur many times over, doing so when ever any colony, or pellicle sinks in the brew.

Strongly alcoholic media should be diluted 1:3 with water before beginning the acetic acid fermentation, as the high alcohol content retards or halts the growth of the acetic acid organisms. The chemicals in the water will affect the final vinegar, so either use distilled or spring water, or boil tap water before using it to remove chlorine.

Do NOT use aluminium, cast iron, or enamelled containers or spoons in or around your vinegar starter culture, or completed vinegar. It will eat through the materials, and in some cases can cause a toxic gas and/or introduce toxins to your vinegar.

Apple Cider Vinegar

Fresh pressed (unpasteurised) apple juice or apple cider is inoculated with about 5% unpasteurized vinegar and some mother of vinegar culture if possible. The container is covered with a cloth or screen, and stored in a dark cupboard for 3 - 6 months. When the vinegar acquires a sour taste without any fizz, it's ready for use. The pH of apple cider vinegar is typically between pH 4.25 and 5.00 if undiluted.

Dom (of Dom's Kefir Site) suggests that half the volume of cider vinegar is siphoned into a bottle ready for consumption and the brewing container may be replenished with freshly pressed apple juice or fresh apple cider, and left to ferment as before. This ongoing process may be performed on an indefinite basis, producing a constant supply of apple cider vinegar.

Any mother of vinegar that forms should have a clean sour odour. No mould should be found on the surface. Brown patches or web-like tentacles are generally considered safe, and may be due to yeast colonies, tannins, or oxidation.

Wine Vinegar

A similar process, using wine instead of fruit juice, can be used to produce wine vinegar. Wine may be stored in a container with a cloth placed over the mouth of the vessel to let in air while keeping out dust and insects. Left for 3 to 6 months to ferment at room temperature, this produces vinegar.

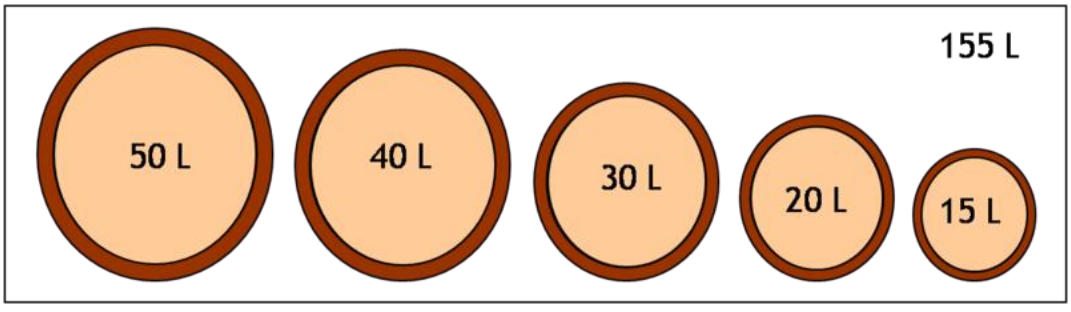
Vinegar can be siphoned off, and the vinegar barrel can be topped up with fresh wine. A wooden barrel, made from oak, chestnut, ash or cherry wood is ideal for this process.

Vinegar produced in this way can then be left to mature for months or years in other casks; wooden barrels are usually used. Red wine vinegar is left to mature for a longer time than white wine vinegar.

Balsamic Vinegar

Balsamic vinegar is made from grape must. Freshly squeezed grape juice is cooked to reduce the volume by approximately half to two thirds, until the must acquires the consistency of a thin syrup and the sugar percentage is at 1%. This cooked must is referred to as vino cotto ("cooked wine") or mosto cotto ("cooked must"). Traditional balsamic vinegar is produced from the juice of just-harvested white grapes (typically, Trebbiano grapes). Note that if you simmer the grape juice above 90.55 degrees C, the sugar will caramelize and won't be able to ferment.

The must is stored in a battery of five to seven wooden barrels of successively smaller sizes, which have previously had wine vinegar prepared in them in the usual manner (under aerobic fermentation conditions). The smallest cask volume ranges from 10 to 25 L. The barrel set behaves essentially as a device for vinegar concentration due to the water loss through the staves.



The barrels are made of different woods like chestnut, acacia, cherry, oak, mulberry, ash, and, in the past, juniper. The wood type of the barrel affects the final flavour and character of the product; cherry gives a sweet taste, chestnut gives a rich brownish red colour, mulberry gives a spicy aroma and bold taste.

