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Dr. Osborne: Hi. Dr. Osborne here with Module 7 of The Glutenology Health Matrix. Tonight, I'm really excited. We're going to be covering a topic that's near and dear to my heart and my background educationally. It's all about vitamins, minerals, and nutrients that people going gluten-free need to be aware of, need to understand. It's some of the connections between gluten-causing nutritional deficiencies, and it's also some of the connections about how nutritional deficiencies are necessary to recover from years of gluten-induced damage, so pay close attention, we're going to be diving into some pretty complex topics.

Also, you're going to have some really tangible walkaways from Module 7 in terms of what you can do, what lab tests you can ask your doctor to order in your follow-up appointments, what you need to have monitored and measured to ensure that you don't become a victim of illness related to nutritional deficiencies. Without further ado, let's get started.

Today, we're going to be covering nutritional deficiencies, the symptoms, the concerns that you need to have and to be looking for. We're going to be covering gluten-induced nutritional deficiencies. We're also going to be covering drug-induced nutritional deficiencies, very important concept to understand. We're going to talk about processed food and nutritional density. We're going to be talking about real food for real nutrition. We're going to be answering probably one of the most common questions, "Do you need to supplement? Do you need to take nutritional supplements to overcome gluten-induced issues?" Let's dive in.

Let's define first. I think it's important to define biochemistry and nutrition together. Really tangibly speaking, biochemistry equals nutrition. Now, most of you may not realize that because as biochemistry is taught in most schools, undergraduate and even in graduate programs, it's not really taught with a nutritional emphasis, even though the study of biochemistry is applied nutrition.

I've shown this quote to you before. Each of the 100 trillion cells in the human being is a living structure that can survive indefinitely and in most instances can even reproduce itself, provided its surrounding fluids contain appropriate nutrients. Now, this quote, taken directly out of the Guyton Textbook of Medical Physiology. It's important to understand that all of the known factors involving human health and wellness and disease are affected predominantly by nutrition, so you can't escape this topic.

There's no escaping nutrition. Even though many doctors will try to tell you nutrition is not important, nutrition doesn't play a role in your illness or your existing disease, they're wrong. Nutrition plays the major role in the development and the processing of inflammation and the progression towards disease. Now, let's define what nutrients are. We use the term nutrients. What does that really refer to? What are we talking about, right? Let's define it first. The essential substances that allow your body to detoxify, repair, heal, grow, maintain cell function, create energy, and sustain life. This is the definition of what a nutrient is.

Now, there are classes of different nutrients. We have carbohydrates, we have fats, we have proteins. Nucleic acids are nutrients. Vitamins are nutrients. Minerals are also nutrients. Water is a nutrient. Those are your kind of classic nutrients. Now, we can subcategorize or subdivide. For example, carbs, fats, and proteins are made of things like carbon, hydrogen, oxygen, nitrogen, phosphorus, et cetera. We're not going to get into the depths of that type of biochemistry. We're going to keep it more simple, carbs, fats, proteins, again, nucleic acids, vitamins, minerals, and water.

Those are the fundamental nutrients that are essential for body function. Meaning, again, your body can't heal, repair, maintain itself if it doesn't get adequate quantities of these nutrients. Now, I also want to bring up three, what are not classically considered as nutrients, but I think we should put them in the nutrient category because they're equally and critically important, and one are probiotics. Probiotics, meaning your microbiome, the flora that lives inside of you.

Why do we want to classify probiotics or the microbiome as nutrients? It's because there are so many different medications that destroy the microbiome, and when you damage the microbiome, you damage your body's ability to reproduce vitamins. Remember, many of our vitamins are made by our microbiome. Our microbiome helps us digest the nutrients from our food, so we want to really look at your microbiome, in a sense, as a nutrient. We also want to look at oxygen as a nutrient even though it's not something that technically we eat in large quantities. We breathe it in, and so oxygen is very, very important, and cleanliness of our air is important because that's how that oxygen is delivered.

Then we also have sunshine. Sunshine classically not considered a nutrient. In today's day and age, most of you probably have been told by your dermatologist, "Avoid the sun at all costs because sunshine is somehow responsible for cancer of the skin," when, in fact, it's not sunshine at all that causes skin cancer, as much as it is sunburning. Sunburning and sunshine are two very different things. You need sunshine. It helps your body produce melatonin and vitamin D. Both are nutrients, vitamin D being an essential nutrient, so we've got to look at sunshine as critical to sustain the nutritional quality of the human diet as it relates to vitamin D. Very, very important.

Those are your definition of nutrients and what we classically considered to be nutrients. Again, in summary, carbs, fats, proteins, nucleic acids, vitamins, minerals, and water are your primary nutrients. Let's talk about essential nutrients from food. Now, in my decades of experience clinically, one deficiency, one nutritional deficiency can inhibit the healing process and cause overt and outright disease. Let me give you an example.

The deficiency of vitamin B1 is known as a disease called beriberi. A deficiency of vitamin B3 is known as a disease called pellagra. Scurvy is a disease caused by vitamin C deficiency. There are milder forms of disease like hyperhomocysteinemia, which is elevations in homocysteine, which increase the risk for the development of stroke and heart attack. That can be caused by B vitamin deficiency, B12, folate, B6, and vitamin B2.

Again, those are just examples of what we might see nutritional deficiencies causing symptoms or causing disease outright. It's important to understand, one nutrient deficiency can disrupt your body's ability to heal and repair itself, but also one nutrient deficiency can cause frank or overt disease that you should be concerned about. Now, why nutritional deficiencies develop? There are several reasons. Those of you with celiac disease, this is one of the reasons why. Those of you with years of gluten-induced GI damage, this is one of the reasons why nutritional deficiencies develop.

There are other reasons as well. We can have a lack of proper intake, meaning, your diet is too monotonous. There's not enough diversity within the diet, and so there are certain nutritional gaps that can show up. That's lack of intake. It doesn't necessarily even have to be poor diet, just a lack of diversity in the diet where you're missing certain key nutrients can be enough to cause a deficiency. We've also got poor food choice, and this is very common in today's industrialized countries.

People eating out of processed boxes, packaged foods, et cetera. They're fortified with synthetic vitamins, and many of which don't have adequate nutrients in them in the first place, which is why the government is mandating that they be fortified. As I discussed earlier, in 1943, it became illegal to sell processed grain, because they were so devoid of B vitamins that they were responsible for killing about 8,000 people per year. This is one of the reasons why our food fortification program came into existence.

We've got lack of intake as one reason. We've got increased requirements as another. You may be a child or you may be somebody going through growth, and this is typically children, babies, as well as adolescents. They're going through growth spurts. Their body requires more of certain nutrients to accommodate those growth spurts. Very common for adolescence, as an example, to develop zinc deficiency as their body is growing. It's utilizing more zinc to aid in that growing process.

There are other situations like pregnancy. Pregnancy, ladies, mothers, when you're growing a baby inside of you, that requires a lot more nutritional power, so to speak. It requires a lot more nutrients to not only feed yourself and sustain your own health but also to sustain that fetus within you. We've also got breastfeeding after the baby's born. Now, you're eating for two, still, for a prolonged period. If we calculate the nine months of pregnancy combined with a year or two of breastfeeding, really, ladies, you're eating for two people for as much as three years. That baby, once you start breastfeeding, growing at a very, very rapid pace, demanding a lot of nutrients and nutrition.

Those are examples of where you have an increased requirement for nutrients. Again, growth, pregnancy, breastfeeding. There's also things like increased exercise. If you pick up a new exercise program, you're getting more aggressive with your exercise, you're going to have an increased demand for certain nutrients to heal and repair from the damage induced by that exercise. Remember, exercise is, in a sense, muscular trauma that requires nutrients for healing and repair and regrowth of those tissues, so increased exercise. There's also trauma. If you've been in an

accident, sprained or strained a tendon or a ligament, had a broken bone, had a burn injury.

These are all just traumatic events that can occur that can increase the need for nutrients in the healing and in the repair process. Then where most of you fit in if you don't fit in in one of those prior categories is in the chronic inflammatory category. If you're suffering with a chronic inflammatory condition, heart disease, diabetes, autoimmune disease like celiac disease, for example, you're going to have increased inflammation, which is going to put a greater degree of demand on your body's nutritional status. For example, we know that heightened inflammation will cause your body to need more vitamin D to overcome that inflammation, just as one example.

Now, we have other reasons why we can develop nutritional deficiencies, so lack of intake, increased requirement, but then there's also increased loss. There are certain situations where your body loses nutrients at greater degrees. One of them is kidney damage or kidney disease. Any of those, of you, listening, that may be diabetic, that have stage two, three kidney disease where your kidneys are actually losing protein potentially, or losing other nutrients through the damage. There's increased loss in burn victims. The nutrients will seep out of the oozing burn itself, and there will be nutrient-loss as a result to the loss through those burns, especially protein.

People with aggressive skin inflammation, diseases like eczema, or severe psoriasis lose protein and other nutrients more aggressively through their skin. We also have increased loss that's due to medications. Many medications interfere with the way your gut functions. Many medications directly inhibit vitamin and mineral absorption or directly interfere with the way vitamins and minerals work in your body.

We also have drugs that aren't considered to be drugs, things like caffeine, which is a diuretic, which causes a greater degree of water-soluble nutrient loss through your urine, and alcohol, not classically considered a drug prescription-based, but it is a drug nonetheless. We know it can cause B vitamin loss through the urine, but also B vitamin loss through the metabolism of alcohol. Your body needs a lot more B vitamins to metabolize the alcohol and detoxify it. Again, those are reasons where we might see an increased loss of nutrients.

