Dr. Ron Ehrlich: Hello and welcome to “Unstress”. I'm Dr. Ron Ehrlich. Our relationship with bacteria is changing. Well, our knowledge and understanding is anyway. It's been an adversarial relationship for over a hundred years and with the advent of antibiotics and antimicrobials, along with products that promise to make our surfaces and bodies 99.9 percent antimicrobial and clean. As well as you'll hear of a very symptom-based approach to common health issues. All of those things well they're kind of changing.

We're learning that the majority of microbes are actually our friends and we need to learn more about them and how to look after them.

My guest today is Dr. Jason Hawrelak. Jason is a naturopathic physician who has done both his honours and his PhD degrees in the area of intestinal dysfunction, microbiome manipulation and the clinical applications of pre and probiotics. He's also a herbalist. He has taught health professionals at both the undergraduate and postgraduate level for the past 16 years and is currently the senior lecturer and coordinator of the evidence-based complementary medicine program at the University of Tasmania's School of Medicine. Jason has written extensively in textbooks and journals and specialises in the treatment of gastrointestinal disorders both acute and chronic such as irritable bowel syndrome and irritable bowel diseases like ulcerative colitis and Crohn's disease and much, much more. I hope you enjoyed this conversation I had with Dr. Jason Hawrelak.

Welcome to the show Jason.

Dr. Jason Hawrelak: Hey, thanks Ron thanks for the invitation to come in and chat.

Dr. Ron Ehrlich: Now Jason I'm picking up a very, very slight accent there and I know you're based in Tasmania and you've done your PhD you've done a huge amount of writing. I wonder if you might just share with our listener a little bit of your journey to this point.

Dr. Jason Hawrelak: Yeah, sure I sometimes forget I have an accent because I sound normal to me, but I did grow up in Canada at a city called Calgary which is near the Rocky Mountains. So, I grew up with that as my sort of local background and thinking that beautiful turquoise coloured rivers were the norm everywhere, little did I know that they are actually quite the exception and I was one of those aspiring backpackers who was intent to travel around the world but didn't get that far, I got to Fiji, New Zealand and Australia and fell in love with Australia and subsequently never left and that was back in 1992. So, I'm somewhat surprised, I've been in Australia longer than I was ever in Canada, but I still have I think a Canadian accent strangely enough.

Dr. Ron Ehrlich: It's very soft, it's very soft I was being picky.

Dr. Jason Hawrelak: That's all right. It's good it's still there, I met someone from Canada today and it seemed I was Australian right off that. Yeah, but I essentially went to Northern New South Wales where I arrived few days into Australia and lived up there and was lucky enough to study up there so that's where I did my original undergrad training, which was a

Bachelor of naturopathy up at the Southern Cross University. And then I had a lecturer in the last year of my course talk about talking about dysbiosis and leaky gut. And it got me so excited and inspired that I approached Dr. Steven Myers right afterwards and said hey, I want to research this I want to do my honours degree in this and hopefully my PhD and then that started my journey. So I started my honours degree back in 2000 which went for a year and we did some research looking at the impact of…essentially we ran a clinical trial in patients with irritable bowel syndrome and we gave them some probiotics and prebiotics and herbal medicines to see what impact it would have on their, essentially gut symptoms but also what impact it would have on what we termed at the time microflora, which we now call the microbiota and that subsequently flowed into a PhD. So, I was lucky enough, in my opinion, to spend five or six years full-time only studying the microbiota back way before it was cool and trendy. It was pretty amazing to see the rise, the meteoric rise of that topic area because it's something that I loved with passion and back at that time there was a dedicated group of microbiome microbiota researchers around the world that were numbered and probably under a hundred people. So, you read all their papers and all the topics in everything that was published every year and just now it's just the rise in the last 15 years has just been huge and its now thousands of papers published every year on probiotics prebiotics and the gut microbiota and we're linking microbiota to a lot more disease conditions than where we were originally.

We always knew it had a pretty critical role in human health and that research was clear around that for the 1960s and 70s, but it wasn't widely discussed. But now it's been widely discussed and our understanding is it's far more important than what we even believed back then.

Dr. Ron Ehrlich: Yeah and medicines not quick to jump on concepts who said 1960s and 70s the research was already out there, and I know people in the naturopathy world have been talking about leaky gut for many, many, many years and now with the term intestinal permeability which is essentially the same thing its become kind of more medicalised. It's accepted.

Dr. Jason Hawrelak: Yeah. Well, it's amazing how much research there is out there on the intestinal permeability now for type 2 diabetes, obesity. These conditions that are so commonplace in Western nations and we're seeing huh that there's actually a leaky gut. Component of these common conditions that still hasn't filtered through to your average medical doctor on the beat but it's certainly there in research settings that would give another 10 years and your more typical based practitioner will be on board with some of these concepts because as you said it takes a while for it to filter down.

Dr. Ron Ehrlich: Yes. It first hit the journals in the 60s and 70s but by about 2030 it should be readily available than most cheapies practices. Listen you mentioned a lot there and some of that stuff I want to cover with you today I thought we might start with microbes because there is something that people whenever they hear the term microbes they immediately go to infection, disease that all come to mind but this as we've just alluded to being an image change, a PR change in the last few years. Why are we recognising them as being so important?

Dr. Jason Hawrelak: Yeah that's a great question and as someone that was involved with the field before I suppose the great rise to prominence it is now. I think the biggest shift behind that would be a change in research techniques, so we could see better what was there. From the late 1800s to the late 1900s we relied on a technique called culturing to look at the world of microbes and certainly to ascertain what was in our gut and towards the late 90s early 2000 research was coming out suggesting that. That this was insufficient or an inadequate technique to properly assess what was there and then we essentially switch to using DNA type technology and they open up a whole new world.

