

But Why: A Podcast for Curious Kids

How is meat made in a lab?

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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 just like you, and we go out and find the answers. We got a recent question about a new technology that one of you finds intriguing:

Nate 00:40

Hi, my name is Nate. I am 10 years old. I am from Westfield, New Jersey. My question is, how is meat made in a lab?

Jane 00:48

Did you know that meat can be grown in a lab? Most of us think of meat as coming from animals like cows or pigs or chickens that were once alive, not something that can be made in a laboratory or factory. And for most of human history, that's totally true! But advances in technology have led scientists to find ways to grow meat. We're not talking here about plant based foods that taste like meat, we're talking about living animal tissues that were grown in a petri dish inside of a laboratory instead of running around on four legs in a barn or field.

Jane 01:24

We should start today, though, by acknowledging that not everyone eats meat. Some people choose to be vegetarian for moral, cultural or religious reasons. And for other people, the idea of meat grown in a lab might make you feel a little grossed out. But today, we're going to investigate with one scientist who's working on making lab grown meat for a reason. She wants to solve some big problems with our global food system. We took a field trip to see Rachael Floreani at her lab at the University of Vermont.

Rachael Floreani 01:56

I am a teacher. I am a scientist. And I'm an engineer,

Jane 02:02

Rachael runs something called the Engineered Biomaterials Research Laboratory. That's a really big name, but she has a pretty simple way to describe what she and her colleagues focus on.

Rachael Floreani 02:13

How do we solve the world's problems creatively?

Jane 02:19

Now I want to go work in that lab, don't you? Rachael and her team take problems that need to be solved and think about ways they can use engineering and creativity to make new materials that can help solve them.

Jane 02:31

It might help to back up here for a minute and break down a few words. Bio means life. And biology is the study of living things. Engineering is basically using science and math to make things. So biological engineering or bioengineering is using science and math to make things that can be applied to living things. Sometimes bioengineering is a way to make a new technology that mimics or copies the way living things work. And sometimes it's applied to living organisms to make them do new things.

Jane 03:04

There are lots of ways bioengineering comes into our daily lives already. If you need, say, a prosthetic arm or leg to help your body do things like walk or grab. That's an example of bioengineering. Some of the medicines or ways doctors and nurses help us when we're sick are also bioengineered materials. And some of the food we eat involves bioengineering, changing the way the food is grown in a way that wouldn't be possible just through breeding. So Rachael is using the ideas of biology and engineering to solve problems, like how to make environmentally friendly alternatives to plastics, or how to make more efficient and effective treatments for illnesses like cancer, and how to help fix some of the problems with our food system. Specifically, how we currently raise and slaughter animals to get the meat we eat.

Rachael Floreani 03:57

There's multiple limitations with our current food system, or how we grow, distribute and eat food. The biggest reason I'm doing this is food insecurity. So the idea that there are children around the world that live in countries where the food that is grown there is shipped to richer countries to feed the animals that we eat. And even though we could talk about the environmental impact--so cows, they burp, and they fart a lot, really--I just want to try and make more food the best way that I know how, which is in a lab so that less people have to go hungry.

Jane 04:40

When you say there are places where food is grown, and then it gets shipped to other countries to be fed to animals, you're talking about things like grains or other things that are fed to cows, for example, since we're talking about meat. And then those cows are slaughtered and become the food that we eat. But that means that that food that's grown on all of those fields isn't going to help people who might need food in the country where it's grown, which sometimes is the US.

05:11

Yeah, and meat is associated to multiple cultures and religions all around the world. And so we're not necessarily asking people to set aside their beliefs or their culture or their families. But one thing we need to consider is that there's so much food out there that is nutritious that doesn't come from animals. And in fact, if you think about it, the animals eat that food. So it has to be good for animals. And yeah, we're talking about wheat, soy protein, bea--pee--peas and beans, I can't get it out. Yeah.