Then we have other components like malabsorption and maldigestion. Many people suffer with digestive problems across the board. A classic example for a gluten-sensitive individual is celiac disease, the inflammatory damage done to the villi, which causes malabsorption and maldigestion. There are other inflammatory bowel conditions that can affect your body's ability to absorb nutrients. As an example, inflammation of the stomach or gastritis. Very, very common cause of protein and mineral malnourishment, and as well, large intestinal inflammation. The diseases like Crohn's disease and ulcerative colitis can also cause malnutrition long term.

There's medications that can alter GI motility. They can alter digestive processes. For example, if you're taking an SSRI for depression, it alters gut motility. If you're taking an anti-acid to inhibit stomach acid production, that can actually reduce protein and mineral and vitamin B12 absorption through your stomach. Then there

are drugs like antibiotics that can lead to, again, damage to the microbiome, leading to B vitamin deficiencies as well.

Then there's poor dentition, so not having all of your teeth, or having missing teeth where your food is not being chewed as effectively. This is a form of, again, maldigestion. It's just mechanical digestion. We think of digestion typically in terms of enzymes and the acids breaking down food, but the fundamental beginning of digestion is mechanical digestion through chewing. Of course, poor dentition or having missing teeth, or dentures that are not as an effective agent as your own teeth for chewing and breaking down your food can all lead to maldigestion, malabsorption issues. Again, these are all just factors playing a role in a reduction of nutritional adequacy.

Then there's altered metabolic function. Another category. This would have to do with drug use. Medications can alter your metabolic function. This would have to do with toxic burdens, being poisoned by environmental pollutants, things like mold toxicity or excessive exposure to gasoline or petrochemical additives, et cetera, genetically modified pesticides. This could also be somebody who has a genetic, what's called a SNP. A single-nucleotide polymorphism.

There are a lot of companies out there doing genetic testing now for these like 23andMe, and my friend, Ben Lynch's company, StrateGene®. We've got genetic mutations or genetic variants. Then we also have what are called genetic inborn errors of metabolism, which is a severe genetic defect that can lead to altered metabolic function and nutritional inadequacy. Then in the last category, I know I'm going through a lot of these, but I think it's important to give you the overview of who you are and where you might fall into this positioning as to your risk of developing nutritional deficiencies.

Again, last category are surgical procedures. Those that have had their stomach stapled, as an example, or that have had a stomach bypass surgery. Remember that type of surgery creates an element of malnutrition because when you bypass the stomach, you bypass the important components of stomach digestion, which is predominantly the stomach. The acid production aids in protein breakdown and protein digestion. It aids in mineral absorption. It aids in nutrients like vitamin B12 absorption, so bypassing the stomach through surgery can create long-term nutritional deficit.

Having a gallbladder removal surgery or a cholecystectomy. Remember your gallbladder secretes bile. Bile helps you digest fat-soluble vitamins like vitamins A, D, E, and vitamin K, as well as omega-3 fatty acids. Again, not having that gallbladder can contribute to or create a long-term scenario where you are more likely to develop fatty acid deficiencies. Then there's also intestinal resection. A very common surgery in people that have a history of inflammatory bowel disease where they've had sections of their bowel removed. Again, I've seen cases where people had 2, 4, 8 inches, 12 inches removed as a result of chronic inflammatory process. That sets them up for malnutrition for the rest of their lives.

If you fit in any of those surgical categories, it's important to understand this is where monitoring comes in. This is why we're having this module, to help those of you understand, who are struggling with these issues, what you can do and not just have this sense of hopelessness about it. Again, lack of intake, increased requirement, increased loss, malabsorption, altered metabolic function, and post-surgical outcomes are all reasons why a person might have a nutritional deficiency or a greater need for a nutrient in their diet.

Next, I want to talk a little bit about some of the things that happen with gluten sensitivity. I'm going to put it on the board for you some research. In this study, this is a review from a major publication talking about motility alterations in celiac disease but also in non-celiac gluten sensitivity. I'm going to just point out a couple of highlights here. Number one, patients with non-celiac gluten sensitivity are believed to react symptomatically to wheat components. Some studies have proposed the presence of low-grade inflammation in these patients.

This study suggested the presence of altered gastrointestinal transit time as well. Again, in this review, those of you with celiac disease know you can have inflammation of your GI tract, but those of you with non-celiac gluten sensitivity, who are never told you have celiac disease or had celiac disease, you can still have low levels of inflammation in the GI tract that can create and set the stage for malnutrition. There are also some studies that show gastric motility problems. Probably, one of the most common late-stage motility issue seen with people with a gluten sensitivity issue is gastroparesis.

If you've heard that term, or if you've been diagnosed with that term, that's where your bowels quit moving properly. The food is not being pushed, or peristalsis is not working appropriately, and so food just stays in you, doesn't move through your GI tract in a timely fashion, and much of it sits inside of you and putrifies creating all kinds of negative by-products that can create health issues. Again, research shows that aside from the fact that we know that gluten can cause inflammatory damage, it can also cause directly motility issues affecting how well your bowels push food through.

Next, I want to put up another diagram on the board for you to show you how nutritional deficiencies progress, because this is an area where some people think, "Well, I don't have nutritional deficiencies. I don't feel really bad." There are different stages of progression of nutritional deficiency, so it's important to understand these stages. There's what's called the early-stage inadequacy. Now, in this stage, no symptoms typically manifest to any great degree, people aren't struggling with massive health issues. What starts to happen is a decline in internal biochemical body functions. What happens with a subtle decline.

Let me give you an example, your thyroid hormone not converting properly would be a decline in your biochemistry, which would lead later stage to a manifestation of fatigue. As an example, selenium is necessary as a mineral to help your body metabolize properly thyroid hormone. If you develop a selenium deficiency as a result of gluten-induced issues, that deficiency may not show up in this early stage of inadequacy. We have this early stage of inadequacy that can last for days to weeks.

Now, as it progresses on, if the nutrient deficiency isn't corrected or added to the diet, we can get into what's called mid-stage. Mid-stage is a mild symptomatic area where mild symptoms can begin to develop, we see continued decline in internal biochemical body function. These things can be measured. When I say an internal biochemical body function, these are things that doctors can measure to see whether these declines are occurring. This is what we would call preventative, where we can measure preventatively before the minor issue becomes a major manifestation or major symptom, or problem.

That mid-stage, also minor symptoms can start to develop very mild. This stage can last from weeks to months. Then we can get into advanced stage. After mid-stage, we go to advanced stage, and this is where obvious symptoms and physical signs can begin to develop along with dysfunction. As an example, B12 deficiency, if it's left long enough, and it's not corrected, you can start to develop shortness of breath and fatigue and brain fog and lethargy.

If it goes much further than that, you can actually start to develop muscle weakness. This is a loss of function, right? When your muscles become weaker and it starts to hinder your ability to exercise and function, and your quality of life can start to become affected. Again, depending on the nutrient deficiency, will depend on which symptoms begin to manifest, which is why it's so important for doctors to train in nutrition, because many of the symptoms of illness, of disease, are actually the same as the symptoms of nutritional deficiency. Again, at advanced stage, obvious symptoms start to develop and that can progress into dysfunction.

Then we have full-blown disease state. In a full-blown disease state, both biochemical and physical symptoms can become debilitating. This is when you are seeking out medical help in a very, very big way. Ultimately, full-blown deficiency diseases can kill you. This is what I was talking about, referring to earlier. Scurvy, which is late-stage vitamin C deficiency can kill you. Beriberi and pellagra can kill you. Again, these are late-stage deficiencies, and these can come on, again, slowly and mildly but over a period of months to years depending on the nutritional deficiency that we're referring to.

For example, for vitamin B12, because your liver is so good at storing vitamin B12. In some cases, for as much as two to five years of your need for vitamin B12 can be stored by the liver. A person going, for example, on a vegetarian or vegan diet where they may not be getting adequate B12, they may not start manifesting a major vitamin B12 disease deficiency state for two to five years.

Again, for other diseases like, for example, vitamin B1 where your liver doesn't store massive quantities for years on end, B1 deficiency can progress very quickly over months. Again, the progression from early stage to mid to advanced to full-blown disease state can be anywhere from weeks to years, depending on the nutrient, but again, it's important to pay attention to these things.

Now, deficiencies are rarely investigated. This is another big problem. Again, the average medical doctor receives less than seven hours of total training in their entire eight years of undergrad and medical school as it relates to nutrition, and the only

way most doctors get adequate training in nutrition is to seek it out in a postgraduate fashion. There are a number of different postgraduate programs that doctors can get involved with that go well above and beyond the traditional training and nutrition.

As an example, I have a diplomate with the American Clinical Board in nutrition, which was a three-year program, and an additional 300 hours, just to meet a minimum criteria of nutritional knowledge, so that's an example. If you see a doctor with the initials behind their name, DACBN, that stands for Diplomate with the American Clinical Board of Nutrition. It's one of the most advanced trainings that doctors can do to have a good level of mastery of nutrition. Again, I say all that just to help you understand. If you're looking for a doctor who understands nutrition, look for that DACBN credential.

It's the only federally recognized credential for doctors with nutritional training. It's a board certification. We call it the cream of the crop in terms of that postgraduate education. I say all that again just to remind you that nutritional deficiencies are very poorly understood by most doctors. They don't understand that nutrient deficiencies can cause disease symptoms and a lot of common problems that they're treating with medication.

