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FOR FUNCTIONAL AND EVOLUTIONARY MEDICINE

Interview with Dr. Aristo Vojdani

Chris Kresser: I'm thrilled to welcome Dr. Aristo Vojdani as a special guest for the ADAPT Level One Framework program.

Dr. Vojdani obtained his PhD in immunology and microbiology from Bar Ilan University, Israel. He carried out postdoctoral studies in comparative immunology at UCLA and in cellular immunology at Tel Aviv University Medical Center.

Dr. Vojdani's research, spanning a 40-year career, focuses on the role of environmental factors, such as toxic chemicals, infections, and dietary proteins and peptides in complex diseases.

Dr. Vojdani has published 120 peer-reviewed articles in scientific journals. He is a member of the editorial boards of the following peer-reviewed journals: the Journal of *Toxicology and Industrial Health*, the journal of *Environmental Epidemiology and Toxicology*, the *European Journal of Inflammation*, and *Evidence-Based Complementary and Alternative Medicine*.

In 1984, Dr. Vojdani was recipient of the Scientific Presentation Award from the American Academy of Otolaryngic Allergy. He has participated in research which has been funded by the Environmental Protection Agency, the NIH, the National Institute of Allergy and Infectious Diseases, and the Department of Veterans Affairs.

Dr. Vojdani is CEO and technical director of Immunosciences Lab and Chief Scientific Advisor at Cyrex Laboratories, which we're going to be talking about extensively.

Dr. Vojdani is an incredible pioneer in this field. I became aware of his work early on in my research. I think I've read almost all of his 120 peer-reviewed articles, including his most recent paper that he sent to me. He really kind of invented IgG food allergy testing and knows more about it than just about anyone else, and as I mentioned, he's the Scientific Advisor at Cyrex Labs and helped develop all of their food intolerance testing panels, which I'm going to be teaching in this program. I'm really honored that he was willing to join us and share his extensive knowledge with us, and I look forward to passing that on to you in this interview, so let's get started.

Dr. Vojdani, thank you so much for being here. It's a real pleasure to speak with you. As you know, I've followed your work for several years and just can't thank you enough for your contribution to the field. It's really helped open my eyes to the contribution of food

intolerances and autoimmunity and so many interesting topics that you've covered and published in the literature, so I just wanted to thank you for that and for being here with us today.

Dr. Aristo Vojdani: Thank you. You are a very busy man, and being able to spend time with me and interview me, it's a great honor.

Chris Kresser: Oh, I appreciate that. Without further ado, I know folks are going to be really interested to hear from you personally because you've been such a pioneer in this world of food intolerance testing, and let's face it—there's so much misunderstanding and so much information out there. I think a lot of people are really overwhelmed by it all, so why don't we just start out with the basics. I've covered a lot of this on my podcast and blog, but since we have you today, I want to talk a little bit about and go into a little more depth since we're talking to clinicians here about IgG and IgA food intolerance testing. Then I'd like to spend the remainder of our time focusing on on of your newest arrays, Array 10, which is, I think, unlike anything else available right now, and I just want to go into some further depth on that, too.

Dr. Aristo Vojdani: Perfect.

Chris Kresser: Maybe we should just start from square one and talk about why IgG and IgA food intolerance even makes sense clinically.

Dr. Aristo Vojdani: Yeah. I'm extremely happy to hear that you did not name this "food allergy."

Chris Kresser: Yes!

Dr. Aristo Vojdani: Right?

Chris Kresser: I'm not that much of a rookie!

Dr. Aristo Vojdani: As you know, many people mistakenly are calling this "food allergy," and my goal in writing those articles in *Alternative Therapies* is to change this notion that this is not about food allergy. This is about food intolerance. It is about food immune reactivity and possibly autoimmunity. Why food intolerance? Because the bottom line is just that. When we make IgG or IgA antibodies against dietary components, that is an indication of failure of immunological tolerance and possible autoimmune reactivities. I'm not calling it even autoimmune disease. When our immune tolerance mechanism fails and is not able not to react to the food that we consume on a daily basis—

Chris Kresser: Right.

Dr. Aristo Vojdani: —then the failure of that can result maybe in penetration of antigens through the mucosa to submucosa and finally IgG and IgA production against that.

Chris Kresser: Yeah. Thank you for clarifying that. I sometimes forget to do that because I'm so interested to get into the details, but that's a really important point. We see a lot written about food allergy. We know that 15 million Americans have food allergies, with 1 in 13 kids affected, and that they've increased by 50 percent between 1997 and 2011, but—I'm curious to hear your take on this—that's allergies. We're not talking about statistics for intolerances, which could be even higher than that, I would guess.

