

## PREFACE

**Y**OU NEVER KNOW which moments in life will create that spark—that lightning bolt of energy that illuminates a new area of fascination and then animates this interest into a quest for deeper understanding. At first it was not clear what I was chasing, but the everyday experiments bubbling away on my countertop have created (but also literally quenched) a thirst for understanding more about a vast range of topics that affect my experience of life. For me, a snapshot of such lightning moments is actually best seen in the rearview mirror. A series of seemingly mundane events led me to meeting and subsequently trying to understand my first kombucha culture, and becoming responsible for feeding this alien-looking yeast and bacteria mat, beginning a symbiotic exchange where I reap the benefits of the tasty beverage that the organism has alchemized from plain tea and sugar.

The first fermented beverage I consumed was by accident. Rum-maging through a friend's pantry as a kid, I found a grape juice box. It was bulging, all the corners rounding under pressure building inside. Piercing it with the straw—*gush*—I enthusiastically guzzled the fizzy drink. My first taste of wine was very unrefined; the presence of some wild yeast had transformed the sugars in the juice box, creating carbonation and alcohol. This memory contributed to my



▲ Some fermented beverages at the dinner table at a cooking class the author presented. KRAUSE BERRY FARMS AND ESTATE WINERY

later understanding of wild yeast and the transformation that I was creating (this time on purpose) in making my first ginger beer.

Skipping forward a decade or so, my stepdad was on another of his health kicks. This time, he had some sort of mushroom (as he called it) growing in a big plastic bucket in the basement. He would harvest and then chug the vinegary-smelling, murky water from the bucket, referring to it as the “fountain of youth.” There were rumors that kombucha could help one’s hair grow back, so maybe it was *that* pillar of youth he was chasing (spoiler alert—kombucha is not a cure for male-pattern baldness). The kombucha he was brewing wasn’t given the right conditions to create the tasty, slightly tangy and bubbly brew that we love, so that regime went the way of any other health fad.

The topic of fermentation came up a few years later. While tasting oils and vinegars in culinary school for garde-manger class, I stumped the teacher by asking, “But where does vinegar come from?” leading me on a tangent into food chemistry, learning about the fermentation of sugars into organic acids, and piquing my interest into the fascinating lives of micro-organisms and how they shape the flavors, nutrition, and even textures of our food.

And finally, after I had been working in restaurant kitchens for years, a coworker friend of mine (who has a talent for sourdough baking and a background in nutrition) was raving about the health benefits of this drink called kombucha, and she offered to bring some for me. I flashed back to the big plastic bucket that my stepdad brewed his powerfully vinegary health tonic in, so I politely declined to taste the stuff. Later on, while visiting her place, she handed me a glass of bubbly, slightly tangy, yeasty-smelling drink. I enthusiastically drank it, asking for more, assuming that it was some sort of homemade alcoholic cider. The feeling of radiant energy was actually not because of alcohol; it was some of that nutrition magic she had been so excited about. Now that I was finally on board and fully excited about this drink, she introduced me to the SCOBY that was

responsible for making the tasty fermented tea. She showed me how to brew and sent me home with my first kombucha culture. For years now, I have been sharing the descendants of this culture, and mixing them with other cultures that I have been given, passing them on to countless friends and participants of fermentation workshops that I lead. I have also shared one with my stepdad and he's back into brewing kombucha, but this time, with much tastier results by adjusting his brewing method.

Making kombucha and other fermented beverages really satisfies the culinary nerd in me. Creating tasty and inventive flavor combinations while learning more about food science and traditional cultural food and drink is what I will spend my life being fascinated with and will pass on to my daughter, so maybe she will pick up the good fermentation bug.

Brewing drinks and fermenting jars of food has also inspired me to study holistic nutrition, with specific interest in how microbes affect and largely comprise personal health. I have made it part of my life's work to understand and befriend the bacteria that support my health, as well as learning about the role of these invisible creatures in creating and maintaining cultural diversity, resulting in strong and resilient systems (both in the micro-world and in societal cultures).