They're also rarely investigated. Many doctors don't investigate nutritional deficiencies because they're not trained in how to properly or adequately assess nutritional status in an individual. With nutritional deficiencies, you've got to understand that nutritional deficiencies can cause symptoms and disease. There are a number of relationships here and I'll talk about more as we go along today, but they can lead to poor health. They contribute to poor or slow healing.

Nutritional deficiencies can lead to more doctor's visits, which leads to more medications, which can lead to what are known as drug-induced nutritional deficiencies, which over time leads to more patients being frustrated because their disease may have just been caused by nutritional deficiencies, and when the doctor medicates the symptoms of that disease, the drug itself causes additional nutritional deficiencies, which then lead to additional symptoms.

A patient gets stuck in this vicious, vicious trap, and that ultimately leads to a lack of recovery. What I'm going to put on the screen here for you is a kind of a diagram that illustrates this trap. I call it the gluten-induced gut damage cycle. Again, it's where you have gluten exposure, causes gut damage. The gut damage leads to nutritional loss or nutritional deficiency. The nutritional deficiency leads to symptoms. In essence, the progression of health issues. Those health issues progress to a point where a patient seeks a doctor's advice.

Generally what most doctors do is they medicate symptoms. They don't look for the origin or the reason the symptoms exist, but they medicate the symptoms in an effort to be compassionate toward their patient. Unfortunately, many drugs have untoward side effects in your GI tract, or untoward side effects towards your nutrition, thus causing more nutritional deficiencies, thus causing more symptoms, thus leading to more medications, thus leading to a massive cycle that unless you understand it is very, very hard to catch, and it's very, very hard to get it to end.

Again, that cycle is a very, very common scenario for many people that come to see me in my nutritional practice, but it's also very common for people across the world, not just for people specifically in my practice. What I'm going to put up on the board next-- this is a synopsis. This diagram is a synopsis of a major review. It was a narrative review published in the journal Nutrients in 2020, showing that nutrient deficiencies in adults and in children with both treated and untreated gluten issues and celiac disease still have a lot of nutritional deficiency.

What these authors go on to point out is that many of these nutritional deficiencies actually increase the risk of the development of diseases, as I was just talking about. If you look at the diagram here, you can see common nutritional deficiencies of those with gluten sensitivity in the red circles. If you look at the left of this diagram, you can see zinc, and zinc deficiency can lead to anorexia, and in children failure to thrive or failure to grow.

Just below that, you see folate. We know folate deficiency can contribute to cardiovascular disease. What they don't mention in this particular study is that folate deficiency can lead to birth defects in the mother. When mom's got a folate deficiency, the baby develops neural tube defects and can be born with things like cleft palate, tongue-tie, and other problems. Then you have vitamin B12 deficiency that can cause elevations in homocysteine, increasing the risk for heart disease. B12 deficiency can cause anemia, as can iron, as you see in this illustration.

Over on the right-hand side of the graph, you'll see B12 showing up again because it's known that B12 deficiency causes neurological disease, things like vertigo and cerebellar ataxia or dizziness. B12 deficiency can cause tinnitus or ringing of the ears. It can also cause severe brain fog and early cognitive decline, so a lot of neurological problems associated with a lack of B12. Then you can see other nutrients just below that. Vitamin D and calcium, which play a role in hyperparathyroidism. Not having adequate calcium and D can contribute to that condition as well.

You'll see repeats on this right-hand side. You'll see zinc and folate again, causing neoplasia, which is a form of precancer, if you will. This now we're upping the ante. This disease association is getting more and more dangerous. You'll see, just below that, zinc deficiency causing, specifically in males, impaired sexual dysfunction and impaired sexual maturation. Meaning that lack of zinc, it makes it harder for secondary sexual characteristics to develop in males, but also in females.

In one more box, you'll see here that these authors present in this study is folate, vitamin D, and calcium. Again, all repeats, but also diseases of osteoporosis and increased risk for development of bone fracture, so bone musculoskeletal health. Very, very important. Again, this is just one review of how those with treated and untreated gluten issues have prevalent nutritional deficiency and how those deficiencies can contribute to disease.

Next, I want to show you a slide that kind of illustrates the research on how people with celiac disease and gluten sensitivity have greater levels or greater degrees of nutritional deficiency when actually tested. Remember what I said earlier, doctors,

because they don't study nutrition, typically don't value it, so they don't analyze for deficiency, even in patients with celiac disease.

Well, this study published in 2020 in Mayo Clinic Proceedings shows a couple of different things. This study was done on 309 people, and here's what they found. Albumin, which is protein was low in 19.7%, almost 20% of the people in this research study. Copper was low in 6.4%. Vitamin B12 was low in 5.3%. Folate was low in 3.6% of the patients. Vitamin D or 25-hydroxyvitamin D was low in 19% of the patients. Then lastly, ferritin, ferritin is stored iron, so it's iron storage in the body, was low in 30.8% of the patients that they tested, and that's just one particular study.

Now, I'll point this out as well. This study was looking at serum levels of nutrients. As you may have heard me talk about already, using serum labs is less accurate than using a technology called lymphocyte proliferation. Even in this research study, using analytical parameters that are less accurate, they still found quite a heavy burden of nutritional deficiencies.

The research authors of this study conclude micronutrient deficiencies remain common in adults with celiac disease despite increased non-classic presentation. Meaning that not everybody presents with the classic manifestations. They go on to say, "This study provides support for micronutrient assessment at the time of celiac disease diagnosis." Again those of you with celiac disease and gluten sensitivity, get checked, that's basically what they're saying.

Now, I'm going to put another study up on the board for you. This one was published in the journal Human Nutrition and Dietetics in 2013. The title of the study, Nutritional inadequacies of the gluten-free diet in both recently-diagnosed and in long-term patients with celiac disease. Here is what they found in their results. More than 1 in 10 of both newly diagnosed and experienced women had inadequate thiamine, which is vitamin B1, folate, which is vitamin B9, vitamin A, magnesium, calcium, and iron. So 10%. 1 in 10 of newly diagnosed and experienced women, experienced on the gluten-free diet that is, had low levels of vitamin B1, B9, vitamin A, magnesium, calcium, and iron.

They also go on to say that more than 1 in 10 newly diagnosed men had inadequate vitamin B1, folate, magnesium, calcium, and zinc. Inadequate intake did not relate to nutrient density of the gluten-free diet. Again, that person could have been following the gluten-free diet, had adequate nutritional intake, but these people were still showing up with low levels.

Also, what they go on to say is inadequacies of folate, calcium, iron, and zinc occurred more frequently. They go on to say the frequency of inadequacies with similar pre and post-diagnosis, except for thiamine and vitamin A, where inadequacies were more common after the gluten-free diet was implemented. Again, thiamine and vitamin A were deficient in both pre, but also more commonly deficient even after a gluten-free diet was implemented.

This other study-- I'm going to put up several studies here we're going to go through because I want you to see that this is the science. This is what the science actually

has to say. I think it's important that you understand this. This study published in 2019 on micronutrients, dietary supplementation advice for celiac patients on long-term gluten-free diet with good compliance. This was a review of 73 studies. Anytime we have a review of multiple studies, that's a good thing. It means we're collectively taking a lot of data and crunching it into really important and imperative data sets or points.

Here's what these 73 studies, this is what the review of them concluded. Deficiency was detected in up to 30% of subjects for vitamin B12. In essence, 30% of individuals on long-term gluten-free diet with good compliance were still deficient in vitamin B12. 40% were deficient in iron. 20% were deficient in folate. 25% were deficient in vitamin D. 40% for zinc. 3.6%, we're talking about children in this, were deficient for calcium. 20% of them were deficient for magnesium. Again, children. The conclusion in this, again, this nutritional review is if integration with diet is not enough, starting with supplements may be the correct way after evaluating the initial blood level to determine the right dosage of supplementation.

Again, these authors conclude that supplementation may be necessary, which we'll get to more of that here shortly. I think it's important though for you to understand that many of these review studies, so in this study, this was again 73 different studies that were reviewed concomitantly together, the way that the researchers were evaluating nutritional status was using serum lab testing. Again, not the most accurate way to assess nutritional status. Even with that less accurate methodology, finding a lot of nutritional deficiencies in people on a gluten-free diet after many, many years.

Another study I'm going to put up was published in The American Journal of Gastroenterology in 2001 on vitamin B12 deficiency and untreated celiac disease. You see here just reading from some of the abstract here, iron and folate malabsorption are common in untreated celiac disease as the proximal small intestine is predominantly affected. It's a common knowledge thing that B12 and iron, because they're absorbed in the proximal small intestine, that's the area of the small intestine that's closest to the stomach, that area tends to be damaged in people with celiac disease, and that's where vitamin B12 and iron and folate are absorbed.

That it's very, very common for those nutritional deficiencies in people with celiac disease. Now, moving on, their conclusion of their research study was this, that vitamin B12 deficiency is also common in untreated celiac disease, and concentration should be measured routinely, and that vitamin B12 concentrations normalize or can normalize on a gluten-free diet alone, but symptomatic patients that have persistent symptoms may require supplementation to get correction. In this research study, it can correct, a nutritional deficiency can correct, but they don't always correct. That's an important concept to understand.

Now, another-- this was a multi-center research study published. Name of the study is evidence of poor vitamin status in celiac patients on a gluten-free diet for 10 years. Again, in this study, they took people who were following gluten-free diets for 10 years, and here's what they found. Patients showed a higher total plasma homocysteine level than the general population. Homocysteine elevations are

indicative of poor B vitamin status. For example, homocysteine is elevated when people have vitamin B12, folate, and vitamin B6 deficiency.

