How is cheese made?

October 24, 2022

Jane 00:21
This is But Why: A Podcast for Curious Kids, from Vermont Public. I'm Jane Lindholm. On this show, we take questions from curious kids all over the world. In fact, we've gotten more than 10,000 questions from kids in more than 90 countries and it's our job to find answers to all the things you want to know about. Today, say cheese!

Sound Effect 00:44
Camera shutter clicks

Jane 00:45
We're actually not talking about cameras, or taking pictures. We're going to be talking about cheese. What is it? How is it made? And why are some people okay with eating cheese that smells like dirty socks and has mold on its rind?! You've sent us a lot of questions about this fascinating and culturally important food. So today, we're going to go on a cheese factory tour to learn more.

Jane 01:11
Before we get started, let me give you just the briefest history of cheese. Humans have been making cheese for thousands of years, probably for almost as long as we've had domesticated animals. Cheese is a way of taking fresh milk that goes bad pretty quickly and preserving it or storing it so you can eat it for longer. Sometime, way back when, someone figured out that adding rennet--an enzyme--to milk could make that milk curdle, or form curds. Add some salt and flavoring, and you've got delicious cheese!

Jane 01:45
Since its initial discovery, the making of cheese has spread all over the world. Different cultures make different types of cheeses, and some regions are known around the globe for their specialty cheese. In fact, for some types of cheese, you're only allowed to call it that cheese if you're making it in one specific part of the world. Like Parmigiano Reggiano in one part of Italy, or, until recently, Gruyere in France and Switzerland.

Jane 02:12
Here in the US, where we are based, the two most popular types of cheese are mozzarella and cheddar. Did you know that the average American eats more than 40 pounds of cheese per year? That's a lot of cheese. But that's nothing compared to those of you who live in Denmark, Iceland and Finland, where people eat an average of more than 60 pounds every year! And France isn't far behind.
Jane 02:39
I think some of you are as into cheese as I am, because we've gotten a lot of cheesy questions from you over the years. So, for today's episode, we're going to get some answers.

Gabe 02:51
I'm Gabe. I live in California, Alameda. I'm five years old. How do they make cheese?

Runah 03:01
My name is Runah. I am six years old. I live in Marietta, Georgia. How is cheese made?

Jane 03:08
We knew a place right near us here in Vermont that makes cheese that winds up getting sold all over the US and beyond. So we asked them if we could come take a look at how they do it. And they said yes. Melody and I drove over to the Cabot cheese factory in Cabot, Vermont to learn more.

Maegan Olsen 03:24
My name is Maegan Olsen and I am now the QA manager for the Cabot campus. But I have been at Cabot making new products, working in research and development, for the past 14 years.

Panos Lekkas 03:39
Panos Lekkas, and I'm the plant manager for the Cabot manufacturing facility for Agri-Mark.

Jane 03:45
Okay, so do you want to take us through the steps of how you make cheese?

Maegan Olsen 03:48
You're gonna start with milk and we use all cow's milk here in Cabot, but you can also use goat milk and sheep milk and buffalo milk to make your cheese.

Jane 03:58
We wanted to see what they were talking about. So Maegan and Panos gave us a tour. Before we got started, we had to put on a big white coat (it made us feel like scientists) and some coverings for our shoes and a covering for our hair. You definitely don't want a hair in your cheese, do you? Panos also handed us some earplugs because some parts of the factory are really loud.

Jane 04:22
We started at the beginning. And the beginning for the Cabot factory is when the farmers in the cooperative collect all the milk they've gotten from their cows and drive it in big silver tanker trucks right to the factory. In a factory setting like this, milk goes through a lot of tests to make sure it's safe to use. The first test happens even before the milk is loaded off the truck, when it gets checked for bad bacteria and antibiotics. You don't want those things in your milk.

Jane 04:51
So right now we’re looking at the back end of a big truck and there’s what looks like a big hose at the end of the big truck. How do they get the milk out of a milk truck?

05:00
So the end of that hose is connected to that big pump. And that pump is what basically throws out the milk and puts it in the silo. We pay extreme attention of how fast we do that because it will shear the proteins. So we want to make sure that we don’t do it too fast, but not too slow.

Jane 05:17
You don’t want a milkshake.

Panos Lekkas 05:19
No, no milk shakes required right now.

Jane 05:22
And is this milk pasteurized or raw milk that came straight from the cow?

Panos Lekkas 05:26
That’s an excellent question. That is raw milk right now. It will get pasteurized later on in the process.