Jane 05:50

One of the things that is a challenge for people who are looking at environmental problems in our world right now is how much energy it takes to grow a cow or a pig. And how challenging that is when we think about things like climate change, but also when we think about how we want to use our land and

use our resources. And so is one of the things that you're trying to do to help make sure that we don't have to use so many resource resources, just so people who want to have a burger can have a burger?

Rachael Floreani 06:24

Yeah, and resources can mean different things to different people. Depending on where you live, the land use is a big issue. And if we were to continue on the same trajectory of how much we eat meat, we will need over 100% more land. And that is not possible.

Jane 06:40

There are lots of issues with how we consume meat in the modern world. As Rachael noted, sometimes land that could be used to feed people gets used to grow plants that become food for animals. And the meat industry is a significant share of our global carbon emissions, which drives climate change. Plus lots of animals that are raised for their meat don't have very good lives. So you might be asking now the same thing this listener did:

John 07:06

Why do people have to eat meat? My name is John, I'm five years old, and I live in California.

Jane 07:18

People don't have to eat meat! And lots of people don't. If you don't eat meat, you might call yourself a vegetarian. And if you don't eat any animal products, including things like milk, or eggs, maybe even honey, you might call yourself a vegan. Lots of people agree we should eat way less meat, even if we're not vegetarians. But everyone becoming a vegetarian or even mostly vegetarian doesn't seem likely very soon.

07:43

I do understand where those people are coming from. But I also don't know if those people have traveled around the world and seen how important food is to cultures. And even one of my students in the lab who's working on this, he's from Pakistan, and he grew up eating meat, it was part of their culture. So to just tell people to set aside, I just ask those same people could you do without turkey on Thanksgiving.

Jane 08:08

In fact, meat consumption (that's how much meat we eat) is going up around the world. That's what Rachael meant about needing 100% more land if we keep going the way we are now. So Rachael is one of the people trying to come up with a different way to make meat that doesn't cause all of the same issues our current model does. And what she's doing is growing meat right there in her lab. They do still start with a living animal. But instead of killing the animal, they just take a few of its cells.

08:35

It's actually a medical procedure. So a veterinarian will numb an animal in the area where we're going to take the cells. They will stick in a needle and pull out some of that tissue and it doesn't hurt the animal, they're fine. And then we can take that small little piece of muscle into the lab. And we're able to

isolate those living things out of the tissue, those cells, and then once we start putting them on our material, they just grown they grow and they grow.

Jane 09:04

What you eventually grow though, doesn't look like a pre made hamburger. What does it look like?

09:10

It looks like a sponge that's red and has meat on it. It looks like a sponge that's been grown but it has meat on it. I don't know how else to explain that. But um, that that's essentially what it looks like.

Jane 09:28

Wait, a sponge with meat on it? Hmm. Let's break it down. First, they take those special cells from a living animal. Then they have to grow those cells so they put them in a soupy mixture that kind of feeds them. It allows the meat cells to divide and multiply. Rachael took us to an isolated part of the lab where they grow those cow cells. She opened the door and pulled out a little clear rectangular container with a thin layer of liquid.

09:55

How we grow our cells, almost like an oven. Everything in here really resembles something from the kitchen. So these are our flasks, and you can see our soup happens to be pink.

Jane 10:06

Kinda looks like cranberry juice or fruit punch.

Rachael Floreani 10:09

That's right. And then if I show it up there, you can see like, it's kind of cloudy on the bottom. That is a layer of muscle cells.

Jane 10:20

To be totally honest, there wasn't really much to see at this point. It just looked like a container with some pink liquid in it. But over time, the muscle cells will start to grow, and then they need a structure to grow on. That's where the sponge comes in. Rachael makes the sponge out of edible materials, but you might be surprised which ones.

Rachael Floreani 10:39

Firstly, we use a seaweed. So we actually take a powder from seaweed and mix it with water and it kind of looks like snot. I don't know. I mean, kind of right.