Dr. Aristo Vojdani: Unfortunately, we don't have the exact statistics, but when I did my study about a year ago only with two major antigens, common antigens, or food proteins —wheat and milk, which are very common—I found about 20 percent of healthy—so-called "healthy"—

Chris Kresser: Right, "so-called."

Dr. Aristo Vojdani: Yes,—reacted strongly to wheat and milk, and about half of those also produced antibodies against their own nervous system antigen. So another meaning, that about 10 percent of the population—so-called, again, "healthy"—today, they react to different food antigens and in the future may develop devastating neuro-autoimmune disorders such as multiple sclerosis or neuromyelitis optica.

Chris Kresser: Yeah, and I know I'm preaching to the choir here, but what is so tragic to me about this is that when those people develop those diseases later on in life, there's very little chance that there's going to be any connection made with the development of that disease and the consumption of those foods.

Dr. Aristo Vojdani: My friend, I'm 100 percent with you. Unfortunately, you are not going to find many dot connectors like yourself and me. The bottom line is this, that unfortunately 53 million Americans suffer from autoimmune disease and allergy and other disorders—one out of three, probably, if we add up all these numbers—but when they get the disease, the patient is asking the doctor, "Doctor, why do I have this or that disease?"

Chris Kresser: Right.

Dr. Aristo Vojdani: The answer is always, "I don't know."

Chris Kresser: Or "Bad luck."

Dr. Aristo Vojdani: Or when you ask the question why autoimmune diseases, allergies, and other immune disorders are on the rise, they don't say, "I don't know." They say, "Because we detect them much better."

Chris Kresser: Right.

Dr. Aristo Vojdani: So it is unfortunate that they cannot connect the dots to the triggers of autoimmunities and allergies and others.

Chris Kresser: Well, that's what we're definitely doing in this training. I'm happy to know that all of the people that are listening to this recording are going to be dot connectors also and they're going to be out there helping people to make these connections.

With that in mind, let's go into a little more detail on this. Tell us what the difference between IgG and IgA antibodies is, in terms of what the body is telling us if we see an IgG antibodies that's positive versus an IgA antibody.

Dr. Aristo Vojdani: The IgA and IgG antibody elevation indicates breakdown in oral tolerance. In our gut immune system, we have a type of cell called regulatory T cells or Th3 cells. We used to called them suppressive cells in the past, but now we know they're regulating the immune system. Part of their job is that during the process of maturation of the immune system, the first three to six months or a year of life, these beautiful T cells get developed. Their function is to produce two regulatory cytokines, TGF-beta and IL-10, and altogether make the body actually learn now to react to food that we consume and also to live in harmony with friendly bacteria.

Chris Kresser: Right.

Dr. Aristo Vojdani: And so any breakdown in this process, in this mechanism of action, can result in immune reaction against dietary components, even bacterial toxins, and so the first time this happens because of lymphocytes in the gut reacting to the antigens in the mucosa, the end result is going to be IgA antibody production in secretions, including saliva, milk, and even in the stool. When this process repeats itself and a lot of IgA is going to produce against various food antigens, the overflow of that from the mucosa goes into the blood. First, when we react to any food antigens, the antibodies are IgA antibodies and are detected in secretions, including saliva that we can measure, but later on, those antibodies also are going to be found in circulation. When further immune reaction occurs,

inflammatory cytokines are produced. Together they may open the tight junctions, and this time not only are lymphocytes going to produce IgA antibodies against the food antigens. Unfortunately, undigested food antigens can penetrate the tissue, entering into the blood; our body's lymphocytes are going to react to them, and eventually and finally it is going to be resulting in production of IgG antibodies in the blood.

Chris Kresser: OK, that's helpful. So someone could present with either IgG or IgA antibodies, and IgG antibodies, it sounds like, implies that the problem has been going on at least for a little while, or at least there's some penetration of the mucosal barrier in order for us to see IgG antibodies, whereas IgA antibodies could be more related to production within the gut with the lymphocytes in the gut.

Dr. Aristo Vojdani: Absolutely. Yes, I agree with that.

Chris Kresser: Great. OK. One of the criticisms, as you well know, of IgG and IgA food intolerance testing is that it's not reproducible. Can we talk a little bit about that?

Dr. Aristo Vojdani: If it's possible, I would like to share also with you and your audience at least 20 different articles I put together right now in front of me. It's showing the clinical significance of IgG and IgA antibodies.

Chris Kresser: Yeah, let's definitely talk about that first.