The added benefit of environmental sustainability and independence in doing it yourself (vs. depending on corporations to supply food sustenance) means that the practice of brewing my own fermented drinks is not just a fad; it is woven into daily routines that enrich my life on many levels and so is here to stay. Making my own fermented foods and drinks is a microcultural practice that is fortified every time I share the knowledge passed on to me, or whenever I pass along another SCOBY to a friend.



# AN INTRODUCTION TO HOMEBREWED SPARKLING BEVERAGES

## **THE REVIVAL OF KOMBUCHA AND HOMEMADE FERMENTED SODAS**

Welcome to the world of home-fermented beverages! Whether you have dabbled here before and need more guidance, or are just entering into your first project, this book will help you confidently craft lively, refreshing, fizzy, and healthier drinks at home.

When I embarked on my journey into fermenting beverages, I learned from a friend who was kind enough to give me my first kombucha culture (aka SCOBY) and show me how to brew. The SCOBY itself was a pancake-shaped mat floating in some murky, brownish liquid. It was tinted brown, apparently from being used to brew some black tea, and it had the texture of raw squid. It was truly unusual to me, but I was ready to take on caring for this creature so that it could in turn take care of me. On the surface, it seemed incredibly simple. Once I got my new culture home and enthusiastically brewed my first batch by making sweetened tea and cooling it to room temperature before adding the SCOBY and liquid from previous batch, I watched the kombucha culture drift around in the sweet tea in the jar. Some doubts started to intrude upon my newbie glow; I started questioning what exactly was happening in that jar. What is this SCOBY, anyway? How would I know when it was ready? Would it be obvious if it went bad? Why can I leave this on the counter for days



▲ A rainbow of fermented drinks: beet kvass, turmeric soda, and butterfly peaflower kombucha. HONAMI WATANABE

and weeks and it not make me sick?! So I dug deeper, looking, of course, on the internet, where I was suddenly knee-deep in zealous articles on both the “for” and “against” sides of homebrewing kombucha. After getting sucked into the research wormhole, it seemed like special equipment and know-how was necessary to brew consistent and safe beverages. It was intimidating.

Coming back to brew with my friend, who was as confident and relaxed about brewing as she was with making bread or throwing together a salad, helped me remember that we are definitely not

treading new waters here. While it may be a few generations back for some of us, remembering that people have been fermenting beverages through all of civilization has helped me and my fellow fermentation enthusiasts relax and have fun as we learn. Long before we had the technology to see and subsequently name, count, and classify the micro-organisms that surround us, people have learned by observing these natural processes, and by passing on the knowledge of fermentation to each other—just as I was learning from my friend in her kitchen and have offered the skill back through workshops and now through this book.

In some traditions, fermentation is referred to as cooking without heat. Just as we have become masters of fire, knowing how applying heat to food will change the textures and flavors, so too can we harness the ancestral knowledge of how the process of fermentation works to produce new flavors, properties, and textures in our food and drink.

## Science

A little science on basic beverage fermentation will help us get a handle on the seemingly mysterious world of bacteria and yeasts that transform sweet liquids into fizzy, tangy, healthier beverages. By understanding a little more about what's happening in the microcosm inside your bubbling jars and bottles, you will become a better problem solver and, therefore, a more adventurous and confident brewer. While I slept through much of my chemistry class in school, when I became fascinated with the applied science of food and beverage fermentation, suddenly my interest in science was piqued.

In culinary school, during salad dressings class, we were doing a vinegar tasting. An innocuous question sparked my quest to understand more about microbes: “But where does vinegar come from? How is it made?” My question stumped the instructor. “Well, err, it is just wine, or apple juice that is left out and goes sour...?” So my query left me sifting through chemistry formulas, starting with carbohydrates and ending up with acids.

