

July 2013 Issue | Patrick Hanaway, MD The Institute for Functional Medicine

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Welcome to Functional Medicine Update for July 2013. Gastrointestinal health. How many times have we talked about that over the 31 years that we've been doing *Functional Medicine Update* repartee? Well, it's an important fundamental process, isn't it? In the Institute for Functional Medicine algorithm, it's one of those core principles. We recognize that it plays a significant role beyond that just of the fact that it's a digestive conduit that breaks large molecules into small and makes them bioavailable for absorption. We recognize that the gastrointestinal tract has multiple personalities, meaning it is pleiotrophic in its functions. One of the major parts of its function, as we've examined and discussed at length is its role as part of the immune system. In fact, we recognize that the mucosal associated lymphoid tissue and the gastrointestinal associated lymphoid tissue constitute, collectively, more than 50 percent of the body's total immune system and secrete more than 70 percent of the antibodies that ultimately arrive at systemic circulation to provide defense against foreigners. So the GI tract is very, very important, and we recognize that beyond its immunological effects, it also has a very intimate relationship with the nervous system, because as Dr. Michael Gershon pointed out in his book *The Second Brain*, there is this density of nervous system connection to the GI tract.^[1] And in fact, in a recent discussion with Dr. Alessio Fasano from Harvard Medical School, who is arguably one of the world's experts on celiac disease and gluten enteropathy, he suggested—in a discussion I had with him—that maybe we should actually say the gut is the first brain—that there are actually more plexus of nerves in higher density of neurological connections in the gut than there is even in the brain. So these are interesting concepts. The neurotransmitters produced in the brain have an effect upon gut function, and the gut hormones, and gut modulators influence the nervous system, both peripherally and centrally, so there is this crosstalk which really is centered around the GI system to both the nervous and immunological system. So we might consider the gastrointestinal system to be the seat of the neurological-immunoendocrine system—that they are all interconnected and tightly wired to the function of the GI system.

This is very kind of contextually interesting view of the gastrointestinal system that has impact across many subspecialties of medicine. We probably would start, wouldn't we, with a gastroenterologist who is supposedly the person who knows the most about the gastrointestinal system and ask the question, "How many of these practicing, board-certified gastroenterologists think of their organ of interest—of specialty—as being the center of the neuro-immunoendocrine system, and manage its function and dysfunction with that context in mind?" I haven't done a survey of all the gastroenterologists, but I have talked to quite a few of them and I would say that this is more the exception than the rule that they would think of their own organ as having that centrally important function across these different subspecialties of medicine. In fact, as you probably recognize, a gastroenterologist that might think that way about the broad impact of the GI system on other organs that cut across other medical specialties do so at some

peril because now they start crossing over and transecting into other people's country clubs (other medical specialties) and they start interfering with the sanctity of these independent, siloed divisions of medicine as if each organ is owned by a different specialty and don't ever cross over those boundaries because you're liable to get yourself censured. So I think that the medicine of the future—this functional medicine model, this systems biology model—is going to witness the breakdown of these synthetic barriers among organs, and we'll start looking at the body as a network biological/physiological, real-time, responsive holograph, where all parts are reflected in all other parts in real time.

The GI Tract and Its Relationship to Chronic Diseases

So what does that have to do, then, with the emerging new thoughts about gastrointestinal function? You know, we could say that there are major breakthroughs being made in the basic sciences of virtually every organ or organ system today, and we've tried our best in *Functional Medicine Update* to bring that out as we go through our various issues to look at how breaking news in the world of biosciences and medicine is changing our perspective from a histopathology-based model to a functional-based model, but certainly as we focus this issue on gastrointestinal function, we're amazed at the extraordinary number of new discoveries that are being made virtually every month and being published in the world's primary scientific and medical literature that are redefining the important role that the GI tract has in its relationship to the prevalent diseases of the day, beyond that of gastrointestinal diseases. Diseases such as type 2 diabetes, cancer, inflammatory arthritis, neurological disorders including dementia; there is an emerging GI link to every one of those. That's a pretty exciting evolution, but it also then begs the question, what do you do with this information? How does it filter down into clinical practice and what are the clinical takeaways and payoffs from these discoveries?

Let's, if we can, set the context before we have the privilege of moving into our discussion with our clinician/educator/researcher of the month, who fulfills all those criteria, by the way, Dr. Patrick Hanaway. You'll have the pleasure of what I think is a most remarkable discussion that Dr. Hanaway and I had just recently at the Institute for Functional Medicine Annual International Conference that was held in Dallas, Texas in late May/early June, in which Dr. Hanaway and I had a chance to really, as they say, "get real." Before we get to that discussion with Dr. Hanaway, let's set some of the context as to the nature of the changing playing field.

Reviewing Facts about the Gut

Let's review quickly some of the things that are happening in this area of discovery in the gastrointestinal system. As you know, we recognize that the gut is one of those places that comes into direct contact with the outside environment through the food that we eat and the fluids that we consume, so the gut mucosa samples our environment, so to speak, just as our sense of touch samples the environment when we touch things, or our sense of smell when we smell things, or our vision when we look at things, or when we hear sound waves hitting in the tympanic membranes of our ears we get a sense of auditory stimulation. Similarly, the gut is bringing information to the body through the nervous and immune system, and also through the endocrine system that's altering its function. So the food that we eat is very, very important in its translation of its message through the gastrointestinal tract as kind of a sense to pattern the body's function. It's more than just eating calories, it's more than just eating nutrients; it's consuming information that could be either positive information that helps orchestrate appropriate immune function, nervous system function, and endocrine function, or it could be disinformation, just like a noxious smell,

or hitting your head with a hammer, or a loud noise, or, you know, glaring lights can create disturbance of your physiology, so can information coming in through the GI tract cause disinformation to produce “dis”-ease. That’s a very interesting way of looking at this broad perspective of gastrointestinal function and its interrelationship with gut function.