Jane 10:51

It's a clear gel.

10:53

Yep, pretty viscous. Almost like honey. That's probably a nicer way to say it. Well, kids know snot. And then we have curdled milk.

Jane 11:04

Okay, so we have seaweed and we have curdled milk. And you're using those to create a gel.

Rachael Floreani 11:09

Yeah, we're using those to create a gel.

Jane 11:12

Once they have their gel created, they actually need to get all of the liquid back out of it. So they use a special machine.

Rachael Floreani 11:19

It is called a lyophilizer

Jane 11:21

Lyophilizer. I love that word, lyophilizer. How do you spell that?

11:28

L-Y-O-P-H-I-L-I-Z-E-R. So it is that very loud, rattling machine. But what it can do is it can take something that's liquid and frozen, like ice cream. And that machine will take all of the ice that has all the water that has crystallized and formed, that frozen, all that ice. This machine will take that ice and instead of melting it, so you have your melted ice cream all over the place, is it sublimates that water, which means it goes directly from the solid to the gaseous phase. So now when I turn off that machine, if I were to pull out my ice cream, it would still have that shape. That's how they get astronaut ice cream.

Jane 12:16

I was gonna say that just sounds exactly like astronaut ice cream, which is kind of just dehydrated ice cream, essentially.

12:23

That's right. And if we wanted to take that whole process and spray a bunch of ice cream, then you'd have Dippin Dots. Yeah, that's how we make that's how we make the sponges for our meat.

Jane 12:36

So the same process that makes Dippin Dots makes a nice dry seaweed and curdled milk cracker. Mmm, yum, right? Not so much. Instead of popping those wafers or crackers into your mouth, they actually serve a different purpose. They become the scaffolding for the meat to grow on. Think of it kind of like this: the liquid that contains those animal cells is kind of like a soup. And those dried wafers are like crackers. You know how when you drop a bunch of crackers into your soup, they swell up and get soft and full of delicious broth? It's kind of the same thing. The wafers absorb the broth, and then they provide a structure for the meat cells to grow on. Or to put it another way:

13:15

What we're doing is taking those cells out of the animal, putting them into this material that we made, and trying to grow that muscle. And what's nice is now instead of getting, I don't know, let's say 100 hamburgers from our cow, Betty, now we could make a billion hamburgers from Betty. All we need is the cells and they grow and they grow and they grow.

Jane 13:38

And that's where the potential solution to the problem we have with meat starts to come in. If companies can grow a lot more meat using a lot less land and fewer resources, that can help the environment and clear up land for people to grow other things or to live on. There are those still lots of questions about how much energy it will take to make meat this way if it ever starts happening at a really big scale. But Rachael is already starting to imagine some big possibilities.

Jane 14:07

Coming up: could you already be eating meat that's grown in a lab and not even know about it? Spoiler alert: no! It's not legal to sell lab grown meat in most places yet. And what might the future of cooking meat at home look like? Stay tuned.

BREAK 14:22

BREAK

Jane 14:23

This is But Why: A Podcast for Curious Kids. I'm Jane Lindholm. We're learning about lab grown or cultured meat today with Rachael Floreani at the University of Vermont. I have a question for you: Do you think you would ever eat lab grown meat? Might sound kind of weird, right? But there are lots of things we eat that are made in factories. And as we think about how to feed the world while our population continues to grow, and as we work on trying to reduce the number of people who don't always have enough food, researchers are doing all kinds of experimentation. But as these new ways of growing our food are starting to be developed, one question is how we make sure people know what they're eating and where it came from, and can make an informed choice about whether and how they'd like to eat it. So what is lab grown meat going to be called when and if it comes to your local grocery store? That remains to be seen. Right now in the US, there are just two companies that have gotten permission to sell and cook lab grown chicken at a couple of restaurants. But you're not going to find it on your grocery stores or restaurants or anywhere else. And when you do, I'm guessing it will be labeled to let you know it was grown in a lab. Perhaps an equally important question is, of course, does it taste like meat? Rachael Floreani says, yes.

