



**University of Manitoba: “What’s the Big Idea?”  
Series 3, Episode 4 HEATHER ARMSTRONG**

**TITLE**

**Gut Instincts: Unlocking the Microbiome’s Secrets to Health and Happiness with Dr. Heather Armstrong**

**INTRODUCTORY MONTAGE:**

**HEATHER ARMSTRONG**

The gut does act as a second brain. It’s up taking all of these nutrients that it will communicate to the body in all these different organ systems.

How can we tell if someone's microbiome is unhealthy? How can we predict what illness they're headed towards and what their trajectory looks like? And how do we stop that?

This could help everyone in every setting, I think that's what excites us most.

**INTRODUCTION:**

**MICHAEL:**

They say the gut is the key to our health, but it's more than just digestion. It plays a crucial role in everything from our mood to our immune system. Yet, for most of us, what happens in our gut is a bit of a mystery. My guest today is shedding light on this fascinating inner world. She's one of the leading voices in gut research with groundbreaking insights on how we can harness the power of our microbiome to fight disease and improve well-being. Dr. Heather Armstrong is an assistant professor in internal medicine at the University of Manitoba and a Canada research chair in integrative bioscience. An award-winning scientist and a rising star in her field, Heather shares her big ideas on how the gut can transform health and improve medical interventions.

**MAIN INTERVIEW**

**MICHAEL:** I'm really excited to learn more about your research and the big idea that we can treat diseases such as cancer, arthritis, and MS by improving gut health. I'll admit, I didn't think of that connection. It's obviously a complex topic. So, to begin, can you explain what we mean when we say gut health and what is the microbiome?

**HEATHER ARMSTRONG:** Absolutely. So, it's a fairly big question, but when we talk about gut health, we're not just talking about the stomach. So, the gastrointestinal system actually runs all the way from your mouth and the things that you eat. But your gastrointestinal system runs all the way down to your stomach and from there into your intestinal tract. And so, when we talk about gut health, we're not just talking about any individual part of the gut, but from the mouth all the way through the intestinal tract and out the other end. And so, when we talk about the gut microbiome, we would typically actually be



talking about the intestinal microbiome, so that's past the stomach. But the mouth has its own microbiome, the esophagus has its own microbiome, the stomach even has its own microbiome, and the small intestine and the large intestine have very different microbiomes. So, most of the microbes in the gut live in the colon, which is the large bowel, the final stage of the gut. But there are microbes throughout the entire way, and they will have a role to play in our health.

**MICHAEL:** And so, building on that, your research and a whole bunch of the research happening at the University of Manitoba shows that our overall health, including even our mood and happiness, begins in the gut, as you've described the gut. What's the link between the microbiome and our overall health?

**HEATHER ARMSTRONG:** There are a lot of different roles that the microbes that live in our gut play in health and it depends on what organ system we're talking about but, in general, what happens is these microbes that live inside of our body naturally. They're very healthy, they're meant to be there, they produce what we would call metabolites. They're just these small molecules that you secrete almost like how we sweat, and those molecules are taken up into the bloodstream into other organ systems and they can communicate with our cells, human cells, to typically benefit us. So, they will help our body produce different hormones. They'll help with breaking down food and creating nutrients and vitamins that we otherwise wouldn't get access to. And so, it's that communication that happens through these small molecules between the microbes and our human cells. That's what's driving the health benefits.

**MICHAEL:** And you've talked about how this could be related to happiness. And you've likened the gut to a second brain. And you just spoke about this sense of communication that's taking place within our body that, you know, we don't really think about all the time. So, what did you mean by the gut is a second brain?