But how? Who or what was responsible for the conversion of sugar to vinegar? The next step led me from chemistry to biology books, learning about yeast and bacterial fermentation.

I am by no measure a food scientist, but getting a handle on the basic science of fermentation in food and drinks helped me understand food safety, troubleshoot a gushing or burst bottle, a soda that didn't fizz, and get to the bottom of why one batch went differently than planned while the next was tasty.

I appreciate this straightforward definition of fermentation by Sandor Katz, author of *Wild Fermentation* and *The Art of Fermentation*: Fermentation = the transformative action of micro-organisms.

This simple definition reminds me that fermentation is all around us! It is what turns milk into yogurt, transforms flour and water into delicious sourdough bread, puts bubbles and alcohol into malted barley water to make beer, and makes sweetened tea into fizzy, sour kombucha. Fermentation is responsible for the transformation of flavors, textures, and nutrition of many of the foods and drinks we love. We are innately attracted to foods and drinks that have benefited from the transformative process that is fermentation. As you can see, fermentation produces a wide variety of different outcomes, depending on: 1) the medium (contents of the food or drink being fermented); 2) time (how long it was cultured for); and 3) the conditions it was cultured in (like temperature, humidity, access to oxygen, etc.). People spend their lifetimes becoming craft makers of just one or a few of these foods or drinks, perfecting their methods as they learn the intricacies of the specific culture(s) at work.

While I admire that people dedicate their lives to becoming experts at a narrow scope of fermented beverages or foods, do not let this discourage you from trying your hand at it. Carrying on the craft of fermenting beverages can easily be incorporated into home kitchen routines; in fact the realm of beverage fermentation has roots in home kitchens all over the world; it was first the domain of amateur cooks, with access only to basic equipment, handed-down recipes and cultures, and hands-on learning. In this book,

you'll learn about basic beverage fermentation, with a focus on low-alcohol drinks. These are projects that are right at home on any kitchen countertop or tucked away into an airy pantry.

#### THE BASIC FORMULA FOR FERMENTED BEVERAGES IS AS FOLLOWS

Water + sugar + micro-organisms (bacteria and/or yeasts and sometimes even mold)	=	Alcohol production, reduced sugar content, carbon dioxide, production of organic acids, increased enzyme activity, increased bacteria counts and production of B vitamins.
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These are the key factors that contribute to how much of each product of fermentation that you get:

1. Time
2. Temperature
3. Type of organism (culture[s]) introduced
4. Amount of available sugar

Two examples:

1. A yeast-dominant culture at higher temperatures with high sugar content will result in higher alcohol and carbon dioxide production.
2. Bacteria-dominant culture over a longer period of time will result in a drink that has the least sugar, little to no alcohol, and is highly acidic (vinegary). A batch of long-fermented kombucha will accomplish this high acidity, low sugar, and alcohol.

#### WATER, SUGAR, CULTURE

While each beverage has its own nuances, the ingredients water + sugar + culture are constant. The quality of your inputs will make a difference for the outcome. Remember, the cultures you are caring for are living things. Give them good quality ingredients and they will thrive and perpetuate themselves. That said, fermented beverages have been made in home kitchens using what's around for centuries, so feel free to improvise and use what you have. I wouldn't

canoe to a fresh spring for water to make most everyday sodas (but that does sound like a nice pace to create slow food and drink by).

I'll mention a bit about each of those ingredients here, and for each recipe, you may find that you can switch things up a bit.

## Water

**TIP** Use the best water you have available. Purchasing a good water filter is a great investment for your health and the health of the cultures that you are growing in your fermented drinks. Look for a solid carbon block filter to install on your tap. Only ever run cold water through the block filter and change as often as is recommended.

One historical motivation for people to ferment their own drinks was to make their water safer to drink. The acids and alcohol that form during fermentation actually kill off some potentially dangerous bacteria and parasites in the water. Fermentation of drinks has resulted in safer beverages in situations with less-than-ideal water sources. Neither fermenting beverages nor boiling water removes heavy metals, though, so if the water is contaminated with lead, arsenic, or other heavy metals, switching to another water source is imperative for your health.