Now there’s another part of the gut that is important to recall as well, and that is that it’s not living as an organ in absence of a community relationship, and the community relationship it has is represented by what is called the microbiota (the gut enteric bacteria). We now recognize that those bacteria, they have dietary preferences as well. They have different personalities. So they pick up nutrients that comes from the same source that nourishes the gut mucosa itself; that’s the food we eat. Some of those bacteria like certain foods that we consume better than others, so they flourish and they are selected for under certain dietary principles, and other bacteria are less selected for. I mean, there’s no magic barrier that keeps these bacteria out of our guts. The only thing that kind of determines the...I guess you would call it the population of our community of bacteria is the food they are eating and our gut immune defense that kind of tells us who are the campers that are camping on our GI mucosa, particularly in our large intestine. So certain diets encourage certain types of microbiological communities, and certain other diets alter these dietary communities. Now, why is that important? Recall that you can have upwards of 2 kilograms of bacteria (almost 4 to 5 lbs of bacteria) in your gut. It is a substantial organ. The only difference is that this organ is not connected to your body by the blood stream; it’s connected by the absorption of its metabolites, through the GI mucosa, and filtered through the immune system. So think of these campers all eating food, and producing waste products, and some of them camping so long that they die and have to get resorbed. All that information is picked up by the immune system of your intestinal tract and it’s sent out to the rest of the body as either: Yes, you’ve got a group of happy campers, or, no, you’ve got a group of not-so-happy campers, and that produces these dysfunctional messages.

So, nutrition, gut microbiota, gut mucosal integrity, gut immune defense, and systemic messaging. That’s kind of the sequence of events that we’re talking about. What we do know is that this degradation of food that we call digestion also is associated with aspects that we call fermentation, because these gut microbial inhabitants can ferment by the way that they metabolize foodstuff into metabolic byproducts, some of which can be considered endotoxic, meaning they are not friendly molecules. They are nitrosated intermediates. They are deconjugated bile acids. They are modified steroids. They are twisted molecules, basically, that come as a consequence of the microbial metabolism of food and gut contents. Different bacteria have different personalities in how they form those metabolites, so we then breakdown some of these characteristics into three types of bacteria in our gut. We call the best our symbionts. Those are doing work for us and making vitamins, and they are making short-chain fatty acids that our gut mucosa can use, they are producing trophic factors that stimulate our immune system. This sounds like good work, so these are symbiotic bacteria. Then there are what we call commensals. Commensals are bacteria that take up space. They like the warm environment of our GI tract. They don’t necessarily do a lot of good work, but they don’t do bad work either. They kind of just live in cohabitation and they provide part of the occupying real estate in our gut, and we would say, “Good on them” for bringing social structure to our community of microbiota. And then there are the last ones that are the disruptors—we call those the parasites. They are very small in number, but they might have a fairly loud voice, so they could still do some mischief. As those number of parasitic bacteria increase at the expense of decreasing your friendly bacteria, then you kind of get more and more of these unfriendly voices being spoken, and you get the release of things like a bacterial lipopolysaccharides, cell wall debris from the bacteria that are proinflammatory. You get these funny transformed chemicals being released by them, and this produces a

stress on the physiological system (on the immune system of the gut). All of this is interrelated to the diet and lifestyle of the individual, so it's a very complex matrix. It's a community. It's an ecology that we're talking about. You probably have heard that recently the genetics of these bacteria that live in our gut is starting to be analyzed—this is called the gut microbiome—using gene sequencing data, and it turns out that there is much more diversity of DNA present in our gut bacteria than there are in human eukaryotic DNA, so there are all sorts of messages that are being communicated in our gut from the gut microbiome that then influences our function.

These are, I think, very, very interesting advances in our understanding of the complex role that food, gut function, and immune and neurologic interrelationships have on overall health and vitality. Now as it relates to that, we would then say, “Can we modulate, then, this environment in such a way as to promote a healthy balance of the symbionts, commensals, and parasitic bacteria, and change the personality and characteristics of our gut microflora so that it becomes friendly and supports health?” And the answer is yes, it does appear that these are modifiable factors. They can be changed through environmental circumstances like high sugar diets, high stress, alcohol, certain drugs and medications, certain types of dietary persuasions, lack of fiber in the diet—all of these things can influence the nature of the population of our microbiota in our gut and change the balance between the symbionts, the commensals, and the parasites. One of those big things that we all do commonly is that we consume food. We know that food is a factor that influences the speciation of our microbiota. If you eat a low fiber diet, you then do not have as many of the bacteria that are there that are fermenting fiber into these favorable secondary byproducts, like short-chain fatty acids, like butyric acid. So we know that certain dietary characteristics play an important role in establishing the GI environment and influencing the GI immune system.[\[2\]](#)

Firmicutes and Bacteroidetes

We know that there are two families of bacteria that have been studied quite extensively for their different personalities on this relationship to health. One are called the firmicutes, and the other are called the bacteroidetes. There's an interesting balance between the two. When the firmicutes family of bacteria in our gut tends to become greater in prevalence, it is more associated with a tipping of the balance towards what we might call endotoxic effects within our GI tract, which are associated with such things as insulin resistance and type 2 diabetes, obesity, and dyslipidemia. When, however, we have a balance that's more predominant with the bacteroidetes and lower in the firmicutes, then we have greater probability of insulin stability, and proper weight control, and proper lipid management.[\[3\]](#) This might seem to be a pretty remarkable change in our thinking that somehow our gut bacteria can influence weight gain, and can influence things like insulin signaling, and can influence the level of triglycerides and cholesterol and the packaging of them into lipoproteins within our blood. How in the world can that happen? That is the question of the hour. There are literally hundreds of studies now being published over the last few years in explicating this relationship. It's still a work in progress. All of the evidence is not in. But it certainly is directionally important to recognize that, yes, gut microbiota does influence things like obesity, diabetes, and heart disease. We also know that because of the neurological connection to the gut that it can influence things like dementia through influence on the microglia of the brain and its function (the brain's immune system), which is interconnected to the gut's immune system.

