**Boost Your Oral, Dental & Throat Health with Probiotics – Prof. John Tagg with Dave Asprey – #808**

Announcer:

Bulletproof Radio, a state of high performance.

Dave Asprey:

You're listening to Bulletproof Radio with Dave Asprey. Today, we have a live audience from the Upgrade Collective, which is my membership group, which has hundreds of people who are learning over the course of a year, all of my books with structured classes and coaches and things like that. And one of the benefits of being in the Upgrade Collective is you get access to live podcasts and the chance to ask our guests questions at the end, which are now becoming a part of the show. So, it's not just what I wanted to know, it's what you wanted to know as a listener of the show.

 So, thanks, guys from Upgrade Collective for being in the audience today. And I'll be looking at what you type during the show so I can add your questions in and we'll take a couple of live ones at the end.

 Today on the show, we're going to talk about bugs, the good kind of bugs, the kinds that live on you, in you, around you. Emeritus professor and microbiologist, John Tagg, has been looking at bacteria since the mid-1970s, about when I was born. He's done this work primarily at the Department of Microbiology and Immunology at the University of Otago in Dunedin in New Zealand. And he's pioneered research in which bacteria strains are good. He's discovered two probiotic bacterial strains.

 And what's really interesting about this, as you've heard a lot about the microbiome just in the context of the Bulletproof Diet going back over the last 10 years, but there's a bacteria that lives all over the body and in the body. And what he's looked at is an oral probiotic strain that's from the mouth and for the mouth. In other words, what's going in your mouth really matters. And another probiotic strain that targets dental and gum health.

 If you've been following the health world for a long time, you've probably heard people talk about how health starts not just in the gut, but in the mouth. So, if you have lots of cavities and gum problems, it's actually an indicator of heart disease even. So, having a healthy mouth is really important.

 So, we're going to learn a ton in this episode about good bacteria from a guy who's isolated over 2000 bacterial strains in his career. Professor Tagg, welcome to the show.

Professor John Tagg:

Thank you very much, Dave. It's great to chat, always great to chat about bacteria. Being a microbiologist, that's my favorite topic.

Dave:

One of the things that brings me the most joy is being able to learn from people who have spent decades in the field because you develop a just a rich sense and sort of a built-in intuition about where to go and to be able to learn from you over the course of the next hour. So, it's always an honor and a pleasure to do it.

 You and I shared some childhood experiences, which I was really surprised to learn when I was doing the research for the show. You were a 12-year-old living in Melbourne, and you had Streptococcus pyogenes, strep throat. Tell me about what that was like.

John:

Yeah. That was at the time not at all pleasant. This was about 63 years ago now. Living in the wilds of suburban Melbourne, I had an encounter, an encounter of the wrong kind with this Streptococcus pyogenes in the form of a strep throat. So, this is the peak age, about 12 years old, for getting strep sore throats.

 Now, normally they pass and there's no consequence. But for me, there was a rather unpleasant consequence. I developed rheumatic fever. Now, every year, tens of thousands of children worldwide have this outcome from strep sore throat. Children about my age, they end up with rheumatic fever and actually thousands of children die as a consequence of rheumatic carditis.

 I didn't die. But something quite unpleasant happened to me. I had to be put on two penicillin prophylaxis. There is no immunization. There is no vaccine to protect against Streptococcus pyogenes. The only way you can really protect children from getting further episodes of strep sore throat is to give them penicillin daily.

 And so, for a decade, I was given penicillin pills two a day to pop, not pleasant, not pleasant, because that penicillin had to go somewhere. And so, all through my teenage years, I found myself peeing and perspiring penicillin profusely, unpleasant. I thought there's just got to be a better way. There's got to be a better way to protect young children like myself from Streptococcus pyogenes.

 So, I think of myself as a storyteller. In my stories, usually, Streptococcus pyogenes is cast as the master villain, the real villain of the piece. And perhaps as we'll learn later on, there is a hero in my story as well. It's another streptococcus, and streptococcus that brings salvation. It's Streptococcus salivarius. But perhaps that will emerge later.

Dave:

It certainly will. Because starting at about age eight, until I was about 23, I had chronic strep throat. And I was on antibiotics every month for 15 years. They didn't do it prophylactically, but it would just come back and come back and come back. And in terms of setting yourself up for obesity, gut problems, potentially for life, if you don't take action on it, years or more than a decade of antibiotics is just not good for you.

 And so, understanding all the things that are influencers of the bad streptococcus, it's not having the good bacteria. I also know that having toxic mold present in the environment increases your risk of getting strep throat. I had my tonsils taken out. I was on prednisone. All the things that happen when you have a chronic infection that just never goes away.

 So, it sounds like we shared some of these same bad bacteria and didn't know what to do about it. And since then, your path clearly has said, "Well wait, what if you use the good guys to fight the bad guys." That's something I do in one of my companies, using good soil bacteria to fight mold. And I've been managing my biome as well as possible. Your research, though, is interesting, because you're looking at not the gut, but the mouth, the gums, and even the skin.

 And I want to go really deep with you on first, what do people do to stop strep throat? What's going on there? Walk me through what you would do now, if you could talk to your 12-year-old self?

John:

Well, now as an outcome of the research that I've done all of those years, we do have a probiotic alternative, but still in many parts of the world, that don't have access to our probiotics, there's a lot of penicillin being used. And if it's not penicillin, it's erythromycin. And so, children who are vulnerable and still a large proportion of the population are vulnerable to bacterial sore throats have to be given penicillin.