Whatever the water source, be sure to use clean, drinkable water. In the spirit of DIY, I refuse to buy bottled water. I am fortunate enough to live where water from the tap is clean. Even so, I choose to affix a solid block charcoal filter to my tap to minimize any potential chlorine, fluoride, lead, and other contaminants.

I know people who trek to a nearby mountain spring to get water for their drinking and brewing, claiming that the increased mineral content helps the SCOBY grow, just as the added minerals benefit their own health. The trek has become a ritual part of the making of kombucha.

**TIP** Traditional brewing of fermented beverages is steeped in ritual. Ritualizing everyday health-giving activities can enrich our lives by bringing intention and purpose to what we are doing. Creating even



▲ Sugar cane.

a simple ritual, such as how you wash the jars and bottles, or writing positive words on the kombucha jar to imbue that batch with a desired characteristic or virtue, can bring meaning to the happiness- and health-promoting practice of making fermented drinks.

### Sugar

Sugar is what drives fermentation of beverages. The yeast and bacterial cultures consume the carbohydrates, which transforms water into tasty, fizzy, sweet-sour drinks.

**Best** In general, the best sugar to use for fermented beverages is evaporated cane sugar. I recommend organic cane sugar to avoid both GMOs in beet sugar and residual pesticides. It can be found in well-stocked organic grocery stores. Evaporated cane juice/sugar is off-white to tan in color and is a little more granular than refined

table sugar. Using organic cane sugar in fermented beverages results in a clean flavor, good, consistent carbonation, and avoidance of off-flavors that can develop from using some alternatives.

**Good** Refined sugar (the pure white stuff) will also produce consistent batches with a clean flavor like organic cane sugar does. In fact, I think that making refined sugar into kombucha is the only good use for the stuff. I simply avoid the extra-refined sugar because if it is labeled simply as “sugar,” it is likely made from genetically modified sugar beets. I prefer to support organic agricultural practices.

**Experimental** I have many health-motivated students who avoid sugar in their diets, opting for alternatives such as maple syrup, fruit juices, molasses, coconut sugar, or dates—which is great for making healthier cookies, but for fermentation to work consistently well, the culture needs access to a more pure form of sugar. The presence of fiber, some minerals, and a different composition of sugars in these more wholesome sweeteners can actually interfere with fermentation, resulting in off-flavors or the culture failing to thrive. Pasteurized honey can be experimented with ( $\frac{2}{3}$  cup of honey replaces 1 cup of sugar). Raw honey has its own enzymes and antibacterial properties that may compete with the culture. (With the exception of Jun, a kombucha-like drink that has adapted to love raw honey.) If you have an excess of any particular culture and want to experiment with some of the wholesome sweeteners, I encourage you to keep a fermentation journal to note what you did so you can learn what works and what doesn't.

Do not use non-caloric sweeteners! Stevia, sucralose, and sugar alcohols such as xylitol are non-caloric, and so will not feed the culture, and could actually harm it, possibly resulting in a dead SCOBY or at least a ruined batch. Agave syrup and brown rice syrup are also not recommended.