And also we concede that the microbiota did change when we changed diet, it did change when we took antibiotics more than just for a week or two but actually for months to years to change, it did change when we took other medications and it really opened up and the research became much more in-depth and we can start making these connections between different disease states because we had technology that was sensitive enough to see the changes. I think that is the big, the biggest change because we knew back in the 60s and 70s 80s that the microbiota was important for autoimmune system function and then if you took out the microbes and they actually did this they called germ-free rats where they essentially are born sort of sterile and given tons of antibiotics. They keep them sterile and put them in a little bubble to mean that they can't grow microbes.

And what they observed then was that the thymus gland and the spleen would shrink which are both important immune system organs. They also found that the capacity of white blood cells to deal with invaders dropped dramatically. They just couldn't properly, and if you could introduce some poo back into those mice or rats than the immune system functions would improve again, the thymus gland and spleen would grow again back to normal size.

So, some of the things we knew but for a long time but I think really from the early 2000s onwards were certain that they started making this connection between not only immune system health and nutritional health in terms of B vitamins and vitamin K again that was known for a long time but this connection between microbes and how they regulate metabolism, how they actually impact our mood, how they impact your inflammatory or more generally and I think that is perhaps the key thing that's really shifting things around because research has shown that the composition of the ecosystem you have, the composition of your microbiota really determines your inflammatory environment body-wide. Not just in the gut but body wide in that. If you've got a predominance of certain species then this is a driver of inflammation. And as a health professional would probably have been hard-pressed finding a disease state that is not associated, there is not inflammation as a key driver. And it turns out that these microbes are potentially one of, if not the key driver of that inflammation that's going on in the body.

And conversely if you have a different group of bacteria growing you actually have an anti-inflammatory driver, so these microbes are ensuring that your gut integrity is good and they're producing compounds that have anti-inflammatory effects body-wide and help modulate the immune system response.

Dr. Ron Ehrlich: So, I mean these culturing techniques that were commonplace at the time I mean correct me if we are wrong but we have both anaerobic and aerobic bacteria and it's

reasonably easy to culture aerobic because they're out there and they need air. But the challenge has always been anaerobes. Is that part of the problem, was that part of the problem in the culturing?

Dr. Jason Hawrelak: It is certainly part of the problem and back in the late 1960s there was a huge leap forward in microbiology because they developed anaerobic techniques and before that could only see a small amount of what was in the gut like some e.coli, some lactobacillus, some microbes that could handle being exposed to oxygen. In the late 1960s they developed anaerobic techniques and realise, oh we had no idea what was there, was a huge leap that they could find a whole bunch new genera, that they didn't know existed before. And similarly, in early 2000s there's another even bigger leap to give an insight as to what species can compose people gut ecosystems, they isolated another two hundred forty or fifty species they didn’t know existed before from early 2000 onward.

Dr. Ron Ehrlich: This was with the DNA testing?

Dr. Jason Hawrelak: Yeah. And you're right it was essentially that even with the best anaerobic techniques we had at the time we still couldn't grow these things because they are so sensitive to oxygen that the tiny exposure would kill them off. In culturing depends on having a live microbe then and feeding it the right food that it needs and we could observe it and isolate it out from other competitive microbes and we can give it a name and etc and describe what it does but the change of DNA taking status to see what was there that was independent of having them alive when they enter into the toilet bowl essentially.

Dr. Ron Ehrlich: Yeah and then I mean this is taking a gut microbiology to a forensic level really isn’t it?

Dr. Jason Hawrelak: Yes. Yeah and there has been tremendous evolution in tools that we’re using in the end from tools overlap to see what went genus or genera were present to ones that can go down to the very strain specific aspects and tell us what genes are present even in microbes that we haven’t named yet and we don't know what they do but we can see what changes are actually present. And really, I do DNA based microbiota assessment with many of my patients we get this list of 100 different species that are there, the vast majority which we still don't know what role they play and what they do because they've only recently been discovered. And I think gosh another 10 or 15 years once researchers get on top of this backlog of research that needs to be done, we'll have a much better idea of the role of many of these different species.

Dr. Ron Ehrlich: And I'm guessing that the combination it's a bit like environmental toxins isn't it? These kinds of tests one toxin at a time and determine how its effect on human health and it's very limited because that's not how we are exposed to environmental toxins and the same would be true of the microbiome. Yeah, we could test one microbe at a time but as soon as we add another one then that's a combination and we could certainly you mention 250 that we've just been identified in varying combinations. I mean the research challenge is huge.

Dr. Jason Hawrelak: It is, it is because you're right because how one species reacts on its own is completely different potentially reacts with other species or dozens or hundreds of species

that you'd actually have in a more vertical gut environment. So, it is very complex and details there are thousands of researchers around the world trying to tease out these very same questions that we're discussing now.

Dr. Ron Ehrlich: Yeah, but there are some general principles we know for sure. I've heard the estimate of manubial cells to microbial cells that are commonly on our body varying from twice the number there are twice the number of microbes to ten times the number of microbes. Can you just clear up for me Jason what should we be saying when we make that statement?

Dr. Jason Hawrelak: That depends on whose paper you read. There's still debate and discussion around that between that you as a human being are 90 percent microbe and 10 percent no microbe would be the most commonly used ratio but there are some more recent researchers are suggesting it. At the other extreme end of that would be half - half maybe half microbial cells half non-microbial cells to make up the human being I think most people generally believe that we're more microbes than we are non-microbe as humans.

Dr. Ron Ehrlich: Yeah, yeah. Okay, now that's good because well I heard the 90 percent story and then I'd heard two to one story and I thought there's quite a range there isn't there? I want to get it right. Now I wanted to also to ask a some basics now, I want to go back to gut microbiome or microbiome 101. People are familiar with the term antibiotic and actually experience it from very early on in life but we're hearing the terms now prebiotic, probiotic and I know you've even used the term symbiotic. Could we just give our listener a little bit of a definition of what those terms mean?

