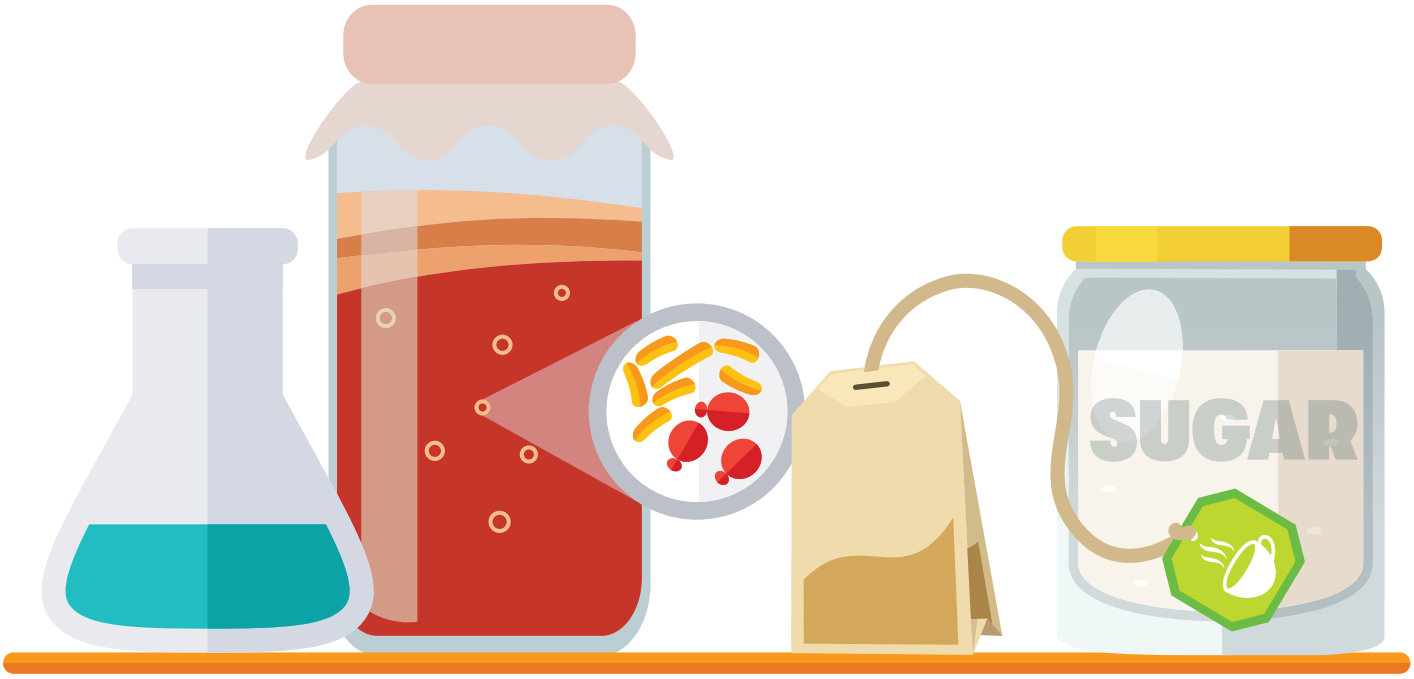
The Tech Interactive at Home

Making with Microbes Activity Guide

Who says all the fun has to happen at The Tech Interactive? This DIY biotinkering activity can be done with inexpensive store-bought supplies and things you find around your home!



Introduction

Ever wanted to make your own paper? Or create "leather" without animals or plastics? Why not try teaming up with microbes — tiny microscopic organisms — to design and grow a custom biomaterial at home! This biomaterial is made by millions of living yeast and bacteria that work together to produce kombucha, a fermented tea. If you take care of your microbes, they will work to grow interesting and different pieces of biomaterial for you.

Learn More

What is Biomaterial?

Making with Microbes Essential Questions
Such as...will this make my house smell?

Subject:
Biology, Biodesign

Age:
8+

Time:
Mix: 30 min
Grow: 1-3 weeks
Dry: 1-2 days
Create: 30 min

Key Concepts:
Living systems, biomaterials, microbes, fermentation

Design Challenge

Grow your own unique piece of biomaterial and make something creative with it.

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
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Materials

You will need **kombucha**, which is your source of living microbes, as well as basic kitchen equipment and supplies. We have included our favorite suggestions below to get you started, but use whatever you have on hand — be creative!