The barrels are cleaned thoroughly with strong vinegar, salt and water. Completely fill all barrels with must. If there is not enough liquid in the barrel, the enzymes will not activate and cannot transform the sugar into acid. Secure a fine mesh cloth over the opening of each barrel. This allows the liquid to evaporate and reduce, and provides oxygenation for the initial fermentation.

Six months later, replace the liquid in each barrel. Fill the smallest barrel with must from the next largest barrel. Continue down the line of barrels replacing liquid with the next largest barrel until you arrive at the largest barrel. Fill the largest barrel with new must. Only the big barrel gets new must. You may plug the barrels at this stage, as evaporation will still occur through the wood of the barrels.

Continue to transfer liquid from the larger barrels to the next smallest one once every year for 5 years. If the barrel is not filled to at least 80% with must, the process will not work. The alternating heat and cold of the seasons are essential to the necessary changes in the vinegar, so the barrels are often stored in the attic.

At the end of the fifth year, you may (optionally) take 1 L of the vinegar from the smallest barrel. This is not yet authentic balsamic vinegar, but it is a form of vinegar. You may continue to take 1 lL per year from the smallest barrel.

Continue to transfer liquid from the larger barrels to the next smallest once every year for the rest of the aging process (a total of 12 – 25 years, and up to 100 years). During this period up to 80% of the original volume is lost due to evaporation.

None of the product may be called balsamic vinegar until the end of the minimum aging period of 12 years. At the end of the aging period (12, 18, or 25 years) a small portion (up to 5 L) is drawn from the smallest cask and each cask is then topped up with the contents of the preceding (next largest) cask. Freshly reduced cooked must is added to the largest cask and in every subsequent year the drawing and topping up process is repeated.

Kombucha

Kombucha is an effervescent drink made by fermenting tea and sugar with the kombucha culture. The result can taste like something between sparkling apple cider and champagne, depending on what kind of tea you use. As the kombucha culture digests the sugar in the tea, it produces a range of organic acids, vitamins (particularly B vitamins and vitamin C), amino acids and enzymes. The yeasts in the culture do produce alcohol but the bacteria in the culture turn the alcohol to organic acids (e.g. acetic acid). Only minute quantities of alcohol, typically 1% by volume, remain in the kombucha brew.

The kombucha culture is similar to the mother of vinegar; it forms as a film or pellicle on the surface of the inoculated tea. The culture is is commonly referred to as a SCOBY (Symbiotic Culture Of Bacteria and Yeast) among kombucha enthusiasts. The young ('baby') kombucha SCOBY resembles to a greyish white pancake or mushroom. An older ('adult') SCOBY may appear in brown colour due to the tannins in the black tea medium. The SCOBY can be safely handled, as long as you wash your hands and remove all jewellery first. Excessive heat and direct sunlight can damage the SCOBY.

Kombucha requires tea for its fermentation (*Camellia sinensis*, not herbal or rooibos teas). It can be also be sensitive to strong aromatic oils. A tea like Earl Grey that contains Bergamot oil can sometimes kill or damage the culture. There are several different kinds of tea that give different results from lighter tastes to stronger more cider like tastes.

Health Benefits

Many health claims are made for kombucha but there is less research on the benefits of kombucha than there is on fermented milk products. It has certainly been shown to have similar antibiotic, antiviral and anti fungal properties in lab tests. In rats it's been shown to protect against stress and improve liver function. There is a lot of anecdotal evidence from people who have been using kombucha over many years for benefits including improvements in energy levels, allergies, cancer, digestive problems, candidiasis, hypertension, chronic fatigue and arthritis. It 's also used externally for skin problems and as a hair wash among other things.

Making Kombucha

Make up 2 L of tea (white tea, green tea, black tea, or any mixture) with 2 - 6 tsp of loose leaf tea or 2 - 6 tea bags. Use the best quality tea you can. Leave it to brew for 15 to 20 minutes, or add your tea to a saucepan and simmer it gently for 5 minutes.

Dissolve ½ cup or just over (approx 160g) of sugar in the hot tea, or substitute 2 Tbs each of honey and liquid malt extract or dry malt powder.

Pour the tea into a 2.5 – 3 L capacity glass jar or wide mouthed container, and cool to room temperature. Do not use crystal glassware, as most crystal contains lead. The kombucha culture needs oxygen for the fermentation. A Pyrex bowl gives a large surface area and is an excellent brewing container. But you *can* use taller jars to brew the kombucha, it will simply take longer to brew because there's a smaller surface area exposed to oxygen.