These are, again, examples of this network biology/systems biology emerging conceptualization where we can't think of health and disease just one organ at a time—kind of siloed and isolated from any other organ. In fact, there's probably no such thing as an independent disease that doesn't have

interrelationship with function of other organs.

You Can't Have a Sick Gut and a Healthy Body

When we start examining the literature we say, “Well, gee whiz, that opens up for us a different way of interpreting papers like those that have the title ‘Nutrition Influence on Gut Microbiota and the Consequences for Gastrointestinal Health’.”^[4] Because now we recognize that gastrointestinal health is associated with systemic health. And in fact, it might be so bold to say, “You can't have a sick gut and a healthy body. They are interrelated.” This sounds like it goes back to Metchnikoff hypothesis in his book *The Prolongation of Life*. You'll recall that Elie Metchnikoff won the Nobel Prize in medicine back at the turn of the last century for his discovery of cell-mediated immunity, and then later authored this book when he the director of the Pasteur Institute on the important role of *Lactobacillus vulgaricus* yogurt for treatment of various types of health problems and prolongation of healthy life. So he was already speaking about the gut as the seat of good health or of disease back at the turn of the last century, and the recognition that various foods that contain both what we call prebiotics and probiotics can be helpful in establishing proper gut function. In fact, Dr. Marcel Roberfroid, who now is Professor Emeritus from Catholique Universite Louvain in Belgium, was one of the first people to coin the term called “symbiotics.” Symbiotics is the interrelationship between prebiotics and probiotics that work to establish a proper GI milieu of microbiological organisms, and that by the consumption of appropriate symbiotics (prebiotics and probiotics) you stimulate the appropriate activity of the GI microbiome, which then interrelates with the GI immune defense system in such a way as to promote favorable outcome.

One might ask, “Well, what are symbiotics?” Symbiotics would be giving appropriate prebiotic selected food for the friendly bacteroides bacteria—things like fructans or arabinogalactans. These are prebiotic substances for which they form substrates for the friendly bacteroides. And then of course the addition of the probiotics, the friendly strains of bacteria that may have condition-specific activities on augmenting certain functions or supporting certain functions within the gut-associated or systemic immune system. One of the most principally important components of this has emerged to be that of maintenance of gastrointestinal mucosal integrity, because we now recognize that as you get a break down of the gastrointestinal mucosal barrier, you get what has been euphemistically called the Leaky Gut Syndrome. And it's interesting to note that that term was first employed in *Functional Medicine Update* more than 20 years ago when it was considered, in traditional medicine, to be heretical to good thought; there was no such thing as “Leaky Gut Syndrome.” People almost made fun of that term in traditional gastroenterology. Now it's very interesting in 2012 and 13 you're starting to see article being published using the term “leaky gut” in the title of articles. It's amazing how things can change with increasing information availability.

What do we mean by “leaky gut”? We mean that the intercellular junctions that exist between gastrointestinal mucosal cells become impaired, losing their integrity, opening up then a portal of entry between those cells of larger substances. It could be larger molecular weight substances or even bacteria themselves that can translocate this juncture, and now can have access to the immune system that sits on the other side of the mucosal barrier and thereby activating the mucosal associated lymphoid tissue or the gastrointestinal associated lymphoid tissue so that it feels that foreigners are onboard and it needs to call out the guards.

Metabolic Endotoxemia

One of the ways that this is well known to occur has been titled metabolic endotoxemia, or post-prandial endotoxemia, meaning after-eating endotoxemia. This is a consequence of a diet that might be high in fat and sugar, maybe even a single meal, by the way, because these studies have been done in humans administering a single high fat high sugar meal to people and then examining gut mucosal integrity after the meal and finding post prandially that lo and behold that one meal tends to break down their intercellular junctions and makes their mucosa more leaky so that what happens is you start getting bacterial lipopolysaccharides, the cell wall debris from gram negative bacteria start swimming across (or leaking across) the gut mucosa into the access to the immune system, and these are proinflammatory mediators.^[5] They activate the release of inflammatory cytokines like tumor necrosis factor alpha, interleukin-6, interleukin-1, which then stimulates the inflammatory cascade ultimately downstream releasing inflammatory prostanoids and leukotrienes. What we are starting to see is a very, very interesting supportable story emerging as it relates to how diet can adversely affect or positively affect gut mucosal integrity and ultimately either releasing, to systemic circulation, proinflammatory mediators that can actually be measured in the blood, by the way. There are many studies that have been published showing that these inflammatory mediators like lipopolysaccharides can be seen in the blood post prandially and are correlated with increasing systemic levels of cytokines, like TNFalpha and interleukin-1.^[6]

I think this is more than just theory and just conjecture. There are now very strong associations between diet, microbiological function of the gut, gut mucosal integrity, and ultimately leakage of these immune active molecules into systemic circulation that can induce action at a distance. The distance can be joint space problems that we call arthritis, or it could be liver inflammation that we call fatty liver infiltration, or it could be cardiometabolic effects at the endothelial cell that we call atherogenesis, or it could be influences that occur at the blood-brain barrier with the microglia that we call dementia. All of these, then, are mechanistically interrelated to this sequence of events of breakdown of gut mucosal integrity, release of toxic metabolites, and activation of the immune system.