In accordance, the plasma levels of folate and B6 were low in 37% and 20% of the patients respectively and accounted for 33% of the variation of the total plasma homocysteine level. Again, in this research study, these authors were analyzing elevations in homocysteine, vitamin B6, and folate, and they found, again, that 37% of the patients were deficient in folate and 20% were deficient in vitamin B6 after following a gluten-free diet for 10 years.

That's indicator that either one, the damage to the gut is somehow permanent, where they're still not absorbing nutrients super effectively, or two, the gluten-free diet that these patients were following was not adequate in those nutrients to supply what these individuals needed. Either one of those scenarios that that, what remains to be really well-researched is, does the nutritional deficiency come as a result of the long-standing damage caused by gluten, or does a nutritional deficiency come from poor diet or other preexisting conditions? Things that we talked about earlier like altered metabolic function, any kind of medications that somebody might be taking, or other confounding diseases or other issues.

Another study, this was a major study. I call it a landmark study because it found a lot of really solid data. Probably one of the most aggressive in terms of measuring larger quantities of nutrients. This study was published in the journal Nutrients in 2013. You can see vitamin and mineral deficiencies highly prevalent in newly diagnosed celiac disease patients. This study was done predominantly on people who just got a diagnosis.

Here's what they found. I'm going to put an info diagram up on the screen for you so you can see how common is nutritional deficiency in those with gluten sensitivity when first diagnosed. Here's what these authors of this study found. 87.5% of patients diagnosed were deficient in at least one nutrient. Remember what I said earlier, it only takes one nutrient to disrupt healing. It only takes one nutrient deficiency to create a disease state that can interrupt your healing process. These authors of this study found that 87.5% of newly diagnosed were deficient in at least one nutrient.

They also found that 53.8% of patients diagnosed were deficient in at least two nutrients, so more than half deficient in two, almost 90% deficient in at least one. They go on to state 7.5% of patients were deficient in vitamin A. 14.5% of the patients were deficient in vitamin B6. 20% were deficient in folate. 19% were deficient in vitamin B12. 67% were deficient in zinc. 46% of them had iron storage deficits, an iron deficiency. 32% of those patients had anemia. I point both of these things out separately, and here's why. You can have an iron deficiency without developing anemia. You can also have an iron deficiency that causes anemia.

If you look at the discrepancies and the numbers in their study, 46% of these individuals had low iron, but of those, 46% of the total, only 32% of the total actually had iron deficiency anemia that showed up on lab work as anemic, meaning they had low hemoglobin or a low hematocrit in their blood. Again, all these statistical

points just simply showing that it's very, very common for people with gluten sensitivity who are newly discovering that to be very malnourished, and multiple nutrient deficiencies, again, very, very common.

Now, another study shows-- this one on nutritional deficiency present regardless of the extent of gut damage or antibodies. I think it's important because many of you may have a doctor that says, "Hey, look, your gut looks good, but yes, you are gluten-sensitive, but you don't have gut damage." Other of you may have zero antibodies present when they're measuring for those gluten antibodies. Remember we talked about it in earlier modules, how lab testing can yield false information or information that can be misleading.

Here's what this research published in the Journal of Pediatric Gastroenterology and Nutrition in 2017 has to say about nutritional deficiencies being present in the absence of gut damage and in the absence of the production of antibodies against the gut. Here's what they found. They found that vitamin D was the most commonly deficient vitamin in 70% of children and they found that ferritin, which is iron storage, was suboptimal in 34.5%, zinc was deficient in 18.6% of the children.

They conclude that at diagnosis, most children with celiac disease have vitamin D deficiency. The degree of micronutrient deficiencies-- important note, the degree of deficiency does not correlate with the degree of villous atrophy of serum titers. In essence, you don't have to have the obvious markers that show your gut is damaged to be nutritionally devoid or to be low in nutrients.

I think that's important to point out because, why? Because some people associate the gut damage causes the nutritional deficiency, so if they don't have the gut damage, they don't worry about their nutrition and their doctors don't worry about their nutrition. They don't have their nutrition levels checked. Again, this research study shows just the opposite of that. Despite gut damage, you can have an absence of gut damage, an absence of antibodies, and still have an increased risk for the development of nutritional deficit.

Next study here, this was published in The Journal of Clinical Nutrition in 2016, gluten-free diet and nutritional deficiencies. This is another review study. I'm going to summarize the results here. The gluten-free diet was found to be poor. Again, this study is focusing on people following the gluten-free diet. Again, these researchers are analyzing what is the nutritional density or quality of those following a gluten-free diet.

They found that the gluten-free diet was found to be poor in fiber due in particular to the avoidance of the different foods richer in fiber like your grains. They found that the diet was low in fiber. They also found that it was poor in vitamin D, vitamin B12, and folate. In addition, they found it was poor in minerals like iron, zinc, magnesium, and calcium. Moreover, they found an inadequate macronutrient intake was reported related above all to the focus on the avoidance of gluten. In essence, people were undereating because they were worried about getting gluten exposure, so they didn't eat enough calories.

It was also found that the gluten-free diet, again, we're talking about the traditional gluten-free diet. Those of you who have tuned into Module 1 and 2 you know that difference. Hopefully, you understand that this research study was done on people following a traditional gluten-free diet. What they found is the diets were poor in nutrients but high in saturated fat and high in hydrogenated fat. Not that saturated fat of a natural plant-based source or even healthy meat source is unhealthy, but it's those hydrogenated fats that really create problems. They also found that these individuals were eating far too much high-glycemic, high-carbohydrate processed foods.

Again, if you're following that traditional gluten-free diet where you're on that gluten-free food aisle looking for the bread and the pasta and the cereal, you're buying all into that corn and rice and all those other substitute grains, what you're getting is very poor nutritionally dense foods with poor quality high overall calories in terms of carbohydrate, but low overall calories in terms of proteins and fats and other healthy macronutrients. They conclude that despite the gluten-free diet being necessary, people that are avoiding gluten need to take better care of their food choices because if they're not, they're going to end up becoming deficient.

The next study is, again published in The Journal of Nutrients on gluten-free diets. They're talking about gaps and needs for healthier diets in individuals. I'm going to put up a big diagram, again, this is part of these researchers' findings. Here's what they found. The nutritional status when a person was diagnosed, so at the time of diagnosis, they found in this review that iron deficiency, calcium deficiency, zinc, vitamin B12 and folate, vitamins A, D, E, and K, excessive fat, and secondary lactose intolerance were all quite common.

What does that mean, secondary lactose intolerance? People with celiac disease, when their gut lining is damaged and destroyed, so too are the cells that help to produce the enzyme lactase. Lactase is the enzyme that breaks down that sugar in dairy called lactose, and this is why secondary lactose intolerance can develop. This is why many people that go gluten-free also do better going dairy-free because they've lost their ability secondarily to gluten-induced damage. They've lost their ability to break down the sugars in dairy.

Again, at time of diagnosis, several deficiencies. Now, what they also go on to state is that nutritional status during adherence to a gluten-free diet. You can see that people that are adhering to a gluten-free diet, again, this is a traditional gluten-free diet, have a tendency to have iron, calcium, selenium, zinc, magnesium deficiencies. All those are minerals. They also tended to have vitamin B12, folate, and low intake of vitamin C and vitamin D. They also found they had excessive fat in their diet, excessive sugar in their diet, and they had a controversial protein intake, and that they also had dietary fiber. That's what DF stands for, is a low level of dietary fiber.

Again, there's nutritional deficiency issues prediagnosis. There's also nutritional deficiency issues when you're following a gluten-free diet. Again, in these cases of these research studies, these are true or rather not true gluten-free diets, but they are traditional gluten-free diets, which tend to be, again, lower in nutrient-density. We've talked about this in past modules about why you would want to follow a true

gluten-free diet versus a traditional gluten-free diet. A big part of it boils down to nutritional density of the diet to help you get nutritional adequacy so you can heal and repair.

Let's talk about why all this matters. As I said earlier, one deficiency can completely inhibit the healing process. It only takes one. As I've shown you and as I've shown you with the research, that almost 90% of people with newly diagnosed gluten issues are deficient in at least one, and more than half are deficient in at least two. This is very common. It only takes one. Now, in my experience, I'm going to share my experience with you, 20-years-plus of looking at blood work in people with gluten issues and helping people overcome nutritional deficit, I have found that the average person with gluten sensitivity in my studies have at least four nutritional deficiencies.

Again, we're using different methodologies of testing. Our methodologies are much more accurate. They are intracellular analysis, so there's a greater degree of accuracy than what we can see in the serum lab testing, but an average of four. Now, the top ones that I see, hands down, number one is iron. Number two is vitamin D. Number three vitamin B12, number four zinc, and number five omega-3 fatty acids. Again, I'm sharing with you my experience in testing thousands and thousands of individuals over the course of several decades.

I just wanted to share my experience with you, because my experience shows that that paradigm of nutritional deficiency with gluten issues is even greater than what much of the research currently has to say about it. Remember that nutritional deficiencies cause symptoms and they also cause diseases that often lead to prescription medication use. As I was talking about earlier, there are many drugs that are prescribed in order to mitigate symptoms or to treat the symptoms that patients have. These drugs can have continuing or further deterioration of a person's nutritional status, and that's where that cycle can really, really set in.