**HEATHER ARMSTRONG:** So, if you think about it, the goal of our brain is to communicate with each of the organ systems in the body and make sure that they're functioning in a very healthy way, that your muscles are contracting, that your gut is contracting and pushing food through it, that the other organs are producing hormones and just doing the job that they should be doing. Now, the microbes and the microbiome and the gut, they have that same communication with all of those organ systems and so essentially, the gut does act as a second brain. It's up taking all of these nutrients that it will communicate to the rest of the body in different organ systems. The microbes are secreting these molecules that do the same. And so, in doing so, similar to how the brain communicates with every organ system to tell it what to do, the gut is in turn, doing the same thing.

**MICHAEL:** And so, if it gets out of balance in a sense, then your whole body will be out of balance, that can affect your mood?

**HEATHER ARMSTRONG:** Absolutely, yes. So, there's two ways that the gut itself can communicate with the brain. And so, when we consume food and it's broken down and we take up these nutrients or these microbial molecules, they're taken up into the bloodstream through blood vessels that surround your gut, surround your intestine. And so, that can pass into the bloodstream and go throughout the entire body. Now, the other way that the gut communicates directly with the brain is through nerves. And we have this really large nerve called the vagus nerve that goes from the gut directly to the brain. And so,



the gut can use that nerve to communicate directly with the master brain, the primary brain, to tell the brain what to do differently. And in doing so, it can help regulate brain hormones, which serotonin and dopamine, these are the hormones that are involved in making us happy.

**MICHAEL:** Wow. I had never thought of, until I began to look at some of your work, that kind of connection and, and being a bit more conscious. Maybe when I'm crabby, maybe it's in my gut that this is happening and not something that's happened to me outside, in the world, that my big brain is processing.

**HEATHER ARMSTRONG:** Yeah, and it certainly could be. So, I mean, the very interesting thing about our gut and the microbes that live in it. So, there's so many different aspects of our life that can change the health of those microbes and which microbes are there. And it can come down to, have you slept well? Are you stressed? What have you been eating? So, there's so many different life factors that can change the microbes in the gut and change what your gut is actually doing. And so again, that kind of cross communicates back to the brain, as well. So, you know, if you've had a bad night's sleep and you're feeling crabby, it could just be that your microbiome has changed a little bit overnight. And so, it's not doing what it should be doing.

**MICHAEL:** So, let's continue to pick up on the connections. Here at U of M, you and others are finding ways to leverage this complex ecosystem, to improve how we treat disease. Can you tell us a little more about that? You've talked a little bit about the interconnections. And what really excites you about this line of research?

**HEATHER ARMSTRONG:** Yeah, for sure. So, I think what's quite interesting in the global research community is, historically, when you read what is the microbiome on the internet, what you're going to find is information about what we call a composition of the microbiome. So, it's which microbes are there and how much of each of those microbes is present. So, you know, who's the dominant microbe that lives in the gut, for example. Now, what we're starting to find is it's not just about which microbes are there. So, for example, there are lots of companies that will allow you to pay them to quote, profile your gut microbiome. And all they're really doing is showing you which microbes are there and how many. The problem is what research has been showing is you could have a gut microbiome that from the surface looks correct. You've got all the right microbes, the right number of them.

But if they're not doing their day job, if they're kind of stressed or feeling lazy and they've just got their feet kicked up and they're not producing those small molecules, they're not helping you break down the foods that you're eating, it can be about the functions of those microbes. And so, if you're not measuring what those microbes are doing, then you may not actually be seeing the influence that they're having on the body. So, it's gotta be that, that two-way communication. If they're just silently sitting in the gut and not doing anything, not communicating with the body, then you won't be receiving that benefit, and you may actually be receiving the opposite. They may be harming the body by producing the wrong metabolites and interacting or, you know, yelling at the body, being mean to it, communicating in the wrong way. So, global research has really started to focus and hone in on what the microbes are doing and measuring microbiome health in very different ways. And I think in doing that, we are really going to see significant strides and better understanding, not just which microbes have to be there, but what



functions they have to be doing to define health of the microbiome and the gut.