Intervention in Creating a Proper Microbiological Gut Community

This opens the door, obviously, for intervention, so what do we intervene with? We intervene with agents that would reduce the burden of irritants that cause breakdown of gut mucosal integrity. We would intervene with friendly bacteria and prebiotics to develop symbiotics so we get the proper microbiological community in the gut, and we'd intervene with nutrients that are necessary for restoration of gut mucosal integrity, things like the amino acid l-glutamine, for instance, or l-arginine, or nutrients like zinc in a non-irritating form, or pantothenic acid, or essential fatty acids or the the omega-3 fatty acid family, all of which have been shown to help improve the integrity of the gut mucosal junctures. ^[7]^[8]

This, as translated through the lens of functional medicine, becomes part of what has been called the “multiple R” program—the Remove, Replace, Reinoculate, Repair type program—where you're actually doing gut restoration through selective delivery of a different environment that nourishes both the friendly bacteria, establishes the right gut microbiota, and establishes proper gut mucosal integrity. Now, what we have learned recently as this work has proceeded is that there are certain substances in our diet that can really be serious irritants to gut mucosal integrity, and that these irritants can be individualized based upon the genetics of the person. The one that rises very tall in this list, obviously, is gluten and gluten-containing grains, where in people with specific genetic propensities or sensitivities this molecule which is found in food protein in grains can induce, through its partial breakdown into various what are called

proteic fragments, that these fragments can create an irritant effect on mucosal integrity leading to leaky gut and to inflammatory responses, not just local, alone, that we associate with things like celiac disease, but also systemic that we start seeing, like arthritis. So autoimmune disorders are identified with the etiology of these gluten immunological-mediated problems. We used to think that these only existed as a consequence of histologically identified injury to the mucosa that you could do and find under biopsy. But now we recognize that you can have biopsy negative sensitivity but have systemic sensitivity to these food proteins. So this wouldn't be a typical sprue-like patient (a typical celiac patient). This would be a patient that has gluten-related sensitivities—intolerance, might be the better word—for which they fall outside the bounds of what we would call a classic celiac patient.

The links, then, between these dietary principles and leaky gut syndrome is becoming much more well understood, and we recognize that gluten is not the only family of potential GI irritants, that based on different individuals' genetics that there may be many different families of irritants that are not allergic substances but hypersensitizing substances that also contribute to the depreciated integrity of the gastrointestinal mucosa.

We also recognize that as food becomes more highly processed and you heat treat food in processing where you have sugars and protein together and therefore you get this chemical connection between sugar and protein that we call glycosylation, that these glycosylated proteins that we eat in foods, particularly in highly foods, can also become irritants to the GI mucosal system and activate the immune system. So, overprocessing of foods and the production by the heat processing of these secondary glycoproteins that cause immunological reactions can also induce these difficulties.

You probably recall that these glycoproteins activate what are called the receptors for advanced glycosylation end products. That's R-A-G-E: receptors for advanced glycosylation end products. So we might say that these food materials en-RAGE the gut immune system, right? They bind to these receptors and they activate this inflammatory cascade, so I just used, euphemistically, the term they en-RAGE them—they cause amplification of the inflammatory response.

What this really says to a clinician is if a patient has systemic inflammatory conditions or local GI inflammation they need to be very cognizant that multiple offenders could be involved in activating this system, causing gastrointestinal permeability to occur and enhancing mucosal immune function in producing systemic inflammatory mediators. Therefore it's a little bit of a trial and error empirical approach that's why elimination diets can be so helpful, why gastrointestinal restoration approaches can be so helpful. It may require a very rigorous and aggressive intervention to try to determine exactly what the offending foods and substances are that are intimated in this breakdown of gut mucosal integrity. It's not just one-size-fits all. It's not just one agent. Obviously gluten is getting a lot of press recently, but it's not the only family of substances within foods that can cause this difficulty. Certainly we know that dysbiosis itself, unfriendly bacteria, can induce this difficulty producing post-prandial metabolic endotoxemia as well.

So our colonic flora, probiotics, obesity, diabetes, cardiovascular disease, dementia—it has a tremendously rich influence across a wide range of clinical effect and that's why many people say when you've got a chronically ill patient, start with the gut first. Look at their digestive function. Look at their diet. Look at their microflora. Try to understand whether that may be a principal seat for some of these difficulties.

With that in mind, I think this is a good context to move to this extraordinary discussion we've had with Dr. Patrick Hanaway, who, as you know, was the Medical Director for Genova Diagnostic Labs for a number of years. He's an extraordinary family doc, wide-ranging in his skills and background, and most recently—I'm very excited to say—has taken on a new role, a very important role, as Director of Medical Education for the Institute for Functional Medicine. Dr. Hanaway is kind of almost the archetype of the type of person you would want in charge of education under the Institute for Functional Medicine banner. He's a lifelong learner. He's a person who is working very, very hard, always, to know more, to take this news and make it news-to-use in the clinical arena. He's an articulate communicator. He's a passionate doctor who is an advocate for his patients. And I think, above all, he is a person who is conscious and present always for the best intention of his work for setting up a healing environment.