Let's talk then about medications. It's an important topic I think that needs to be covered. It should be better taught in medical school. Unfortunately, it's not. There are at least four different medical textbooks written on this subject. Again, they're not commonly handed out in medical school curriculum. It's one of those post-graduate. If a doctor pursues an education in nutrition, they might come across some of these very important textbooks, but it's highly unlikely that the average doctor is pursuing that additional education in nutrition. It's just not super common.

Let's talk about medications that are used to treat the symptoms that are caused by gluten. Common medications prescribed for the treatment of gluten-induced or related diseases cause vitamin and mineral deficiencies that can absolutely hinder the immune system but also hinder the body's ability to heal and repair. I'm going to put up a diagram. Now, by no means, is this a comprehensive diagram. It's more for emphasis, and I want to give you some basic fundamental information. These are some of the more commonly prescribed drugs.

You can see going from the left side, you can see there are certain classes of blood pressure medications that are commonly prescribed to treat, what? The symptoms of high blood pressure, right? It's a symptom. Now, let me give you an example of a

classic nutritional deficiency that we know causes high blood pressure. Magnesium. Magnesium deficiency is a known cause of high blood pressure.

What many doctors do when a patient has high blood pressure, is they don't measure whether or not that patient has low magnesium to confirm it. What they do is instead is they prescribe a drug like hydrochlorothiazide or a diuretic like furosemide. Commonly prescribe diuretics. Diuretics are then taken by that patient to lower that blood pressure, but many diuretics cause magnesium deficiency. Again, I'm just giving you one example.

I think it's important to understand that nutrition, there's far more connections that we could make. Again, in the case of blood pressure medications, they can cause B vi-- In the vitamin depletion category, you can see diuretics cause B vitamin deficiencies, cause vitamin C deficiency. Magnesium, calcium, potassium, zinc deficiencies, as well as the B vitamin-like compound, CoQ10. All can be depleted as a result of taking blood pressure-lowering medications.

You'll see the same kind of pattern with cholesterol drugs. You'll see a host of different nutritional deficiencies. When occur, many of these nutritional deficiencies, for example, vitamin D and CoQ10 deficiency, increase the risk for the development of heart disease. Well, the whole purpose of lowering cholesterol is to reduce the risk for the development of heart disease. If the doctor is treating you with a drug to reduce your risk but inducing new risks by causing nutritional deficiencies, you can see how you can get caught in this dangerous game where you're chasing your own tail.

Same thing goes with diabetic medications. Drugs like Glucovance metformin deplete B12 and folate and CoQ10. Pain medications can deplete a host of different nutrients, depending on the class of the medications. Steroids deplete calcium and magnesium. Non-steroidal anti-inflammatories can deplete folate and vitamin C and iron. The list goes on and on and on. Again, this diagram is something you can use as a quick reference tool, but there's a much more prevalent and profound quantity of nutritionally-related deficiencies or drug-induced nutritional deficiencies than just what we're showing here, so it's important.

My point is this, I want you to understand concept so that you can discuss concept with your prescribing doctor. That's where this conversation needs to be had, is with your prescribing doctor. If he's not aware of these things, it needs to be brought to his attention. If he's not willing to investigate it with you. If he's not willing. Say, he's got you on two or three medicines of which we know can deplete nutrients and he's not willing to monitor those nutrients, then you might look at finding a different doctor who is willing to work with you a little bit more aggressively in terms of your nutritional status.

Now, I would be remiss if I didn't bring up a medication topic, and that's antibiotics. I want to show you another slide here. You can see the antibiotics deplete vitamin K. They also deplete B vitamins, but they also deplete probiotics. Now, I mentioned earlier when I was defining what nutrients were that the more we learn about the microbiome, the more we really should classify it in that category of nutrients, or at

least nutrient-like compounds, because they're so critical for our body's ability to be able to make B vitamins and vitamin K.

Remember that about 60% of your vitamin K is made by your microbiome. About 40% of your vitamin B biotin is made by your microbiome. When you wipe out your microbiome with an antibiotic when you take strong doses or you have a chronic history of antibiotic use, you're in essence inducing nutritional deficiencies by default by destroying or harming your microbiome in your natural flora.

Now, the other problem with antibiotics, and I've mentioned this and I'll mention it in upcoming models as we talk about gluten mimicry and things that mimic gluten is that antibiotics, one of the most common side effects of chronic or persistent antibiotic use is that they can cause and perpetuate yeast overgrowth. As you see in this diagram here, the yeast overgrowth. Yeast produces a protein that can mimic gluten.

Maybe your diet is perfect. Maybe you're 100% gluten-free, but you've got yeast induced by chronic antibiotic use and those yeast are producing proteins that are mimicking gluten, thus perpetuating your gluten-like illness or your gluten-like symptoms that leads to the same problems that you changed your diet to resolve. Again, antibiotics, very very important. We also know a number of research studies show that antibiotics increase the risk for the development of gluten sensitivity. I'll show you those here shortly.

Let's talk about probiotics as nutrients. Remember that your healthy gut flora is responsible for several functions. One of those functions, as I said earlier, is to help you produce vitamins, your B vitamins, vitamin K, all produced by healthy gut flora. What are some of the other functions of your gut flora? Number two, they help you digest your food. They help you break down your food so that when you're breaking your food down the whole premise of that is that you can extrapolate the vitamins, the minerals, the nutrients from the food that you're eating so that your body can become nourished.

Probiotics help you do that. They are an essential part of how your body is capable of digesting the nutrients from the food that you eat. Probiotics also serve to do something called immune crosstalk. Immune crosstalk is the chemical messages that are transmitted between your gut flora and your gut immune system. Also known as the GALT. The gastro-associated lymphoid tissue. These two talk to each other so that your microbiome discusses what's in your gut to your immune system so your immune system and your gut can prepare for what's in it. That immune crosstalk is very, very critical to maintaining tolerance.

A lot of people with gluten sensitivity issues end up collecting food allergies because they have a leaky gut because they have had years of antibiotic use destroy their healthy bacteria and their bacterial immune crosstalk is hindered, it's diminished, and so they end up reacting to things that they wouldn't otherwise react to, or developing acquired allergies to other foods. That immune crosstalk is very important and it can't happen if you don't have a healthy microbiome.

One of the other major functions of the microbiome is it serves as a primary barrier for your GI drugs. Your gut has some major barriers,

one of them, we know gluten destroys, which is called your tight junctions. Your microbiome is another one of those major barriers which we also know gluten can diminish. We know, there are research studies that show that gluten alters good bacteria. It lowers some of those very healthy species of bacteria that help serve as a barrier to your GI tract, thus leaving you exposed to the potential for intestinal permeability, aka leaky gut syndrome.

I'm going to show you a research study here on an infection. This is a meta-analysis. It's published in 2020 out of the Journal of Gastroenterology and Hepatology, and you can see here that the title of the study is Infection, Antibiotic Exposure and the Risk of Celiac Disease. This was a meta-analysis, in essence, another study that was reviewing lots of other studies. Here's what these authors have to summarize. There is evidence of a relationship between infection and the associated antibiotic exposure and the risk of celiac disease. This study performed a meta-analysis to investigate this relationship.

Their conclusion was that exposure to early infection of antibiotics appears to increase the odds of developing celiac disease, suggesting that intestinal immune or microbiota dysbiosis may play a role in the pathogenesis or the development of gluten-related health issues, in this case, celiac disease, and what these doctors are investigating. In essence, antibiotics potentially increased the risk for the development of gluten-induced gastrointestinal damage.

Now, I'm going to put another study up on the board for you. This was published in Mayo Clinic Proceedings. You can see here, the name of the study is entitled Association of Infant Antibiotic Exposure With Childhood Health Outcomes. This is not just measuring celiac disease per se, but it's measuring children's health outcomes. In this particular study, the risk of celiac disease in this study was increased in girls who received one or more antibiotic prescriptions, and specifically, the penicillin class of antibiotics, which is really the go-to. It's the most common antibiotic used in children.

Their conclusion in this study, again, the present study finds significant associations between early-life antibiotic exposure in several distinct health conditions with childhood-onset, celiac disease being one of them, asthma and allergies being other symptoms and illnesses that these researchers also discovered. Again, we started this part of the conversation talking about drug-induced nutritional deficiencies and I took a hiatus because I wanted to talk about antibiotics specifically, as they relate to nutritional deficiency because again, antibiotics are destructive of the microbiome. The microbiome is very important for digestion of your food, but also for the assimilation of B vitamins and vitamin K.

Back to the topic of drug-induced nutritional deficiencies, I'm going to put another diagram, and I think this diagram is going to illustrate very effectively for you the way you want to approach this with your doctor. You can see at the top of this diagram, medication. If you have a medication that's prescribed to you and it has known

nutrient depleting qualities, meaning if we know that drug can cause vitamin and mineral deficiency, there are several things that need to happen. Number one, a proper follow-up and education around the patient needs to happen regarding the symptoms of the known nutritional deficiencies.

For example, if you're taking a drug that blocks CoQ10 like a statin, your doctor should say, "Look, the deficiency symptoms of CoQ10 are increases in blood pressure, increased muscle pain, brain fog, fatigue, and neuropathy or nerve damage or numbness and tingling in your hands and feet." Your doctor should be giving you informed consent, making you aware that the drug can deplete the nutrient and that depletion can lead to those symptoms. That's part one of what should happen, and that way, as the patient you're now educated.