 So, there's a lot of penicillin being used. We know not only does it have the unpleasant consequences of seeping out of your pores, and making you smell like a mushroom. But penicillin being used a lot helps to evoke or select for penicillin resistance in our microbial friends and enemies. And so, we have a progressive buildup of antibiotic resistance.

 But at the moment, for most of the world, that's what has to be done, use penicillin or erythromycin because there is still not an effective vaccine to protect against the streptococcal sore throats.

Dave:

If they did make a vaccine that affected streptococcal sore throats, might it also affect our immunity towards the good species of streptococcus that we need?

John:

Not likely. If it was devised to be specifically protective against the virulence antigen, which is specific for Strep pyogenes, then the vaccine should have some specificity and shouldn't have an effect, an adverse effect on normal commensal streptococcal populations.

 And they are a really important part of our microbiota. You might notice that I very specifically use the term "microbiota," not microbiome. Many people use the two terms almost interchangeably. I think of myself as a purist, and my interest is in the microbe and the different microbes. So, I still focus my attention and consider myself a specialist on the microbiota, rather than the microbiome. The microbiome is the microbiota. And if you like also the theater of activity of those organisms that are part of your microbiota.

 But I find myself thinking very specifically, and that can be at the strangest times that I might be walking along the beach or something like that, and my mind flicks to, "Oh, I wonder what's happening to my microbes in my mouth." And that's where some of my best ideas come actually strolling on the beach and just thinking laterally about how my microbes are getting on today. So, very, very specifically, I think of the microbes themselves, how they behave, how they interact with others around them.

Dave:

It's a really important distinction. So, one is an environmental description that includes the bacteria. And the other one is let's look at just the bacteria. Sort of like looking at a city versus looking at the people who live in the city.

John:

Yes.

Dave:

Is that a good...

John:

Yeah. So, I mean, I like the term "microbiome" as well. And it's very sexy, isn't it? Everyone seems to like to throw that into their almost sort of dinner table conversations. They talk about their microbiome, but do we really understand what the microbiome is? It's a little bit more far reaching than just thinking about the microbes themselves.

Dave:

One of the things that you've done in your career that's really impressive is you wrote the first major review of the bacteriocins, the toxins made by Gram positive bacteria. Can you tell me more about what those are and why that's important?

John:

Yeah. Bacteria sends very specific sort of anticompetitive protein molecules. So, we know that microorganisms produce a whole range of molecules as they grow in nature or in the laboratory, that can have an effect on the growth of other bacteria around them. But the class of molecules that really attracted my attention are the so-called bacteriocins.

 Now, literally, that means, cin here is not sort of like a transgression or something like that. Cin here means kill. So, these are killer protein or proteinaceous molecules that bacteria produce to interfere with the growth of the competitive bacteria in the immediate ecosystem.

 So, just to put that in other words I suppose, they are little proteins, some of them are larger than others, but the ones that I'm interested in are around about three to 5000 Dalton in size, so they're relatively small molecules, that most bacteria will produce in nature to suppress the growth of competitors. So, these bacteriocins, these killer molecules, they more or less stop the growth of other very similar bacteria from getting carried away.

 So, if you want to retain your patch in the world, if you want to survive, you don't want to be overrun by competitive bacteria. So, Mother Nature, in her wisdom, has really evolved this class of molecules that pretty much all bacteria produce bacteriocins of one sort of another. So, we can imagine all of the bacteria in an ecosystem producing low levels of these bacteriocins just really to conserve their patch, to stop the competitors from over growing them.

 And the way that many of these bacteriocin and molecules work is they will kill, cin means kill, kill if a competitor bacterium is growing too fast. So, they can identify that because if you grow fast, as a bacterium, you will generate a higher charge across your membrane.

 Well, generate a high charge across your membrane at your peril, grow too fast, they generate this greater charge that becomes vulnerable to bacteriocins insertion. So, what I'm trying to say is that these bacteriocin molecules are most effective against rapidly growing competitive bacteria.

 And so, it's a strategy so that we have this image now of a whole lot of bacteria in your microbiota, sitting there, occupying space and producing low levels of these bacteriocin molecules to protect themselves from overgrowth by other bacteria in their environment.

Dave:

It makes sense. You have penicillin. One of my favorite is roqueforticin, which is the bacterial killer made by Roquefort microbes in cheese.

John:

Right.

Dave:

And so, when you're listening to this going, oh, yeah, I know about these types of cins because most antibiotics that are derived from either fungus or from other bacteria are in the cin family.

John:

Yeah. You might be or might not be. But I'd like to tell the story of when I first started working with these molecules, I actually was working not with streptococci, but with another tribe of bacteria called pseudomonas. These are Gram negative bacteria. And Pseudomonas aeruginosa is rather a nasty Gram negative bacterium.

 And my first introduction to bacteriocins was looking at the bacteriocins of Pseudomonas aeruginosa. And so, normally we name the bacteriocins after the species of the bacterium producing it. So, you have now the notion of Pseudomonas aeruginosa producing original cins, original cin.

Dave:

Love it.

John:

So, my introduction to bacteriocins was with the Gram negative tribe, but I don't know if you are interested in the story in how I actually found the first streptococcal bacteriocin. Why don't you ask me that question?