Dr. Jason Hawrelak: Yeah. Well, we can start with probiotic. Probiotic is a live microbe that when administered in adequate amount confers a health benefit on the host, that's the strict definition that's been widely used for the last decade. And there are some things that can be teased out from that. Live, live microbes so therefore if you have a supplement that contains dead bacteria it's no longer a probiotic at that point.

And then the other aspect of the definition is when it administered in adequate amounts. So, you actually have to have a therapeutic dose involved with this process too because if you have below a certain amount then the microbes might be alive, but they won't have a therapeutic effect. And then the last bit of that definition is it has a health benefit when you ingest it.

And in some parts of the world, they're very picky about this definition and that you can't call your supplement a probiotic unless you have human clinical trials showing that this health benefits associated with ingestion.

Well, nowhere in Australia we're not that picky about that but in some parts of the world, say Europe it's like no you can call it a microbial supplement or active culture supplement but you can't call it a probiotic unless you have human clinical trials showing that your exact formulation these act strains containing your formulation have at therapeutic effect. I find it interesting that we've got quite loose definitions used from a commercial perspective here in Australia compared to elsewhere.

Prebiotics are essentially the best way of looking at them are like a selective fertiliser. So, it's a substance that is selectively fermented by beneficial microbes in the gut and generally one or limited number of species so it's substance that is indigestible to humans reaches the colon the large intestine where then it is selectively fermented by only certain microbes that is a hundred-plus that might be present have got the right machinery to break down or digest those contents.

And as a consequence, when they consume it they get an ecological advantage and their population will increase and then it can then change the environment locally because of their they're now larger amount of territory they hold in the gut and then we tend to see that especially with health benefits as well.

Dr. Ron Ehrlich: So, the prebiotic is not bacteria but it's what bacteria would feed on?

Dr. Jason Hawrelak: Yes, but it's the selectivity that will define a pre-biotic versus a typical dietary fibre. A typical dietary fibre is not prebiotics, it might feed 30 or 40 or 50 different species or more. That's still helpful, we still should be consuming lots of what is a wide diversity of fibre shapes and sizes for sure that's how we get a more diverse healthy ecosystem. But prebiotics are defined by the selectivity that there might be one or two species out of 100 plus in your gut that actually can break this down and their populations do grow where it's the other populations don't when you introduce plea bargains into the mix.

Dr. Ron Ehrlich: Going back to the probiotic I'm often confused when I go into a health food store, you know some are in the fridge and then some on the shelf? And I can't logically I'm thinking well hang on either they should be in the fridge or what's the difference? We know when we have freeze-dried, and we have this, how do we make sense of that as a consumer?

Dr. Jason Hawrelak: Yeah. Now, most probiotic supplements are freeze-dried and some strains have got a great degree of toughness, they can handle room temperature for years without losing any viability. But there are others that are actually far more sensitive to environmental conditions that we know we need if we want them to be alive when we consume them, we need to keep them in this fridge. And this is very much a strain-specific trait. And these days I mean back in the old days it was 20-30 years ago it was pretty random what microbes showed up in some probiotic supplements.

There wasn't a great degree of systematic research that went into choosing that particular microbe to put into the supplement and that has changed dramatically over the last 20 years. So, these days thankfully most of the probiotic supplement out there, the strains contained in them have actually gone through a battery of tests first before they were ever developed commercially, and that battery of tests would include can they survive stomach acid, can they survive wild and other digestive secretions. Can they attach to your gut cells after you ingest them there are basic criteria but on top of that they look to go okay, can it survive at room temperature for a couple years, so it doesn't need to be refrigerated?

So, there's a lot of strains that have hit the marketplace in the last decade-plus that actually were selected because they've got that hardiness, they can handle room temperature, so we can't necessarily assume that because a product is in the fridge, therefore, it's better than one

that room temperature. It really depends on the quality of the strains and most good companies would have actually selected the storage method based on the hardiness of the strain that's contained in the supplement.

Dr. Ron Ehrlich: Okay, we've got those probiotics in their various forms live microbes', adequate amounts, health benefits. What are your thoughts when we kind of look at its food versus supplements? How do we how do we wade through this for both probiotic and prebiotic?

Dr. Jason Hawrelak: Okay. Well, let's look at probiotics first and I think the most recent definition of probiotics clearly separated out typical fermented foods that they said were essentially sources of live and active cultures and not probiotics. So, they would put things like kombucha, sauerkraut, kimchi, most kefir all in that category, that you yes you get exposure to lies and active microbes cultures but essentially they said they don't meet the strict definition of probiotics because of the inherent variability you have with wild ferments in terms of numbers of microbes species of microbes strains of microbes. We can't actually guarantee you can have any sort of therapeutic, therefore, we won't call it a probiotic.

So, you've got the more traditional ferments which are still widely eaten. I still eat them, you can't rely on them for a specific series of effects in the same way you can well defined probiotic supplements. But you do get some fermented foods where they actually add specific therapeutically critically active strains to their finished product and so there'll be for me those brand of yogurt that I call food yogurts then there's medicinal yogurts, which essentially have been spiked with therapeutic strains of bacteria that with clinical trials showing that there they do things that have specific effects versus just food yogurts that are just they taste good you're getting some microbes and varying amounts which differ batch to batch but still will have some general health benefit like enhanced immune response for example but nothing very specific.

And you'll find that even in the realms of kombucha you can buy commercially or kefir you could buy commercially around the world. Some companies deliberately spike their product with a therapeutic strain on top of the wild ferments to ensure that it has a therapeutic effect beyond just being a tasty fermented beverage.

Dr. Ron Ehrlich: So, the thing that defines it's claimed to be a probiotic is its specificity as well which is that third criterion of providing a health benefit. Specific health benefits.

