The Building Blocks of Yogurt and How it is Made

Student Name

Course and School Name

Contact Information
Capstone Proposal

Does the introduction of different cultures effect the taste of Yogurt?

What is fermentation? How is it used to make yogurt?

What do you think affects the smell, taste, and firmness of a yogurt product?

If you made a yogurt culture using a starter that did not have live bacteria in it, what do you think would happen to the yogurt culture?

Are their different types of cultures used in making yogurt and do they effect taste and texture.

For my capstone I plan on researching the building blocks of yogurt and how it is made.

I then plan on learning how to produce yogurt in my home. Once I am able to make yogurt I will start experimenting with the different types of bacteria cultures available to determine if they effect flavor. I will also be experimenting with different fermenting times and fat levels to see if this also effects taste and texture. I will present my findings for the capstone fair, and include samples of my work.
THE BUILDING BLOCKS OF YOGURT AND HOW IT IS MADE

How Yogurt Works

People have enjoyed yogurt as part of their diet for centuries, but now it’s more popular than ever.

If you’ve been down the yogurt aisle at your local grocery store, you know that there’s a wide variety of styles and flavors to choose from. You can buy Turkish or Greek yogurt. Go non-fat or low fat. Organic, soy or frozen. Fruit on the bottom or fruit stirred in. Plain, blueberry, key lime pie. Some yogurts even claim to improve digestion or help you lose weight. How do you choose?

Of course, it hasn’t always been this way. The tangy mixture probably originated thousands of years ago, as early as 7000 B.C.E., in the Middle East. Back then, nomads carried milk in gourds or sacks made from animal skins [Chandan]. Without refrigeration, the milk would've warmed and curdled during the voyage. When the travelers arrived at their destination there it was -- sour milk. Bacteria already present in the milk transformed or fermented it into a thicker substance, giving it that tart taste that you might be able to distinguish if you can get past the jams and sweeteners used in most yogurts on the shelves today.

But the addition of sweeteners is partly behind the yogurt craze here in the United States. Sugars took away some of that sour bite, which prompted Americans to delve deeper into a product that other
countries were already in love with. In 1980, Americans ate more than 570 million pounds (258.5 million kilograms) of yogurt. In 2008, that jumped to 3.6 billion (1.6 billion kilograms) [source: Schultz].

Major yogurt companies eventually capitalized on the notion of yogurt as a health or functional food. This certainly helped the industry grow in a country that was becoming increasingly concerned with its waistline. So, are the claims of healthfulness warranted?

Yogurt Bacteria

To understand how yogurt works, you first have to understand how the bacteria in yogurt work.

The good bacteria in yogurt are often called probiotics. They come in the form of culture concentrates in certain foods, dietary supplements and fermented dairy products, like yogurt or cheese [source: WHO].

Probiotics are usually bacteria, but yeast can act as a probiotic, too. These good bacteria are used to ferment milk. Sometimes manufacturers add other bacteria that are not considered to be probiotic.

Your gut already has thousands of types of bacteria, whose job it is to aid in digestion. The good bacteria in a healthy system stave off any of the pathogenic, or disease-causing, bacteria. Together they're called our colonizing microbes, and each of us has a unique set. When you came into this world, you had very few bacteria in your little body. Breast milk is the first, and quickest, way to transfer essential microorganisms to a newborn. Development of gut microflora begins early and the makeup changes often, but maintaining the balance of good and bad is important in developing a mature immune
The same sort of balancing act is also constantly happening in other parts of the body. For example, a healthy number of lactobacilli live in the vagina and inhibit harmful bacteria. If the number of lactobacilli drops, a vaginal infection can occur. Some evidence suggests that eating yogurt may be a way to maintain that positive balance.

First, the bacteria must get through all that tough-to-survive gastric acid in the stomach and into the intestine. Many national organizations set minimum standards for the numbers of bacteria in yogurt. One of these is the National Yogurt Association in the United States, which requires 100 million bacteria per gram in products that carry the Live and Active Cultures seal [source: National Yogurt Association].

The truth is that probiotics have to be introduced in those numbers to survive the digestive process. Researchers are testing what is left in the stool to determine what specific strains might get through. Some say yogurt is a good vehicle for these bacteria because the food acts as a buffer against the acid. This way the bacteria may be protected long enough to make it through the gut. But there are other factors in play, too, including the other contents in yogurt and the way it's stored.

**How Yogurt Is Made**

Believe it or not, the basic method for manufacturing yogurt has been the same since milk curdled
in those animal skins centuries ago. On the other hand, the recent demand for low fat and fruity yogurts made with very specific bacteria do require a few changes to the basic process.

First, the manufacturer separates the milk into skim and cream. To make sure the yogurt will have a thick texture regardless of its fat content, workers evaporate some of the liquid from the milk. Yogurt is also thickened with the addition of stabilizers such as gelatin or milk powder.

Workers heat the now-fairly thick milk to kill off any harmful bacteria through pasteurization. High temperatures help thicken the product further, but heating the milk for 15 seconds at 171 degrees Fahrenheit is all that's necessary to kill any bacteria [source: Wolke]. Any cream still left in the mixture will naturally separate from the milk. Manufacturers homogenize the milk to disperse the molecules of cream, creating a consistently smooth texture.