Dave:

Well, you read my mind there. Because this is a major discovery and understanding, it's not just the bacteria, it's what the bacteria produce, the chemicals they're producing that are causing all this biological problem. You mentioned the charge across the cell membrane. We talk a lot about mitochondrial stuff and electrical flow quite often on the show. So, yeah, how did you come across this? Because this is a seminal discovery, at least in my view of the world.

John:

Yeah. Well, I love telling the story. So, I'm glad you thought to ask me that. It was sort of like a eureka moment in my life. And I think everyone deserves a eureka moment. It was a eureka moment, not followed by me leaping up and running naked in the streets and yelling, "I found it, I found it."

 But I often think now retrospectively that I should have acknowledged that moment in a more spectacular fashion. It occurred when I was in a lecture at Melbourne University. I had decided I wanted to become a microbiologist. I wanted to understand streptococci in some great depth and I wanted to understand how maybe we could control streptococcal bacteria, stop them causing rheumatic fever in young children such as myself.

 So, I was sitting in this microbiology lecture one day at Melbourne University and the lecturer at this occasion was a Dr. Rose [inaudible 00:17:54]. She had just come back from the Rockefeller University, where she'd been on a study leave with a very famous ecologist called [Renee Dubeau 00:18:04]. And she came back charged with the idea of using bacteria to fight other bacteria, using good friendly bacteria. But her interest was in the gut, in the gastrointestinal tract.

 And so, she was telling story of how she wanted to find an Escherichia coli, this is a very generally a fairly friendly bacterium found in the gut. She wanted to find one producing the bacteriocin called colicin that would act against salmonellas and shigellas. These bacteria that cause nasty gastrointestinal infection.

 So, she was talking about how she wanted to feed us, her class, Escherichia coli producing bacteriocin to protect us against salmonellas and shigellas. Sitting there in her class, I thought, "Wow, what a great idea. What if I could find a friendly streptococcus that would specifically do battle in the oral cavity against Strep pyogenes and prevent Streptococcus pyogenes sore throats going on to rheumatic fever." So, that was my eureka moment in life.

 I knew right away what I needed to do in my life was to find a friendly bacteriocin producing streptococcus, and that goes way back to 1968. So, it was on my card of things that I wanted to do in my life from quite a long time ago.

Dave:

Your whole group really is about revenge at this point. You're just going to get even with those streptococcus who came after you when you were 12, right?

John:

Yeah. I guess so.

Dave:

Not really.

John:

No, because it's more subtle than that.

Dave:

It is.

John:

Yes, because what I found after learning a bit more about the world of streptococci and internationally, there is a streptococcus club. This is a club of streptococcal devotees, people who have this love-hate affair with the streptococcus. They are intrigued by the mystery of the organism. It was one of the first bacteria discovered and described, goes way back to Louis Pasteur, in fact, was the first to observe it.

 But there is now an international streptococcal club, we call ourselves the Chain Gang because streptococci form these chain-like aggregates. And I learned that the king of the streptococcal club at this stage was someone at the University of Minnesota called Lewis Wanamaker. So, I wrote to the king and said, "Look, could I come and study in your court, Dr. Wanamaker? I want to learn more about ways to control Streptococcus pyogenes."

 Interestingly, Lewis Wanamaker was one of the panel of researchers who first introduced the use of penicillin prophylaxis. He introduced that for the troops for the army in the United States as a way of preventing streptococcal sequelae, like rheumatic fever.

 And so, I wrote to him and said, "Look, I've got it in mind another strategy that doesn't depend on penicillin to try to prevent streptococcal infections. Could I come to your court and study in your court in your labs? And maybe together, we could progress a new strategy to protect against Strep pyogenes." And he supported that.

 So, I went to work with Professor Wanamaker for three years. But my storyline is going that he wasn't angry about Streptococcus pyogenes. He respected the enemy. And he said, "John, I don't think Streptococcus pyogenes deserves extermination? No, we just need to learn to live with the streptococcus. We need to understand one another. And we can coexist with Streptococcus pyogenes if we have greater knowledge."

 And so, I often thought of Professor Wanamaker's advice, that maybe what we can do is even in this strategy of using good bacteria to kill the bad ones, because the bacteriocins only kill rapidly multiplying Streptococcus pyogenes, that is Streptococcus pyogenes causing an infection, that's when they're growing rapidly. If they sit there and don't cause too much trouble just by growing slowly, if you like, then we can coexist with them. And we can actually come to love and respect the enemy, Streptococcus pyogenes. If we understand, we just need to train it, not to grow too fast.

Dave:

That's a really enlightened view, and one that really is in line with how humans have lived for tens of thousands of years where we didn't have penicillin out there to kill it. And I've got to say, of all the secret societies I've heard of, I think that yours is probably the coolest one to join the streptococcus club.

 So, I love when researchers get together and share information and knowledge because what's come out of your work is two different patented strains. Ones that I actually after I came across the research started using, ones I wish I had when I was a kid, the BLIS K12 and BLIS M18, which are the salivarius form, that actually work against the bad guys. So, after I brush my teeth, I chew one of the lozenges to repopulate my oral bacteria, which is different than repopulating the gut bacteria. What is the difference between doing it in the mouth versus in the gut?

John:

For me, the real importance is that the mouth is the portal of entry of most microbes, good or bad, for the human body. We have our skin microflora, of course. But I believe that by focusing attention on having a healthy and protective oral microbiota, you cannot only sort of interfere, you can delay or divert infections or disease of the oral cavity, then it can have a flow on effect also to the gut.