Dr. Jason Hawrelak: That's right this is because a traditional fermented food like sauerkraut probably have live microbes, I think when you're consuming it, because pickling it yourself should be alive and it should based on research have aa therapeutic amount of microbes it with a teaspoon of sauerkraut is but 100 million lactobacilli typically. But what you don't know is that the strain of life is plant that's found in your sauerkraut which would be different than the one that's found in mine if it has any therapeutic effects whether it will survive gastric juices or bile salts, whether it will compete against pathogens are bad bugs in your gut. We don't have that specific sort of data whereas with a good supplement we'd have that sort of data we so we'd know for sure that it can meet those criteria but it might have an

additional staggered effect on top of that like decreasing inflammation in the gut or improving transit time from you go ahead up slow colonic transit time for example.

Dr. Ron Ehrlich: And the prebiotic I mean I've often picked up a sauerkraut in the health food store Organic sauerkraut looked very impressive and then I read the fine print and it had been pasteurised. And I thought gee that seems like a contradiction in ambiguities there. I mean why would you pasteurise something that you want but then maybe it's a prebiotic just the fertiliser for these. Are those kinds of fermented foods could they be called prebiotics or is that not specific enough?

Dr. Jason Hawrelak: Not really because what you've really done is pre-digested the food first, which often means that there's actually less food for your indigenous populations and if you had it unfermented so cabbage, we would probably feed your own microbes in your gut better unfermented than vs. fermented. So, if you make the sauerkraut the microbes that have created cabbage and turn into sauerkraut. They've already pre-digested and eaten some of the same compounds that otherwise your gut bacteria would eat.

So, the compounds that we tend to see most as classic prebiotics would be things like fructooligosaccharides or inulin that we find in a range of natural food items from onions and garlic to asparagus, burdock root, dandelion root, Jerusalem artichokes. So, some of those foods are not so widely consumed in the last hundred years but used to be widely consumed by humans and then we get galacto-oligosaccharides that we find mostly in my game and those compounds essentially because of the shape of them they're oligosaccharides which means that they're in between a sugar and the fibre in terms of size. Fibres are much generally longer and/or polysaccharides much longer and these are medium size of but humans don't have the framework to or the machinery to break down those oligosaccharides, they reach the colon and they are there selectively fermented by those microbes that can utilise them often microbes like Bifido bacteria that people are quite familiar with to other microbes that were often not so familiar with because they've only recently been isolated and named. Species like acromania, that are really important key gut species that people didn't even know exist. That are fed by us and consuming these prebiotic compounds. And you can also get them separated out into supplements. You can get fructooligosaccharides as a powder or oligosaccharides as a powder, but you can in this case eating the whole food that contains this thing also will give you that prebiotic effect as long as you ingest a sufficient amount.

Dr. Ron Ehrlich: Okay. And symbiotic, tell me a bit about that because that's an interesting one.

Dr. Jason Hawrelak: Yeah. So, symbiotic the idea is that you've actually combined a probiotic and a prebiotic together and then that should enhance the survival of the supplemented probiotic strain in the gut to be giving it a good source of life. I think the research has been mixed in terms of living up to its hype, but a part of that has been issues with funding, making sure that the exact strain used in your supplement can utilise that exact sugar, that your prebiotic compound you're putting with it and you would think that would be common sense but you think wrong.

Some companies haven't bothered to do that. They just have some random probiotic with some oligosaccharides and assume that it's going to be able to ingest that and enhance its survival characteristics or have some additional therapeutic benefit. But that's not always clear from what we had commercially available. But you can if you have a certain amount of knowledge or what practitioner does is combined take this probiotic take this probiotic which will feed that when I'm taking the same mouthful and you should get enhanced numbers of that microbe for at least a short period of time whilst you're taking it.

Dr. Ron Ehrlich: Now you've also spent a good deal of your professional life and research looking at digestive disorders. What are some of the common ones you that we see in our in our society now and what are some of those signs that people might have that they've had these?

Dr. Jason Hawrelak: Yeah, that's sort of quite a lot of questions there. In terms of my practice, I would see irritable bowel syndrome patients or patients who were given that label of your bowel syndrome IBS would probably make up the bulk of my practice these days. My job is always to try to tease out what that means for them and what the cause of their gut symptoms is because the most common symptoms for that sort of condition are abdominal pain or discomfort, bloating, distension and changes in bowel patterns so that might be constipation or might be diarrhea. Those are signs more broadly that your gut function is not ideal, particularly pain distension bloating and big changes in bowel patterns. So, doing one bowel movement a week is a clear sign that's not going well and doing seven a day is a clear sign that things are not well also having blood in your stool or mucus in your stool also signs that there's something at least further up that needs to be investigated and treated.

Dr. Ron Ehrlich: Now IBS is kind of a broad term isn't it really? That the kind of this needs to have been going on not just for a couple of days but for a minimum of…

Dr. Jason Hawrelak: Three months strictly with current definitions. Yeah. Yes, it's more of a chronic condition that for many people is episodic there are some people across all day every day as well so that variable per person. But it is very much an umbrella term that this is if you have these symptoms then we're going to label it with IBS as long as you don't have other inflammatory bowel disease or these other conditions and sort of rule these out.

But then it's really a matter of working out what the issue is because from seeing IBS patients for 18 years, there's no one thing that's a problem for all IBS patients and the challenge of the clinician is working out what's the driver of those symptoms for this individual patient who's sitting in front of you. It would be different from the next person that has IBS.

Dr. Ron Ehrlich: And then these two terms as sound almost so aligned but they are quite different IBS - irritable bowel syndrome and IBD - irritable bowel disease. Is that an umbrella term for those other ones like ulcerative colitis Crohn's and all that or are they separate again?