If you want to take that drug you can take it. It's your choice. If you want to you know what to look for. If you start to develop some of those symptoms, now that you're educated you can have that follow-up conversation with your doctor and that can be very helpful, and in some cases, even life-saving. I've seen people with severe enough CoQ10 deficiencies that they ended up being in wheelchairs and having debilitating illnesses as a result of that massive CoQ10 loss.

Moving back to this diagram, you've got, again, if your doctor is prescribing you a drug that is known to deplete a nutrient, it might benefit you to have a conversation about taking that nutritional supplement, taking that nutrient in supplement form in higher quantities, potentially in therapeutic levels to prevent a nutritional deficiency from developing, which could also reduce your risk of developing some of the serious and dangerous side effects of nutritional deficiency.

If you go again, to the far right of this diagram, a biannual laboratory workup to rule out nutritional deficiencies. Again, if you're going to take the medicine, you need to be aware that you need to check for the deficiencies in your blood and in your cells a couple of times a year to make sure that you're not creating problems that could lead to additional diseases and other issues that you don't even realize are being caused by the very drug that you're taking that's supposed to be treating you to help you improve your health.

If in that annual lab workup, that biannual lab workup that you find deficiencies, then your doctor can address those deficiencies by helping prescribe the appropriate levels of those nutrients, either supplementally, or have you eat foods that contain more diversity and richer quantities of those deficiencies that you have. Again, this is a flowchart or a diagrammatic chart to help you follow through in this process. Again, have that intelligent conversation with your doctor so that you're not just being dismissed.

If you're doing that lab follow-up, it's important to remember this name, lymphocyte proliferation. Lymphocyte proliferation is a type of methodology. It's one of the most effective and one of the most accurate ways to assess nutritional deficiencies. If your doctor runs a bunch of serum lab tests, you could have some information. It's better than no information, but it's again, you get a lot of inaccuracies with serum lab

testing. It's just not an effective way to assess with a great degree of accuracy nutritional deficiency.

Let's talk about adequate nutrition. Adequate nutrition requires fundamentals. Now, we broke this down in the first few modules of the health matrix, we talked about how eating real food and eliminating the processed food is a very important part of that. Processed food, remember by law, it has to be fortified because it's processed, and when it's processed, a lot of the nutrients that were present in the original food are destroyed. Adding synthetic vitamins does not make that food, let's just say a whole food. It just makes that a fortified food. It's still not as good for you.

Eliminating processed food as much as possible is one of the key fundamentals of maintaining a solid nutritional status. Choosing organic as much as possible as well because many of the pesticides, not just antibiotics. Remember, pesticides can behave like antibiotics and disrupt the microbiome thus leading to malnutrition and other issues. Choose organic wherever you can, or grow your own food, or go to a farmers market where maybe the food is not organic, but you can talk to the farmer and ask him whether or not they're using certain types of pesticides or ask them whether or not they're aggressively spraying their crops.

Choose nutrient-dense foods. One of the best ways to get more nutrients in your diet is to pick foods that have the greatest degree of nutritional density. I'm going to put up some examples of nutritionally dense foods. Bone broth, organ meats, berries are nutritionally condensed foods. Soups, if especially you cook down the vegetables. A lot of people think that heating of the food destroys the nutrient quality of the food or cooking food destroys the nutrient quality of the food, it doesn't. It does nothing to the minerals. You're not destroying the minerals by heat.

Now, certain B vitamins are less heat-stable, but not all of them are. Not all B vitamins are destroyed in cooking food. There's this whole trend with the raw food diet right now, where people are talking about how eating everything raw is somehow healthier and better, and it's just not, so be aware of that. Soups, you can pack a lot of nutritional density into soups. Fermented vegetables, it's a great way. For example, sauerkraut, fermented carrots, fermented cauliflower is a great way to get good probiotics, those agents that live and help you digest your food and create solid B vitamins, the probiotics. We need to eat them, we need to get them in our diet.

Then part of the way we do that is we eat fermented foods that are nutritionally dense. Then consider following the no grain no pain diet. If you really want to follow a really strong platform with decades of tried and true experience in a clinical setting then the no grain no pain diet is a really good place to start if you haven't had your doctor check you for other food allergens or do a bunch of advanced tests to give you more specifics, so the no grain no pain diet.

It's a 30-day diet. You can certainly stay on it longer than 30 days, but it's a great place to start if you're just trying to navigate the waters as best as you can and you don't have a doctor who's nutritionally oriented or trained who's really giving you much help. Avoid the processed gluten-free food. I know I've said that before. I think

this is an area where I can afford to be redundant a little bit. Those adhering to a traditional gluten-free diet struggle to meet nutritional adequacy as I've shown you in many of the studies already.

That leads to the question, should those with gluten sensitivity, should they supplement? Is this something that they should consider even though they've been following a gluten-free diet, maybe even for a pretty long time? Well, let's talk about that. I'm going to talk about it by putting another diagram up on the screen for you. If you look at this diagram, it's the gluten-induced sodium deficiency trap. You may have heard me talk about this before. It's one of the classic issues revolving around answering the question, "Should people with gluten sensitivity supplement?"

What you can see here in step one of this gluten-induced trap is that gluten damages the intestine leading to the potential for malabsorption. When gluten damages your intestine, remember that damages your villi. It's notorious that people with gluten sensitivity and celiac disease have severe malnourishment. That's a very well-established fact, so that gluten-induced gut damage is step one, leading to malabsorption, and then malabsorption contributes, in this case, to reduce selenium absorption and a potential selenium deficiency. Now, again, I'm using selenium as an example, not as the end all be all, but as just the example in this case.

Selenium deficiency is known to cause intestinal inflammation. Here's where it gets tricky, right? Again, the gluten caused the malabsorption, which led to the selenium deficiency. The selenium deficiency by itself can also cause intestinal inflammation. Gluten can cause intestinal inflammation, but selenium deficiency can also cause intestinal inflammation. Again, there's more than one element that can create intestinal inflammation. Regardless, intestinal inflammation exacerbates or worsens the selenium deficiency because, in order for the gut to begin healing and absorbing and digesting, we've got to put the inflammation out, right?

Again, the intestinal inflammation worsens the selenium deficiency. Then, if the person's following a traditional gluten-free diet, they're eating a bunch of processed gluten-free foods that don't contain adequate selenium. They're not really getting selenium in their diet in an adequate quantity. That selenium deficiency persists, increasing the risk of other health issues, but even more importantly, recycling the intestinal inflammation.

That's why this can be a vicious cycle, and again, this is just selenium as the example in this scenario. We could put vitamin D in this scenario. We could put vitamin A in this scenario. We could put zinc in this scenario. We could put many nutrients in the same diagram because many nutrients alter and impact and affect the way that your gut is capable of healing and repairing from long-term inflammatory issues.

To answer your question, "Should those with gluten sensitivity supplement?" Many should. This is one of the reasons why, is that when you're going gluten-free, you've got this preexisting inflammation it's already created malnourishment. In fact, malnourishment is the roadblock in the path to your healing. Then you tend to

struggle. Some people I've seen, who've come to see me in my practice, have struggled for years and years and years before they figured this part out.

I'm going to show you another research study. You notice this module is full of research studies, and a big reason why is I didn't want to give you anecdote. I can give you anecdote all day long. I've had thousands and thousands of people come to see me over the last several decades who could give you that anecdote, but I wanted to give you actually what researchers are finding so that you would have something to print out, take to your doctor again, and be able to take the most away from this masterclass on gluten.

In this research study, you could see published in the Scandinavian Journal of Gastroenterology, talking about homocysteine. Now, you've heard me mentioned that a number of times in this module. Homocysteine, again, is a chemical we can measure in your blood. When homocysteine levels are elevated, it's typically indicative of B-vitamin deficiency. That's why these researchers were measuring homocysteine. What they found in people with gluten-- You can see Homocysteine and related B vitamin status in celiac disease: Effects of gluten exclusion, and histological recovery.

Here's the result. Homocysteine concentrations were significantly higher, and red cell and serum folate was significantly lower in untreated patients compared with controls, meaning that they found as general rule in people that were gluten sensitive and didn't know, or they were gluten sensitive rather, and were not adhering to a gluten-free diet. These individuals had elevated levels of homocysteine as well as a reduction in their serum and in their red blood cell folate levels.

What they found in their conclusion was that gluten exclusion in celiac disease improves folate status and normalizes homocysteine concentration, reducing the risk of homocysteine-related diseases may be another reason for aggressive diagnosis in treatment of celiac disease. Again, because celiac disease can cause the homocysteine elevation through B vitamin deficiency, that in and of itself can increase your risk for the development of heart disease. This is one of the reasons why gluten can contribute to heart disease. These authors are concluding that, at least in their research, that a gluten-free diet was enough to correct the folate deficiency.

In some cases, again, it's not all or none, it's not, "Should everybody supplement or should no one supplement?" In some cases going on a gluten-free diet corrects the nutritional deficiency. In other cases, it doesn't. This particular study, it corrected the folate problem. Now, these authors were only studying folate. They were not studying other nutrient deficiencies and so it's somewhat limited in its scope.

Again, I showed you this diagram earlier, I'm going to put it back up on the screen for you, and this is nutritional status and people with gluten sensitivity at the time of their diagnosis, it's common to see iron, calcium, zinc deficiencies, as well as B12 and folate and vitamin A, D, E, and K deficiencies. Then if you look to the right, people that are following a gluten-free diet, again, this is traditional gluten-free diet, still tended to have iron deficiency, calcium deficiency, selenium, zinc, magnesium, B12,

folate, vitamin C, vitamin D, as well as low dietary fiber, excessive sugar, and excessive fat.

