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If you do not have pineapple juice or want to try using only water, use filtered or spring water. You can also substitute orange juice or even diluted lemon juice. The starter may or may not stay on the predicted feeding schedule, depending on the presence or absence of leuconostoc bacteria and other similar bacteria in your flour. Roughly 30 to 40 percent of starters end up with the leuconostoc problem, depending on the growing conditions in the wheat and rye fields that year. However, if you aerate, stir, or knead the starter a couple of times each day, the starter will eventually overcome any leuconostoc, even if you have not used pineapple juice.

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Opinions are divided as to whether the pineapple juice is really necessary after Stage 1. It probably is not, but it won't hurt to use it during Stage 2 and may, in some instances, serve as insurance against the appearance of leuconostoc bacteria.

The following method will work with either organic or commercial flour and produces a mother starter, what I fondly call the barm, in 5 to 10 days, depending on the weather and location.

I updated my original seed culture to account for a strain of leuconostoc bacteria—and perhaps other bacteria as well—that hinders many starters but generates lots of carbon dioxide in the early stage of a seed culture starter, making it falsely seem that the wild-yeast cells are growing rapidly. I learned from a group of dedicated home bakers (all contributors to the King Arthur Flour Baker's Circle website) that the action of these bacteria can be counterbalanced by using pineapple juice or other acidic liquids on the first day or two. Of course, you can make this starter without the pineapple juice, as has been done for centuries; the acidic juice merely moves the process along more rapidly.

### Seed Culture

MEASURE	OUNCES	GRAMS	INGREDIENTS	%
<b>STAGE ONE (DAY 1)</b>				
1 cup	4.25	120.5	coarse whole wheat or whole rye (or pumpernickel-grind) flour	100
½ cup	4	113	unsweetened pineapple juice (from a can) or orange juice, at room temperature	94
<b>STAGE TWO (DAY 2)</b>				
½ cup	2.25	64	unbleached high-gluten or bread flour	100
¼ cup	2	57	water or unsweetened pineapple juice, at room temperature	89
<b>STAGE THREE (DAY 3 AND UP)</b>				
1 cup	4.5	128	unbleached high-gluten or bread flour	100
½ cup	4	113	water, at room temperature	94
<b>TOTAL</b>				n/a

Stage One (Day 1): Mix the flour and juice together in a bowl until they form a wet, sticky dough or sponge. Be sure that all the flour is hydrated. Press this dough into a 4-cup (945ml) measuring beaker and place a piece of tape on the beaker to mark the top of the dough. Cover the beaker with plastic wrap and leave it at room temperature for 24 hours.

Stage Two (Day 2): The dough should not have risen much, if at all, during this time. In a mixing bowl, combine the Day 2 ingredients with the Day 1 sponge, mixing with your hand or a spoon until all the ingredients are evenly distributed to form a new sponge. This sponge will be even softer and wetter than the Day 1 sponge because of the switch to white flour (you can substitute whole wheat or whole rye flour if you prefer to make a 100 percent whole-grain starter). Return this to the beaker, pressing it down, and replace the old tape with a new piece of tape to mark the spot. Cover with plastic wrap and ferment for 24 hours at room temperature. Do not be put off by the strong aroma of the dough; it will eventually brighten. Even if there is fermentation activity, this does not always indicate wild-yeast activity. It is more likely bacterial fermentation masquerading as yeast activity, and the seed culture may go dormant for a few days as you enter Stage Three.

Stage Three (Day 3 and up): Check to see if there has been a rise or other activity in the dough. There may be some fermentation but not a lot, perhaps some bubbling or even up to a 50 percent rise. Regardless, discard half of the starter (or give it to a friend to cultivate) and mix the remaining half with the Day 3 ingredients to make a sticky sponge-like dough. Again, return it to the beaker and press it down. Reapply tape to the beaker to mark the top of the dough, cover, and ferment for 24 to 48 hours. If no observable rise has occurred after the first 24 hours, mix the dough again for a few seconds in a clean bowl, return it to the beaker, cover, and let it sit for another 24 hours. If there is still little or no rise or bubbling, repeat the mixing every 12 hours for up to 4 more days (Day 8), or until the dough shows signs of fermentation (bubbling) and growth to approximately 1½ times its original size, or even up to twice its size. This will usually occur sooner than Day 8 but not always, especially during cooler weather. Your seed culture is now ready to be turned into a barm, or mother starter. (Note: The mixing every 12 hours prevents molds from settling on the surface of the dough while the wild yeast and bacteria are growing in the dough. If the dough hasn't activated by Day 8, don't give up on it. Just keep stirring every 12 hours until it activates, even if it takes a few more days. It will happen.)