Dr. Jason Hawrelak: IBD or inflammatory bowel disease. Yeah, is quite different and it does sound similar to IBS – IBD. They have quite separate. IBS is about a functional condition that we don't see associated in general with severe gut damage. There might be mild-

moderate degrees of inflammation, but it's defined as a functional condition whereas the inflammatory bowel disease is associated with certainly more severe symptoms of blood coming out in your poo and severe pain and actual tissue damage and severe levels of inflammation. So, the severity is much greater in general with inflammatory bowel disease but the two key ones fit that category the most common ones would be ulcerative colitis and Crohn's disease but you also get collagenous colitis and microscopic colitis and even some idiopathic colitis that colons inflamed we don't know why so it often diagnosed with the people come with two to my practice and they are my role so to tease out why there's there is inflammation in their colon.

Dr. Ron Ehrlich: Yeah, I mean one of the things I often kind of a message that I think's worth telling people is that each and every day your body sends you a report card and let you know how you're doing and the question is do you listen to it or not and you've mentioned bloating and wind I guess also and reflux. And these to some people this is normal, but it's not is it?

Dr. Jason Hawrelak: I would say wind is normal but let’s declare about that, that the farting is totally normal, and you will fart more when you eat more whole plant foods. Everybody will produce more gas. What's not normal which is a sign that there's something wrong is when you get bloating distension, your gut balloons out like you're nine months pregnant hey that's a sign of dysfunction and something's not quite right. Pooing once every two or three days is dysfunctional and even if you don't have symptoms now besides just pooing in between three days it will probably lead to some negative sequelae later on and it should be it should be addressed or at the earlier stages rather than waiting 20 years for colon cancer to develop or something along those lines.

Dr. Ron Ehrlich: Yes. So, okay passing wind. That’s okay take that box bloating not so good reflux, indigestion, heartburn.

Dr. Jason Hawrelak: Those are certain signs or something not going right we shouldn't be having burning pain in our esophagus on a regular basis yeah. Once a year if you have a big night out drinking you'd expect that but a few times a week no, that's a sign that some things are not normal, and you should get it tested.

Dr. Ron Ehrlich: And typically, and I think you would see this all the time of people coming into you that have suffered for a while, of course, the typical approach to that in our Western medical approaches take an antacid or take a protein pump inhibitor. They're huge selling products. What are some of the problems with that approach?

Dr. Jason Hawrelak: Well, I mean yeah, it's fascinating the research that's come out the last four years or plus a bit but there's been a lot looking at the microbiota consequences of proton pump inhibitors. If you go back to some of the early research that was done on them they were shown to have antibiotic-like effects back in the early days of development and people sort of forgot that, the reason it is used as part of that triple therapy to kill he'll go back to pylori which are the main micro that's involved with causing stomach ulcers or peptic ulcers more broadly. The main reason it's used is that it does kill h.pylori, but we've forgotten that they have anti-bacteria effects and we're taking this thing not just for two weeks we're taking his medication daily for years and for many, many years in many patients.

And what research has shown in the last four years that it has an antibacterial effect in the gut and it's killing off bacteria in the colon and these people that have been on proton pump inhibitors for long periods of time, so these are the four things are often prescribed in huge amounts for reflux. Actually, have similar damage to their ecosystem as if they've been on prolonged antibiotics for four months once at a time. It's actually caused massive shifts in diversity through extinctions of species occurring in the microbiota and decreased levels of a range of beneficial anti-inflammatory species and an increase in the level of gut pro-inflammatory species. It's really fascinating to see the tease out that with what's been occurring in the colon that's a consequence of these meds. And other things we knew for a while like you have increased risk of osteoporosis and increased risk of pneumonia because all of a sudden your stomach, which is supposed to be essentially sterile because you've got this really strong stomach acid to kill any microbes that you ingest or event any sort of backlog of microbes from coming from lower down the gut.

When you take that proton pump inhibitor it inhibits your stomach acid from being very potent at all and researchers fan of these people that take them off and have moulds they'll have yeast and they'll have a whole range of bacteria growing in the stomach and it's a pretty easy journey from the stomach into the lungs to their much greater risk of bacterial pneumonia for example.

Dr. Ron Ehrlich: And for our listener who's sitting there thinking well proton pump inhibitors that's no good thank goodness I'm only on Nexium or… So, what are some common brand names that just to alert how listener to the fact that there are really might quite common and medication? What are they? Nexium?

Dr. Jason Hawrelak: Nexium is a big one. There’s like ten million prescriptions every year in Australia. Ten million in a country of like 24 million. It's scary the amount that's being prescribed but Nexium, Bozek, Somaek are the common ones. Most people that are prescribed medications for Reflux are taking a proton pump inhibitor they may not know it by that name. In some recent research was with looked at whether people were taking them based on sound reasoning or good rationale and the research was suggesting that between 25 and 70 percent of people that were taking proton pump inhibitors and the current here and now we're doing so inappropriately didn't need to be on them.

So, maybe something that's worth revisiting think of those alternatives based on the current data sets because there's even linking it now with increased risk of Alzheimer's, dementia the proton pump are used in it and then that makes full sense if you think about the damage to the colonic microbiota that we're having as a consequence and the types of species that increase due to a program probably reduced and their pro-inflammatory by-products which are being linked in other research to Alzheimer's disease, tell you what to expect to happen in that situation.

Dr. Ron Ehrlich: Yeah. This report card that we keep getting every day is bowel movements and you've just kind of said once every two what is normal? What would one consider what would you consider given your knowledge that is normal bowel movement? Frequency and form. Frequency and form here Jason. You can get specific.

Dr. Jason Hawrelak: Can I? That's cool. So, I'll clarify from medical perspectives. They would say that three bowel movements a week is one extreme of normality through to three bowel movements a day. So, if you're between three bowel movements a week to three bowel movements a day you'd fit normal and that would fit on that that bell curve that most Westerners would fit in within that spectrum and that's why it's defined as normal.