As you probably recognize, Dr. Hanaway takes on a big responsibility as the new Director of Education for the Institute for Functional Medicine. We might say they are big shoes to fill, but I think he has the capability of not only filling those shoes but growing the impact globally of the functional medicine model as he steps into this new role.

The discussion I'm having with him you'll notice is done live at the recent Annual International Conference of the Institute for Functional Medicine. It was, for me, a very intimate conversation, a very warm and extraordinary example of the deep humanist that is present in those people who are within the Institute for Functional Medicine community, what I call a very special tribe of individuals dedicated to patient management. So with that in mind, let's move to our very, very interesting discussion with Dr. Patrick Hanaway.

INTERVIEW TRANSCRIPT

Clinician of the Month

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You know, we're very privileged to have with the Institute for Functional Medicine Movement, some extraordinary spirits, souls, intellects—dedicated people, courageous, tireless workers. There are so many attributes and adjectives I could use that characterize the energy that goes into this institution that it would be hard to pick out one feature set of characteristics that defines those that are meritorious in the organization.

But, with that said, I'm very pleased that we are going to be talking with one of those people who has those characteristics that define why IFM has grown up over the last 20-plus years to be an agent of change of great significance, and that's Dr. Patrick Hanaway. Patrick, thanks so much for being here.

Dr. Hanaway and I go back a few years. I'm not going to disclose how many because it would once again contribute to my aging process, but let's suffice it to say I first met him and his wife in Asheville, North

Carolina, where we shared the same dinner establishment. I got introduced to him as the most esteemed family doc in Asheville, North Carolina, and I've come to recognize that that was an understatement of Patrick's skill, and also his wife who is a physician.

Patrick, your depth of your vision as to how medicine travels is built on your experiences both as a child growing up in obviously a very, very interesting family with interesting mentoring and role modeling, and then secondly with your experiences that you chose as to how to use your medical training and some of the after-medical-school experiences. Maybe you could just tell us a little bit about that journey because it's very much part of your texture.

PH: Well, if we're going to go back to the beginning on that, my dad was a lawyer, my mom was a nurse, and I knew by the time I was five years old that I wanted to be a doctor. I had the microscope and the little microscopic man for Christmas gifts, and that was all I ever planned on being. When I went to college at the University of Wisconsin and studied biochemistry and molecular biology it was all planning to go to medical school, and frankly it wasn't until I got accepted to medical school and took some time off when I was 21 and I thought, "Is this what I want to do? I don't even know if that's what I want to do." I had a chance to travel and was very interested in public policy and health policy, and I considered and made application to not go to med school but to go to public policy school. Then something happened and I said, "No, I want to help people." I grew up in a political family and I kind of was like, "I'm not really sure that politics is going to be all that helpful." So I went to med school at Washington University—and I think you've heard me say this—but when I started medical school I thought it was going to be about how to help people, and how to learn how to care, how to promote health and well-being. It was sort of surprising to me that it wasn't. It was all about pathology, and memorization, and we started a nutrition course in our medical school that first year. We asked the Dean for \$400 and he gave it to us, and he thought we would go have the RDs teach us about nitrogen balance. We talked about many different things. We spent the money to go buy fresh fruits and vegetables to give free to the medical students so they'd come to our lectures and they came because there was free food and it wasn't donuts and they still came. We had Nathan Pritikin come. That was 1983, and Washington University was not exactly a place for Nathan Pritikin at that point in time (low fat diet).

You know, I was working in the Lipid Research Center, adamant that cholesterol was the worst thing that could ever happen in the body and that we should have a cholesterol of 100 plus your age and went through all that. Of course, got depressed. Imagine that, with that low of a cholesterol. My cholesterol was 102 (total cholesterol, I'm talking). And, you know, I learned and went through the training and decided that the best way to be of value was to be a family doc. I went through medical school, I studied traditional Chinese medicine, I learned acupuncture for a couple hundred hours, I learned chiropractic, I learned nutrition, I learned the things that I wasn't getting in medical school that helped me to think more broadly, and I think that there are not very many people who choose to go through medical school and say, "This is one aspect."

A quick, brief story. Jeff Gordon. You know who Jeff Gordon is.

JB: Yes.

PH: Jeff Gordon taught our pathology class our second year, and I'd been studying that summer Hans Selye, and understanding this and traditional Chinese medicine, and we started off the first day of class, 8

o'clock in the morning, first day of the second year of medical school, pathology, and he starts off and he says, "Well, you know there are many different views of health and disease, and we can look at it from a model of Chinese medicine, or Ayurvedic medicine, or stress models of Selye. We're going to look at the model of pathology and that's what we're going to focus on here. It's just one of many models." That was like the big liberation. It's like, "Oh, okay. I can learn this model well, but it's not the whole thing." And all my life, since medical school, it's like, "I'm interested in the whole thing. I'm interested in, how do the pieces fit together?" And that's what I've done, so my career—learning each additional aspect—is, how do the pieces of the puzzle fit together? Really, that's what functional medicine is: how do the pieces of the puzzle fit together? This is the first and only operating system that I've seen that allows us to put those pieces of the puzzle together. So I give thanks—homage—to you and David for the work that you've done to help build this and bring it together. And it's evolving. It's deepening. It's not even so much like evolving; it's more like the depth is being mined as we move through the process of applying it.

JB: So let me just throw out a couple of words and do a Rorschach test. Soldatna, Bethel, King salmon. Tell us a little bit about how those words relate to your experiential inventory.