 We know that now that Streptococcus salivarius also is a significant colonizer of the gastrointestinal tract. There's not a lot of research outcome about what the value of it there is. But I believe that not only do we get a benefit from having good BLIS producing strains of Strep salivarius in the oral cavity, but it is great that they also form a population in our gut and in our lungs, because now it is also recognized that the lungs, the human lungs are not sterile, they have their own microbiota.

 And I think it's important that Strep salivarius comprises a significant proportion of your lung microbiota because if you have BLIS producing Strep salivarius in the mouth, then the organisms, the bacteria that these BLIS molecules can act against are less likely to cause infections of the lung.

 We know that K12 and M18, the BLIS that they produce are very active against Streptococcus pneumoniae, for example. And this is one of the organisms that we still have difficulties with in the lungs, as well as in the ears and other parts of the body. So, I've been talking about BLIS, I suppose, your listeners know the little bit about the origin of that term.

Dave:

I was going to say, what is BLIS? It's B-L-I-S is the K12 and M18 is the one I'm talking about. But I don't know what B-L-I-S stands for or why doesn't it have two S's. What's the deal there?

John:

Yeah, when I introduced the use of this term a number of years ago, first of all, I really had thought of it as an acronym for bacteriocins like inhibitory substance, but it's really evolved beyond an acronym now to a term in its own right, I think. And I think of it as a description of molecules that in the bacteriocin class or are still not fully defined, but have the characteristics that are consistent with bacteriocins.

 So, it's bacteriocin like, you think this is probably a bacteriocin, but I haven't necessarily done all the homework on it yet to be sure. So, we can use the term. And it's a cute term, isn't it? And it makes you smile, peace when you say it.

Dave:

I love the origin. It is funny when you get scientists who name things quite often. It's just a descriptive name that no one could remember. But I can remember BLIS, B-L-I-S, so good job on naming. You beat most of your colleagues.

John:

Yes. And I've taken it one step further. Just last year, my wife and I had a child and we named her of course, Bliss. And so, it's been, I guess, a translocation of my scientific term to a human reality that now I have more BLIS in my life.

Dave:

I love that. Although if you were to count the BLIS, given that you're using, I'm assuming you use the BLIS oral stuff every day, because you still don't want to get strep throat. So, you have what, billions of BLIS K12 and a daughter named Bliss?

John:

Yes, yes. And people may wonder why you need to regularly use. I mean, is that a question you were going to ask?

Dave:

It is, how often do you need to repopulate this in your mouth?

John:

That's a good question you ask. For some people, maybe you just need one dose and you are well colonized. But that's less typical than if you take one lozenge or lots of lozenges that you will be partially colonized and gradually, that population will dwindle. Now, why do they dwindle? It's because it's actually quite energetically demanding for the microbes to produce these BLIS molecules.

 And so, unless there's a really good reason for them to produce it, then those microbes producing the BLIS will not have an advantage, will not have a growth advantage in that population. So, gradually, the numbers will dwindle, dwindle.

 Now, if there was a challenge to them, then say with a Strep pyogenes infection coming in the numbers increasing, then there is a response. There are feedback responses so that the BLIS activity is increased. And if the BLIS being produced by a bacterium increases, then it's sort of like a feedback mechanism. The bacteria sense that there may be as a competitor for their terrain, so they pump up the production of BLIS.

 So, in answer to the first question, why do you have to repeatedly take it? It's just to ensure that you have a baseline level of the protective bacteria marshaled on your microbiome. That's mostly the time /The only place on that Planet Earth, where you find this Streptococcus salivarius species is the human tongue. But that's the main habitat. It's on other parts of the body, obviously, as well, but human, it's a human-associated bacterium.

 Its closest relative is in yogurt. It's the organism that's used commercially to make yogurt. That's the closest of the bacterium, but Streptococcus salivarius itself is found only associated with humans. And the BLIS producers comprise about maybe 10, 20% really good BLIS producers and why are they good BLIS producers? Because they have a megaplasmid.

 Now, a megaplasmid is, if you like, a secret advantage, not a secret, I mean, it's a practical advantage that Strep salivarius can have is a little bit of extra DNA, a circular DNA called a plasmid. But in Strep salivarius, these plasmids can be very big. And because they're big, we call them megaplasmid. And on these megaplasmids in Strep salivarius, loci, genetic loci for bacteriocins.

 And for instance, strain K12 and M18 have an ability to produce not one, not two, but three, four, or more known bacteriocin molecules. So, that makes them sort of like super warriors to heaven on our tongue. But the train of thought was why do you need to take product more than once to be for efficacy? It's because we need to ensure that we maintain at least a basic population, a basic proportion of our salivarius population with this capability.

Dave:

And these are only found in maybe two to 5% of people's tongues normally, unless they're doing something special, right?

John:

Yes. So, the original studies, when I started, I didn't know what I was looking for and I was truly blind. I believed if I looked hard enough, I would find a friendly streptococcus associated with humans that might be a good competitor against Strep pyogenes. I didn't know what this species might be. So, I went in quite blind. And the way the study was done was to enroll a 100 5-year-old children here in Dunedin in a longitudinal study.

 And so, all the way through primary school from age five to the next six years, I visited these 100 children at school three or four times a year, got them to spit for me, preferably in a bottle, and swab their throats and tested. Do they have Strep pyogenes? Do some of them not get Strep pyogenes as frequently? And then focus my attention on the children who didn't seem to get as many Strep pyogenes infections.