Now from my perspective as clinician and one familiar with the gut areas that I would say somebody doing a poo every two days it's not great. You need to do at least one poo per a day and ideally two or three. I think if you're eating a predominantly a whole food plant-based diet with loads of plants of fibres and mixer of fibres and polyphenols, Mediterranean-style diet you're going to be pooing generally three times a today. It would be pretty, pretty common and certainly I'd be concerned, I'm concerned with patients who don't poo daily and the other aspect of that is looking at your bowel transit time and one of the things I get all my patients to do is a very simple home experiment of eating some corn on the cob, ensuring you don't chew it very well write down or put on your phone when you ate the corn then look for it in your poo.

And this is fascinating because you have some patients that are doing a poo every single day, they've got no sort of obvious pain or discomfort that they were doing you think would it be associated with constipation for example and they don't need this definition constipation. So, doing the poo every day but it still took ten days for that corn to go from their mouth to the toilet. Ten days.

Dr. Ron Ehrlich: Wow.

Dr. Jason Hawrelak: Despite the fact they were doing a normal poop daily both in terms of form and frequency. And I bet other patients were 21 days for the corn to go from mouth to the toilet bowl. And that's completely abnormal.

Dr. Ron Ehrlich: What is good bowel transit time? A bowl of food how long should it take ideally to pass them through the other end?

Dr. Jason Hawrelak: I would suggest between 16 and 24 hours is ideal. If it's below sort of 12 hours, it essentially goes through the bowl quickly which means you may not have absorbed all the goodness out of the food at that time point and it's much quicker than that then you can see that you have to work much the goodness out of that food. Longer than 24 hours that means you're just reabsorbing a lot of those compounds in your poo that you wouldn't be but think of it one that's 10 days or 20 days you're absorbing a lot of bacterial by-products but also other compounds that your body's trying to get rid of because one of the main elimination route your body uses is essentially bile that comes out and supposed to be pooed out and if your ribs since it has got 10 days of brewing time in your colon you're going to be reabsorbing so it's immediately your body turn get rid of.

Dr. Ron Ehrlich: So, this concept of auto toxification like food that has sat in your gut for too long in that whole digestive system reabsorbing toxins within the system is a reality.

Dr. Jason Hawrelak: I'm a witness it defined it as food being sitting on too long but certainly the food that the poop breakdown products. Yes, because you're certainly be reabsorbed into stuff and we know that you reabsorbed a range of compounding your body was trying to get rid of via the bile for example you can absorb more bacterial by-products the negative pro-inflammatory ones when it's sitting around for that long. Yeah, that's clear. So, I think we need to be aware that on top of yeah you should be doing a poo daily, check to see how long it takes for things to go through your gut because that's not always obvious. And when my patients have done it they're like I'm sure it's just 24 hours I always do 2 poos daily. Like well you can't make that assumption. Do the test. Yeah and then they're often surprised at the results like Oh hard to poo daily and I had no idea took ten days fast enough to do for one in the other.

Dr. Ron Ehrlich: Yeah. And corn is a good one isn't it because it doesn't seem no matter how much you chew it, there's corn.

Dr. Jason Hawrelak: Yes, and it's because we lack the ability to break down cellulose and those though corn nibs have got a little protective cellulose envelope around them. Westerners have sadly lost many of our cellulose-digesting bacteria from our guts. So, it will come out intact because we can't eat in our few of our microbes that we have as Westerners can consume that sailor's envelope around the corn as well.

Dr. Ron Ehrlich: I'm shocked to hear that three times a week is even on the normal range. It's just yeah incredible. But listen still on that subject because I know the Bristol stool chart and maybe we'll have links to this because this has raised people's interest, piqued their interest in the shape of the message that's in the toilet bowl. What do you think? Is that a good way?

Dr. Jason Hawrelak: I love the Bristol and I've got like a laminated poster I bring up for all my patients in the pic web who is most closely other than what they do. So, with the Bristol the what's with the fun is normal as type three four in size and this is important to note because some people get really fixated on type four which is that sort of hard log and if they do a type 5, they think the guts dysfunctional.

I've had patients got no symptoms well nothing wrong with at all great health you just do a type five poo two twice a day who think that there are some guts dysfunction because they're not doing one hard log daily so it's important that we break down and it's information that types three one-five are all normal and be doing poo one two three times a day is ideal.

Dr. Ron Ehrlich: Terrific. That's good gee. Now I really believe that report card is something we should be listening to. The other one is skin because of people a lot often don't associate skin problems with digestive problems and I'm sure most people who are been to see their skin specialist, the skin specialist may not have asked them very much about that but there is a connection isn't there?

Dr. Jason Hawrelak: Yeah for a number of skin conditions and I'd say that list is ever-growing. So, the obvious ones or the conditions associated with coeliac for example. But even the more common ones like psoriasis or atopic eczema are very common conditions that now are having a prominent link to gut dysfunction and permeability issues as well.

Dr. Ron Ehrlich: Yeah, yep. Look now back onto antibiotics, antibiotics in fact we know they affect bacteria and our and our microbiome and they have far-reaching effects. Given what we know about the importance of all of these things watch how should we be approaching a course of antibiotics. What do you think the best advice we know when someone comes in to you and says oh, my doctor or dentist has just prescribed amoxicillin capsules three times a day, what should I be doing?

