Ed Yong: The following program is rated SGM for science, genitalia, and microbes. Viewer discretion is advised.

[Music playing]

Your first birthday may have looked something like this. Not that you remember any of it. That was the day you received your favorite rattle; you loved that thing. Oh look, your first stuffed animal! You may think that these were your first birthday presents, but actually they weren’t. Your first presents were given to you much earlier on the very day you were born. It wasn’t your name. It wasn’t the love of an adoring family. It was microbes.

You were born slathered in your mother’s microbes. They were everywhere ... all over you ...

Maria Gloria Dominguez-Bello: They’re in every mucosa ... The mouth, the skin, the gut, the nose. These are microbial communities, and they are our first birthday present.

Ed Yong: That’s Maria Gloria Dominguez-Bello.

Maria Gloria Dominguez-Bello: I’m an associate professor at NYU School of Medicine. And I work on babies.

Ed Yong: Babies and bacteria—which might sound like an awful combination, but Gloria believes that those first microbes from mom are really important for the development of a strong immune system.

Maria Gloria Dominguez-Bello: The bacteria that the baby encounters during labor, before being born, those are the pioneer bacteria.

Ed Yong: So, here’s how that first birthday present works ... The vagina. Microbes number in their millions in here. Oh look, there’s you, barreling along head first. If you were born vaginally, you were given a serious bath in mom’s microbes.

Maria Gloria Dominguez-Bello: It’s like an earthquake to have a baby, the squeezing, the work.

Ed Yong: Microbes are going into your eyes! Your nose! Your mouth! With each swallow – oof! New microbes going right into your gut! By the time your umbilical cord is cut, that microbial bath is seeping into every one of your orifices!

These microbes are the founders of the rich community of organisms that live on and in the body – what we call the microbiome. When an infant is born, it still has a lot of developing to do. Its environment and its diet help to shape that process, but so do its microbes. We’re starting to discover that microbes play a really important role in those critical early months, and they help to shape the immune system so it functions properly throughout the rest of our lives.

So what happens if we miss that first microbial bath? That first birthday present? What happens if we are born via C-section? In Caesarean section, or C-section, the fetus is removed through an incision in the mother’s abdomen and uterus. This method has been practiced for thousands of years. Today, nearly a third of babies in the US are born through C-sections. It’s often used when the fetus is sideways, or if it’s in distress, if the mother is experiencing medical complications, or if the fetus is just too darn big. The C-section can also be used for the sake of convenience.
Maria Gloria Dominguez-Bello: Unfortunately for moms, labor takes hours. Those hours of labor, the baby already gets exposed to a flora from the vaginal canal. That doesn’t happen in C-section.

Ed Yong: So with a C-section, the vaginal microbes are missing, and environmental microbes take their place. So I guess the question is, does that matter for babies?

Maria Gloria Dominguez-Bello: The effect on microbes is proven.

Ed Yong: So babies born through C-sections definitely have different microbes than those born vaginally?

Maria Gloria Dominguez-Bello: Exactly. What is not proven is the effect on health of the baby. When babies are not exposed to the natural, primordial, microbial — I call it yogurt —

Ed Yong: Mmm...

Maria Gloria Dominguez-Bello: When babies are not exposed to this primordial soup of microbes, we think there are consequences such as increased risk of obesity, increased risk of asthma, type 1 diabetes, celiac disease.

Ed Yong: There is some evidence that babies born through C-sections have a higher risk of allergies and other health conditions. So Gloria is studying those babies to better understand the potential consequences of bypassing the birth canal and being deprived of that first microbial bath.

Ed Yong: So, how do you do that? You can’t just go back in time and deliver the baby in a different way.

Maria Gloria Dominguez-Bello: We cannot restore labor, but can we restore the microbes that happen naturally?

Ed Yong: So, Gloria designed an experiment to answer that question.

Maria Gloria Dominguez-Bello: We had a pilot study in which the eighteen first babies, seven born vaginally, seven born by C-section, with no exposure, and four born by C-section and exposed to the maternal vaginal fluids.

Ed Yong: Wait, how do you do that? How do you expose a C-section baby to mom’s vaginal fluids?

Maria Gloria Dominguez-Bello: To do that, we have used a swab that we fold, like a tampon, place it in the vaginal canal before the C-section. When the baby is born, first thing is to clean, swab this baby with the gauze.

Ed Yong: Ok, I’ve got this, so gauze.

We take the gauze and we fold it up ... fluids from mom ... baby! And we swab the baby. Swab swab swab. And ta-da. One baby completely covered in mom’s microbes.

Ed Yong: And how soon after it’s born do you do that?

Maria Gloria Dominguez-Bello: As soon as possible, within the first two minutes.

Ed Yong: So question. When you were trying to get parents involved in this, were they like, “You want to do what with my baby?”
Maria Gloria Dominguez-Bello: Exactly. The first time, was like what? What’s the rationale? Why would you give microbes to a baby? But then, once you explain, it’s reasonable. It’s a natural exposure. What we want to understand is, will the babies that are born by C-section and are exposed to their mother’s vaginal fluids be colonized by the vaginal bacteria, as if they were born vaginally?

Ed Yong: So what happened in the end? What were the results?

Maria Gloria Dominguez-Bello: We followed those babies for the first month and compared them and what we found is that the babies born by C-section with exposure to the vaginal gauze, you see vaginal microbes as if the baby was born vaginally.

Ed Yong: Huh, so the swabbing was enough to give the babies their microbial birthright!

Maria Gloria Dominguez-Bello: Yes.

Ed Yong: So, this sounds very simple, but I’m guessing you’re gonna tell us that you shouldn’t do this at home.

Maria Gloria Dominguez-Bello: You should not do it yourself, alone, without the knowledge. Because infections could be transmitted.

Ed Yong: So, what’s next? Are you going to do a bigger study beyond just the eighteen babies?

Maria Gloria Dominguez-Bello: We did it. We continued it to eighty four and we are now analyzing massive, massive data. It’s over ten thousand samples that we are analyzing, right now, the results.

Ed Yong: But here’s the thing. Other large studies have found that if you look at children later on in life who were born either vaginally or through C-sections, you don’t see any differences in their microbiomes anymore. They start to look the same after a while. So the question is, would normalizing the microbes to mimic a vaginal birth at this early point in life reduce the risk of disease later on. That is what Gloria wants to find out.

Maria Gloria Dominguez-Bello: That’s correct. We, we know that we are restoring the microbes, but what we don’t know is, are we protecting them from the increased risks that they had because they were born by C-section? That, we don’t know, and that takes a long study, big and long study.

Ed Yong: So, what should people take away from this research?

Maria Gloria Dominguez-Bello: The point is, C-sections save lives, we know that. So what is important to consider is that it’s not free. There is a price to pay.

Ed Yong: But through your work, you’re hoping to minimize that price.

Maria Gloria Dominguez-Bello: I think, in principle, we can restore nature through replacing the microbes.

Ed Yong: So that however you come into this world, you’ve got the best possible chance for a healthy start.

Maria Gloria Dominguez-Bello: That’s correct.

Ed Yong: Thank you, Gloria, for helping us to see the process of birth in a whole new light.

Maria Gloria Dominguez-Bello: You’re welcome.
Ed Yong: And now, if you’ll excuse me, it’s nap time.

Ed Yong: We aren’t the only ones who give bacterial birthday presents to our kids. Check out our video about the beewolf, an insect that does much the same, but in a very surprising way. I’ll link to the video below, and don’t forget to subscribe to our channel for new videos every Monday.

END OF EPISODE