Activity Tips

Care and Feeding
Microbe likes and dislikes to set you up for success!

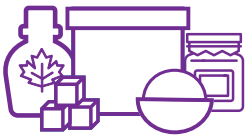
Knowing It's Growing

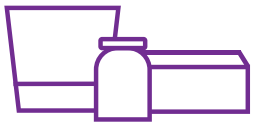
Kombucha *(1 bottle, approx 2-4 cups)*

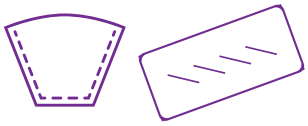
Find at grocery stores or online. Look for varieties labelled "raw", "live", or "active". If you brew kombucha yourself you could use that too.

Growing Supplies *(Choose one or more of each)*

Sugar *(2-4 tsp)*	Tea *(1-2 bags or 2-4 tsp)*	Growth Container *(1-3)*	Covers *(1 per container)*
• Brown or white sugar • Agave syrup • Molasses • Maple syrup	• Black • Green • Oolong • White	• Food storage containers • Jars • Bowls • Cups	• Snap or screw-on lid • Coffee filter • Clean cloth • Plastic wrap • Paper towel







Instructions

Part 1: Mix food for your microbes *(30 min)*

You'll first need to prepare food for the living microbes in your kombucha. Luckily, that's easy — they just need sweet tea to survive. Since different microbes have slightly different food preferences, you can discover what makes your microbes happiest by trying several types of sugar or tea.

1

Boil some water (2-4 cups). Ask an adult for help!

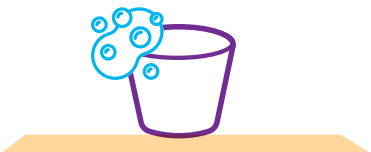
2

Mix in some sugar (2-4 tsp) and add tea to steep (1-2 bags or 2-4 tsp).

3

Cool the sweet tea to room temperature. Hot tea will kill your microbes!

4



Clean one or more growth containers with warm, soapy water. Rinse well.

5

Add equal amounts of cooled sweet tea and kombucha (living microbes) to your growth container(s).

6

Cover your growth container(s). Secure the cover to keep bugs out.

Part 2: Grow your biomaterial *(1-3 weeks)*

1. Leave your microbes to grow at room temperature for at least a week. Try not to move them too much.
2. Watch the surface of the mixture for a layer of biomaterial to begin to form. The longer you let it grow, the thicker it will be!

Part 3: Dry your biomaterial *(1-2 days)*

1. Remove your floppy biomaterial from the growth container. Don't forget to save the liquid if you want to grow more!
2. Lay it out to dry. You can speed the drying process by putting it next to a fan or in the sun.

Avoid metal or rigid drying surfaces as biomaterial often breaks when removed from these.

Part 4: Create something! *(30 min)*

1. When your biomaterial is fully dry, carefully peel it off of the drying surface.
2. Consider the properties of your specific piece as you decide what to make with it. Is it thick or thin? Brittle or flexible? Sticky or not-so-sticky?
3. Have fun creating something with your biomaterial that is unique to you and the living microbes that grew it!

Want to grow more biomaterial?

Now that you have fully woken up your microbes and they are happy and strong, you can challenge them to do more complex things! They will continue growing pieces of biomaterial as long as you give them food. Repeat the process above, but use the liquid left in your growth container after Part 3 (which has lots of microbes) instead of store-bought kombucha.

To design and grow biomaterial that has more of a personal flair, you could explore:

- **Shape** — Use different growth containers to make new and interesting shapes.
- **Color** — Add dyes to the sweet tea to grow your favorite color.
- **Feel** — Combine different types of tea and sugar to modify the feel of the material.

Explore More

- Add color to your soggy biomaterial with liquid dyes (like food coloring) before drying it.
- Want to add 3D textures? Dry it on a surface with a cool pattern, like plastic or silicone mats.
- Don't like the texture? Too sticky? Rinse your dried biomaterial with water and dry it out again.

Get Inspired!

Making with Microbes Ideas

Suncatchers
Customize your biomaterial so that it shines in the sun!

Share Your Results! Keep us posted on social media with **#TheTechatHome**.

The Tech Interactive at Home

thetech.org/athome