FOOD SCIENCE

The study of the physical, biological, and chemical makeup of food

WHY DOES SWISS CHEESE HAVE HOLES?

The holes in Swiss cheese come from bacteria that helps turn milk into cheese. All types of cheese contain bacteria, but not all bacteria are the same. When making Swiss cheese, cultures of the bacteria *S. thermophilus*, *Lactobacillus*, and *P. shermani* are mixed with cow's milk.

The bacteria helps produce curds, a thick substance that forms when milk becomes sour. These curds are pressed in large molds, which are then soaked in a salty water solution called brine. Afterward, the cheese is stored at 72-80 degrees Fahrenheit and left to age, or ripen.

During the aging process, the bacteria *P. shermani* releases carbon dioxide, which forms small bubbles in the cheese. These bubbles burst and form little air pockets, resulting in the holes of the Swiss cheese.

Cheesemakers can control the size of the holes in Swiss cheese by changing the length of the aging process, as well as by changing the acidity of the brine and the temperature of the environment that the cheese is in during the process.

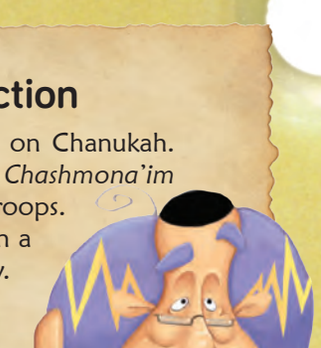
Eye See You!

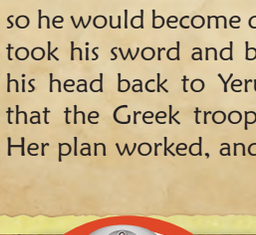
The holes in Swiss cheese are called "eyes."

Torah Tidbits

The Cheese and Chanukah Connection

There is a custom to eat dairy products and cheese on Chanukah. This custom stems from the heroism of Yehudis, of the *Chashmona'im* family. Yehudis was taken by the leader of the Greek troops. While she was with the Greek officer, Yehudis fed him a dish cooked with cheese, so he would become thirsty. Once he became thirsty, she gave him wine to drink, so he would become drowsy. When he fell asleep, she took his sword and beheaded him. She then carried his head back to Yerushalayim and displayed it, so that the Greek troops would become demoralized. Her plan worked, and the troops retreated.





Tech Talk

Since the year 2000, the holes in Swiss cheese have shrunk. It turns out that Swiss cheese with large holes does not slice well in mechanical slicers, as the cheese tends to come apart. So in July 2000, the U.S. Department of Agriculture ruled that the size of the holes would need to be between 3/8 and 13/16 of an inch in diameter.

WHY DO PEOPLE CRY WHEN THEY CUT ONIONS?

An onion is a plant, and like all plants, it is made of cells. The cells are divided into two sections that are separated by a membrane. One side of the membrane contains a chemical called an *enzyme*; this helps chemical processes occur. The other side of the membrane contains molecules which have the element sulfur.

When you cut an onion, the contents on each side of the membrane mix together. This produces a powerful sulfur compound called *syn-Propanethial-S-oxide*, which rises upward toward your eyes. When the vapors reach your eyes, they cause a burning sensation in them. In order to wash this irritant away, your eyes begin to tear, and they continue to do so until they've successfully gotten rid of the irritation.

-Noe's Notes-

TEAR-FREE CUTTING TECHNIQUES

Aside from wearing safety goggles, there are a few ways of cutting an onion without the tears.

- Cut the onion under a stream of cold water. The sulfur compounds dissolve in water, so they will be rinsed down the drain and the vapors will be unable to reach your eyes.
- Place the onion in the freezer for 10–15 minutes before cutting it. Cold temperatures slow down the reaction between the enzyme and the molecules containing sulfur, so fewer of the burning molecules can reach your eyes.
- Have a fan blow the vapors away from you.

Hair, Hair!

Due to the high sulfur content in onions (sulfur is the necessary mineral for keeping hair, skin, and nails in good condition), people use this vegetable to prevent hair loss by eating onions, drinking onion juice, and smearing onion extract on their scalps.

Now, That's Punny!

Q: What do you get when you cross a potato with an onion?

A: A potato with watery eyes!

WHAT MAKES POPCORN POP?

Hot Popper

On average, a kernel will pop when it reaches a temperature of about 350° Fahrenheit.

Popcorn, also known as popping corn, is a special kind of corn that expands from the kernel and puffs up when heated. Popcorn kernels contain oil and water with starch, and are surrounded by a hard and strong outer coating called a *hull*.