**TIP** The kombucha eats sugar, so you don't have to!

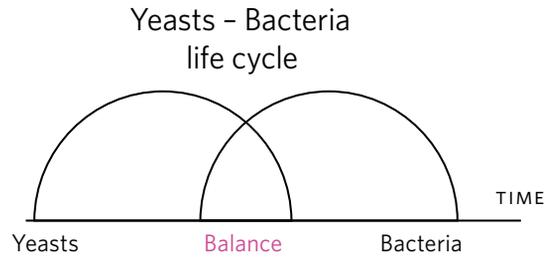
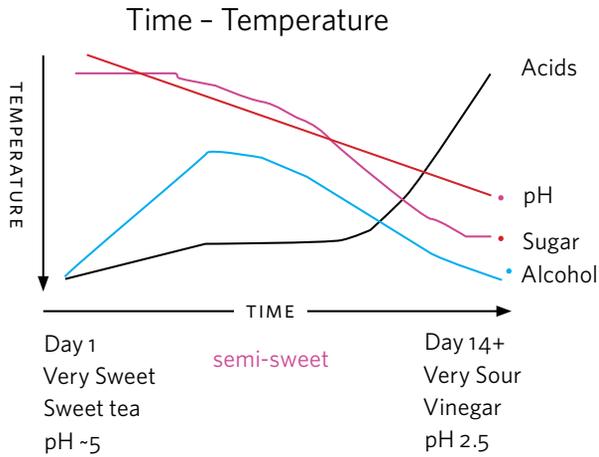
While I am on board with ditching the refined sugar in food and baked goods, it is important to note that kombucha and other fermented beverages require a pure source of sugar in order to ferment. The amount of sugar in the finished drink varies depending on fermenting time, temperature, and other factors, but generally the final product has between 30–80 percent less sugar than it did on the day you made it. The sugars are metabolized by the culture’s resident colonies of bacteria and yeast and transformed into organic acids, B vitamins, carbon dioxide, and some alcohol.

### Culture

**TIP** Fresh is best when you are receiving a new culture. It is okay to ask what a culture has been fed before you get one; ask about whether it was fed organic sugar and (for kombucha) tea, and whether it has been fed recently. Freeze-dried, dried, and frozen cultures will take a little more care to revive.

In this context, we’re referring to the biological definition of “culture.” While your motivation to craft fermented beverages might be to enjoy a refreshing drink, you are in effect actually providing the conditions for bacteria, yeast (and sometimes mold) to thrive. You are essentially a steward of these microbial cultures, and when you take care of them, they take care of you. For each project in this book, you will need the appropriate culture to get started. Under the right conditions, cultures will grow and/or multiply and so you can perpetuate your culture, sharing with friends. The kombucha, Jun, and water kefir cultures will need to be tracked down, while the ginger bug culture is a wild ferment, meaning that, like sourdough, it harnesses wild yeast and bacteria to make a fermentation starter culture.

I have been teaching fermentation classes for almost a decade now, and I estimate that I have given away well over two thousand kombucha cultures. I do brew regularly for my own consumption and a little extra for friends, which results in *lots* of kombucha SCOBYs. When I need lots of SCOBYs to send each student home with one, sometimes I call upon friends or students I have taught to brew to



The yeast dominate until the dissolved oxygen depletes causing the yeasts to produce alcohol which fuels the bacteria to domination.

Yeast prefer cooler temperatures 60-80°F (16-27°C)  
Acetoro Bacteria prefer warmer 74-88°F (23-31°C)

▲ Time and temperature effect on kombucha. [WWW.HAPPYHERBALIST.COM](http://WWW.HAPPYHERBALIST.COM)

return some of their extras so I can pass them on. Other cultures have come to me through friends who brew; my first water kefir culture came from a teacher at the nutrition school that I studied at. (I eventually neglected the water kefir grains, and attained more through Cultures for Health.)

You can order cultures online at GEM Cultures and Cultures for Health (see Resources at the end of the book). Fresh cultures may not be available for shipping outside of the US, but dried cultures can be shipped and then revived according to package instructions. Other ways of obtaining cultures are from buy/sell/swap sites, local fermentation clubs, or online groups or friends and family who brew. Passing on the physical culture becomes part of the social culture that knits us DIY folks together. Be generous by sharing your extra cultures, your tasty brewed drinks, and the knowledge of how to make them.



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## EQUIPMENT

Here are the bare bones of what you will need to make fermenting beverages fun and easy. Part of what I love about micro-batch fermenting my own drinks at home is that it is relatively easy to find what I need to get started right away. You may find what you need is already at home, or that you can get the rest from houseware or hardware stores, or rescue and reuse bottles and jars from recycling depots. Homebrew supply shops are worth a visit for some of the specialty items such as airlocks and bottling siphons. Keep an eye on buy/sell/swap websites or ads for beer or wine brewers getting rid of their equipment.