 I don't know if you're aware that this is the peak age range for strep sore throats is all the way through our primary school, so, age five to about 12. There's a greater occurrence of strep sore throat. But what I found was some of the children in those 100 were not getting as many strep sore throat.

 So, really took a hard look at what else they had in their mouths microbiologically. And what came out of that was the realization that Strep salivarius was often present in those children in relatively large numbers, Strep salivarius powered by ability to produce very strong BLIS activity. And the K12 strain of Strep salivarius came from child number 12 at Kaikorai School in Dunedin. And so, that's the origins of the term, K12.

Dave:

I was wondering if I'm in kindergarten through 12th grade, because that's what happens. So, K12 is actually the name of the school and subject 12.

John:

Yes, so that was origin.

Dave:

What's frustrating to me is that the BLIS oral probiotics have been on the market for 20 years. They have masses of clinical data behind them. And even though I'm pretty well read in the world, I didn't know about these 10 years ago. They've always been this sort of this hidden secret. And you think I would know because of this history of strep throat. So, how many people are using them now? Is this a global phenomenon? Is this just a few parents who figured it out? Is this adults? Who's using BLIS?

John:

More and more people it seems. I mean, you would probably know better than I. I'm just a mere microbiologist, who beavers away in the lab. And then there's a lot of other people within the company who really are charged with interest in how do we promote? How do we spread the word? How do we spread the microorganism worldwide?

 And so, I realized just from my lab positioning, that this is something that doesn't come rapidly. Because it's a first, it is the world's first oral probiotic, then it's a matter of educating people that when you think probiotic, it's not just gut. I mean, most mostly people have that gut feeling that you got to take something to live in your gut. And we know even that the most of the intestinal probiotics, they don't survive in the gut, they just make a very rapid transit.

 So, we were trying to make a case now and to introduce an organism that would actually persist, would have more than just a transient presence in the oral cavity. So, your question about who is using and why not more, I guess, it seems to be increasing in its usage. I think, in North America fine and many parts of Europe. So, there are an awful lot depends on particular enthusiasts, streptococcal enthusiasts, in different parts of the world to help spread the word.

Dave:

Well, part of the role of this show is to find these new shining discoveries that a lot of us don't know about that have good science behind them that solve problems or give us new abilities. And you mentioned plasmids. And plasmids are very interesting because bacteria can trade them with other bacteria.

 So, the way I've explained them on the show before, and I want you to tell me where I'm wrong in this description, whether it passes your muster as a scientist, it's that if you imagine X-Men, the superhero mutants. And if they all got together at a swap meet, and Wolverine said, "Hey, I've got a plasmid that makes me heal quickly. I'll give that to you." And someone else can say, "Oh, here, I'll give you my shape shifting ability." So, basically, bacteria can sort of swap these and the ones you're finding have a plasmid that has extra super powers on it, basically.

 And this is how bacteria when you put them in feedlots and cows and you give them lots of antibiotics, they can swap antibiotic resistant plasmids. So, is that analogy of trading cards with superpowers that superheroes would have or mutants would have? Good analogy, bad analogy?

John:

I like it. I mean, the interesting and important thing about the salivarius megaplasmids is that they do seem specific to Streptococcus salivarius. So, if people are concerned all what if the megaplasmid managed to take up residence in a Streptococcus pyogenes, wouldn't that be bad? Yeah, in a science fiction, could it be bad? Well, that would be bad, but there is no evidence. I have looked at all of the complete range of different serotypes of Streptococcus pyogenes. And there is no evidence of presence of these salivarius megaplasmids in the bad guy, Strep pyogenes.

Dave:

Good. So, this is a plasmid that doesn't get traded with the bad guys, which is fantastic.

John:

I mean, in this world, you can never say never, can you? Well, you do at your peril.

Dave:

You haven't seen it yet.

John:

Yeah. It certainly hasn't been observed.

Dave:

Okay.

John:

And I don't know how many hundreds of thousands of doses now of K12 had been administered worldwide, but many, many, many. And the other really good thing comforting thing from my perspective is when getting no feedback about misadventure from Strep salivarius K12. Even though it's equipped with the ability to produce these BLIS molecules, it doesn't turn nasty. It doesn't overgrow. It still occupies a respectable space within our microbiota, it seems.

 And we were just trying to think of ways to encourage it to spread to other parts of the body or to what sort of a job can it do for us in the gut? What can it do? What about on your skin? I mean, when I went to the king's laboratory, Lewis Wanamaker, his interest was in Strep pyogenes infections not only of the throat, but of the skin. And we know that pyogenes can cause school sores and impetigo. And so, I had wondered more than once, could we get salivarius strains that could be implanted on the human skin survive and do a job in protecting against these streptococcal infections.

 And to the extent that when I visited these school children, I sometimes would take swabbings from the fingers and from their thumbs, because they often sort of stray into their mouths. Of course, I thought maybe some of the salivarius would have colonized it. So, we do have strains of salivarius that seem to be adapted to grow on human skin. They haven't been further developed, because we meantime found another strain of something called Micrococcus luteus. This is the latest of the team, I suppose, of probiotics produced by BLIS technologies.

 And this Micrococcus luteus Q24 is the world's first skin probiotic strain. And when I first discovered it, I was interested because it also acted on Streptococcus pyogenes, and I thought, well, maybe this is an opportunity to find or maybe we have here an organism that can help protect against impetigo and some of the consequences of impetigo in children and adults. So, I digress, but ergo.