Dr. Jason Hawrelak: Just take a little step back first off and I think the best thing that you as a consumer can do is actually verify that it's really, really needed and never ask for them. I think that can put on pressure on practitioners and they feel like they should do something and if they're not that familiar with the fact that course of amoxicillin might wipe out certain species forever in your gut and it might take two years for things to normalise again from the gut dysfunction species perspective. They may be thinking okay well yeah, I know it's not super indicated but I don't want to make you leave the office with nothing because a few bags and we do want to help. There's those bad aspect to it and we know for viral infections. I think there's some Australian data from Medical Journal Australia last years from that 85 percent of Australians are prescribed antibiotics for viral bronchitis when it's got no chance actually remotely helpful for. So, you need to make sure that they're actually needed for the indication that there aren't they're off oftentimes where they are where they're life-saving in saving and we need to take them. And in that particular instance then we should do our best to try to limit both the side effects to you can experience with them and also the level of damage that are going to occur consequently to your ecosystem and then help restore it as quickly as possible to a healthier state.

So, there's a number of strategies we can put in place. One of the core aspects is taking the right probiotic during the antibiotics and you see I stressed a couple of comparatives say that not all probiotics help only some do we have plenty of research showing this and do it during the antibiotics. So, ideally you want to space it out by two or three hours from the antibiotic as much as you can, but you don't want to wait till afterwards that if you wait till afterwards, you're going to have increased side effects so the antibiotics and greater damage to your gut ecosystem. So, it makes no sense to wait till afterwards we've got 25 plus years of research showing clearly that if you take the right probiotic it will reduce the side effects the reuse the risk of an erotic associate diarrhea dramatically reduces the risk of overgrowth of pathogens like crossbeam difficult as a consequence of that. And then limit the damage to the ecosystem. So, it's a no-brainer to do it alongside sadly this research has only slowly filtering out.

And if anyone tells you that there are none of her probiotics should be used along with antibiotics, they are sorry ignorance of the current state of research we've got meta-analyses coming at our eyeballs showing that the right probiotic is useful in this situation.

So, it's period nerds in that case of what the research is saying. And then the other core aspect is doing prebiotics afterwards to help restore those very important anti-inflammatory gut healing species would have been knocked around like the called atrium Bifida bacteria are command-z of those of ones and many other butyrate producing microbes and really focusing on post antibiotics to help restore their populations quickly. Those ones that are often knocked around. We know now that antibiotics is not two weeks or four weeks it's months of

effort to repair back to normal so and some species do go extinct with potentially every course of antibiotics and some people. So, once you're extinct is not much we can do about that besides doing fecal transplants which is another that whole talk, but we can restore populations that as long as there are survivors we can nourish those survivors and bring them up to the point where they're healthy populations again. And that's where prebiotics for at least three months after antibiotics are key.

Dr. Ron Ehrlich: Yes, and that's interesting the spacing out because something like for example Amoxil is taken with meals three times a day so in between those meals and maybe two hours after your dinner before bed you would take a probiotic specific being the key, not just any but specific.

Dr. Jason Hawrelak: Yeah, yeah because we've got clear data. Like there's a study done in the UK published three, four or five years ago where they gave 60 billion CSV or sixty billion bacteria in two different types of Lactobacilli and two different types of bifidobacterial and it didn't help at all. And yet you've got other research using a different bacteria that definitely works as a billion or 10 billion microbes per dose or another one called Lactobacillus Reuteri DSM 17938 which I know it's a very catchy name that works at a hundred million per day.

Yeah, it's like wow. So, the right one works even at three hundred times less dose compared to just taking a random one at high amounts thinking that a high potency multi-strain one will fix the situation. It's not as simple as that. It's choosing the right one that has the right attributes for this scenario.

Dr. Ron Ehrlich: I mean the take-home message here is A) if your doctor has said there's no real evidence to support XYZ you know what they really mean or should be saying is they haven't read it. Number two that this is very specific, so we do need a practitioner who is aware of the specificity of these probiotics. And three, we need to continue the prebiotics for at least three months afterwards.

Dr. Jason Hawrelak: Yeah and I would do, and I agree with all those statements and certainly the second one in terms of the right probiotic and I think getting advice from a health pressure increases your chance. A probiotic literate health practitioner will increase the chance of actually getting the desired outcome because there's a good chance of missing if you're just randomly choosing products off the shelf which is a waste of your money whereas we know that certain products that will definitely help based on sometimes a method or analysis of data there's no doubt that there will be helpful in your situation.

Dr. Ron Ehrlich: And for the health practitioners listening to this too is there a difference between when someone's on Amoxil and someone's on a Retruce and a tetracycline? Say different types of antibiotics obviously they require different probiotics?

Dr. Jason Hawrelak: One would think that would be the case sadly were lacking piece of the systematic investigation into the area. Yeah, so what we do have is studies with a very pragmatic studies of giving people on a whole range of antibiotics and they give the probiotics and it helps and it might be that it might help in three-quarters of people in this 25 percent of people didn't work for and that would still be very positive outcome in the whole

trial but you're right that it might be systematic research into the future will hopefully define this in greater degree of which probiotic supplement is ideal to go alongside which antibiotic because we don't have that kind of data at this time.

But what we do have with some antibiotics is some knowledge of the degree of microbiota disruption that we get to what species are mostly impacted by that antibiotic as collateral damage and that can help fine-tune our use of prebiotics that's going okay well I can give you the right fertiliser for these species that were really bashed around by this antibiotic course. So, that sort of data we've got some of its again it has been done systematically to nearly the enough detail in my opinion but some data that are there but the probiotic area is way behind in that respect. And we may never actually get there in all honesty because it takes so much money to run clinical trials and to run one with all the different course of antibiotics with all different strains of probiotics it's never going to happen.

Dr. Ron Ehrlich: Yeah now the other work we've done quite a few programs with farming and agriculture and of course have done some stuff with oral health as well and the oral microbiome is pretty important as well. And the one word that seems to come up in each of those situations is "diversity". The more diverse, the better. Would you agree? Is that is that the case with the gut microbiome?