Again, one could even argue that going on that traditional gluten-free diet actually creates worsening of nutritional status. This is one of the reasons, again, why I don't recommend the traditional gluten-free diet. It's why we created the true gluten-free diet definition. Again, it's based on my decades of experience in dealing with people that have these malnourished issues as a result of years of gluten-induced damage.

I'm going to show you another diagram here and show you another study. You can see in this one, this was published in the journal Nutrients in 2020, it's persistent iron deficiency anemia in patients with celiac disease, despite a gluten-free diet. Again, I've shown you studies that said that going gluten-free could correct a nutrient deficiency, but I'm also showing you studies that show that going gluten-free doesn't always correct the nutritional deficiency that was found on original diagnosis. This diagram is coming from this particular study. Again, published in the journal Nutrients in 2020.

What you can see here is at time of diagnosis anemia is not an uncommon issue and that the iron deficiency anemia can lead to a host of different types of symptoms. Iron deficiency can create shortness of breath, fatigue, muscle pain, lethargy, brain fog, intolerance to exercise. All common symptoms of iron deficiency. Again, in this study, what they're finding is that iron deficiency is persistent even after the diet change occurs. Now, they're also finding this by analyzing for anemias, what they're finding from this study is that both, not only are people or patients with gluten issues consistently iron deficient, but they're also consistently B12 and folate-deficient.

Understand that B12 and folate deficiency can also cause anemia as well. There are different kinds of anemia. Iron B12 and folate cause those different types. What they're finding in this study is that people with gluten issues that go on a gluten-free diet continue to have persistent anemias despite changing their diets. Again, the pendulum can swing either way. A person could get their deficiencies corrected, a person may also not get their deficiencies corrected through that gluten-free diet change.

There's another research study, and I want to highlight some key points. This is published in the Gastroenterology Clinics of North America. In this particular research study, again from 2017, there is a summary, "While indiscriminate use of multivitamins and mineral supplements in the general population is increasingly scrutinized as largely useless and sometimes potentially harmful." I want to stop there because that phrase in and of itself should tell you what most doctors think about nutrition. They think that supplemental use of vitamins and minerals is not only a waste of time but potentially harmful.

Now, let's think about that for a minute. Symptoms of toxicity of nutrients is extremely rare. As a matter of fact, it barely ever exists. There are only some small examples of children getting into bottles and swallowing massive quantities of nutrients. In essence, most of the toxicities reported from nutrients are actually mistakes and not actually nutrients being taken in a proper way. To the contrary, aspirin, most people

take it over the counter on a regular basis. Aspirin kills about 13,500 people annually. The proper use of aspirin, not the overdose of aspirin. The proper use. 13,500 deaths or more per year from an over-the-counter medicine, yet doctors continue to prescribe it, don't call it dangerous, don't talk about the side effects. You can see again the mentality. I point out the mentality here. The mentality is that to take a multivitamin or multi-mineral supplement could be potentially harmful and is not really merited or warranted. In my opinion, is just a reflection of how poorly educated doctors actually are in the field of nutrition.

Aside from that, let's get back to this research study. Because what they're finding is that if there's a population at risk of nutritional deficiencies, such as, in this case, patients with chronic inflammatory bowel disease, which is what a celiac disease, it's a chronic inflammatory bowel disease, that these patients need to be monitored and compensated for nutritional and metabolic losses. Clear mechanistic links between vitamin and mineral deficiencies in the associated inflammatory bowel disease pathology have been found for some nutrients and normalizing their systemic levels has proven clinically beneficial.

In nutshell, what these authors conclude is that under certain situations, and one of those situations being inflammatory bowel problems, people need to have their nutritional status monitored, and they need to have their nutrition level supplemented, if necessary. The key points, again, to take away from this is that vitamin and mineral deficiencies are common among inflammatory bowel disease patients and warrant supplementation to restore recommended values. Those deficiencies likely contribute to the disease severity and associated comorbidities, meaning the development of other health issues not directly associated with inflammatory bowel disease.

They also go on to say there's a need for more evidence-based approaches supported by well-designed clinical trials to document the optimal supplementation level and to assess the benefit of supplementation exceeding the recommended daily allowance. This is where these authors just need to give me a call. We can have a conversation, and I can steer them in a great direction. I wanted you to see that because it's not-- Again, even researchers who have a skeptic attitude around nutritional supplementation still show and point out the merits of nutritional supplementation and the need for nutritional supplementation in people with an inflamed gastrointestinal tract.

I'm going to put another research study up on the board. This one was published in 2012, on ascorbate. Ascorbate being vitamin C. You see the title of this study is Ascorbate-dependent decrease of the mucosal immune-inflammatory response to gluten or gliadin in celiac disease patients. Here's what they found, here's the conclusion of their study. Vitamin C or ascorbate decreases the inflammatory response to gluten in an intestinal biopsy culture model. Arguably, this study was not done in humans, it was done in a biopsy culture model, but what it showed is that vitamin C actually reduced the inflammation caused by gluten.

This is one of the reasons why we talk about what can a person who gets glutened, if you accidentally get gluten exposure, what's one of the most fundamental things that

you can do immediately that might support a reduction in that inflammation and a quicker recovery? That's vitamin C. This study is evidence to that fact. This is one of the things I've seen in countless people who've gone on vacation, gone and gotten glutened, we find that vitamin C works extremely well in them to help them recover at a higher level or a higher speed. This study just, again, illustrating that.

This next research study I want to put up for you, published in 1985, so going back a little bit more in time. You see that, Serum zinc levels in children with celiac disease, the title of this study. These authors suggest that zinc is measured, zinc concentration in children with celiac disease and to add zinc supplementation in patients with diminishing values during a period of two to four weeks because zinc deficiency could inhibit the recovery of the intestinal mucosa.

Again, if a person is being diagnosed with a gluten issue and they're zinc deficient at the time of diagnosis, that deficiency could actually inhibit their ability to heal the damage that gluten caused in the first place. Again, this is one of those scenarios where sometimes going gluten-free is not enough, sometimes supplementation is necessary to overcome the pre-existing inflammatory damage to allow the body to be able to heal.

Now, I'll put another research study up on the screen for you. This one published in BMC Pediatrics in 2018. You can see here the conclusion, in newly diagnosed celiac disease, this is a study done in children, a significant lowness was established in vitamin D and vitamin A. The evaluation of vitamin A and vitamin D levels will be helpful in the course of diagnosis in these patients. Again, this is a study showing fat-soluble vitamin deficiencies. Another research study on vitamin E that was found, this study here, oral vitamin E supplementation and reducing nitrosative stress in adults treated for celiac disease.

This is a little bit different of a study, less having to do with whether or not people are vitamin E deficient at time of diagnosis, more having to do with using vitamin E as a supplement to help reduce the inflammatory burden in the GI tract to accelerate the healing time of somebody with gluten-induced damage. You can see here, I'm going to read this to you, "The result of the current study demonstrated that vitamin E supplementation in treated patients with celiac disease," again, in people that were on a gluten-free diet, because that's what treated patients in celiac disease means, "reduced the concentration of nitric oxide."

Nitric oxide is an inflammatory gas that shows up when we measuring for inflammation in the gut, which shows that it may have a beneficial effect on the oxidative balance. To our knowledge, this is the first study to assess the effect of vitamin E supplementation in treated patients with celiac disease. In our previous study, we found significantly reduced serum concentrations of vitamin E in patients with celiac disease regardless of compliance with diet.

These research authors, they've done a few different studies. One of their studies was showing that people with celiac disease tended to be vitamin E deficient even if they were compliant with the diet. Their follow-up study was that giving vitamin E to people with celiac disease actually reduced the inflammatory burden. Also, could be

a potential effective element to help, again, reduce that prolonged inflammation that's common in inflammatory bowel disease like celiac disease.

This next study I'm going to put up on the board for you is a review on the possible role of vitamin D in celiac disease. Again, they're just an update to understand why vitamin D is so critical. As I showed you from earlier research studies, in some studies 40%, in some studies a little less, of the people being diagnosed with gluten sensitivity, at time of diagnosis, had vitamin D deficiency. You see here vitamin D is a key modulator of inflammation, immune mechanisms, and of the intestinal mucosal barrier. Meaning vitamin D is an important element to helping keep your gut sealed.

In this regard, vitamin D has been considered as a factor that affects different conditions such as immune-mediated diseases. The new emerging role of vitamin D and its involvement in immune modulation has led to or led it to be considered as a possible key factor involved in celiac disease onset. Now the thought is that latent or long-term vitamin D deficiency could actually play a role in the development of celiac disease. Just like we said, chronic antibiotic use or early-life antibiotic use could lead to or contribute to the development of celiac disease, researchers are now showing the same thing with vitamin D. This just gives new meaning to get your sunshine, don't avoid the sun.

Another research study published in the Annals of Medicine in 2013. Some key findings. This article is a review article on appropriate nutrient supplementation in patients with celiac disease. Key points. They found reduced levels of iron, folate, B12, vitamin D, zinc, magnesium in untreated celiac disease, and some of those deficiencies persist even after the removal of gluten from the diet.

Key Point number two. Nutrient deficiencies may be responsible for extraintestinal signs or symptoms of celiac disease or other conditions. Key Point Number three. Assessment of nutrient status may help identify celiac disease patients who need supplementation for preventing and/or treating clinical manifestations of the disease or comorbidities. Again, just reiterating what we've already said.

