

EPISODE 2 :: STRAIN DIFFERENCES AMONG PROBIOTIC SPECIES

Featuring :: Adam Baker, PhD; Karyn Wulf, MD, MPH

TRANSCRIPT

Maura: If you tuned in for our most recent podcast episode, you know we're in the middle of a short series on probiotics, which are those microscopic organisms that behave like "good" bacteria, and help with digestion, immunity and overall health. If you missed our most recent episode, I really encourage you to take a few minutes to listen to that recording, because our experts did a fantastic job of discussing how and why probiotics work, and the impact they can have across the lifespan.

Maura: I'm Maura Bowen, podcasting for Abbott Nutrition Health Institute. We're moving our discussion along today to discuss strain differences among probiotic species, and to spend some time on comparing their clinical implications. I'm delighted to welcome back our friend, Dr Adam Baker, who is Director of Science, Human Health Innovation for Chr. Hansen in Hørsholm, Denmark. And of course, it's always a delight to talk to Dr Karyn Wulf, Medical Director of Pediatrics here at Abbott and frequent contributor to these recordings. Dr Baker, Dr Wulf, welcome!

Dr Baker: Thank you.

Dr Wulf: Thanks, Maura.

Maura: Let's start, just like last time, by telling our listeners a little bit about yourselves and your backgrounds. Dr Wulf, would you like to go first this time?

Dr Wulf: Sure, Maura. So, my name is Karen Wolf and I am a general pediatrician with 18 years in clinical practice, and I'm also the medical director for Abbott.

Maura: Excellent, thank you. And how about you, Dr Baker?

Dr Baker: Great, thanks. So my name is Adam Baker and I'm the Director of Science and Human Health at Christian Hansen in Denmark. I've been lucky enough to be in this role for the last eight years studying the roles of bacteria and the microbiome throughout the life stages. And previous to that I have over 20 years of experience in the pharmaceutical and biotech industries looking at complex diseases and oncology, trying to work with patient therapies and diagnostics to support treatments and diagnoses of these diseases. It's great to be here again.

Maura: Thanks to you both for the helpful background. And, a quick note to our listeners: Just like last time, we're dialing in for today's episode. Dr Baker is calling in from Denmark; Dr Wulf and I are still social distancing, so we're ringing in from Columbus, Ohio. And I say all this to let you know our recording quality may sound a little bit different from what you're used to hearing. And secondly, we're going to stick with the format we established in our first series episode so we can get a dialog going. Dr Wulf will do the interviewing with added commentary, and Dr Baker will provide his insights.

Maura: Dr Wulf, are you ready to do this again?

Dr Wulf: Absolutely.

Maura: Great. Thanks. Dr. Wulf. The floor is yours.

Dr Wulf: Thanks, Maura. So Dr. Baker can you tell us a little more about strain differences within a probiotic species?

Dr Baker: Absolutely. It's great to be having this discussion. So, we actually focus very much on saying we want to describe the health benefits of probiotics, and these are strain-specific. This is something you hear us say every day at Christian Hansen. To better understand this I think we need to discuss a little bit how bacteria are named and how probiotics are thought of. So we actually break this down into different levels. You have a genus level, which is when we're naming bacteria, and in this case, we're talking mainly about Bifidobacteria. That is the genus. And within the genus level, you have many different species, some of them, or one of them we'll be talking about today—we'll be talking about the Bifidobacterium infantis. Another one is Bifidobacteria animalis or lactis, our BB-12® (*Bifidobacterium animalis* subsp. *lactis* BB-12®), . And it carries on. There are many different genuses of bacteria. And then within each genus species, we have many different strains. And in each of these strains, they'll be slightly different from each other, but are related enough genomically in how they work. When we talk about the infantis species of the bifidobacterial, we're talking about the many, many different strains of infantis, and similar, most of them have similar characteristics but we need to study them individually and see how they perform.

Dr Wulf: That makes a lot of sense. So when we talk about these different species and then the strains, one of those strains we hear a lot about is *b. infantis*—Bifidobacterium infantis—and its role in infant gut health. What should clinicians understand about the different *b. infantis* strains?