**MICHAEL:** So, you just provided an example. People can kind of get themselves tested, see if they have the right microbiomes. But, as you say, that doesn't necessarily mean you'll have healthy gut. And so, we can see the line then is that this research could offer hope for leveraging the microbiome for a more personalized medicine and treatments. It may not just be finding out which microbiomes you have, but it's a lot more than that. So how do you expect to see an evolution from kind of standardized care to more patients? Specific interventions?

**HEATHER ARMSTRONG:** Absolutely. So, we very excitingly, my team has support from the Western Family Foundation in Canada to do exactly that. So, we've got a three-year program ongoing right now where we are trying to better understand, how can we take the microbiome of roughly a thousand different people and define what is health and kind of come up with these types of biomarkers that can define if someone has a healthy gut or not. And so, I think looking forward at what does this mean clinically for personalized medicine, what we're hoping is that in the next three to five years, we'll have the ability to similarly take a stool sample or a sample from the gut during a colonoscopy procedure, for example, and define what is it not just about which microbes are there, but what's inside of them? What does their health look like? What are they doing? How are they functioning? And put all of that information together. Now, if you look at this from a clinical perspective and the types of studies that are ongoing right now, you've got so much diversity. So, you have everything from fecal microbial transplants to treat C difficile infections. And those have high success, but one of the limitations is we can't yet define a healthy microbiome. So, it's work that's being undergone to define what makes the best donor, what makes a healthy, successful donor versus those individuals who they receive an FMT and it doesn't work, it doesn't benefit them. And then you go all the way through to the studies that have been done in melanoma showing that those individuals who are undergoing cancer therapy, they may not respond to their cancer therapy the first time around, but if they receive a microbial transplant and receive that exact same drug, all of a sudden, they do respond successfully, and their cancer ends up in remission. So, there's just this very wide array of how changing the microbiome can benefit humans in these disease settings, but the question still remains, what is an actual healthy microbiome?

**MICHAEL:** I find that very interesting because, in listening and speaking to physicians who have been involved in transplants, kidney, heart. I mean if you think about the early transplants which were rejected by the body, it sounds a little bit like this, at that stage of research, where they didn't quite understand all of the connections that had to take place and now, it's much more sophisticated in the analysis.

**HEATHER ARMSTRONG:** Exactly that. It's very, very similar. So, with human organ transplants, you're obviously trying to understand, you know, the host cells, which immune cells in the body are going to reject that organ coming from another individual. And so how can we use a drug to suppress the immune system to allow that organ time to integrate with the new host?

But it's no different. I mean, the microbe cells that live in our gut, we need to understand what makes that microbiome community healthy. And so, how do we know which donors to choose to, for example, use a fecal microbial transplant? And medicine's getting quite interesting. So, I mean, the more we



understand which microbes are essential for this process to be successful, there are teams out there that are starting to say, do we really need a donor, or could there be a combination of 10 to 20 microbes that are essential for that process to work? And could we actually just create a pill form of this with 10 to 20 beneficial microbes? And that would be enough to receive a health benefit. And does that differ? Does it differ based on the individual? Does it differ based on the disease that they're suffering from? So, going back to the initial example, you know, do different cancers differ from an infection? So, you know? An infection maybe only needs three microbes to be delivered, but cancer being a more complex disease, do you need maybe 20 different microbes to succeed with that therapy?

**MICHAEL:** So, around the transplants, I mean, this has received a lot of press lately. And listening to you, we could see why. I mean, the potential here is to be able to really have an impact, not just on gut health, but on other diseases also, and not just kind of serious intestinal infections, but beyond that. And as you said, in some ways, it's a starting point that we're in, and you've spoken about, different forms. Can we do a pill? And so, can you tell us a bit more about how the bacteria we put into the gut one day can be a drug that cures illnesses in the future? And will the individual have to continue to take that pill forever or will the body just adapt?