Add ½ to 1 cup of fresh kombucha tea from a previous batch, and the kombucha SCOBY. You may add only the fresh kombucha tea, as the brew will create its own SCOBY. When you add the SCOBY it will probably float, but sometimes they sink. It will make no difference if it floats or sinks so don't worry about it. If the SCOBY has a 'dirty' side where it's darker in colour and has beard like brown bits sticking to it then put that side facing down into the tea. The brown bits are yeasts.

Place a clean, ironed cloth over the mouth of the container and secure with an elastic band or tie in place with string. Fruit flies especially like the smell of kombucha and can appear like magic out of thin air to lay their eggs in the SCOBY. So it's important to cover it properly.

Put the kombucha brew in a warm dark place (23°-30°C) and ferment for 5 - 20 days, depending on temperature (the ideal temperature is about 22°C). Check the brew after 2 – 3 days. Start tasting the brew after 4 or 5 days. Gently move the scoby aside and dip a spoon in to the liquid. When the kombucha is

ready it should be neither too sweet nor too sour, with a slight to moderate effervescent sparkle. This is rather a personal taste and will depend on how much sugar you want left in the brew. Some like it sweet but others prefer it sour. It's up to you, so test it every day until its the way you like it. It is best to use a heating pad placed under the brewing jar if the temperature is below 18°C.



Bottling

When the kombucha is ready, with *clean* hands gently lift the mother culture and it's offspring out onto a clean plate. Strain the kombucha into your measuring jug leaving behind about 200ml in the bowl as a starter for the next batch.

Fill your clean bottles with the kombucha, label them and store them in a cupboard or the fridge. You can use any kinds of bottles but some batches will be a lot fizzier than others and it's a good idea to use pop bottles, like the Grolsh bottles, that have rubber gaskets on them. This kind of bottle will let out any excess pressure and prevent explosions. After bottling your kombucha make up a second batch of tea for the culture and set your second brew to ferment.

New SCOBYs

For your first 2 or 3 batches it's a good idea to use both the mother and the baby together until the new SCOBY thickens up. When they are new they can be paper thin. With each brewing a new layer will form on top and your SCOBY will get thicker. Then, when it's somewhere between 6mm and 12mm thick, you can gently separate the mother and baby and use the mother to start off a second brew.

Each SCOBY will grow with each brew, gradually getting thicker. You can leave them like this and occasionally peel of a layer from the bottom and discard it. Or you can separate them and either pass new SCOBYs on to friends or store them as spares in another jar of sweet tea which you can keep in the fridge to slow down fermentation. It's useful to have spares in case your active culture becomes contaminated and you need to discard the kombucha and the SCOBY and start again.

Problems

If any unusual contamination such as mould-growth is found growing on the surface of the mother-culture, one should discard the vinegar or kombucha, and start or obtain a new culture. Some species of fungi or moulds, especially of the *Aspergillus* species, have been known to propagate on the mother of vinegar and SCOBY cultures. These moulds usually have green coloured spores, although some strains may produce black spores. Some varieties of fungi produce aflatoxins and mycotoxins, which you should completely avoid in your brew.

Never culture either kombucha or vinegar with a contaminated kombucha SCOBY or mother of vinegar. Instead, inoculate the fresh media with about 10% of a previous non contaminated brew. A new SCOBY or mother of vinegar colony will begin to propagate within days in the case for kombucha, or within a few weeks when culturing vinegar.

Never culture vinegar or kombucha near a compost or rubbish bin. If a compost bin is near by, mould spores may contaminate the mother-culture. This is especially in the case where acid fruits, potatoes or their skins are spoiling.

A clean cloth should be placed on the mouth of any brewing vessel and kept there at all times. A tightly woven piece of pre-washed, hot-ironed cotton or linen cloth is recommended, doubled over to form two layers in thickness. This is placed over the mouth of the vessel, and secured with an rubber band.

Gently rocking the kombucha or vinegar once daily is an effective preventative measure to ensure that mould does not propagate on the surface of a SCOBY or mother of vinegar. Rocking forces some of the tea solution or vinegar to wash over the surface of the SCOBY or mother of vinegar. Performing this once daily maintains the surface of a SCOBY or mother of vinegar wet at all times, which is a factor in the prevention of mould growth. The SCOBY or mother of vinegar may become submerged, but this will simply allow the brew to form a new SCOBY within a few days. This action also provides soluble oxygen for the specific aerobic bacteria (oxygen lovers), *Gluconacetobacter xylinum*, which synthesize cellulose from glucose in the presence of oxygen is responsible for the pellicle.

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