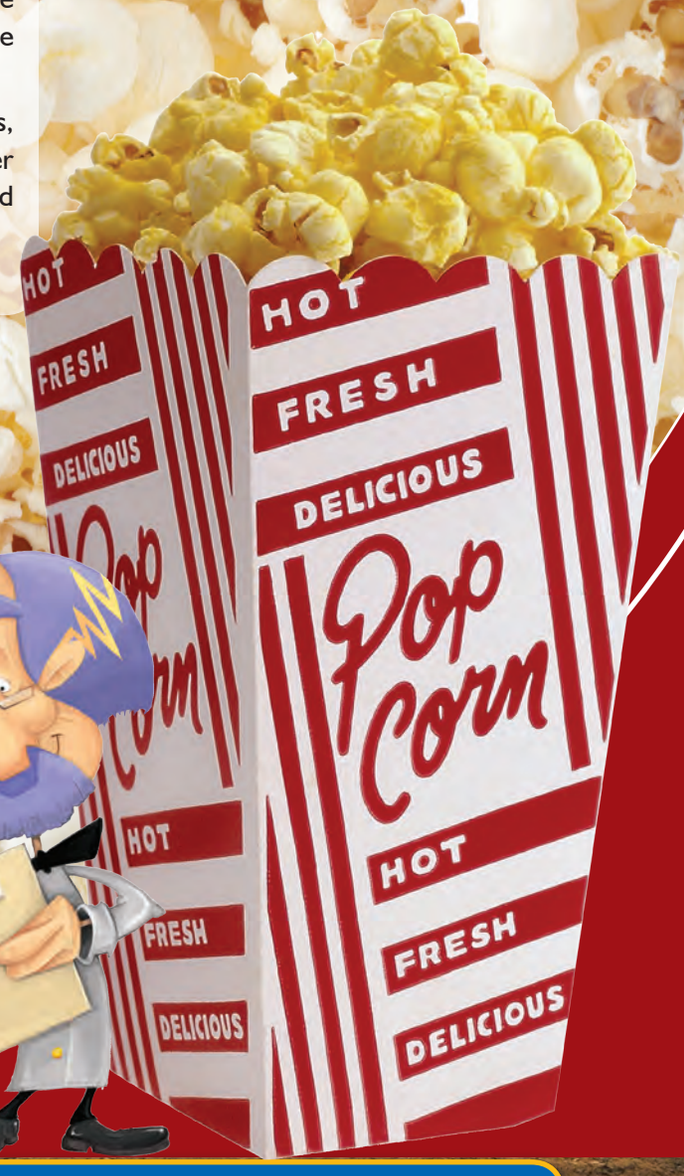
As the popcorn heats up, the water inside the kernel changes to steam and places great pressure on the hull, but the steam is unable to escape through the hull at this point. The hot oil and steam break down the starch inside the popcorn kernel, making it softer and more pliable.

The pressure continues to build, until the kernel finally explodes, breaking apart the hull and allowing the steam to escape. The inner starchy part bursts out at about forty times its original size and becomes the fluffy, airy popcorn we like to eat.

-Noe's Notes-

KERNELS OF TRUTH

- By volume, popcorn is America's favorite snack food.
- Popcorn has more protein than any other cereal grain.
- In ancient times, people would make popcorn by heating sand over a fire and then stirring kernels of popcorn in the hot sand.
- Popcorn is one of the six major maize (corn) types. The other five are pod corn, sweet corn, flour corn, dent corn, and flint corn. Contrary to popular belief, popcorn is not the only corn that pops. Many flint and dent corns also pop, but their flakes are smaller.
- Popcorn is a very healthy snack, as it contains large amounts of minerals, vitamins, and protein. The consumption of popcorn also helps build bone and muscle tissue and assists in digestion. Popcorn's health benefits are compromised, however, when too much butter, oil, or salt is added to it.



Calculated Cheshbon

Americans consume seventeen billion quarts of popped popcorn each year. That's enough to fill the Empire State Building eighteen times!

Science Project

See if you have what it takes to become a Junior Professor!
But before you begin, don't forget the Professor's safety rules.

SAFETY RULES:

1. **Ask for permission from your parents or teacher.**
2. **Follow the directions carefully.**
3. **Adult supervision recommended.**

Edible Science

Science applies to almost all areas of life, even to cooking and eating. Chemical reactions and changes are happening all the time in the kitchen, from bread rising to sauce thickening. Do the following project to explore the fascinating properties of eggs, and have some fun with science you can eat!

Note: This project requires adult supervision.

What You Will Need:

- Frying pan and stove
- Three bowls
- Egg
- Red cabbage (it's called red, but it looks purple!)

What to Do:

1. Chop half a cup of cabbage into a bowl, cover it with boiling water, and let it sit for ten minutes, until the water is dark purple. Strain out the cabbage, keeping the water.
2. Crack an egg and separate the egg white from the yolk by carefully pouring the egg from one half of the shell to the other over a bowl. (Or you can pour the egg into a slotted spoon over a bowl instead.) Set the yolk aside in a third bowl.
3. Mix a little cabbage juice in with the egg white. What happens?
4. Grease the frying pan and let it heat up a little. Then pour the egg white in.
5. Set the yolk in the middle of the egg white and finish cooking!

What Happened?

Red cabbage contains pigments called *anthocyanins*, which change colors when they come in contact with acids (liquids that are corrosive and have a sour taste) or bases (liquids that taste bitter and feel slippery or soapy). When the cabbage juice comes in contact with an acid (like vinegar), it will turn red, but when it is mixed with a base, it will turn bluish-green.

What does this project tell us about egg whites, then? Egg whites are a base (also called alkaline), and so they turn the red cabbage juice green.