**HEATHER ARMSTRONG:** Yeah, so I mean, there's really interesting work going on around the world and even here at U Manitoba. So, Dr. Schneider and Kumar at Faculty of Science here have some large FMT studies going for *C. difficile* infections. And I kind of come back to the struggle of we need to not only understand, you know, which microbes are important for which disease setting, but also what those microbes need to be doing. What is a healthy microbe and what is a healthy microbiome community? And the reason that's so difficult to understand is you take yourself, myself, and you look at our microbiome in the morning and again, our microbiome in this afternoon, and it will have changed. So, there's kind of this fluctuation in what our own individual microbiomes even look like throughout the day, and they differ between each other. So, my microbiome will look very different to yours. And so, the fact that we can all be healthy human beings and yet our microbiomes differ so much, it makes it very difficult to define what makes us healthy. And so, until we're able to do that, until we're able to define what is a healthy microbiome, it makes it quite difficult to pick how do we deliver them? What do we deliver? Who from? Does it even need to come from a person? Or again, can we grow individual microbes?

And I think if you look at the larger studies that are coming out of countries like the United States and Israel, who are really forefront nations in this type of microbiome research, what you see is that there are a number of people who are kind of starting to step away from this fecal microbial transplant work and towards the idea that you may be able to select the specific microbes that can go into a pill form, that can just be swallowed. And that's all it will take. And so, I mean, this is still at a very science level. This is not at a clinical level, at this point, but it's very exciting to think that that may happen. Now, if you consider, you know, what does this mean for product availability and medicine overall? Like I said, I think the more complex diseases like cancer or autoimmune diseases like inflammatory bowel disease, multiple sclerosis, because those range, so an infection, you may clear an infection in a few days. And so, you can take a probiotic or a fecal microbial transplant one time and it will survive long enough that, in a few days, the infection has cleared, and you'll just continue to receive the benefit of that transplant and



microbiome. But when you range up to some of these chronic illnesses that will last lifelong, the question becomes, you know, how frequently will someone have to receive a fecal microbial transplant for this to be successful and will it be successful?

So, do they have to receive this every few months? The studies suggest that if you select an FMT correctly, it can last over a year. But then, there are other studies out there that suggest that the microbes, you know, they may still survive, but they may not be functioning correctly, after a couple of weeks. So, I think we need to understand not only which microbes to deliver, but how to help them survive once they reach the gut, as well.

**MICHAEL:** So again, that's fascinating. And back to the point that you can have the microbes, but they may not be functioning. And then that changes over the course of a day. Is that in response to what we're doing in the day, what we've eaten that day? Or is it a response to being awake and active versus asleep?

**HEATHER ARMSTRONG:** It's all of it combined. So, the second you sit up in the morning, your microbes wake up with you and they start playing a very different role. So, did you eat breakfast, or did you skip breakfast? I mean, they're hungry too. So, it's good not only to feed yourself, but to feed them and help them wake up in the morning. So, the microbes primarily survive off of carbohydrates, which is mostly dietary fibres and starches. And they have to break those down for us, so that is one of the dependencies that we have on our microbes is when we eat something like a dietary fibre, we don't really do much with it. We require the microbes in our gut to break that down. And so, if you feed them in the morning and help them wake up through giving them some dietary fibres for breakfast, that will make them much happier throughout the day. But it kind of comes back to everything. Did you have a good night's sleep? When you woke up in the morning, were you in a rush and now you're stressed running out the door to make it to work or school on time? You're impacting the health of the microbiome in that sense. What did you eat throughout the day? What did you drink? Were you active? Or were you sitting? Is it cold outside, in Winnipeg, minus 40, or is it the middle of the summertime? All of this impacts how we function as a human being, but also how we communicate with our microbes and what happens to them as well.

**MICHAEL:** Wow. So, picking up on that, so let's shift a little bit to how your research can be applied to people's everyday lives. So, if someone wants to improve their gut health, let's think about in the context of what you've been talking about. What does the research show us as far as interventions that work? And let's think about the kinds of interventions we could take to try to improve our gut health.