**A pot (with at least 1 gallon [4L] capacity).** Stainless steel or tempered glass (not aluminum).

**Measuring cups and spoons.**

**Clear glass jars for fermenting in—1 gallon [4L] is most useful.** For smaller batches, 2 quart wide-mouthed canning jars are handy. For kombucha, some people prefer a spigot for easy pouring. Just check that the nut affixing the spigot on the inside of the jar is made of hard plastic, not metal. You can sometimes get the gallon jars from delis or even hot dog carts (where they sell pickles or sauerkraut from big jars), recycle depots, or some houseware or hardware stores.

**Bottles.** Bail-top bottles, also known as swing-cap, are ideal. Source them from bottle depots, or buy them full of beer and drink the contents! Any colored glass should be carefully checked—some can be decorative and painted with toxic paint. Tinted glass, as in recycled beer bottles, work best. Screw-cap wine bottles can also work, as will reused store-bought kombucha bottles. You can also reuse sparkling wine/prosecco and sparkling lemonade bottles, or buy them new from a houseware or hardware store. Beware not to use square or decorative odd-shaped bottles for containing fizzy drinks, as they

**MYTH** Using a metal spoon or strainer will harm your culture.

**FACT** While prolonged contact with metal will harm the culture and potentially ruin the fermenting brew, brief contact such as stirring with a metal spoon, using tongs to lift your SCOBY, or a metal strainer to strain water kefir grains will not harm the cultures or affect your brew.

◀ Basic equipment for brewing fermented beverages.

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are either more likely to explode or may not seal properly, making for a flat brew.

**Funnel.** You can use a plastic or metal funnel, or get a fancy one specifically for bottling, with a built-in strainer and a bevelled stem to prevent bubbling-up while pouring.

**Tightly woven cloth to cover the jar, with a rubber band to secure it.** Cheesecloth is not advisable, as fruit flies can get into even the smallest hole. Paper coffee filters also work fine.

**Sieve/strainer.** It's okay for it to have metal/wire mesh, but some people prefer nylon mesh strainers.

#### **Wooden spoon or metal spoon/stirring implement.**

The equipment below is optional but may make your production smoother, easier, or more consistent. This equipment should be available at homebrew supply shops.

**A siphon.** This can be simply plastic tubing or a more sophisticated siphon with a bottling attachment.

**Airlocks.** These are only for aging sodas and intentionally making more alcoholic drinks. Airlocks are specialized plastic or glass tubes that you fill with water, with a cork or rubber stopper for the bottle-end.

#### **Bottle-washer attachment for tap or tiny bottle scrub brush.**

#### **Bottle-drying device such as a bottle tree.**

#### **One Step peroxide sanitizer.**

► This equipment is optional but can make brewing more streamlined. Most equipment can be found at beer or wine brewing supply stores.

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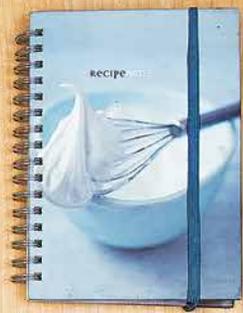
SWINGTOP BOTTLES



AIRLOCK



CLOTH JAR TOPPER



JOURNAL



HYDROMETER



BOTTLE SCRUB BRUSH



BOTTLE FILLER



FINE NYLON STRAINER



SIPHON

**Hydrometer.** A tool that measures how much alcohol/sugar remains in your batch.

## Cleaning the Equipment

**TIP** It is important to remember that the fermentation processes at work on your beverages are pro-bacterial. You want to clean the equipment that comes in contact with your beverages to assure that the right types of microbes are invited to your fermentation party. Unlike in the homebrewing of beer and wine, it is not necessary to sterilize the equipment with surgical precision.