Dr. Aristo Vojdani: Let's establish the case why clinically these antibodies are important, and then we'll talk about reproducibility.

Chris Kresser: Sounds good.

Dr. Aristo Vojdani: Because that's not the case when you talk about the ALCAT test, when you talk about MRT test, LRA, or ELISA/ACT. I couldn't read even a single article to support with those methodologies if there is any clinical significance regarding those methodologies.

Chris Kresser: Yeah, not in the peer-reviewed literature, at least.

Dr. Aristo Vojdani: The peer-reviewed literature. Absolutely, yes. That's why here, if you don't mind, there are 20 different ones that when I read the most important part of each article, you are more than welcome to make some comments in order to clarify the issue.

Chris Kresser: Sure. OK.

Dr. Aristo Vojdani: Number one is casein IgG antibody cross-reacts with Sm, which is Smith, antigen, in systemic lupus erythematosus. Another meaning—you make an antibody against specific peptides of casein, that antibody cross-reacts with specific peptides which are involved in lupus.

Chris Kresser: Right. Drink milk; your body attacks itself.

Dr. Aristo Vojdani: Number two is casein peptides cross-react with S1 protein in the eye, which is involved in uveitis. And the third article about casein is casein IgG antibodies cross-react with islet cell antigens.

Chris Kresser: Diabetes.

Dr. Aristo Vojdani: You know that connection between baby formula and type 1 diabetes.

Chris Kresser: Yes, and perhaps type 1.5 adult-onset diabetes.

Dr. Aristo Vojdani: That's right. The next is about gluten and wheat proteome cross-reactivity with various tissues. I know your audience already heard a lot about this, but in particular I'm emphasizing gangliocyte, cerebellar, and synapsin. You make antibodies against certain peptides in the wheat proteomes that can cross-react with your own brain tissue antigens.

Chris Kresser: Yes, and just a clinical note. I see this so much also with transglutaminase 6 on the Cyrex Array 3.

Dr. Aristo Vojdani: That's right.

Chris Kresser: Yeah, which we're talking about in more detail, everyone who's listening to this.

Dr. Aristo Vojdani: Yes. So right now we talked about two major antigens. Now I'll share with you also articles about Saccharomyces cerevisiae mannan antigen, which is alpha-1,6-glucan. This is, again, IgG anti-Saccharomyces cerevisiae alpha-1,6-glucan in systemic lupus erythematosus and rheumatoid arthritis. Again, this is due to cross-reactivity. The same thing, Saccharomyces antibody, IgG or IgA, in type 1 diabetes. And Saccharomyces IgG or IgA antibodies in systemic lupus erythematosus. IgG against soy, corn, spinach, carrots, cross-reactivity with Sm in lupus. This Smith protein somehow, because it is involved with lupus, there is a lot of cross-reactivity between food with this antigen.

Chris Kresser: Right, so here we've moved away from the typical antigens that you hear about, like dairy and wheat—

Dr. Aristo Vojdani: Absolutely!

Chris Kresser: —to foods that are not typically considered to be problematic.

Dr. Aristo Vojdani: That's right.

Chris Kresser: Which would indicate a kind of more profound loss of immune tolerance or gut permeability or something going on that's causing people to be able to react to a food that humans have probably consumed for quite a long time.

Dr. Aristo Vojdani: Right. Now, another article, IgG anti-corn, peas, spinach, and wheat germ components cross-react with DNA topoisomerase. As you know, DNA topoisomerase is a major antigen in scleroderma, Scl-70. Here several foods are involved in scleroderma.

Chris Kresser: Right.

Dr. Aristo Vojdani: IgG against glycine-rich cell wall protein found in gelatin, meats, eggs, seeds, soybean due to cross-reaction to ribonucleoproteins, fibrillar collagen, which are the target of various autoimmunities.

Another article about anti-polygalacturonic acid, which is found in apple, quince, orange, grapefruits, and berries, with major auto-antigens in the joints.

Anti-shrimp tropomyosin cross-reacts with human colon tropomyosin.

My own work and, of course, earlier work published in the *Journal of Neuroimmunology*, anti-plant aquaporin found in spinach, soy, corn, tomato, and tobacco cross-reacts with human aquaporin, the water channel protein found in blood-brain barrier astrocytes, and the consequence of that, as you know, is neuromyelitis optica.

And IgG antibodies associated with low-grade systemic inflammation and intima-media thickness in obese juveniles, against various foods in this case.

Galectins—these are lectins with a galactose molecule—are involved with pathogenesis of rheumatoid arthritis. I'm sure you know a lot about lectins and agglutinins and their involvement in rheumatoid arthritis.