**HEATHER ARMSTRONG:** Yeah, so again, if you ask Dr. Google, there are so many different products that you can take and prebiotics and supplements and kombucha and you name it. I think most of us would agree, in this field of research, that it starts with nutrition. And so, when you think about the diversity of foods that your microbes want to consume themselves that will help support the diversity of the microbiome community to have lots of different kinds of microbes that all do different things for us. That comes down to the diversity of the foods that we eat, as well. And so, you know, there's a variety of different food groups. You've got your vegetables and your fruits. You've also got nuts and seeds. You've got herbs. You've got lentils. And so, having a diversity of those different food groups, that in itself will



help promote the health of the microbiome. But where people tend to not understand is there is a diversity of different types of carbohydrates and different types of dietary fibres, and they come from different foods. So, you know, when we say eat fruit, if you're eating the exact same single type of fruit every day, you're not getting the diversity of dietary fibres that your microbiome wants.

**MICHAEL:** So, an apple a day doesn't actually keep the doctor away. You need other fruits.

**HEATHER ARMSTRONG:** You need other you need other plant-based foods there too, for sure. And so, that's number one. I think the primary intervention is having a good nutritional base. And we obviously understand, particularly in today's economy, that that can be quite difficult. I mean, food is becoming increasingly expensive and it's difficult to make sure that you maintain that balance and it can be quite stressful to try to do so. But it really does start with nutrition. Now from there, you know, there are fermented foods, there are prebiotics.

The term prebiotic simply means a type of dietary fibre that can benefit the gut microbiome and in turn benefit gut health. So realistically, if you're looking at these very expensive prebiotic supplements and products, all that's happened is someone else, at a company, somewhere on Earth, has taken a plant and extracted the dietary fibre from that plant and put it in a pill for you. So, you know, if you can achieve that, from food, it can be just as beneficial if not more because you're getting all of the other nutritional value from the whole apple rather than just the dietary fibre from a pill. So, there is kind of a benefit to looking at nutrition from that aspect.

And then when you look at things like fermented foods, essentially what's happening is you're not just getting the benefit of the fibre in the plant, but you're also getting the benefit of the probiotic, which is the microbe. The microbe that can ferment or break down these aspects of your food. So, there's certainly evidence available out there that suggests that, you know, these prebiotic beneficial fibres are very helpful, but you can get them from whole foods. You don't have to buy a supplement. And there are also increasing amounts of research showing that these fermented foods can be very beneficial. But you have to be quite careful because if you're going to the grocery store and you're just picking up a drink off the shelf, if it has quite a long shelf life, there's probably no live microbes left in it. And so, there really is a lack of science backing for most of the products that are available out there when you're trying to, you know, buy a quick fix instead of buying something that may actually help you. So, there's a lot of products out there. I think there's no drug that would help necessarily fix the health of the microbiome, but feeding those microbes is essential.

**MICHAEL:** So, there's no shortcuts.

**HEATHER ARMSTRONG:** No shortcuts in life, no.

**MICHAEL:** And you think about how this part of the industry has grown. And in some sense, people are self-diagnosing, and they might in fact have very healthy guts and just feel, you know, they've read the literature and so they're going to go out or they may not have healthy guts, and they may not be dealing with the true problem that they're facing.