Dave:

Is Q24 available? Do I just not know about this one?

John:

It is very much on the cusp of being launched.

Dave:

It's on the cusp, okay.

John:

Yeah.

Dave:

Got it.

John:

So, I don't know what that means. What can I say about that? I mean, watch the space.

Dave:

All right, good deal. Well, here's what I'm doing now. I brush my teeth with a nontoxic, nonantiseptic toothpowder, it is the primal life stuff. Trina has been on the show to talk about that.

 And then I put in one of the K12, the BLIS K12 lozenges, kind of chew it and all that stuff. Then I put in a bite guard that prevents teeth grinding at night. Then I put tape over my lips so that I sleep and I breathe through my nose, not my mouth, which totally transfers my sleep.

 And then I wake up the next morning. And the other thing we haven't talked about is it stops bad breath entirely. So, you wake up and you have no bad breath, no morning breath whatsoever. Is that a good order of operations for my weird evening routine?

John:

It sounds intriguing. Yeah.

Dave:

I'm kind of a nerd.

John:

Yeah. No, whatever works. Now, what's interesting about the use of probiotics and the administration of them, I think, doing it at night is good, because our body has various circadian rhythms. And one of these rhythms relates to the salivation frequency or rate of salivation, which is turned down at night.

 So, by taking your probiotic just after you say your prayers or not at night, before you go to sleep, I think there is good reason because you get less wash out from your saliva. There is a greater opportunity for the microbes released from the tablet or powder, whatever you're using, to establish residents without being flushed out by saliva. And it's not all bad. Those that get flushed out by your saliva, they have a chance then to establish residence in your gut but that's another story. But what you're doing is sensible. I think that sort of time of colonization is what I would generally recommend.

 And the other time of colonization that listeners should be aware of and probably are, but it's good reminding people that when you do have to take a course of antibiotic for whatever reason, you put onto penicillin, then that is the golden opportunity then to slip in your probiotic because the antibiotic will clear space, not only will the antibiotic hopefully deal with the infecting organism, but it will drop the count of your indigenous microbiota by a couple of logs, potentially. And that makes space then for the probiotics.

 I think about the day when hopefully, the medicos will realize the advantages of prescribing for their patient, not only antibiotic, but at the bottom of the prescription, perhaps writing, oh, and don't forget on the last day of antibiotic, start your probiotic course then, because there'll be good space in your microbiota for the probiotic to colonize, and you'll have a much greater opportunity for success.

Dave:

It's sort of like what people do who have small intestinal bacterial overgrowth. So, you can take antibiotics that kind of knock everything out, then you take all the good guys and you reestablish a very different system in there.

John:

Yeah.

Dave:

So, I would support your advice there as well. One of the things that got me also interested specifically in K12, then I want to understand the difference with M18, but you have papers that said influences genes associated with innate response pathways and general epithelial cell function. I have weak epithelial cells genetically. I learned that from the DNA company. In fact, I did a weird lab tests a while ago, and they found parts of my lung biome circulating in my blood, like you probably have weak epithelial membranes in your lungs.

 And so, that's interesting. And so, I'm always like, how do I make my epithelial layer stronger? What do you know about turning genes on and off as a result of the BLIS K12 species?

John:

I'm not an immunologist. So, what I say is very much generalized, but based on I think, good work, we have colleagues in department of immunology here at Otago University, who have done some studies. What we know is when you take a slug, when I say a slug, I mean, take a few K12 lozenges, and this is what I do when I used to be able to travel because you can't travel these days, but when I used to travel just before, about four hours before traveling, I would take a slug like a handful, a bit more delicate than that, John, I say about four tablets of K12. Let them dissolve on my tongue.

 And we did studies that showed it if you take K12 like that, then that's six hours, four to six hours later, you get a boost in your saliva of levels of gamma interferon. Now, we know that gamma interferon has some general protective effect against many sort of common viruses.

 And so, the reason I would take a slug and we have a product here called TravelGuard, and really the purpose of that product is for the benefit of people who are traveling or people going into a meeting where there's a whole cluster of people they don't know, some will be coughing and spluttering, et cetera. So, they might want to try to provide themselves with some temporary antiviral protection due to this gamma interferon increase. And so, that's something that has been documented that K12 can do.

 The other thing is that it has anti-inflammatory activity. So, it does not evoke a strong inflammatory response in the tissues. And this is believed to be also a beneficial attribute of K12 and possibly of M18. I think most of the studies have been done with K12 on there. So, we do know that these probiotics when taken in reasonable loads cannot only colonize, and as they multiply produce BLIS protective activity, but we can get immune regulatory activity in that you have this short-term boosting gamma interferon and a general sort of anti-inflammatory capability. So, this is other benefits, I suppose, of taking the probiotic.

Dave:

One of my hobbies is assembling the right team of weird bacterial species in my overall biota. So, there are some that make glutathione and some of them make anti-histamines and some that makes spermidine, and all sorts of different things like that.

 And so, I look at then, how do I make it so I have on board manufacturing inside my biota that makes the stuff that I want to have, and having the right form of cins, you've definitely got me convinced on that plus the decades of research on K12, I think speak for themselves.

 But you also have M18, which is curious for me, because it's not going after the streptococcus that's causing strep throat, it's going after cavities. What's it doing different? What's different about M18 versus K12?