General “clean-dishes” rules apply, so hot, soapy water and a good rinse is fine for all jars, bottles, strainers, siphons, etc. Some people prefer to use a sterilizer, to avoid tedious rinsing of soapy suds. You can sterilize by using boiling water, but only on shatter-resistant glass bottles and jars; I recommend a peroxide sanitizer. You can get this in powder form and add water to it each time you brew or bottle. The peroxide sanitizer I use is called One-Step and leaves no residue or chemicals, so you don’t even have to rinse it, and it is safe for your skin.

Bottles can be a pain to clean. You can get bottle-washing attachments for your tap, or use a tiny bottle scrub brush to remove any stuck-on residue before your final rinse. Depending on how big your homebrewing operation is, you may want to get a bottle drying tree as well.

## THAT WOBBLY LINE BETWEEN ALCOHOLIC AND NONALCOHOLIC

**TIP** The life of yeast: yeast eats sugar, burps carbon dioxide, and pees out alcohol.

Albeit a little oversimplified, this goofy adage was given to me by a student at a fermentation workshop, and it is a handy reminder

about the role of yeast in fermentation. Too much alcohol? Those yeasts were either fed too much sugar, or were in too high of a concentration relative to bacteria, or were a little too warm. Not enough fizz? Feed those yeasts some more sugar and make sure the “burps” are trapped.

Once I had a grasp on fermenting kombucha, I tried my hand at making ginger beer and root beer. I applied the same principle of leaving the tea with the culture in an open container to ferment for a while before bottling it. My understanding was that, as for kombucha, the longer the sweet medium fermented in the open container, the less sugar it would have, and the more benefits I would reap from the resulting brew.

And wow—did those batches pack a punch! I had accidentally created pretty strongly alcoholic root beer. I had to go back to the drawing board about what I thought I knew about fermenting drinks and here’s what I learned.

In North America, government regulatory bodies have drawn a definite line between “alcoholic” and “nonalcoholic.” Any fermented beverage that is sold as nonalcoholic, or is assumed not to be alcoholic will not exceed 0.5 percent alcohol. In your kitchen, the production of alcohol will not be as carefully regulated, and a brew may become a little (or a lot) more alcoholic.

Yeasts are responsible for carbon dioxide (that fizz factor we all love) as well as alcohol (ethanol) production.

Kombucha, water kefir, and wild fermented beverages use different cultures to ferment the sugars we supply them with. These cultures are comprised of communities of micro-organisms which include both bacteria and yeasts. In the production of modern beer and wine, the fermentable sugars are only acted upon by very specific alcohol-producing yeasts. Other organisms are eliminated by means of pasteurization or chemical sterilization before yeast is introduced. In contrast to beer and wine, the fermented beverages we are creating here are lower in alcohol because of the bacterial fermentation that follows the yeast fermentation.



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All fermented beverages produce alcohol at some stage in their fermentation. The more yeast activity, the more alcohol potential there is (and certain strains of yeast can produce very high amounts of alcohol; the more sugar you feed them the more alcohol they make). Drinks with very little alcohol and more health benefits do indeed produce alcohol during fermentation, but the next phase of fermentation reduces their alcohol content, as bacteria that are also present in the culture feed on the alcohol and produce acids.

To get back to my unintentionally alcoholic root beer project: the culture I used to create the root beer was a ginger bug. It had a lot of yeast activity, and fermenting it in an open container for a number of days, paired with warm summertime temperatures and high sugar content, created perfect conditions to make alcohol. I have modified my brewing method by reducing the sugar content somewhat and bottling the root beer or ginger beer right away after adding the culture, fermenting it only in the bottle and not in the open jar. The result is an ultra-fizzy (beware) but lower alcohol (kid-friendly) summertime sipper.