**HEATHER ARMSTRONG:** That's the trouble is, I think, today's society has become very fast paced. And



so, typically when we want to try to fix something, we want a quick fix and someone else to solve our problems instead of looking internally and saying, you know, maybe I should go to bed at a slightly earlier time or perhaps I should eat a bit more of a balanced diet, to try to reduce my stress through meditation and reducing the number of tasks I have on my plate every day, or spending some time with friends. All of these benefits come from our lifestyle and it's quite interesting because increasingly I think people are becoming aware of the fact that someone may self-diagnose celiac, for example, that's becoming quite common, but then they'll say, you know, I went to Europe, and I could eat breads, and everything was fine. And yet they're still using grain to do that. There's still gluten in those foods. And so, what's quite interesting is I think, it comes down to where is your food grown? How is your food grown? What does the lifestyle look like? And if you look at some of these European countries where they see less frequent disease or autoimmune disease, for example, the lifestyle is very different. It's still very friends- and family-oriented. It's low stress, it's slow-paced. And so, it kind of lends to the fact that many of these health conditions probably come down to lifestyle and environment and the impacts that we're having on our gut and our overall health.

**MICHAEL:** Right, the body tells us.

**HEATHER ARMSTRONG:** Exactly.

**MICHAEL:** Yeah, that's fascinating. One of the things I love about doing this podcast is the variety of people that I get to speak to. But, over time, finding connections between the work of different researchers. Dr. Megan Azad spoke about breast milk contributes to the health of an infant's microbiome. Interesting like this, she spoke about how breast milk changes qualities, not only over the course of a day, but over the course of a feeding. And so, you're talking about, there's similar connections. And your research also looks at how early years of development is a key to establishing a healthy gut. To what extent does this impact kind of the long-term health outcomes?

**HEATHER ARMSTRONG:** Absolutely. So, we have some very exciting work going on with Megan and her team. And it's fascinating the work that they've been doing. But, when you think about the microbiome and its development, and our development as a human being, your microbiome essentially is near fully developed by the time you reach about three years old, which is incredible. That's a very fast amount of time and you've got a long life ahead of you.

So those early life exposures are so essential to developing your overall microbiome. It's that exposure not just to what we eat, but to mum during the birthing process. The birthing process is very messy and that's an important thing. It needs to happen. So, you're exposed to all of mum's microbes when you are welcomed into the world. You're exposed to other families' microbiomes when you're placed on their skin, in those first couple of minutes. You're exposed to oral microbes when someone breathes at you as a child.

And so, you think about historically what this would have looked like when we had these big family gatherings to welcome the new family member and you would have been exposed to every auntie and uncle and cousin and sibling and family and friends and they all, in themselves, carry different microbes on their skin, there are oral microbes. There are microbes that live in the dirt and in the plants around





us, the environment that we're exposed to. And so, exposing ourselves in those first few years of life to all of this diversity of microbes in our environment is so essential to help us create our own microbiome. And when that diversity depletes to just mum and dad and maybe a few siblings, that can be very detrimental to the development of that diversity of microbiomes that we experience as a human being and that we then carry with us for the rest of our lives.

And so, if you look at Megan's work and that of other team members she works with, it's quite interesting because, you know, when we think of dietary fibre, we think of celery and, you know, these very solid foods and that's, the fibre is the structural component. But there are types of dietary fibres that are found in mum's breast milk, and they're called human milk oligosaccharides that Megan would have spoken about in her podcast. And so, even from day one, we are exposed to this food that our microbes in our gut require to survive for them to break it down and eat themselves. And so, that transition that happens from milk feeding onto whole foods and plants. That process, again, that diversity of different plants that you're eating is so essential to help promote the diversity and the different types of microbes that are living in, residing in your gut.

So, some of the work that we're doing with Megan right now is, from our perspective, we're trying to understand if mum is capable of breastfeeding or if a child is on a formula, a store-bought formula. Is there a big difference? Because when you look at formulas, they are increasingly getting these synthetic human milk oligosaccharides placed in them.