John:

Okay, well, M18 can actually also suppress or help suppress the growth of Strep pyogenes, the bad guy. Not as completely perhaps in its repertoire, because K12 has the salivaricin A, which is a killer lantibiotic, salivaricin A, which is produced by M18, doesn't have the same killer potency as salivaricin B perhaps for pyogenes, but still can help control proliferation.

 But what attracted us to M18 as another line of useful oral probiotic product is its enzyme capability. And it was selected not only because of its megaplasmid artillery of bacteriocins, but also it produces urease and dextranase in quite significant quantities.

 Urease, what uses that? Well, urease is an enzyme that breaks down urea. We do have some urea in our saliva. When it breaks down urea, we have some ammonia release and so the pH tends to come up. So, the advantage of having a urealytic probiotic is that it helps to counter the acid formation effect of streptococcus mutants and other bacteria in that cluster that lead to the development of caries. So, that's a tick for urease.

 The other enzyme that it produces in quite effective concentrations is dextranase and we know that dextran is a polymer coating our teeth and the buildup of dextran helps to build up if you like a layer of organisms that have the capability of leading to caries. So, you don't want to have dextran accumulation. If you can limit that by having more dextranase activity in your saliva, then that is perceived to be also another beneficial attribute.

 So, M18 gets three ticks, that gets a tick for being a BLIS producer, and the BLIS producers has some direct activity against mutants streptococci as well. So, a tick for BLIS, a tick for urease, and a tick for dextranase.

Dave:

This is so fascinating, the old approach from back when you started your research would have been take some chemicals that kill it, sterilize the mouth with an alcohol-based mouthwash and all of that. And because of the research that you've been doing and just the research we've been doing as scientists or scientists, humans, we know so much more about it.

 So, to be able to go into that level and say this species does this use it this way, I think it's fundamental to biohacking. And it's such a more natural approach versus sort of come in and kill everything and see what happens. So, kudos for amazing work there.

 I want to take some questions from our live audience. And also, if you're wondering, how would I get this stuff, it's not that easy to buy in the US. But if you go to BLIS probiotic, B-L-I-S, probiotic.com, it'll give you a direct link to where you can find it on Amazon. You won't find it if you go straight to Amazon, usually. And you can use code Dave10. Because I do my best to get you guys a discount whenever possible. And Professor Tagg was kind enough to work it out. So, we can get you a little bit of a discount if you want to try it.

 I did decide that I was going to try using this when I first heard about it about a year or so ago. And I do it most nights before I go to bed. I think it's a meaningful improvement on having better bacteria and better upper GI tract health.

 And the things about cavities are amazing. What I haven't done yet is kind of my kids to use it, which I think really, they've never had problems with strep throat. But certainly, one of them has had a couple cavities. So, why I haven't had them on M18 because I didn't think of it until you just explained that to me. So, I'm going to be remedying that tonight. I don't know if my son's going to be happy about that or not. Well, you open to a few questions from the audience?

John:

Sure.

Dave:

Awesome. Let's bring Emma up from Upgrade Collective here.

Emma:

Hi, Professor Tagg. Thank you for your work. And like Dave, I wish I would have known this earlier. Anyway, the ENT, my ear, nose and throat doctor told me that I have strep that has taken up residence in my nasal membrane. It lives in there. It has its own colony. And I've had it on and off for years. And he said, it may even take a year of mupirocin to get rid of it. Now, would either one of those BLIS products help kill what's in that nasal passage?

John:

Not sure. I mean, it would be probably worth a try. I'm not sure what the causative organism is for your infection. And if it has taken resonance, now, this is another trick that bacteria can play on us is that some bacteria will actually invade our cells and live inside our own cells and that makes them very resistant to antibiotics. So, antibiotics have difficulty eliminating organisms that have taken up residence actually inside our own cells. And Streptococcus salivarius K12, we've looked at the possibility, can it go hunting and actually also live within ourselves, doesn't seem so.

 But something that I as a researcher have an interest in is trying to find a streptococcal warrior, a probiotic warrior that will go chasing intracellular pathogens. Because we know for instance, Strep pyogenes, Professor Wanamaker said we should just learn to coexist with the enemy and treat them more or less as troubled youth. They just need our understanding rather than extermination.

 And what he recommended was that just try to find a strategy that would suppress them, but not necessarily eliminate them. We need these troubled youth, these troublesome bugs as part of nature's plan. We just need to understand them better and find a way to stop them from creating mayhem, multiplying and being riotous in their behavior.

 So, it's probably not answering your question, but I like telling stories anyhow. So, it gave me the opportunity to talk about what interests me is to find a probiotic that will go hunting for these hideaway organisms that other antibiotics can't eliminate.

Emma:

It's something I'm going to learn to live with. And I guess make them my friends. I do know that they really like corn.

John:

Oh, nice.

Dave:

One of the things I tried in my desperate quest to get rid of sinus infections that started the day I had my tonsils taken out was to look at, I have actually snorted a line of probiotics to get them into my nose. I don't think that was a good thing to do to be perfectly honest. Have you seen people though, maybe take a little bit of it and rub it around the inside of their sinuses to help populate it?

John:

People will try anything. Yes. If they're troubled by a chronic condition like that. And who's to say that's not going to be successful? So, certainly, I have quite tremendous confidence in salivarius not being harmful. So, I would put it almost anywhere I think.

Dave:

Okay, so there's a nicely qualified academic answer that says unlikely to harm you. But I'm not guaranteeing it.