Antibody against a determinant called CCD, cross-reactive carbohydrate determinants, found in blood group B, in red meat, and also that determinant is found also in Borrelia burgdorferi. Here is an example of a food antigen which can cross-react with our own blood type cell membrane antigens as well as with infectious agents.

And finally, various studies—this is an article which was published by one of my colleagues from Johns Hopkins University who has a book. In fact, I have his book right here. His book is about *The Gut Balance Revolution*, Gerry Mullin. He wrote a very interesting article about the good, the bad, and the ugly about food IgG testing. Actually in his conclusion, he showed that food IgG testing, based on many references, elevation in IgG antibodies against various foods correlated with inflammatory bowel syndrome. Elimination diet caused significant improvement. And also Jeanne Drisko from, I believe, Kansas University published another article about this.

Then IgG and IgA antibodies against beta-lactoglobulin and gliadin at age one is associated with IgE sensitization at age six. So you see why IgG and IgA antibodies are so important and becoming so important.

Chris Kresser: Yes, clearly plenty of evidence to support their use, and I'm sure there will be more. I just want to point out to the listeners that autoimmunity as a process is similar in all different autoimmune diseases. So when you hear about a finding that an antigen is connected to a particular disease like scleroderma or lupus, that doesn't mean that it may not also be connected to other autoimmune diseases. It's just that not all of them have been studied yet in this context.

Dr. Aristo Vojdani: Absolutely. What is missing right now, they did a study only on these foods that I mentioned, but there many, many other foods that have never been studied, and that's an area which is waiting for more investigation.

Chris Kresser: Great. So now that we've established the reasoning behind IgG and IgA food intolerance testing clinically, why we should be doing this testing, just to summarize here, if we as clinicians are able to identify these food intolerances in people early on and we intervene and we look at pathologies like small intestine bacterial overgrowth and parasites and other things that can affect the gut and we do treatment protocols that heal the gut and seal the gut barrier and reduce the production of these antibodies, we could potentially be preventing serious and even life-threatening autoimmune and neuro-autoimmune diseases 10, 15, 20 years down the line.

Dr. Aristo Vojdani: Absolutely. We established that environmental triggers are contributing to many autoimmune diseases, and environmental triggers are food, infections, and toxic chemicals, and of course, today our focus is on food only.

Chris Kresser: Yeah.

Dr. Aristo Vojdani: Therefore, I shared with you those articles, and also I would like to read a quote from an article published in the *Journal of Neuroimmunology* two years ago where it showed that antibodies against aquaporin in plants can cross-react with human aquaporin and can result in neuromyelitis optica. They finished the article by the following quote: "Future directions would include rigorous in-vitro and in-vivo studies to evaluate the ability and role of these proteins"—meaning all the food proteins in here—"to generate cross-reactive antibodies [with human tissue] and consequently contribute to the development [of autoimmune diseases]." Finally, they say, "There is potential for these naturally expressed proteins to be exploited in therapeutic interventions, as well as the development of guidelines for dietary modifications." I think they really summarized this very, very well. When you measure antibodies against certain foods and these antibodies are highly elevated, I think you are going to help your patients significantly by removing these food antigens from their environment of the patient, and you'll see significant improvement in their clinical conditions, of course, if the test is done reliably.

Chris Kresser: Right. I know we're going to get into that, but I also know a lot of people are just—I mean, I get this question all the time. I know you probably do, or Dr. Alexander does, so forgive me for going off on this tangent, but when we say to remove the foods from a patient's diet, are we talking about forever, or are we talking about remove the foods and heal the gut and then reintroduce and retest, or is it a question mark?

Dr. Aristo Vojdani: OK, my answer is like this. Remember, I'm coming from a family with unfortunately my mother had rheumatoid arthritis, suffered for 47 years, and I was witnessing all of that.

Chris Kresser: Yes.

Dr. Aristo Vojdani: Unfortunately, when I was very young, I didn't have the knowledge of today to tell her, "Remove certain foods from your diet."

Chris Kresser: Right.

Dr. Aristo Vojdani: If we have the genetic makeup for autoimmune disease and you react to certain foods, I believe you should remove that from your diet forever.

Chris Kresser: And are those foods that you're referring to the truly cross-reactive proteins or anything that shows up on any of the arrays?

Dr. Aristo Vojdani: I think if they cross-react with human tissue, but do we have really extensive knowledge about that? We have limited knowledge.

Chris Kresser: Right.

Dr. Aristo Vojdani: So therefore it's safe to remove the highly positive antibodies, I think, forever.