But historically, they would have had plant-based oligosaccharides or fibres that would have been put into them to try to promote the microbiome. But when you think about what an infant needs when they're growing, we're not quite sure that some of these plant-based dietary fibres are safe necessarily for all children. So, say you have a child who's taking antibiotics, for a very good reason, for a very dangerous infection and it's essential for them to survive. You're depleting the types of microbes that live in the gut and so, by doing that, are they able to tolerate the types of foods that they're eating. And so, what our research has shown is that there are certain types of dietary fibre that might be quite dangerous, that are actually found in certain infant formulas that may be quite dangerous to the developing gut, at an early life stage. And so, we're trying to understand, are these HMO or human milk oligosaccharides much more safe in these infant formulas if mom is unable to breastfeed? And Megan's program is so exciting because they obviously have these donor banks that are available for moms who aren't able to produce milk or breastfeed for whatever reason. And so, our research is trying to ask the question of are there certain instances, for example, when a child is on antibiotics that these biobanks may be absolutely essential for the health of those children.

**MICHAEL:** Well, again, really fascinating to think about all the interconnections. The human body is so complex. I love the way you framed it. It wasn't framed in terms of exposure to germs. It was framed as, as, you know, positive exposures that could lead to better health. I wonder sometimes, I came from a big family. You know, I'm from Morocco, and so you didn't have a choice but to let everybody come when you had a birth. I hope my kids were exposed to enough microbiomes that that's contributed to their health.

**HEATHER ARMSTRONG:** Exactly. Yeah, it's amazing. I mean, it's even been linked all the way down to



human allergies that, you know, exposing kids to that diversity of microbes and, you know, what people are so terrified of, this dirty environment. There are actually studies that have shown that infants that are exposed to cats, rats, and cockroaches, in early life, have a much lower risk of developing allergies in their lifetime. And it's hard to say where that comes from, whether it's just saying, you know, they were exposed to a lot of different environmental factors and microbes early on. They trained their immune system and their microbiome in early life. But it's really interesting to see that we shouldn't be quite so afraid of our environment at an early age. And that's not to say, I mean, particularly with COVID still and RSV infections running around, you want to make sure that your children are safe. That's important as a parent, but to not be afraid of the outdoor world and the environment around us and other family members is essential.

**MICHAEL:** Right, you're not suggesting people should get rats and cockroaches.

**HEATHER ARMSTRONG:** No, I'm not suggesting to fill your house with rats and cockroaches. Maybe get a cat though.

**MICHAEL:** Now, just one final question and it's kind of looking forward. And I know all research kind of has limitations of funding, but if you look forward at what excites you and what you might wanna do next and maybe or if you got the funding to do it, what would that be?

**HEATHER ARMSTRONG:** Yeah, I mean, I'm so very thankful. Our team is very lucky to have a lot of funding from a lot of different places for a lot of different work right now, but I think our main goal and the thing that excites us most is these studies that we have ongoing right now that's really trying to define what is a healthy microbiome? How can we tell if someone's microbiome is unhealthy? How can we predict what illness they're headed towards and what their trajectory looks like? And how do we stop that? You know, how do we intervene early on? Is it as easy as nutrition and lifestyle changes? Are there drugs that we can use to target different aspects of the immune system to calm it down and stop it from attacking the microbiome? There's so much diversity in the ways that we can help humans in the gut have health down the road and I think that's the thing that excites us most and just the fact that this impacts not just one disease, we're not talking about one illness, one illness of the gut, we're talking about every organ system and every type of health that the body will receive in its life. So, I think, just the open-ended, this could help everyone in every setting, I think that's what excites us most.

**MICHAEL:** Heather, thank you so much for that. Look forward to seeing more of your work and how it evolves. And I think this is clearly a really important line of work, in health. And thanks for taking the time.

**HEATHER ARMSTRONG:** Thank you for having me.

#### [OUTRO MUSIC FADES IN](#)

**MICHAEL:** Thanks for listening to What's the Big Idea with me, Michael Benarroch, President of the University of Manitoba. I hope you enjoyed this fascinating conversation on gut health and its incredible impact on our bodies and minds. If you like this episode, share it with a friend and visit [umanitoba.ca](http://umanitoba.ca) to learn more about our incredible researchers.