Dr Baker: Yeah, and I think as we touched on in the last podcast, the infantis strains are very, very good at their ability to use human milk oligosaccharides (HMOs) from breastmilk. They all tend to have the genomes that have all the genes present so they can use all these different HMOs which are found in breastmilk. So, we can see that, and we can study that. But I think what we need to see is infantis strains not the same, but many of them have the same characteristics and the same ability. That's why at Christian Hansen, the bifidobacterial infantis strain that we use—we looked at the genome and we can demonstrate that it has all the genes to utilize HMOs, utilize these human milk oligosaccharides, but we also demonstrate this in the lab. Preclinically, we've gone ahead and shown that the infantis strain we use can actually utilize these HMOs by growing them different ways within the lab to demonstrate it. And I think that's what you need to do, just to make sure that the infantis strains you have actually do what they're supposed to do.

Dr Wulf: And along those lines, would you characterize that there would likely be more genomic similarities or differences within strains in a certain species?

Dr Baker: Yeah. So, very, very good question. So, *b. infantis* strains, the bifidobacterial infantis strains within a species, you would expect them to be similar at the genomic level. You would expect them to all have the clusters and genes on the genome that allow them to utilize and take up or break down these HMO molecules. There are subtle differences. So that's what we need to do, is to check and demonstrate absolutely that the actual strain you're using has these capabilities. Just because you're using the infantis strain doesn't necessarily mean it has all of the capabilities—there may be subtle changes there—but we can demonstrate at Christian Hansen that the infantis strain that we use absolutely is able to use all HMOs that are available.

Dr Wulf: So, Dr Baker, how does *b. infantis* utilize HMOs and how are you able to prove this?

Dr Baker: These days we always look at the genome of these strains, and we can demonstrate that the genes are

present with the ability of that bacteria to actually utilize the different HMOs—these HMO clusters are actually there. But then, what's important—and that's what we've gone ahead and done—is we use the artificial gut systems, and we've used in vitro methods, just to grow bacteria and demonstrate functionally that they actually grow and use these HMOs as a food source.

Dr Wulf: Thank you. What does it mean for a probiotic strain to be activated? Does this have any clinical relevance?

Dr Baker: What we need and what we have to have is, in the human, the bacteria needs to be alive, and it needs to be active, and it needs to activate whatever genes are needed to adapt to the food source and the environment it finds itself in when it's ingested. So, it's clinically important that you have a high-quality product, and the bacteria are as viable as possible. Thousands of genes are activated and working when you produce a bacteria in a big fermenter. You have a sort of downstream process that is ready for storage. By doing that, you need to keep the bacteria alive, you need to keep them functional, you could say they're "activated," but they're alive. That's what the point is. Everything needs to be ready to be activated. Not just one gene, or one type of gene. The bacteria has to be able to function fully and adapt to the situation it will find in the body. I don't see any clinical evidence of an activated bacteria that has something present in its fermentation and production, as having any advantage in terms of clinical efficacy in the human body.

Dr Wulf: What happens if only one strain is introduced to a developing infant gut?

Dr Baker: That's very interesting, because we do know that in terms of the infant microbiome and in terms of the process, in terms of life stages, what you're looking for is that, when you're first born and you're breastfeeding or on formula, you're actually looking for a bifido-enriched or bifidodominance of the microbiome, and then certainly if the infantis can be found as being an essential player here within the microbiome at that point. But there are other Bifidobacteria that are present and other bifidobacterial you would like to be there. Other bifidobacterial are strongly associated with the health of the microbiome, and we always say that diversity is good. So from a very early age, what you're looking at is, one you're born and growing, the Bifidobacteria diversity will start to increase, and the other bacteria will start to move in. And so, to start diversity early by providing multiple strains, can really only be seen as a good thing in this case.

Maura: I knew it. You're pros. Alright, let's wrap this one up by telling our listeners about a few educational resources.

Maura: Both Abbott Nutrition Health Institute and Chr. Hansen have a host of educational materials on our respective websites to help you learn more about some of the concepts we discussed on today's podcast episode. Visit anhi.org today and click "RESOURCES" and then "KNOWLEDGE HUB" to find probiotic related content on neonatal health and the microbiome. And, be sure to visit the Chr. Hansen Probiotics Institute—theprobioticsinstitute.com—to learn more about how probiotic strains can benefit the microbiome across the lifecycle. Theirs is a fairly new website, and it's full of fantastic information. I don't say that lightly, either, because I'm a tough critic when it comes to content and the user experience. But the Christian Hansen site? I cannot find fault with it. It's lovely.

Maura: Finally, be sure to return for our final episode in this probiotic series to help us continue this important discussion.

Maura: Thanks everyone. Stay healthy and safe.