Chris Kresser: Right. So if you have the autoimmune predisposition, then removing wheat and milk, dairy products if you test positive to them might make sense forever as a preventative measure, but if you test positive to carrots, it may be more possible to restore oral tolerance to them and they may be less likely to provoke an ongoing response? I'm saying all this with a question mark because we don't really know!

Dr. Aristo Vojdani: I'm in agreement with that. You have to do all the above. Remove the food that the patient is reacting highly to and then repair the gut, and also make sure that some of the foods the patient is reacting to are not due to other cross-reactive antibodies in the patient's blood.

Chris Kresser: Right.

Dr. Aristo Vojdani: I'm going to send you one of my articles that just came out two weeks ago in the *Journal of Clinical and Cellular Immunology*.

Chris Kresser: I haven't seen it yet. You know I've read pretty much all of your articles, but I think that one not yet.

Dr. Aristo Vojdani: This is a new article.

Chris Kresser: OK, great.

Dr. Aristo Vojdani: What I did, I took monoclonal antibodies and polyclonal antibodies, highly pure, affinity-purified antibodies. Monoclonal antibodies are 100 percent pure against the antigen which they're exposed to, produced by a clone of cells. When we reacted that with 180 foods—OK, I'm sorry, these antibodies are made against various infectious agents—Epstein-Barr; Borrelia burgdorferi, the agent of Lyme disease; measles;

and others. More than 40 different foods were reactive with these monoclonal and polyclonal antibodies. I'm sorry I'm interjecting something in here that many people don't know about, but that's why I'm saying that we have to make sure, for example, if the patient is reacting to certain nuts, is this because of a cross-reaction between Epstein-Barr virus and peanuts or really the patient is reacting to peanuts?

Chris Kresser: Right. Just for the listeners, when I review all of the tests in Array 10 and Arrays 4 and 3, I've listed what the cross-reactive substances are with each of the antigens, and that information is on the Cyrex website as well.

A couple of questions related to this: Number one, do you have either internally or have any clinicians that work with the Cyrex Arrays done time-series testing on a single patient —extensive, not just one or two tests, but several tests over a period of time—before and after interventions to see, number one, how consistent the results are from test to test in the same person as these various environmental triggers are removed or changed and as their gut is healed? And number two, as a related question, let's say someone does test positive for some of the truly cross-reactive antigens, like wheat and dairy products, but they also test positive for foods that aren't cross-reactive, like carrots—we've been using that as an example.

Dr. Aristo Vojdani: Yes.

Chris Kresser: If they heal their gut and they remove wheat and dairy from their diet, have you seen oral tolerance be restored, according to the test results, to the non-cross-reactive antigens in a patient?

Dr. Aristo Vojdani: Let me answer the question. First of all, really we don't have extensive studies to follow many patients for a certain period of time, a couple of years, three years, five years, and see how the antibody level changes, but we have some case reports shared by some of the clinicians with me, who repeated testing through, like, three or four tests, which were done in a year. The patient had, let's say, 40 different foods highly reactive. After removing those from the diet, by repairing the gut and repeating the test, the 40 became 20. Then we had some other cases that the patient who out of 180 foods reacted against 100 or 120 foods, and this is the puzzling component of antibody testing. Why is a patient reacting to everything?

Chris Kresser: Right.

Dr. Aristo Vojdani: Is this polyreactive antibodies? Is it … I'm just trying to talk about different ideas. Is this because the patient, for example, is reacting to four or five different

components—Epstein-Barr virus, measles, Borrelia burgdorferi, meat glue, and so forth—if they react to five or six different major antigens, which within those there are many other antigens, then the patient is reacting to 120 or 130 or sometimes even all 180 foods. What do you do in this situation?

Chris Kresser: Yeah.

Dr. Aristo Vojdani: So it's not that easy. About five percent of patients whom I have seen react to many, many foods, and the question is, what do you do as a clinician? Do you want to remove 120 foods from the diet of the patient? Aren't you going to harm the patient by removing all those nutrients from the diet of the patient?

Chris Kresser: Yeah.

Dr. Aristo Vojdani: So until we find the mechanism of action, I think about a few of them, but we don't have the proof of which ones are the right ones. For example, if I'm drinking from plastic bottles every day, and I'm getting so much bisphenol-A in my body, or I use shampoo with formaldehyde, and from my skin every day formaldehyde gets into my blood. If that formaldehyde goes to different tissues, then I'm going to react against a variety of tissues. Or if the food is contaminated with different chemicals, pesticides, herbicides, which are common in many foods, maybe our reaction is against the neoantigen, the new antigen formed due to alliance between heavy metals plus various food proteins, and so therefore the food protein itself is not responsible for this immune reactivity. Maybe it's the chemical bound to the food protein that is responsible for this immune reactivity in which the patient reacts to 80 or 100 or 120 foods.

