A Closer Look at Blue Cheese and Swiss Cheese

by Claire Smith

Have you ever wondered why blue cheese is blue and what makes those holes in Swiss cheese? As it turns out, cheese production is one of the prime examples of helpful bacteria and mold at work. The structure of Swiss and blue cheeses depends on the bacteria or mold used to produce these cheeses.

A lot of us may hold the belief that all bacteria and mold are bad and not good for us. However this belief is irrational; only a small number of bacteria and mold cause disease and distress, leaving a great number of both that are actually harmless to humans. Bacteria can help humanity do many tasks, ranging from digestion of food to the breaking down of oil spills; molds also play a role in making our medicines and producing our food products.

Figure 1a

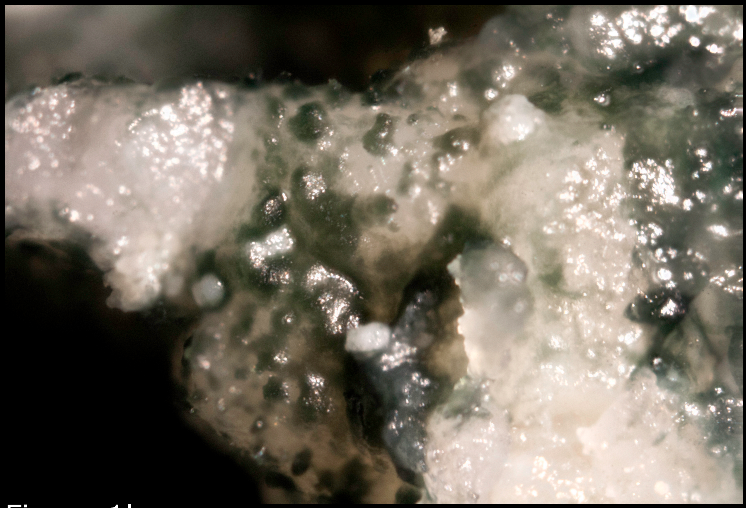

Figure 1b

The first blue cheese, as with most amazing inventions, was purportedly created by accident. The story goes that cow or ewe cheese was left in a cave accidently and later discovered swathed in harmless blue-green mold that gave the cheese its characteristic earthy taste.

It is now known that the cave contained a specific fungus that operates under low oxygen conditions, making it the perfect organism to grow within the cracks of the cheese, creating the characteristic 'blue' streaks (Fig. 1a). This mold is called Penicillium roqueforti for the famous caves in the town of Roquefort, France where blue cheese was traditionally allowed to take up the mold. Nowadays, most cheese makers inoculate the cheese with P. roqueforti spores during a process know as needling as opposed to letting the mold grow on the surface, but both techniques result in the blue veins that define blue cheese.

On the other hand, Swiss cheese owes its characteristic holes to bacteria. A certain group of bacteria called propionic acid bacteria, primarily Propionobacter shermanii, are the organisms responsible for the unique structure and sharp smell of Swiss cheese. These bacteria have the ability to break down the acetic acid in cheese producing propionic acid and carbon dioxide as end products of the process. The carbon dioxide produced by the bacteria creates bubbles inside the cheese, which when cut gives Swiss cheese the appearance of having holes (Fig. 2a).

Leaving the cheese to cure for longer periods of time leads to more production of carbon dioxide and the bubbles get larger, making bigger holes. Looking closer at the structure of Swiss cheese (Fig. 2b), you will notice that the bubbles closer to the edge are smaller than those in the middle. This is because the carbon dioxide has a better opportunity to leave the cheese body when it is produced close to surface of the cheese as opposed to the middle of the cheese.

