

WHO'S AFRAID OF THE BIG, BAD SOAP?

Are you afraid of soap? Is it scary, or do you like relaxing in a nice, warm, soapy bath? Most people like soap and enjoy the way that bathing and showering with it makes us feel. Do you think that pepper is afraid of soap? It's a silly question, but it's something we can test out in our very own kitchens.

Here are the supplies you'll need:

- A shallow bowl or pie pan (a white or light-colored bowl makes it easier to see the pepper)
- Water
- Bar of soap
- Ground black pepper

Fill the bowl or pan with about one inch of water, then sprinkle lots of black pepper evenly on top of the water. The pepper is very light and will float on the surface of the water.

Now, dip the bar of soap into the middle of the pepper-covered surface. Describe what you see. What happens if you move your bar of soap to the side of the bowl?

Why, and how, did the pepper run away from the soap? **Surface tension** gives us the answer. Water has a high surface tension, meaning the water molecules have a strong attraction to each other and like to stick together. This causes the molecules on the surface to form a kind of "skin" or bulge. Pepper is also **hydrophobic**, which means water isn't attracted to it and so it can't dissolve in water. When you add soap, the surface tension is weakened and the bulging water surface is lowered (or flattened) so the pepper is carried to the outer edges of the bowl.

The stretchy, elastic surface caused by surface tension also explains how certain small insects can run across the surface of a pond without sinking and why you can slightly overfill a glass of water.

Have you ever wondered how soap actually works to get us clean? Soap doesn't kill germs, it removes them. The soap molecules act as a link between the water and the oils on your skin. When you rinse, it all washes off with the soap lifting the oil off your skin and taking germs with it right down the drain.

Scientists have looked at particles of the COVID-19 virus under a microscope and identified it as an "envelope virus", which means each particle has a coating of fat molecules surrounding it. When you wash with your hands with soap, that coating falls apart and destroys the virus particle.

You can try this experiment in slightly different ways to compare results. Try milk or juice instead of water. Use a squirt of dish soap on your finger instead of the bar of soap. Float a couple of toothpicks on the water and see what happens when you add soap.

RESOURCES FOR MORE INFORMATION:

<https://www.scientificamerican.com/article/use-surface-tension-to-make-pepper-dance/>

<https://www.instructables.com/id/How-Dish-Soap-Works-Water-Surface-Tension-Experime/>

<https://www.education.com/science-fair/article/pepper-and-soap-experiment/>

https://www.usgs.gov/special-topic/water-science-school/science/surface-tension-and-water?qt-science_center_objects=0#qt-science_center_objects