Chris Kresser: Right.

Dr. Aristo Vojdani: These are the kinds of things I'm just throwing out in order to start thinking about. When you have a patient like that, as a clinician, what is the best way to take care of that patient?

Chris Kresser: Oh, yeah, I'm with you. We have several case reports of our own that are pretty interesting along those lines. One that stands out in my mind is a patient that we had. We ran the Array 3 first, and he was reacting either equivocal or out of range to every single antigen on the panel. Then we did Array 4—the exact same thing. He reacted to every single antigen on the panel. Then we did Array 5 to see what was going on with the immune system, and every single one of those was out of range and many of them significantly out of range, 4 or 5 or up on the scale. Just for people who aren't familiar with the reference range, anything above 1.4 or 1.2 or 1.5 is typically out of range, so 5 indicates

a pretty high score. Yeah, with that patient, that was exactly the clinical dilemma we were faced with, and upon further testing, we discovered that he was living in a moldy environment—

Dr. Aristo Vojdani: Wow.

Chris Kresser: —and had significant chronic inflammatory response syndrome, a mycotoxin/biotoxin-related illness that was just completely activating his innate immune system and causing this hypervigilant reaction to everything, including his own tissues.

Dr. Aristo Vojdani: So let's interject something in here that isn't aflatoxin in many foods?

Chris Kresser: Mm-hmm ...

Dr. Aristo Vojdani: OK, so let's say the patient is consuming food with aflatoxin. Now the mycotoxins in the moldy environment also cross-react with aflatoxin, and therefore there is multi-reactivity.

Chris Kresser: Right.

Dr. Aristo Vojdani: A patient like that, if you remove that patient from the moldy environment and support the immune system, support the gut, I believe eventually he is going to get rid of all those immune and autoimmune reactivities. This patient maybe is making polyreactive antibodies, but the patient is not having 80 different autoimmune diseases.

Chris Kresser: Right, exactly. We're in progress on that, so I'll let you know what happens. It's a very interesting case.

Dr. Aristo Vojdani: I do appreciate you sharing that with me.

Chris Kresser: Yes. OK, personally I could talk with you for hours. We don't have hours, so I'm going to move it along a little bit here! Because we have a limited amount of time left and because I've already talked a little bit about reproducibility in this training and elsewhere, I'd like to talk a little bit more about Array 10, which is the newer array. Cyrex Array 3 looks at all of the different peptides in wheat. Array 4 looks at some cross-reactive proteins but also some proteins that are not truly cross-reactive.

Dr. Aristo Vojdani: That's right.

Chris Kresser: I know that's a distinction that you really want to make clear, and I have in the training materials. And then Array 10 looks at a whole lot of other foods that aren't included on Array 3 and Array 4 and some that you wouldn't necessarily think of when you think of food intolerance but that, in fact, we can produce antibodies to when we have had a profound loss of immune tolerance. In the training materials so far I've already talked about three of the key advantages of this panel compared to other food intolerance tests, which is antigen purity, the purity of the antigens used in the testing procedure, that fact that you run side-by-side duplicates with each individual test result to ensure reproducibility, and then the fact that you're using both raw and cooked antigens, which reflects real-world intake of food, because like you pointed out, we don't typically eat raw pork and we don't typically eat cooked lettuce, so it's good to use the appropriate form.

Dr. Aristo Vojdani: Right.

Chris Kresser: But there are other advantages, things that make this test unique that I'd like to talk a little bit about. The first would be that you're using cross-reactive pan-antigen isolates. That's kind of a mouthful. Why don't you break that down for us.

Dr. Aristo Vojdani: Yes, absolutely. Let me give you an example of a cross-reactive pan-antigen. Parvalbumin is albumin which is very common in many fish and shellfish. When you do testing, the parvalbumin is only probably less than one percent of all fish proteins, so when you test against all fish proteins, you may not get any immune reaction against that. But when you purify to almost 100 percent pure, meaning your amino acids are determined like a necklace of different colors, then you measure antibody against pure parvalbumin, your patient can react to that—significantly.

Another example is pineapple versus bromelain.

Chris Kresser: Right.

Dr. Aristo Vojdani: You test against all these antigens—many labs are doing that—extracted from pineapple, because there are so many proteins in pineapple. You are diluting the antigen so much that there will not been enough antigen so the antibody won't react to it. But if you use 100 percent pure bromelain and you measure antibody against that, then you are going to detect immune reactivity against bromelain. The same thing for lectins versus bean proteins. There are many examples of pan-antigen isolate that we can use in the testing, and that's what we are using in Array 10 by Cyrex.