Building a Foundation for a Medical Career Focused on Communities

PH: I did my residency training, and studied herbology with Tieraona Low Dog during residency, before she went to medical school, and learned that, and then worked for the Albuquerque Indian Hospital and took care of the native people, the Jemez and Isleta pueblos, but I was very fortunate because there were 15 doctors there, all who had on average 15 years of experience of working in the bush, and I was the only young pup. And they learned some things from me. I didn't imagine that I could teach them anything, but they thought I could, so I taught them some new techniques, and they taught me how to care for people and they kept saying, "You need to go to the bush because that's where this comes in. You need to go to the bush." We looked around, and it was a sort of fateful series of circumstances where, there we were, on a plane to Bethel, Alaska, or I should say four planes to Bethel, Alaska, which is 500 miles west of Anchorage on the Bering Sea. There was an article in the New York Times just on Sunday about the doctors in Bethel, and we took care of 28,000 people in an area as big as Oregon (10 doctors). I did that for two years and I learned really the value of western medicine, deeply. And I learned to trust my ability to think through a problem and work to solve it in a pretty stressful setting.

JB: So that was like double-time, emergency room, do-everything, be the Jack of all trades and maybe the master of none. My roommate in college was one of my best friends in high school, and he and I went on, ultimately, to medical school together. He went to USC; I went on to UCLA, then ultimately to Oregon. He, after he got out of USC, went into the Bureau of Indian Affairs to become a public health service physician on the Navajo reservation with another one of his friends. They were going to give him a car, and he said, "No, I really can't develop the relationship by driving in in a four-wheel-drive; I've got to go by horseback. So they gave him a horse. He would do go by foot and by horseback on trips out to the various villages. And he was very aghast at the way that the Native American was being treated as it relates to not just medicine but culturally. He and his partner both railed very heavily against what was going on in these pretty strained circumstances. You know, very, very high stress. They were able to get some policies pushed through the government that changed the way that medicine was delivered to Native Americans on the reservation. Right after this bill was passed, which he had worked for for three years (his kind of part-time job was this advocacy), his partner, who was his partner in advocacy and also in medicine (traveling around on horseback) committed suicide. It was such an unbelievable stressor that

he ended up wanting to get as far away that he could, so he ended up going to Maui to the Kula Hospital on the side of Haleakala. It was, I guess, a hospital that was in kind of catastrophe. They were having a lot of ethnic problems because of the cultural diversity and so he came to the conclusion very quickly that the only way that he was going to be able to do anything there was to learn how to heal through food, because they all had their own way of cuisine. So he took some of the grounds of the hospital and made them into gardens, so there was a Korean garden, a Japanese garden, a traditional Hawaiian garden, and a Chinese garden. And then the people from the community that were of those ethnic origins would then raise those products that were used in the hospital cafeteria and then they had to learn how to prepare meals together. It actually transformed not only the hospital but the whole community, and then that led into dancing, and all sorts of other cultural things where people mixed together, and then he taught himself Chinese and Japanese during that period because he felt that he had to really communicate with the group in their native languages. So that ultimately got him to be recognized by Governor Waihee that he was a pretty interesting guy, although he was a Howli (Caucasian), that he was pretty interesting in the way that he was embracing cultural diversity. So he got appointed to be the Secretary of Health for the State of Hawaii. And then he ran later, when Waihee was retiring, for governor of the state of Hawaii around this whole concept of health as his principal platform. He lost by 325 votes, the governorship, only to end up in California as the president of the California Medical Association, where he tried to do the same thing in California unsuccessfully. But I think his path of enlightenment was one that reflects that there are certain people like you and your wife that somehow seek a road less traveled, and it's always been a question to me as to what are those things? It's not just intelligence. There is something else that is going on that motivates a person to take the road less traveled, and what is not only more complicated, but maybe also not as favored if you're thinking about, "Oh, where is my next appointment going to be, and how do I get the proper kind of pedigree?" What was it in your life that you think kind of defined that you would take this road less traveled?

New Role at the Institute for Functional Medicine

PH: It's about helping people, and it's about finding out where the suffering is, and seeing that. I, in my life, have been so blessed, and I view that as a gift that I've been given, but also a duty that I have to be able to offer those gifts for the benefit of other people. That's what my life is about. So, when we go to look at where there is need, that's a driving force, to be able to apply it. And for me, thinking that medicine would be the way to help the suffering and then realizing, "Oh, this particular paradigm doesn't actually help to relieve suffering a whole lot." It suppresses symptoms, which has its value. When people are extremely sick, the antibiotics in the acute care, or the emergency room, or the hospital room—they're important. But that's not where the bulk of suffering is happening right now. So how do we do that? How do we take care of that? I think that's always been a driving force, so there are many different roads to consider in the conversation.

I was working with a project through the medical student association on health promotion and disease prevention in a federally funded health center in inner-city St. Louis (in North St. Louis). Lisa was working in a project doing reproductive health work with a migrant clinic in the Skagit Valley. The two of us were asked to communicate about that to the federal government and to the National Association of Community Health Centers. That's how we met. So that's always been important. So today, when Oscar from Peru comes up and says, "Hey, I'm a family doc here, and I want to understand how to apply functional medicine in federally qualified health centers and be able to help people of need, I'm like 'Yeah, that's where the opportunity is'."