Jane 05:32
Once the raw milk is cleared to use, it's pumped into big tanks inside the factory and undergoes an extra safety step called pasteurization. To pasteurize the milk, it gets heated up really fast, to kill off any lurking bad bacteria, and then cooled down really fast, so it doesn't cook.

Panos Lekkas 05:51
This is the control panel for our pasteurizer. Okay, milk comes in here and goes into this balance tank, okay. Then it goes through that structure over there. One has a cooling structure, the other has a heating structure, and the milk that comes in cools the hot milk that comes out.

Jane 06:11
So now the milk is ready to be made into cheese. Something called a starter culture is added at this point. Starter culture is actually bacteria. But this time it's good bacteria, the bacteria that starts to turn the milk into cheese.

Jane 06:25
I think it might surprise kids to learn that there is a difference between good bacteria and bad bacteria. And we think, often, because we have to wash our hands, we don't want bacteria, that bacteria is bad. But you need bacteria for really good cheese!

Panos Lekkas 06:41
Absolutely, definitely. And that’s, I think if we take cheese as as what it was, it was a conservation of protein, and probiotics, right? That's what it started for. And it was a method back in the day, 3000 years ago, to actually preserve this source, this high protein source, of food for us. By the same token,
we wanted to probiotic bacteria to come in. And that's how we figured it out. Ah, we didn't figure it out; 3,000 years ago figured it out!

Jane 07:13
Before there were any factories.

Panos Lekkas 07:15

Jane 07:18
You can think of the bacteria kind of like Pac Man or a Hungry Hungry Hippo. These bacteria are very small living cells that just want to eat specific things in the milk.

Maegan Olsen 07:29
That bacteria is going to eat the milk sugar, which is called lactose, and that's going to create lactic acid which is going to drive down our pH and help make our cheese curd but also give a lot of flavor.

Jane 07:42
Maegan said the bacteria drives down the pH. pH is a measurement of how acidic or basic something is. But here's a less scientific definition:

Panos Lekkas 07:53
When you bite an apple versus biting a lemon, okay, so the apple is going to be a little bit tart but it won't really make you squint your face. But the lemon is going to basically say, "I don't want to eat that again." So acidity is that: how acid, how sour, basically, we we have achieved.

Jane 08:16
Milk is just a little bit acidic, but the cheese Cabot is producing is a little bit more acidic. It has a little bite to it. Not sour like a lemon but kind of sharp, you know? So the bacteria helps change the chemistry of the milk.

Jane 08:30
The next step is coagulation. Coagulation is the process of turning a liquid into a semi-solid or solid. We definitely don't want to drink our cheese! So this part is really important. Plus, remember, cheese was originally made as a way to make milk last longer so people could have a way to eat it later. So to get the milk to coagulate, rennet is added. Rennet is an enzyme that helps make that big huge tank full of liquid acidic milk turn into a kind of gel.

Panos Lekkas 09:03
We're gonna go into the cheddar room, now. Okay, we're gonna start with the vats.

Jane 09:08
The cheddar room is my favorite because I really like cheddar.
Panos Lekkas 09:11
We fill each vat in sequence. Then we will add our starter, which we talked a little bit earlier. Then we will add our rennet. And all of that is going to basically make what we call the gel.

Jane 09:27
When Panos says it makes a gel it really does look like a gel. Definitely not fully solid like you would expect from, say, cheddar cheese. So once it's in its gel form, there are big knives inside the tank that get turned on and start cutting up that gel. What that does is separate the solid bits from the liquid bits. The knives start cutting up the gel and the tank gets heated up and the solid chunks called curds separate from the liquid which is called whey. (W-H-E-Y.) Those curds turn into the cheddar and the whey is kind of left over.

Maegan Olsen 10:02
Milk will, for cheddar, will give us about 10% yield. So 10% of that incoming milk will go into cheese and the 90% that's left over will go into whey. So that is a ton of whey that we have to find a home for.

Jane 10:19
Cabot makes protein powder from the whey so it doesn't go to waste. If your stomach is starting to rumble and you're ready for a grilled cheese sandwich right now, don't worry, we're getting close, but you're not going to want to skip the next step. That's when salt is added. Salt gives the cheese curd some good flavor and it also acts as a preservative meaning it helps the cheese lasts longer. Sometimes other flavors like garlic or pepper will be added at this stage, too. Now, some people will just eat those cheese curds, popping them into their mouth one at a time. But most of us like to slice our cheese. So they have to press those curds into big solid blocks. If you were making cheese at home, you could use a small cheese press. But at Cabot, they pump all those curds into towers, and all that pressure for more and more and more and more and more cheese curds going into the towers helps smoosh it down and they use lots and lots of pressure to create a big solid hunk of cheese. And then they cut that cheese into 40-pound blocks. As those cheese curds are pressed together, any last bit of liquid whey gets squeezed out and the resulting block of cheese looks a lot more like that solid brick you might recognize, just a lot bigger. In some factories, they even make blocks of cheese that weigh as much as 680 pounds. Try putting that in your shopping cart!