Chris Kresser: Right, and the next one is similar—protein interactions. What we're really talking about here, what you've set out to do, I think, is create a panel that really reflects

how people eat in real life instead of measuring these isolated antigens that may be present in foods that we eat but there are so many things that happen to a food—processing, cooking, the way that it interacts with other foods that we might eat at the same time and new protein complexes that are formed that aren't reflected in a lot of other conventional food intolerance tests.

Dr. Aristo Vojdani: Yeah. The classical example for that is meat glue. What is meat glue? It is a combination of meat proteins. They take lots of pieces of meat, add to that casein in many cases, add to that transglutaminase made by mold—

Chris Kresser: Right.

Dr. Aristo Vojdani: —and all of that together becomes meat glue, which you and I will not be able to differentiate between real meat versus meat glue, meaning meat made by meat glue, when we go to the supermarket.

Chris Kresser: Right. It's not labeled.

Dr. Aristo Vojdani: If I react to casein and transglutaminase is almost in every single human tissue, including thyroid and brain and joints, maybe this is one of the mechanisms that we react to some of these multiple protein interactions such as meat glue and then you get multiple autoimmune reactivity against every single tissue when you do Array 5.

Chris Kresser: Right.

Dr. Aristo Vojdani: Or you may react against gums, which are huge, large proteins.

Chris Kresser: Yeah, and this is an unfortunate consequence of, let's say, someone finds out that they're gluten intolerant or dairy intolerant or both, and so they go to the store and they're shopping. We have such an array now of new gluten-free and dairy-free alternatives, but unfortunately many of these rice milks and nut milks and alternative products—

Dr. Aristo Vojdani: Almond milks.

Chris Kresser: —almond milks, yeah, they all have these gums.

Dr. Aristo Vojdani: From three to five different gums, believe me, because I'm gluten free and dairy free.

Chris Kresser: Yeah.

Dr. Aristo Vojdani: Every time, even I look at the organic ones.

Chris Kresser: Yeah.

Dr. Aristo Vojdani: They add many gums.

Chris Kresser: Carrageenan, guar gum, several different gums, and so you have to be there at home, soaking your nuts and blending them and squeezing them through cheesecloth. Yes, we know all about this, too! On one hand, this can be really depressing, but as a clinician, I think what we need to keep in mind is that we are doing everything we need to do to get our patients better, and the alternative to these interventions that we're talking about are often powerful immunosuppressive drugs whose side effects can be, in some cases, worse than the disease and can put people at risk for even worse conditions later on in life. Later in the training we're going to be talking more about how to talk about this stuff with your patients and how to prioritize these interventions, but I'm just grateful to have the ability to discover these intolerances in the first place. That's more than half the battle. Then helping a patient to make the changes and transition, that's the other half.

Dr. Aristo Vojdani: Yeah, but we should remember from this conversation we had in the last segment that repairing the gut and removing the trigger—of the food, I'm talking about—is not enough. You have to pay attention to some of these additives into the food.

Chris Kresser: Yes.

Dr. Aristo Vojdani: Whether it's food coloring or gums or others, you have to remove them from the diet of the patient. Otherwise, lectins, agglutinins—otherwise, you are not going to be able to repair the gut.

Chris Kresser: Yes, and this is why as a kind of shorthand version when people ask me what I recommend for diet, I say if it comes in a bag or a box, don't eat it. That's a general rule, and there are some exceptions, right?

Dr. Aristo Vojdani: Yes.

Chris Kresser: But it's a pretty good thing to keep in mind.

Let's talk a little bit about lectins and agglutinins, these binding isolates and glycoproteins and what you test for there.

Dr. Aristo Vojdani: Yes. Lectins and agglutinins, as you know, they are very hard to digest, and as we get older, our digestive enzymes, unfortunately, are not going to work properly, and so undigested lectins and agglutinins can cause inflammation in the gut and the whole cascade. That's why if we make antibodies against lectins and agglutinins on Array 10, we should remove that. That's one of the items I will remove completely from my diet forever. The other option will be you have to cook beans, in particular, and there are many other foods containing lectins and agglutinins. You have to cook them very well. Otherwise, definitely the individual is going to have inflammation and leaky gut due to lectins and agglutinins. The main reason is that on the surface of the epithelial cells we have receptors for lectins and agglutinins, and if undigested, they bind to those receptors, opening the tight junctions, which is the gateway to autoimmunity. So it's highly recommended to remove lectins and agglutinins from the diet. It's not just about gluten and dairy. There are many other factors, including lectins.