These tools work, and they have been promoted or pejoratively cast aside as being an elite or a creaming-the-crop kind of approach to taking care of the worried well. And it's not the worried well who are coming into my office. People have a lot of suffering and they haven't received benefit from the healthcare system. And that has the opportunity to be applied much more broadly, and I feel like it works in any setting. And we see it. People will sometimes say, "What's this thing about why functional medicine?" And I say, "You know, there's really only one reason: It works. It's helping people." And that's what brought me here. You told me you'd take me to this spot. That's it is and that's what the vision is. It's like how do we standardize this and create it in a reproducible way so that it can move across and that the teachers...everyone's on the same page? We're all very close, but let's work to create some clear standards so that it can be leveraged, and what we've taught to 1200 people here can be taught to 12,000 doctors two years from now, and 120,000 doctors twelve years from now. It's totally doable.

JB: So you've walked the talk, or put your money where your mouth is by changing your life significantly from a family practice doc of great repute to a medical director of a diagnostic laboratory that's involved with support of functional approaches to health care, to now becoming the Director of Medical Education for the Institute for Functional Medicine. These are kind of sweeping changes, maybe, in how people would see their professional life, and maybe even consider it three career changes. And you've done it by maintaining what I would call a very high level of scholarship. Maybe, to be a little bit cute about it, "eggheadedness," as you've approached this heart-felt need to help people. In those kind of major career transitions, what was your moral compass that led you to make these changes, because you could have been very comfortable just staying a well-esteemed family doc.

PH: I'm going to touch on the eggheadedness first because I find that within western medicine the science is the coin of the realm, and that it's important to be able to meet a high standard. One of the things in my medical training at Washington University is they taught us to be critical, to learn how to read a paper and understand what it is. Now, I saw both sides of that equation where a favorite paper I remember reading was this paper on looking at—this was 1983—trans fats and their effect on lipoprotein lipase and HMG-coA-reductase. I'm reading this paper, and we're having our journal club on it, and I'm talking to Oliver Lowry of Lowry assay. This guy is like one of the most referenced authors ever, and I said, "You know, what's fascinating about this is these guys are from the Hormel Institute and this is SPAM they're talking about, and SPAM has this effect on lipid metabolism." And he said, "Well, you can't take it that far." And I said, "Look, it's in the methods." I'm going, "This is what's happening." It was kind of like he argued with me, but then he's like, "Okay, it is right there in the methods section." It's like learning how to use science in a way that's teaching us. You know, in business we have agreements upon which we work so that we can do business together. In science, we have agreements upon looking at data so that we can have a conversation about it. There can be different interpretations of it, but we have a language. That's important. So the eggheadedness comes from there.

Now in terms of the moral compass, it's almost like there's nothing else to do, that each of these decisions have that have occurred...you know, I looked at being in practice and I actually went into what some might call a vision quest when I was looking at a change, considering a change in direction. I came away and there was no question. It was like, "Oh, this is the path to follow." Because I had set a clear intention that what I wanted to do was help be—as you said—an agent of change to transform medicine. That's what I've been interested in since I was in medical school, and I feel, again, just incredibly blessed that I get that opportunity. It's like, "Wow, it's happening in my life." And so as it came time to know that I was done working for this diagnostic laboratory, it had been 10 years, it had been successful,

everything that I worked to do had worked out well, and quite frankly I had problems with being seen in the business setting as being someone who was just trying to promote a business or a product. Anyone who knew me knew that wasn't the case. In fact, they often would say, "Actually you kind of go over backwards to not do that." Because integrity is important, but it was time to change. So I stepped away, creating space purposely in doing that, and the opportunity here with IFM just seemed to be perfectly aligned with what my life interests are, which is about the transformation of medicine. It says that on one of the posters somewhere. So at a time where the inflection point for change has taken off, again, what a great opportunity.

JB: So, *carpe diem*, you've obviously done that in your life, you've made decisions that would be considered major decisions very decisively, you and your wife have supported those and made a transition successfully, and now you stand at a threshold with the IFM or the functional medicine model development in which it has probably passed through the first two stages of an evolving concept. Stage one is: Is there anyone more than the founders that would be interested in it? So that's stage one, because generally, you know, there might be five people in the family that think that the idea of a founder is interesting and then it falls off the edge and dissolves into the universe. So we passed first level a few years ago. Now it has passed the second level. The second level is: Gee whiz, it's recruited people from a broad array of different backgrounds who have credentialed expertise in areas of medicine and have demonstrated their capability of implementing those concepts that they learned successfully in their own practice with their patients, and now those people are becoming affiliated as, let's call it, early-adopters but not first-level adopters, so we start to get a little bit more stickiness to the concept, so that's like the next level of "we will survive as a concept" phase. And then it's the next phase, which is where you get into the potential knee of the hockey stick, where it really starts to have a replicative action across people that may not have even considered it at all until they heard it in a different way and suddenly they became an affiliate. So in this particular phase, one of the dominant themes that we've heard time and time again is, "Well, this is a really great model, this functional medicine model. It really seems to address issues in the ways that are consistent with why I went to medical school to begin with." And then we have a "but." And we never put a "but" in the sentence and that means that everything after the "but" is probably the most important thing, which is "How do I make a living doing this?" How do I actually make this work within the scope of seeing 35 to 50 patients a day in managed care, and the reimbursement coding, and the oversight of uninvited guests in the exam room called the insurance company and Medicare? So this is going to be your challenge. Are you having any thoughts about how you're going to approach those questions?