Jane 11:46
The last step in making cheese is maybe the hardest one of all, because it means you just have to wait. Some cheese, like mozzarella, is eaten fresh. But cheddar and other types of cheese, especially hard cheeses gets aged. Sometimes for years. The big blocks or wheels of cheese sit in a cold dark storage room, or sometimes a cave, until they're at peak flavor and ready to get eaten.

Maegan Olsen 12:13
With time comes some extra flavor compounds that can be developed and things get broken down.

Jane 12:19
The older a cheese gets the stronger its flavor. It kind of gets more cheesy. The texture also changes with age. Cheese can get more crumbly as it gets older. In a cheese factory like Cabot there's even
more testing to make sure that cheese tastes exactly right and that no bad bacteria has crept in while that cheese was resting. And then if it's deemed high quality, it gets packaged up in those smaller bricks or shredded packages or whatever way you like to eat it and sent out for you to buy at the store. Yum! Coming up: more cheesiness! We'll learn why cheese doesn't all taste the same, even though it's made from the same ingredients.

Jane  12:58
This is But Why: A podcast for Curious Kids. I'm Jane Lindholm. Today, we're learning all about how cheese is made. We visited the Cabot cheese factory in Cabot, Vermont to see how they make their cheddar. But there are lots of different types of cheese, hundreds, maybe thousands of kinds. Some cheeses are hard and some are soft, some are white, some are orange, some have blue streaks in them And they all taste different from one another.

Emily  13:25
My name is Emily. I am nine and a half years old. And I live in Manhattan, Kansas. And my question is: why do cheeses have different flavors when they're all made from milk?

Fischer  13:39
My name is Fischer. I'm from Toronto, Canada. And my question is: what's the difference between every type of cheese and how is cheese made?

Jane  13:52
Maegan Olsen from Cabot Cooperative says it all depends on the cheesemaking process and the types of ingredients you add, from different starter cultures to other things that get added later.

Maegan Olsen  14:02
Cheese can have different flavors for a ton of different reasons it can be the season, it could be the cow or the animal that the milk is coming from. So sheep milk cheese will taste a lot different than cow's milk cheese. It can be because of those good bacteria cultures that are added. If it's made from raw milk, if it's made from pasteurized milk, those can taste really really different. And just you know, different steps during the day, like who was making the cheese can have an impact. The plant that's making the cheese gonna have an impact. So like I said, cheese from Vermont will taste different than cheese from California, and cheese from England. They all taste different based on those animals and that process.

Jane  14:42
And then you sometimes add lots of flavorings, too. You mentioned you can add garlic or you add different kinds of herbs in some cheeses. There's a cheese that I really liked that comes from Wales that has mustard seed in it. Some people put cranberries or like jam in there too. You can add up lot of different things and get lots of different cheese flavors.

Maegan Olsen  15:02
Exactly. And then for blue cheese, you can either add blue mold to the outside or the inside of the cheese. You can use different milk. So there's a lot of different things, different recipes, different tweaks to those can give you a lot of different types of cheeses.
Should the kids tell their parents that their parents are eating mold?

Maegan Olsen 15:23
I'm proud of it. It's good mold. Yeah, exactly. It's like good bacteria.

Panos Lekkas offered another way that cheese can be different from one place to another.

Panos Lekkas 15:32
So I will say the difference between every kind of cheese is where it's coming from and the culture behind it.

Culture is a fun word choice. In this case, Panos was talking about a difference in how people in different places like and make their cheeses. But culture can also refer to the bacteria in the cheese, as we learned earlier. For some cheese's, the taste can change based on the landscape, the weather, what the animals have been eating. Cheese can even taste different depending on the season it was made, usually because the cows are eating different things in the spring than they might be in the fall. And sometimes the way a cheese is packaged, like if it comes in a really big, has to do with things like government taxes.

And one of my favorite stories about his why Alpine cheeses are so huge, and their wheels, you know, they're like big, big kind of wheels of cheese. And that was because back in the day, the government used to charge them by the wheel. So instead of making 10 wheels, they made one big one. So that's that's pretty much it. And that's what it was. So I think that's, that's one of the main differences. And the other one is how their aged. Soft cheeses need to be brushed. You know, they need to be and form the mold, as we say, or the fungus outside. Our cheeses here need to be aged in a very good environment. There are, you know, other cheeses that have, you know, dipped into wax to maintain their freshness. That's that's pretty much it.