## CARBONATION

**TIP** The results of fermentation are indeed more nuanced and varied than the shortcut method of carbonating water and adding sugar syrup. The flavors and health benefits that you are able to produce using microbial cultures and traditional methods make it all worth the effort.

Many homebrewers have a fantastic and sometimes scary tale of popped caps, geysering pressure releases, and even exploding bottles.

I'll share one such story. After I had learned how to make kombucha, I invited a friend to embark on making ginger beer with me. Our kombucha had reliable fizz, and actually aged well in the bottles (we were not doing secondary fermentation so the sugar level was low),

◀ SCOBY formation in the bottle.

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making it practical to make a large batch and store the bottles for a while before enjoying them. Once we learned how to make a ginger bug, we got ambitious and thought that we'd make a summer's worth of ginger beer at once.

A couple of weeks later, my friend called me in a panic—the bottles, stacked a few cases high, had begun to explode! The only advice I could offer was to get out of the line of fire, and as she took shelter, she heard one explosion detonate the others. Needless to say, it was a mess of epic proportions. Luckily, nobody got hurt.

Another story was shared over a fermentation forum that I contribute to. This unfortunate situation was costly: A bottle of half-consumed kombucha was left in a hot car while the owner was on holiday. There, in the long-term parking lot at the airport, the interior of the car got very hot, which resulted in a pressure release from the bottle—blowing the swing-cap off the bottle with such force that it shattered the car windshield!

Remember that carbonation is the work of yeast digesting sugar, which yields carbon dioxide, so beware of overcarbonated bottles!

Now that I have illustrated that overcarbonation can cause serious damage, let's learn from these mistakes.

### **Too Much Fizz: How to Avoid Overcarbonation**

Fill bottles to halfway up the neck (almost full). Underfilled bottles can pressurize incredibly, as carbon dioxide fills the space in the bottle.

Do not shake bottles! Those yeast love oxygen, so don't overexcite them. Warm temperatures increase yeast activity, so don't put sealed bottles in the warmest area of the house. Comfortable room temperatures (66–77°F [19–25°C] for most beverages) are ideal for fermenting beverages, and fridge or cold-storage (39–50°F [4–10°C]) slow down fermentation, so store carbonated bottles in cold-storage.

Burp your bottles. Carefully open them during fermentation and listen to the pressure release. Once you get sufficient pressure, move

▶ Carefully opening a very fizzy bottle. CHRIS MCLAUGHLIN



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the bottles into the fridge. The fridge slows fermentation, but does not completely stop it, so I recommend drinking your beverages within a month or so.

### **Protect Yourself and Save the Mess**

I have resorted to using a big plastic bin with a lid to store fermenting beverages. (I refer to this setup as “the bomb shelter.”)

Open bottles carefully. One trick that I found is to put the bottle in a big bowl, put a plastic bag over the cap and neck of the bottle as you slowly open the swing-top bottle. Any geyser is prevented from staining your ceiling and the excess is just poured into your glass once the fizz dies down.

### **Too Little or No Fizz: Troubleshooting Lack of Bubbles**

Once you have bottled your beverage and are finding that you get little to no carbonation, check these things and adjust:

Do your bottles seal properly? The best bottles to use are swing-cap bottles that are designed to hold in carbonation. Used beer bottles or prosecco bottles or bottles bought specifically for fermenting drinks are ideal for holding in fizz. Check the gasket for integrity of the seal and replace if needed.

Culture not active? If you used a kombucha or water kefir SCOBY or ginger bug, you may need to replace it.

Not enough sugar or the wrong type of sugar? Yeast needs easy-to-digest sugar, so experimental sugars might result in slow fermentation and few bubbles.

Too cold? Move to a warmer spot. I place the bottled bevies in my oven with the light on for a couple of days if I want more bubbles and am getting impatient.

Very few bubbles? You can gently swirl the bottles around a bit, move them to a warmer spot and keep waiting for the carbonation to happen. Never forget about your bottles though, as they can go from too little to too much carbonation within a few days.