 The other thing to look at, for listeners, if you're dealing with that same thing is do a Google search for the Bulletproof Sinus Rinse, which you could do beforehand with saltwater, or even with a little bit of iodine to help knock down whatever's going in there and then repopulate, which seems like it'd be an interesting strategy. But again, work with your doctor.

John:

We like to hear at BLIS to think of our probiotic as being the probiotic for all ages. Because right from the moment of birth, and I know I had a big interest in newborn baby is very vulnerable to streptococcal disease. In fact, Group B streptococcus is the major bacterial killer of human newborn babies. And a lot of moms who have Group B strep colonization of the vagina will be put on antibiotics prior to birth to provide hopefully some protection to the baby against Group B streps.

 So, I'm very interested and we had some studies underway in Canada actually looking at whether colonizing mom, just prior to birth of her baby with K12, would provide a mechanism for right at birth, when mom is kissing and cuddling her baby to inoculate newborn baby with K12 right in those first few hours to help provide some protection against Group B strep infection. I really like that idea. And I'd like to see more studies sort of exploring the extent of protection that can be offered to babies in that way.

 But then when you go and look at all the different stages of life, there's no reason to stop taking K12 ever because very early on in life you have strep sore throats and then you go through ear infections. We know that there are benefits in protection against otitis media. And then we have halitosis, our teenagers need to have a good friendly protective Strep salivarius population if they want to optimize their dating experiences, they want to have good breath. And then later on in life right through, we have problems with periodontal disease, that we have studies showing that some of these streptococcal probiotics can help to limit periodontitis.

 And then later on in life in the latter years of life, we have candida infection. So, we know candida can cause oral thrush and can cause infections of other parts of the body as well. And Strep salivarius seems to have an ability to interfere with the growth of candida also.

Dave:

Wow.

John:

I mean, you should just put it in your bath and bathe every night. No, no. It has a role for everywhere on your body. We've even tried giving it to our penguins at the moment we have trouble. Well, our penguins, a yellow eyed penguin population is suffering from corynebacterium infections. And so, I have a student who's been looking at administering K12 to penguin chicks to try to provide some protection. And we had dog biscuits made with K12 in to help deal with canine bad breath, et cetera. So, the opportunities are limitless.

Dave:

The Swiss Army knife of a species. That was a fantastic question. Thank you, Tina, for asking that. First, it was Emma who asked it. Tina had one more question for you before the end of the show. Tina, do you want to hop on and ask your question?

Tina:

Because you want to keep different bacteria growing at different times, and so, if you stay on the same probiotic, you will kind of just have the same microbiota. So, should we cycle on and off your product?

John:

Cycling the probiotic meaning to switch from K12 to M18 to K12 to M18?

Dave:

Or just going off and going back on, either one.

John:

Yeah. What I'd like in the future, and hopefully the future is not too far away, is a very simple test. Because consumers would like to know obviously and practically, am I successful colonizer? In some time in the future, it'll be nice to just have a simple saliva test, perhaps. So, you take a sample of your saliva. You mail it in or you find some way of then getting the feedback on how good a colonizer am I? How good is my population? And then maybe a recommendation based on your existing microbiota, what would probably work best for you is this strain and that strain.

 And I think those days are not too far off. And I'm hoping I'd like to think the BLIS technologies would be a big part of that sort of development, because consumers are well informed. They want to be better informed. They want to be more in control of their own health and how to regulate that.

 So, I think by providing the tools for them to have more knowledge about their own microbiota and what is likely to be most successful at the moment, it has the feeling of being a bit haphazard, doesn't it? But that's just because of the limits of technology, we want to cover the opportunities by making sure we take it regularly. But how regularly do we need to take it and do we need to make switches? They are obvious questions that people will be interested in sometime finding answers to.

 And a good way to colonize is to find someone who's well colonized and become very friendly with them. Because saliva transmission is actually a very efficient way of colonizing. I used to give some of the students in the lab, get them to colonize with K12. They go home and do some experiments with their partners, and they bring back saliva samples from their partners and, whoopee, they're colonized as well. So, we get two for the price of one. So, I mean, there's all sorts of strategies for optimizing your colonization levels.

Dave:

This has been such a fascinating lesson for me and just how we got to the knowledge that we have now over the past decades of research. And I'm really happy that you're doing this work because this is something that should be as important as antibiotics when we talk about the future of our health and probiotics as a category are growing and we're learning more every day.

 But here you've gotten 30 years of research and tons of data on things. It's all very point-specific problems, the strep throat, cavities and things like that with all sorts of other benefits. I didn't know about the candida benefit, which is a major issue for people.

 So, thank you for your work in the world. And I think it's showing a lot of promise and it's already clearly changed a bunch of people's lives. Appreciate what you've done and that you're still doing it.

 Guys, you can go to BLIS probiotic, B-L-I-S, dot com and use code Dave10 at the link that they're going to give you. So, thank you.

John:

Can I leave one comment?

Dave:

Please.

John:

For your listeners, may the BLIS be forever with you.

Dave:

Beautiful.

John:

Okay.

Dave:

If you'd like today's episode, you know what to do. If you have bad breath or any of these other things we just talked about, maybe you ought to try the new BLIS probiotic. I think it's worth your time and attention and the science stands for itself as you just heard on the show. I like to bring you stuff that I use and stuff that I think is worth your time and attention and energy and this makes the cut for me.

 Have a beautiful day.

 I think we got a good episode. What do you think Upgrade Collective guys? You guys enjoy that?