Rosie 17:04
Hello, my name is Rosie. I'm seven years old and I'm from Pittsburgh, and my question is: how do you make Colby Jack cheese?

What is Colby Jack cheese and how is it made differently than...cheddar?

Maegan Olsen 17:16
We have a plant in New York that makes Colby Jack cheese and they make a vat of Colby cheese. So that's that orange cheese. The moisture is a kind of in between that of cheddar and Monterey Jack, which has a little bit higher moisture. So they make a vat of that and they'll make a vat of Monterey
Jack. And they'll mix them together. So they press the white curd from the Monterey Jack and the yellow curd from the Colby together and they get a really cool marbled look.

Jane 17:46
Does orange cheese come from orange cows with orange milk?

Maegan Olsen 17:51
Orange is my favorite color. So I wish that there were orange cows with orange and milk. But no, we add a natural color called anato to our cheese. And it's a super, super concentrated color. So it would really stain your skin if you touched it. But we put just a tiny amount in our cheese milk, and then we end up with yellow cheese at the end. And we make both white and yellow cheese at Cabot.

Jane 18:17
Let's pause on that question of orange cheese for a moment.

Evelyn 18:21
I'm Evelyn from Maryland, and I'm six and a half. How does cheese get its color?

Jane 18:28
Maegan explained that for the orange cheese made by Cabot and lots of other orange cheeses natural colorings are added during the cheesemaking process. But panels told us that, historically, cheese got its orange color. Another way, too.

Panos Lekkas 18:41
It's the feed that the cows used to take. And that's what it was basically now.

Jane 18:48
And is that why people still make orange cheese, because it mimics the old fashioned cheese?

Panos Lekkas 18:52
Pretty much. It can be, again, based on the feed, based on the cow, as in the breed of the cow, based on the area that has been fed based on the way it was milked sometimes, it will add different things to eat that is going to change its physical...

Jane 18:55
...characteristics.

Panos Lekkas 18:55
There you go. Physical characteristics.

Jane 18:59
But most cheese is kind of an a white or off-white or cream colored or that can be slightly darker, almost to that sort of yellowy. But there's no cheese that's naturally purple.
Panos Lekkas 19:27
Naturally purple? No. But there is one, right, that we did get an orange rind that's because of the bacterium that gives it that. That's the Meunster right? Yeah.

Jane 19:40
And of course with that blue cheese the mold is actually blue.

Judah 19:44
My name is Judah and I live in London, Washington, and I'm five. And my question for But Why is: why do you say cheese when you take a camera? (Adult: a picture.) Picture.

Panos Lekkas 20:00
(Chuckling) Uh...I'm not...uh, I think it has to do with the double ee at the end.

Jane 20:05
You mean because you want people to have a smile on their face and when you say cheese...

Panos Lekkas 20:08
It's about this this old aids that makes your, gives you that goodness that we talked about earlier and we want to smile every time we actually eat the cheese and I think that's that's pretty much it.

Jane 20:19
So Panos thinks cheese is so good, it makes you smile just to say the word. He comes from a long line of cheesemakers, so I guess cheese really must make him happy. But we tried to get to the bottom of this question more scientifically. And it seems no one is really sure. Photography really only became available to most people in the middle of the last century. In the early days of photography, most people never even got their pictures taken because it was rare and expensive. And when they did get their pictures taken, they didn't smile. It just wasn't done. At some point people started smiling. And at some point they also started saying cheese. And most historians think those two things are connected. Like Panos said the double E in the word cheese makes you pick up the corners of your mouth and look like you're smiling when you say it. In a lot of other languages, the instruction might not be, "Say cheese!" But it's often something that requires you to smile to say the word. But I wonder now that people have cameras on their phones and they take pictures all the time, sometimes several per day, do we still tell people to say cheese? What do people say when they want you to smile for a picture? We'll leave you with that "cultural" question. Thanks so much to Panos Lekkas and Maegan Olsen and the whole team at Cabot Cooperative for letting us come pay a visit. If you have a separate question about anything at all, have an adult record it. It's easy to do on a smartphone using a voice memo app. Be sure to tell us your first name, where you live and how old you are, as well as your question. Then your adult can email the audio file to question@butwhykids.org. We can't wait to hear what's on your mind. But Why is produced by Melody Bodette and me, Jane Lindholm, at Vermont Public and we're distributed by PRX. Our theme music was composed by Luke Reynolds. We'll be back in two weeks with an all new episode. Until then, say cheese! I mean, stay curious!