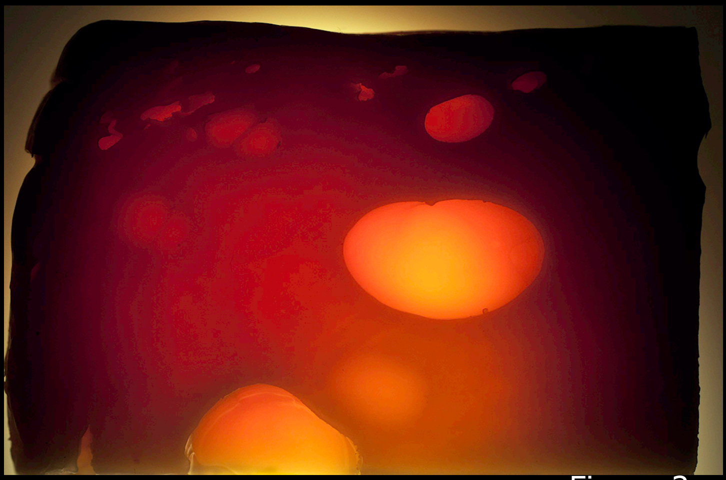
Figure 2a


Figure 2b

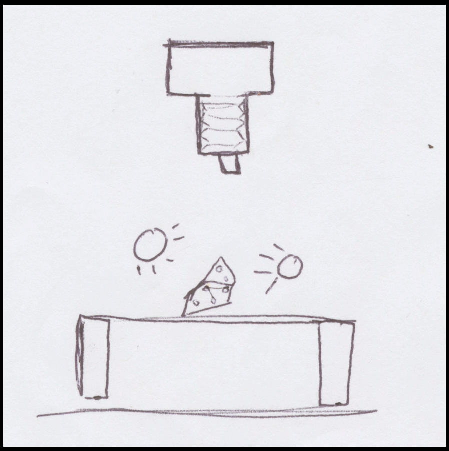
Figure 3

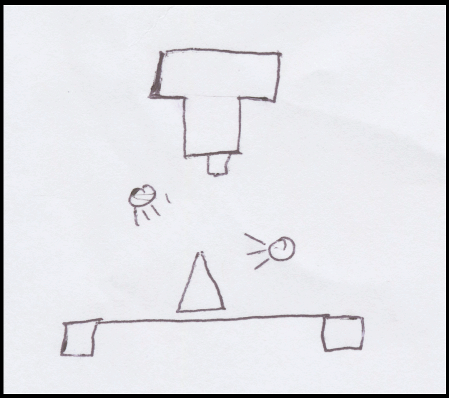
Figure 4

I had the following specimen preparation and lighting set ups to produce images of these two cheeses that emphasized their unique structure and texture.

To get the best images of both cheeses, I would recommend that any photographers seeking to reproduce my results work quickly. The blue cheese is prone to getting soft and oily under the heat of the fiber optic lights, which will cause it to lose good definition of the crevices that contain the P. roqueforti mold. On the other end of the spectrum, the Swiss cheese tends to dry out under the lights and look like a piece of plastic fake cheese.

For the blue cheese surface photographs(Fig. 3) I used a Canon 50 mm macro lens. For the lighting setup, I placed two fiber optic lights with ping pong balls over top of them to diffuse the light on both sides at similar angles in order to achieve even illumination of the specimen.

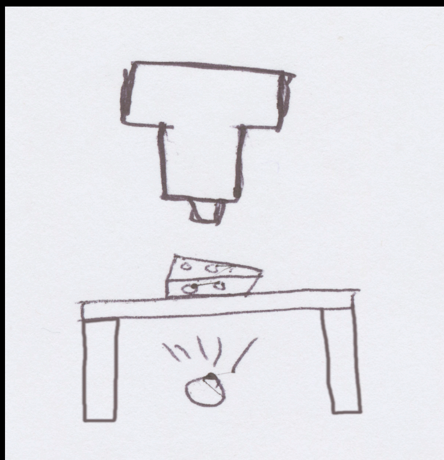

Figure 5

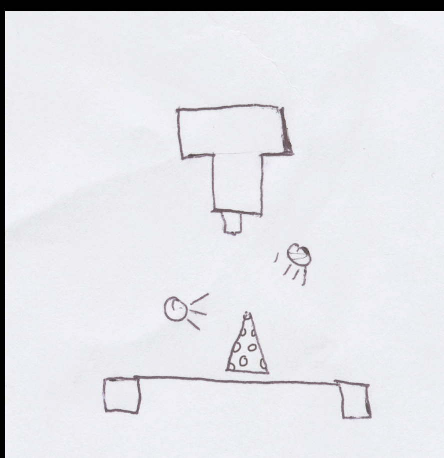

Figure 6

For the close-up photographs of the crevices of blue cheese (Fig. 4) I switched to using a Canon bellows system with a 20mm thimble lens. My lighting setup used the same two fiber optic lights with ping pong ball diffusers, but with one light placed directly above the crevice and the other somewhat perpendicular angle to the first light. This allowed me to get light into the deep crevices full of the all important blue green mold, as well as light the exterior of the cheese evenly.

For the Swiss cheese, I took two different approaches. The first entailed that I create a setup that send light through the subject to reveal characteristics on the inside (Fig. 5). To do this, I placed the cheese on white Plexiglas that was elevated by two wooden blocks. I then placed one fiber optic light underneath the Plexiglas in the region where the subject was lying on the Plexi. From here I captured an image using a 50mm macro lens.

In the second setup (Fig. 6), I continued to use the 50mm macro lens, but I changed my lighting. The setup was with one bare fiber optic light perpendicular to the subject and the other light with a diffuser set to light the interior of the holes.

My name is Claire Smith. I am a fourth year student in the Biomedical Photographic Communications major at the Rochester Institute of Technology in Rochester, New York. If you have found these images interesting and want to learn more about the process, I can be contacted via email at csmith792@gmail.com. Thank you for your time.

Sources used:

http://www.inspirationline.com/Brainteaser/cheese.html

http://www.squidoo.com/Blue-Cheese#module47649522

http://www.seriouseats.com/2010/02/what-microbes-make-cheese.html

http://www.gotcheese.net/swiss-cheese.php