Rachael Floreani 15:45

Oh, that's a great question. Well, I had a cultivated burger and that burger tasted like a burger. And it's hard because you want to be able to taste the beef. But really what we're trying to do is replicate whatever it is that people want to eat. And so yeah, you put a little pepper, you put some salt in there, but it tasted like a burger.

Jane 16:07

So are you ever tempted at the end of a very long day to just go into your lab and grab a few slabs of the meat that you've made and take them home for your family? Because you're like, I haven't gone to the grocery store...here, I made this today?

Rachael Floreani 16:18

Yeah, no, that is a very common question is they ask if we eat this stuff in our lab. And if we circle back to all of these awesome bottles of all of these awesome things on the shelf is this is not a kitchen. It is it is a laboratory. So the next step where people want to eat it, and we're going to make chicken nuggets for all the for all the boys and girls and all the kids out there is we have to now take all the experiments in the science we're doing here and move it into a kitchen. And so that really is how the scientific method and a protocol becomes a recipe.

Jane 16:57

Right, because when we think about protein, or other things that we need to fuel our bodies with, you can get that in a number of ways. And it could just be a powder or a drink. But if what you want is to feel the taste of a food that is familiar to you, and the flavor of it, and the smell of it, and the way it feels when you bite into it, those are really specific things, but they change the way we experience food. And so even if you could make something that has the same kind of health benefits or same calories as meat, it also has to have that same experience and all of the culture that goes along with it if people are gonna want to eat it.

Rachael Floreani 17:41

Yeah, absolutely. I think one thing that I remind my own students of when they're thinking of, is this really a problem, is, you know, our is our society so wrapped around it. And so I ask them, what do they eat at Thanksgiving? And they tell me a turkey. And I say, can you describe the taste? What about the smell? And the smell is what gets them the most excited. But those are the things that we remember, those are the emotional connections we have with food, and so the texture, the taste, the smell, all of it, if we if we can achieve it, you know, we want all of it.

Jane 18:19

But how about just not eating meat at all?

Rachael Floreani 18:22

And there's so much food out there. That's what's great is there really is so much food, there are not only the plant based, the veggie burgers have gotten pretty good over the past few years. And so there is that opportunity. And what is really hopeful for us working in this field is that more and more people are paying attention to what they buy and what they eat.

Jane 18:43

While some people are excited about the idea of meat grown in a lab, because it might help improve our food systems and feed more people, others might be concerned about getting scientists involved in food production, or may not want to eat something that comes from a lab. So what's in our future? Will we be eating way less meat or no meat at all? There are plenty of plant based meat alternatives that also tastes like meat, but don't use animal proteins at all. And there are lots of people who don't eat any

meat or anything that even tastes like meat. That might be the future for lots of people. Or we may have a future where some of us are manufacturing our meat at home.

Rachael Floreani 19:21

So they have these things called cultivate hackathons, where students and kids from all around the world will try and come up with ways to do this in their home so they don't have to go outside. One issue with food is access to food. And so if you want protein, you want meat, we don't have enough land to grow the meat. What if you could grow it in your home using a microwave or a Dutch oven? So realistically, yes, it could be possible to grow your own steak in your in your kitchen.

Jane 19:53

What do you think will happen in the future? Talk it over with the adults in your life, or your friends, and then let us know what you think. I have an adult to help you send us an email. Or make a video for our Instagram page. Send your thoughts or your questions for us to questions@butwhykids.org. Thanks very much to Rachael Floreani at the University of Vermont for telling us more about the science behind cultured meat. But Why is produced at Vermont Public by Melody Bodette and me, Jane Lindholm, and distributed by PRX. Kianna Haskin is our engagement producer. Our theme music is by Luke Reynolds. We'll be back in two weeks with an all new episode. Until then, stay curious!