Dr. Jason Hawrelak: For the colonic microbiota definitely yeah. There's no doubt and if you have 100 microbiota experts what define the healthy ecosystem all 100 would agree on diversity. They might disagree on some other points, but all would agree on importance of diversity. And we know from considerable research that's been done and last probably five or six years that low diversity or a lack of microbial diversity is associated with increased risk of allergies and asthma and kids increased risk of obesity insulin resistance slide from type 2 diabetes like high cholesterol high triglycerides, autoimmunity and importantly just part of body-wide information and you just look at that with star just weighed out. That's what we see as chronic Western diseases that we see associated with this lack of diversity. And it's true that most Westerners we compared us to hunter-gatherer societies we've lost a decent chunk of our diversity already from three generations of antibiotics to c-section birth to formula feeding program pump inhibitor use. Never mind the Western diet which it's not particularly good at feeding our microbiome. There are consequences and that's what we're seeing now.

Dr. Ron Ehrlich: Now look let's just because we've talked about specificity and the importance of being specific about our probiotics and our prebiotics but if the listener now just giving our listeners something to go away with if they were wanting to focus on establishing and maintaining their best microbiome they could, they want to feed their friends not their foes what would be a few tips you might leave them with to say this is my advice?

Dr. Jason Hawrelak: Yeah, the research thankfully is pretty clear on ways to improve diversity the best way of improving diversity is increasing the diversity and types of whole plant foods you eat. That is by far the most effective way of improving diversity because we tend to see besides a study that fibre is fibre, it's not. Fibre in broccoli is going to be different than the fibre found in spelt versus the Fibre found in black beans for example and we feed different microbes we get different combinations of fibre shapes and finds with different

foods. So, literature is clear that if we expand our diversity of foods and I give my patients a target of 40 plus whole plant foods per week not per day but per week. That's just something that's achievable in some patients go well beyond that to 50 and 60 per week that they're getting the widest variety of shapes and sizes and types of dietary fibres and soluble fibres, insoluble pectin gums as possible. So, that's the core aspect and also having wide colour variety in your diet too.

So, having purple carrots and purple potatoes and red carrots and red rice and black rice and black beans. Getting that variety of colour means getting a variety of compounds called polyphenols. And those polyphenols tend to also be used as a food source for a range of beneficial species in the gut as well. So, it tends to nourish those species that produce antimicrobial our acid anti-inflammatory compounds for us and our gut healing compounds for us. In fact, when they eat those polyphenols those blue compounds we find in blueberries or black currants or blackberries those sort of colour compounds. We know that they're associated with a range of health benefits and antioxidant and you can sort of properties but we don't get that benefit until those polyphenols reach the colon where they work as a food source for microbes may they break that poly phenyl down to a smaller component which we then absorb and that's how we get the benefit from this food.

So, it's just a lovely relation that we have that we feed them, and they nourish us as a consequence of that. So, it's a wide diversity plant food a wide variety of colour. Those are probably the core aspects from a diet perspective moderate amounts to exercise seems to help improve diversity scores as well and getting seven hours or more sleep per night which I'm not always good at doing also improve diversity scores too.

Dr. Ron Ehrlich: Terrific. Well, all of that music to my ears now listen I just finally I just want to take a step back from your role as a naturopath with all the research and reading you've done because we're all on a health journey in our own lives. What do you think the biggest challenge is for people on their health journey in our modern world?

Dr. Jason Hawrelak: I mean I'm going to look at it from my own land obviously, it's gut and it gut bacteria and I think the biggest challenge that I suppose I see clinically and around me in terms of the diseases that are on a rise and in the society is protecting and nourishing the gut microbiota. Because of when we don't do that there are long-term consequences and as I said before that's what we're seeing on a societal level with chronic disease now are the long-term consequences of what's Martin Blaser in New York calls the disappearing microbiota. That there are consequences of other part of us losing key pivotal species that we've evolved alongside with and we're losing the functionality that we didn't even know we had until we were so late and see the piece of actually researching it. So, I think maybe protecting that ecosystem and optimising that ecosystem is perhaps the biggest issue that I see currently.

Dr. Ron Ehrlich: Jason thank you so much for joining us. It has been fantastic. Well, I'm going to have links to your website and you've got such great resources as well and your out teaching all the time. But thank you for joining me today.

Dr. Jason Hawrelak: You're welcome. It's a pleasure of having conversation. I enjoyed it as usual. Yes.

Dr. Ron Ehrlich: Well, in case you thought all probiotics were made equally… Well, the importance of specificity should not be underestimated. You may need to actually consult a knowledgeable health practitioner and integrative doctor, a naturopath or a nutritionist well versed in what that really means.

I've often said that health practitioners when I hear of health practitioners or so-called experts make a statement like there is no evidence to support X-Y or Z what they really should be saying, in all honesty, is they have not read any evidence. There's a very, very big difference there.

The other thing is this daily report card. Each and every day your body sends you a message. A report card on how what you are eating is affecting you. Bloating, reflux, constipation, diarrhea, skin problems - They're all messages. Now protein pump inhibitors are an excellent example of how Western medicine approaches health. For example, acid reflux - take an antacid or Nexium, Lowsec, Soumik problem solved. Well, not exactly. Listen to your body and respond accordingly. Find out the cause. Don't just settle for the symptom or the management of the symptom because after a few years months or years other problems will emerge.

Now diversity is another word I love whether we are talking about the soil microbiome, the oral microbiome or the gut microbiome. The more diverse the more resilient and the healthier you will be. Rather than taking this adversarial approach to microbes most of which are friendly nurture your friends and build diversity. I think it's a great metaphor for the world in which we live and the people that make it up but that's a whole other story.

Well, we'll have links to that Bristol stool chart remember type 3 4 & 5 you're fine. Don't forget to go onto iTunes as we will leave and review if you have been enjoying this podcast. It helps get this message out and what is that message? Take control of your health and be the best you can be. So, until next time, this is Dr. Ron Ehrlich. Be well.