From Learning about Functional Medicine to Experiencing Results

PH: Yes, certainly. To me, the answer is simple; the execution to get there will be what it's all about. And that ends up, from my perspective, focusing on outcomes, and doing the systems-based research, and having the codification that allows us to be able to demonstrate what we who are using it know to be true. You know what it's like to be in practice and using these tools. You may recall when I first met you I was of the questions, "Well, you're talking about all these complex things that I don't understand. I don't think I'm stupid, but I'm not following this. It's way too complex. How do I do this in practice?" I got taught how to use that, and lo and behold it worked. But I have to say, in those days I thought that a large part of the reason why it worked was because I was special or different. I had the right stuff to do it. And what it meant when I went out and started teaching it, and people would say, "I applied what you said and I have my son back, or my father is now healed, or these patients, it worked," I sort of honestly looked

like, “Really? It’s not just me? There’s value in this?” And I found that, and I find that over and over again, and we’re finding it here. As I said earlier, it works. So I have no doubt that as we do the systems-based research that focuses on outcomes, which is what? The stages of the Affordable Care Act and working towards accountable care organizations, and the development is going to be focusing on. Reimbursement will be based upon outcome and effect, and so we’ve got two or three legs up on everybody else because we continue to hear from everyone who comes through the training and does it and applies what we’ve been talking about that it works. And I think that our hit rate on being able to simplify it enough to bring people along as David Jones has said “to help to make that on ramp easier.” We find that what we’re talking about now in relationship to nutrition as a single common avenue that people can jump on that onramp and be able to get on to it and see, “Oh, nutrition isn’t about nutrition for IBD, or IBS, or asthma. Nutrition is for health, and that we have changed the overall structure of what’s going on.” And we use that and apply that in clinical practice, it’s going to work. So now it’s our job twofold: 1) to codify and ease the training so that people can clearly see the path and they can move to a place where they are applying it in practice; and the other is to be able to do the systems-based outcomes research, and it sounds like it’s a couple of simple words, but it’s such a different paradigm that understanding how to set up systems to be able to do that, it’s going to be three five years, but I think that in three to five years we’ll have the outcomes data that is there that will lay the framework. We wanted to do this three or four years ago, but we weren’t mature enough as an organization and a set of practitioners to be able to all be on the same page to do it. We are there now.

So those are the steps that are going to help, and I think, frankly, working with various individuals of what are business models that work? There are several different kinds of approaches, and frankly, I think that there’s value across a lot of different models, but I see subscription models (even low-income subscription models) where someone is paying \$75 bucks a month to be able to get rudimentary care from a functional medicine model. That, if I’m a doc and I’ve got a thousand patients and they are paying \$75 bucks a month, that’s nine hundred thousand dollars right there. Then I’m taken care of. I’ve pretty much got my practice covered, and I should be able to do this for that. Seventy-five bucks a month is a cup of coffee a day. Do you care enough about your health? So I think there’s ways to be able to do this and we’ll need to investigate those, but my primary focus is on simplifying the onramp relative to teaching and working to develop a structure to allow for outcomes-based research.

JB: That’s really beautiful and I totally agree with your assessment. So let me ask one last question, which I learned this from a very sage gentlemen that had traveled through three different careers and had been successful in three entirely different fields of activity, the last one which was medicine, actually. I was asking him what characteristics that he felt would define an area that had really great opportunities for providing social good, for providing a livelihood, and for being something that would be considered high social value? In other words, a place you’d want to put your life, because we know we can work, but work which occupies a lot of our life should also be a fulfilling part of our social enterprise. And he said, “Well, it’s very simple. There’s one rule that he’s learned, and that is it would have to be something that fulfilled the litmus test of encouraging your own children to go into it. If you can’t be confident enough that you would want your children to go into it, it’s probably not something you should be involved in as an individual.” And right now in medicine I hear from so many docs saying, “I wouldn’t want my children to go into medicine.” Just like I wouldn’t want them to go into investment banking—you know, you hear that too for other reasons.

Give me your litmus test. How do you look at medicine and the future? As your boys come to you, what

would you say about the future?

PH: It's a great and timely question. My younger son is starting college. We had an entire conversation from a family trip we did last weekend about intermittent fasting, glycogenolysis, and how to be able to optimize energy output. He's 18 and he's a high-level athlete who plans to continue to do that collegiately, and he cares about his body and he had looked at business, and sports medicine, and being an agent, and doing this kind of thing. We've been having the conversation recently like, "You know, doing sports medicine, and working with athletes, and working to help optimize health and well-being as I'm trying to do would be great. What do you think about that?" "That's perfect. That's a great synthesis of what you know and who you are." He cares and this is what he's watched us do, and the fact that he's been able to see us finding joy. We work hard. We take care of many different people, but we love what we do. So, that's a great litmus test. And for me, the other litmus test that is fundamentally important for me is about service. Being of service to other people. That is what brings me joy in my life. It makes me feel that there is incredible worth in doing that.

JB: I have to say having had the privilege of knowing you now for the better part of going on two decades that you radiate service. You embody service. You don't even need to say the word; it comes across, it's on your countenance, it's part of your aura, your energy, it's authentic it's deep, it's behind the screen—if you look behind the screen you see more than you see up front. That's what really establishes the authenticity of any field, is there's a core group of people who, when you dig deep below the surface, what you find no matter what level that you want to engage, no matter what stress that person's under, that you'll find that that core principle—whatever that principle is—is all the way through to the roots, and it is in you. And I think the future of the Institute for Functional Medicine and its educational curriculum, and its heuristics, and epistemology is in tremendously good hands with Patrick Hanaway. It's really a privilege to know you and have a chance to watch how your energy, and wisdom, and experience, and knowledge permeates into the evolution of this model. Thanks.

PH: Thank you. And, as you know, Newton said, "We can see farther because we stand on the shoulders of giants," so thank you for bringing us along on that journey as the initial pioneer and scout.

JB: Thank you.

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