Next comes the most important step in making yogurt taste like yogurt. The manufacturer pours good bacteria in, although the amount and specific type varies greatly from one company to another. If you were making your own yogurt, this is when you put in the starter culture, or a scoop of store-bought yogurt identified by its live and active cultures (LAC) seal. You'd leave it for a few hours to let the
microorganisms do their work. Heating the yogurt again will destroy these live cultures.

The bacteria work together to metabolize the milk sugar, or lactose, to form lactic acid, among other chemicals. After fermentation, which can take three or four hours, the mixture will no longer resemble the milk you started with. It'll be thick and creamy.

Finally, yogurt manufacturers add any sweeteners that are used in the product. Additives range from processed fruits to artificial sweeteners and are usually used to mask yogurt's acidic flavor.

Bacteria required for fermentation in yogurt in the United States are called Lactobacillus (that's the genus) bulgaricus (that's the species) and Streptococcus thermophilus. Manufacturers may also add Lactobacillus acidophilus. Lactobacilli are present in our intestines naturally, before we even eat a spoonful of yogurt. Adding them to yogurt helps replenish our supply.

What is it made out of?

Often, yogurt companies or production companies patent strains of bacteria and give them different names on the packaging. This can cause problems when it comes to studying yogurt's health effects. Researchers focus their efforts on specific strains, and their results often apply only to those strains. For example, the strain Lactobacillus GG (LGG) was tested in clinical trials. It showed promising
benefits for those with colon infection pseudomembranous colitis, which usually results from the use of antibiotics. In those clinical trials, LGG was also found to be helpful for children with atopic eczema [source: Wallace].

**Yogurt and Nutrition**

For being so tiny, probiotics have created quite the stir in biological research. Some companies maintain that probiotics stop a proliferation of unfriendly bacteria that otherwise might result in bad breath (from periodontal disease and tooth decay), and certain kinds of infections. Also, probiotics may help replace some of the good bacteria that have inevitably been killed off by antibiotics that you take when you’re sick.

Microbiologists are studying all of these claims in depth, especially since yogurt consumption is up, but there has not been enough research on most strains to be conclusive. However, there’s some promising evidence that they may help the immune system and reduce the risk of diarrhea.

As we know, bacteria in yogurt give it that special taste. They also break down the lactose in the milk. So, for the 30 to 50 million people who have trouble digesting that milk sugar, yogurt is a great way to get enough calcium. Another way to go if you’re lactose intolerant would be to eat soy yogurt, which has also been fermented with live cultures. However it usually does not have as much calcium as milk-
Yogurt also includes riboflavin, potassium, vitamin D and protein, among other nutrients.

Speaking of protein, if you want more of it (the Institute of Medicine recommends about 8 grams of protein for every 9.1 kilograms of body weight, per day), traditional, full-fat Greek yogurt is probably your best bet. It has a less sodium, fewer carbohydrates and a creamier taste because it's strained to remove most of the whey -- that liquid that settles on top of the curd. Go for the low fat Greek yogurt if you're watching your weight.

A study in the International Journal of Obesity says that low fat yogurt may help you lose weight. Researchers found that the dairy product sped up the body's fat-burning ability. The main finding in this and other research articles like it is that if you're substituting low fat yogurt for a fatty meal or snack, you can probably lose weight. If you're snacking all day long on whole-milk yogurt or yogurt-covered raisins, it's not. (By the way, the "yogurt" in yogurt-covered raisins is mainly sugar.) The National Dairy Council recommends three servings a day of low fat or fat-free dairy to help support weight loss (National dairy council, Feb. 22, 2012)

As with any food, if you're worried about calories, you should check your yogurt's label. The same is true if you try to avoid artificial sweeteners. The light or no-fat versions are made with aspartame,
sucralose or saccharin. And even those versions often contain a good deal of sodium to preserve the yogurt.

You can avoid eating preservative-laden yogurt simply by learning how to make your own. And you can use yogurt as a substitution for oil or butter when you bake.

**Yogurt History and Culture**

Yogurt has long been a part of most people's diets in India, Asia, North Africa and Eastern Europe. In India, it's made from buffalo milk. It's now sometimes served with cucumbers, cilantro and other spices as a side dish known as raita. The cool ingredients soothe the tongue after a spicy bite. Plain yogurt in India is dashi, Turkey's is jugurt or eyran and in Greece it's tiaourti. You may have had an opportunity to try tzatziki, which contains cucumbers as well.

It wasn't until the early 20th century that Ukrainian immunologist Dr. Ilya Mechnikov determined that the acidic bacteria in fermented milks might be beneficial. He even connected yogurt to the longevity of Bulgarian peasants. In 1922, Danone began producing yogurt commercially in Europe. Sweden still consumes more than five times the amount that Americans do, which, in 2007, was 11.5 pounds (5.2 kilograms) per person per year [source: Agricultural Marketing Resource Center].

Marketing efforts have convinced us that even the sweetest-tasting yogurts aren't so bad. The frozen
varieties are an alternative to ice cream. Don't be fooled, though -- only some of the milk in frozen yogurt has been fermented. It's usually 4 to 1, ice milk to yogurt, and that yogurt might have been made with whole-fat milk or even cream. With only one part yogurt, probiotics are often not plentiful in regular frozen yogurt. Recently, though, there has been a surge of frozen yogurt shops, including Red Mango, Yogen Früz and Berry Chill, who all market the probiotics within their products and don't use ice milk.
References