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The full flavor of the barm will not develop until it has been refreshed 2 or 3 times over a 2-week period, during which time the organisms indigenous to your region will gradually take charge of it. (This is why a starter made from a seed culture imported from Egypt or Russia will, over time, produce bread that tastes like a starter made locally from scratch.) When the barm reaches its peak flavor, you will be able to maintain that flavor with periodic refreshments. However, you can begin using the barm as soon as it ripens. The leavening power will be strong from the first, since the wild yeast ferments the barm at a faster pace than the bacteria produce their flavorful acids.

### *Barm (Mother Starter)*

Makes approximately 4 cups (1¾ pounds/794g) barm

MEASURE	OUNCES	GRAMS	INGREDIENTS	%
2 cups	9	255	unbleached high-gluten or bread flour	100
1 cup plus 2 tablespoons	9	255	water, at room temperature	100
1 cup	7	198	seed culture (page 240)	78
<b>TOTAL</b>				278

Stir together the flour, water, and seed culture in a mixing bowl (you can discard the remaining seed culture or give it to a friend to build into his or her own barm, or refrigerate it for up to 5 days as backup in case you need it). Make sure the seed culture is evenly distributed and all the flour is

hydrated. It will be a wet, sticky sponge similar to a *poolish* (page 112). Note: If you prefer to work with a firmer mother starter, you can reduce the water to 4 to 5 ounces (113g to 142g) and knead by hand or mix in an electric mixer with the dough hook.

Transfer this sponge to a clean plastic, glass, or ceramic storage container that is twice as large as the barm is. When transferring it to the container, repeatedly dip your hand, spatula, or bowl scraper in water to keep the barm from sticking to it. Cover the container with a lid or plastic wrap and ferment at room temperature for 6 to 8 hours, until the barm is bubbly. The plastic wrap or plastic lid will swell like a balloon. When this happens, lift the lid or plastic wrap to let the gas escape (try not to breathe it as it escapes, as the carbonic gas mixed with ethanol fumes will knock you across the room!). Replace the cover and refrigerate the barm overnight, where it will slowly continue fermenting and growing while it also goes dormant. It will be ready to use the next day and will remain potent for 3 to 5 days. After that, or if you use more than half, you will need to refresh it as described next.

## REFRESHING THE BARM

- The standard refreshment for barm is at least to double it. You can also quadruple it, however, as the organisms in the barm are capable of feeding on a large refreshment, up to 5 times the weight of the barm in new flour, and converting it into fresh starter. I double the barm at each feeding if I want a very sour bread, but I triple, quadruple, or even quintuple it when I want a less sour flavor. Remember, it takes longer for the bacteria than the yeast to work, so while a larger feeding dilutes both the bacterial and the wild-yeast communities, the yeast bounces back faster than the bacteria, creating a strong, but less acidic, leavening sponge. But by the second or third day in the refrigerator, the bacterial fermentation does catch up, and the sponge becomes quite acidic and sour (with a pH level of about 3.5). (Note: for those who don't think their starter is sour enough, you can add up to 1 ounce/28g of granulated sugar to it when you refresh it, which will promote the growth of more sour-producing bacteria. But only use this trick after first testing your unsugared starter in a bread or two.)
- It is important to understand what happens when you refresh the barm. After 4 to 7 days, the acids and protease enzymes in a barm that has not been refreshed break down the gluten, turning what was at first a strong, stringy sponge into a protein-weak, potato-soup-like consistency. There are still plenty of live organisms to leaven and flavor bread, but they will make a flaccid dough. For this reason, it is advisable to feed your barm 3 days or sooner before you plan to use it in a bread (ideally, the day

before). If you have a lot of barm but haven't fed it for a while, discard all but 1 cup (7 ounces/198g) and refresh that cup with 3½ cups flour (16 ounces/454g) and 2 cups (16 ounces/454g) water (use less water if keeping a firm mother starter), stirring until all the flour is hydrated.