Chris Kresser: I'll be talking more about this clinically with Dr. Alexander, but I believe that you recommend if a patient is sensitive to one lectin that they remove all lectins rather than just the one that they're testing positive to.

Dr. Aristo Vojdani: Yes, that's right.

Chris Kresser: OK. Well, because we didn't have time to cover this earlier, let's step back a little bit and talk about reproducibility since that historically has been one of the bigger criticisms of IgG and IgA food intolerance testing. Let's say someone accepts the validity or the reasoning behind doing them in the first place, but their concern is that they are not reliable, so even if it makes sense physiologically to do it, we don't have the tools to do it because they're not reliable. What would you say about that?

Dr. Aristo Vojdani: My answer will be it depends who is doing the test. You already covered the issue of purity of the antigen, and the best example I gave during my lecture is if you take apple versus peanut, apple has only 0.2 percent protein, and peanut has about 20 or 30 percent protein. Unfortunately, many labs buying lyophilized, meaning the powder of apple and the powder of peanut, and they take similar amount, make extract out of it, and they put it on a plate, an ELISA plate or test tube, and they measure antibodies, is this a fair game, Dr. Kresser? Absolutely not!

Chris Kresser: Yeah.

Dr. Aristo Vojdani: In one case, you are going to get false positives in relation to peanuts. In relation to apples, you are going to get false negative results. Therefore, purification of

the antigens and also optimization. That's why it took us three years of research and development until we introduced Array 10. Because in 1986 when I developed food IgG testing, I had the SOP in front of me, which everybody is following. In every single laboratory doing right now IgG or IgA antibodies, they are following my methodology from 1986, where I compared everything to a standard curve generated against wheat or milk. Another meaning, if I measure antibodies against broccoli, I used to compare broccoli to milk or wheat, a standard curve generated by wheat and milk. Years ago when I started my research again about this issue, I came to the conclusion you cannot do that. That was 1986. Now it's 2016 almost. Therefore, you have to optimize your antigen, purify the antigen, optimize it, and then do antigen-specific validation. Another meaning, when you compare broccoli, your standard curve should be generated with broccoli. If you measure antibody against potatoes, your controls also should be generated by using potato proteins. That's a major, major component of this whole issue of optimization and also parallel testing, meaning you have to do duplicates, because in any assay—no matter what—if you do a single test, the probability of false positive or false negative is going to be more than 20 percent.

Chris Kresser: Yeah.

Dr. Aristo Vojdani: Therefore, we need duplicates. If your duplicates do not correlate with each other, the lab technicians know that they have to repeat that test and then report the test results. But if your duplicates are within 10 percent variation, then you can report the results, and that's done at Cyrex only.

Chris Kresser: Yes. As I said, we could go on, and I really hope to be able to do this again with you, Dr. Vojdani. I'm so grateful for your time today, and I think this is really going to help people to understand the clinical utility of these tests, how to use them in practice, and how important and significant dietary changes can be. I think my readers and listeners, of course, are already familiar with that and accept that much more so than the general public, but when you go deeper into this material, you can really see the power of what we eat, what effect those foods have on us and what effect dietary changes can actually have. We're not just talking about digestive discomfort and changes in things like gas and bloating and bowel movements. We're talking about really serious neuro-inflammatory conditions like Alzheimer's and dementia and autoimmune conditions like MS and lupus, which are some of the more progressive and destructive conditions in medicine. It's a really important thing to talk about.

Dr. Aristo Vojdani: Absolutely. Very recently a scientist from UCLA published this article about patients with Alzheimer's. If you put them on a gluten-free diet, every single one of them improved.

Chris Kresser: I did see that. That was fascinating.

Dr. Aristo Vojdani: Why shouldn't we do that in relation to autoimmune diseases in general? Right?

Chris Kresser: Yeah.

Dr. Aristo Vojdani: Really, removing the triggers will be the best approach for prevention and treatment of autoimmune diseases.

Chris Kresser: Yeah. I agree. All right, well, thank you again, Dr. Vojdani. It's been a real pleasure to speak with you, and I know all of the ADAPT Framework participants appreciate it as well, so keep up the great work—

Dr. Aristo Vojdani: Thank you so much.

Chris Kresser: —and we'll talk to you very soon.

Dr. Aristo Vojdani: Sure. Thank you.

Chris Kresser: Thank you.

Dr. Aristo Vojdani: Byebye.

Chris Kresser: Bye.