- If you have been using and feeding your barm regularly, you do not necessarily have to discard any. However, what you do not want to do is, for example, use 1 cup barm from your supply to make some bread, then refresh the remaining barm with only 1 cup flour and some water. You must always at least double the remaining barm. You can do this by either throwing out or giving away some barm before you refresh it, or by using up more of it before refreshing it (remember, you have a 3-to-5-day window before you need to feed it again).
- If you do not plan to use the barm for a while, do not throw any away until you plan to refresh it again, and follow the guidelines given (see Commentary) to refrigerate or freeze it in a tightly sealed container. Since you do not want to freeze a glass or ceramic container, you should transfer the barm to a zippered freezer bag that has been misted with spray oil, or use a plastic container (allow enough room for expansion and gas development).
- Use high-gluten flour, if possible, for the refreshments (except in the case of a rye barm), as it has more gluten than bread flour and can thus better withstand the acid and enzymatic degradation. However, bread flour will also work, especially because high-gluten flour is hard for home bakers to find.
- You can refresh in two ways. One is to weigh the amount of barm you plan to refresh and the other is to eyeball it. I use both methods and find that as long as you stay in the doubling to quadrupling ballpark, you will have no problem keeping your mother starter strong, active, and clean tasting. By clean tasting I mean that no off-flavors develop, such as a musty or cheesy flavor caused by overfermenting at warm temperatures or by leaving it out too long. This allows unwelcome bacteria to join the party or for the yeast to create too much alcohol, resulting in what we think of as a too yeasty flavor. The yeasty flavor is a combination of alcohol and glutathione, an unpleasant-tasting amino acid released by yeast as it dies.

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If you want to save the barm but do not plan to make bread for a while, you can refrigerate it for at least 2 months in an airtight container and then refresh it by discarding all but 1 cup (or even ½ cup) and building up from there. Or, you can freeze the barm for up to 6 months and then defrost it in the refrigerator 3 days before you need it. When it has thawed enough to use (the next day), discard all but ½ cup and refresh as described at left. Then refresh again the next day, building back to 4 to 6 cups barm, depending on your need. The following day you will have a strong, ready-to-use barm. Of course, you still have 1 or 2 more days of dough building to accomplish, as described in the formulas.

- The weighing method is simple: weigh the barm and calculate how much flour and water it will take to double, triple, or quadruple the weight (the easiest way is to figure equal parts water and flour). Thus, if you plan to refresh a 1 pound (16 ounces/454g) barm, you can build it to 2 pounds (32 ounces/908g) by adding 8 ounces (227g) each of flour (1¾ cups) and water (1 cup); or you can quadruple it by adding 1½ pounds (680g) each of flour (5¼ cups) and water (3 cups). The larger the refreshment ratio, the longer the fermentation time, usually 4 to 8 hours, depending on the size of the refreshment and how cold the barm was when you started. If you are using a cold barm just out of the refrigerator, warm the water up to about 90°F (32°C) to compensate and to hasten the onset of fermentation. Never let the starter actually be warm, however. It is best for the organisms we want to cultivate, the lactic- and acetic-producing bacteria, if the starter ferments slowly, between 65°F and 75°F (18°C and 24°C), or at room temperature.



- When the starter is bubbly and foamy, put it in the refrigerator overnight before using it. Technically, though, you could begin using it as soon as it foams up, but I wait for the overnight development because I believe it gives the bread a more complex flavor. Either way, with a ripe and ready barm, you are ready to move on to the next build.

The barm, or mother starter (back), is a wet sponge similar to a *poolish*, while the firm starter, or *levain*, is about the same texture as a *biga* or French bread dough.