We talked about nutrients, let's talk about probiotic supplementation. What about probiotics? Should somebody with a history of gluten sensitivity supplement with probiotics? To answer that question, I'm going to show you some more research. Again, I think it's important to show you that this is not anecdote, this is not me pondering and pontificating on what people may be able to do that might be useful, this is research-backed, research-driven information for you. It's also coming from a clinical setting with decades of experience.

In this study, again, putting it on the board, published in the journal Nutrients in 2018. They've been identifying and looking for different identifying mechanisms of what contributes to the proverbial straw that breaks the camel's back in the development of gluten sensitivity. How can a person go for 20, or 30, or 40 years eating gluten their entire life, and then one day they lose tolerance, and they start developing massive symptoms of illness and disease? Well, one of the factors involved in this, if you look at this diagram, as you can see here on the top right, is probiotics. We know that early life antibiotic use increases the risk for the development of celiac disease.

This is one of the reasons why we believe that the disruption in the microflora is part of the contributing factor. It's not just the antibiotic by itself, but it's what the antibiotic does, which is it lowers your good microflora. It lowers your probiotics if you will. That lowering of probiotics exposes your gut. Remember probiotics play a role in the lining or the barrier function of your GI tract. When that barrier function is diminished, this is actually a point at which we know gluten sensitivity can begin to develop more aggressively as well.

The answer to the question is really, and what we see here, in that probiotic deficiencies definitely can accelerate the gluten sensitivity paradigm. There's a number of other research studies I'm going to show you. I'm going to scroll through here. This one published is a randomized controlled trial published in 2015 on the administration of a type of bacteria called bifidobacterium. In this case, Bifidobacterium breve, and they found that it decreases the production of an inflammatory chemical called TNF alpha or tumor necrosis factor-alpha in children with celiac disease.

Again, this was a double-blinded placebo-controlled trial. It was a small trial, mind you. Only 49 children with celiac disease, but here's what they found. Probiotic intervention with bifidobacteria strains has shown a positive effect on decreasing the production of the inflammation. What's called the pro-inflammatory cytokine, or the chemical that creates the inflammation. Good healthy bifidobacteria when treating celiac children was shown to reduce inflammation outcomes. Very important because, again, the question is, "Do we supplement?" Do we need probiotics with a history of gluten sensitivity?

Now, another study I'm going to put up on the screen for you is another randomized clinical trial published in British Journal of Nutrition in 2014. It was a double-blind trial as well. What they found is that the bacteria Bifidobacterium longum, which is a strain of probiotic, what they found is that it could help improve the health status of celiac disease patients who tend to show alterations in gut microbiota composition and to biased immune response even on a gluten-free diet. Again, these are people, they've gone gluten-free, they're still struggling. They're still not really fully recovering. They're finding that bifidobacteria longum is a very effective strategy in that situation.

Here's another research study published. This one was published in the Journal of Clinical Gastroenterology in 2017. Here's what they found. The beneficial symptomatic effect observed previously in patients with celiac disease treated with a type of bacteria called Bifidobacterium infantis may be related to the modulation of the innate immune system. What they showed in this study and their results was that a gluten-free diet decreases the white blood cell counts in the intestine and in the small intestine of celiac disease patients more effectively than giving this probiotic.

However, this probiotic also reduced the white blood cell infiltration into the duodenum. Again, it's important to understand that it's critical to go gluten-free. Don't just take the probiotic and still continue to eat gluten. The probiotic in itself in the research shows that it reduces the white blood cells that are coming in there to damage the intestine. It reduces those types of white blood cells called

macrophages, but a gluten-free diet does it even better. You're better off doing the best of both worlds, which is the potential to supplement with a probiotic plus maintaining a gluten-free diet.

Again, their thought is that this particular type of probiotic actually affects the innate immune system and improves the innate immune system. This next study recently published in the journal Beneficial Microbes in 2020 found that using Bifidobacterium infantis, again, what we were just talking about, same strain. The Bifidobacterium infantis was previously shown to alleviate GI symptoms in newly diagnosed celiac disease patients consuming gluten. A high proportion of patients following a gluten-free diet experienced symptoms despite their dietary compliance. This goes back to true gluten-free diet versus traditional gluten-free diet, so keep that in mind.

The bottom line here is that the bifidobacteria improves specific celiac disease symptoms in a subset of highly symptomatic treated patients. In essence, maybe you're on a gluten-free diet, you're still struggling, what these researchers are finding is that this bifidobacterial strain can actually help improve those symptoms. Another research study published in the Journal of Clinical Gastroenterology in 2013 on Bifidobacterium infantis again. Another one. You'll see a lot of bifidobacterial research that I'm presenting here to you today. Those randomized to Bifidobacterium infantis experienced a significant improvement in GI symptoms. They also experienced a reduction in serum macrophage inflammation protein-1 beta.

Patients receiving, again, this bacteria had a reduction in symptoms but also a reduction in inflammatory markers in their blood. Again, the conclusion of the study, it suggests that this Bifidobacterium infantis may alleviate symptoms in untreated celiac disease. The probiotic produced some immunologic changes but did not modify abnormal intestinal permeability, meaning it didn't change the gut leakage. This is why it's so important to understand that you can't just supplement your way out of a gluten issue. You've got to change your diet.

Supplements are supplemental to that. They can be of importance and they can be a benefit to many individuals, but they should not be used, let's just say, in lieu of changing the diet. Now, I'm going to show you another research study published in Frontiers in Immunology. This was published in 2020, on bacterial-based strategies to hydrolyze gluten peptides and protecting intestinal mucosal. What these authors were studying was how they could use probiotics to basically break down gluten proteins. That's what hydrolyzed means. To break them down so that they're less toxic, that they're less damaging to the GI tract.

Those of you who have attempted sourdough bread. What sourdough bread is, basically it's adding different bacteria to the bread. It's the strains of bacteria that have been shown to have some potential ability to break toxic gluten proteins down, thus to diminish the potential for a side effect. I don't recommend everybody run out and eat sourdough bread if you're gluten-sensitive. It doesn't matter how sour your sourdough bread is, you're still going to react to the gluten in it. It's interesting that these researchers are analyzing the probiotics that have the ability to potentially minimize the toxicity of gluten epitopes or gluten proteins.

Why is that important? Because you're going to eat out, you're going to travel. If you're traveling and if there's something that you can use that's supplementing your diet that could potentially reduce the toxicity of cross-contamination, well, that might be something that you might want to do. In this particular study, you can see again probiotics are viable microorganisms thought to have a healthy effect of the host. The proteolytic, meaning the protein cutting mechanism of lactic acid bacteria, comprises an extracellular or extracellular serine protease. Well, let's skip the fancy words because I don't think that's important for you.

Basically, the lactic acid degradation bacteria contain different elements that have the ability to degrade certain types of gluten-based protein. It can affect gluten degradation. Therefore probiotic supplementation is an attractive therapy because of its possible and inflammatory and immunomodulatory properties. Several studies have been performed to assess the effectiveness of various specific probiotic strains showing positive effects on immune modulation inhibition of pro-inflammation chemicals as well as restoring gut bacteria and decreasing immunogenic peptides, meaning decreasing the toxic gluten proteins.

It's interesting that we have this entire world of probiotics that are opening up to us in the potential for benefit in individuals with a gluten sensitivity issue. Don’t forget probiotics, and this is why I go back to what I said earlier about, first change your diet. If you know you need to go gluten-free and you're following a traditional gluten-free diet, you need to change over to that true gluten-free diet. That needs to include a source of healthy food-based probiotics like a sauerkraut or fermented vegetables to get those different strains of healthy bacteria.

Now, if you want to consider supplementation, we'll get to that in just a minute and I'll talk about some of the critical things that I think that anyone with a gluten sensitivity who's not had appropriate lab testing should take as just kind of precaution or preventive measures. We’ll get to that, but before we do that, I want to pop up another image on the screen for you here because I want to give you again a tangible list of labs that you can take to your practicing doctor, to the doctor you’re seeing to help you understand what labs to run to evaluate your nutritional status. Very, very important to summarize action steps that you can take as you move forward from these modules.

Consider the following labs to help assess nutritional status. Number one, iodine loading. It's a special type of urine test that measures iodine. Number two is 25(OH)D, which is a blood test that helps to pick up on your vitamin D levels. You always want to have your doctor run an iron panel, but also have them measure a compound called ferritin. You want to have them run what's called a CBC, which stands for complete blood count. You also want them to run a chemistry screen or panel that can tell you some information about your nutrition as well.

Ask them for homocysteine. Ask them to run your plasma, amino acid level. This is amino acids, so it's ascertaining whether you're getting adequate quantities of the essential basis of protein. You want to ask them to measure your C-reactive proteins and marker for persistent inflammation. Maybe you've changed your diet, but maybe you're still inflamed. You want to make sure your doctor's monitoring that

inflammation because it should be going down if your diet is being appropriately changed in the right direction and your nutrition is being appropriately taken care of.

You also want to ask them to measure your glucose, your insulin, your hemoglobin A1c, because that tells you about your nutrition and how your body's processing carbohydrates or whether you're being overburdened by glucose or carbohydrate-based foods that could again, increase the viscosity of your blood and lead to other health detriments. Those are your fundamental tests that any doctor can run. There's nothing special about any of those tests. Most doctors could run them on a basic lab panel, on a basic blood requisition.

We also want to get into specialty labs. You want to make sure that you ask your doctor to measure your vitamin and mineral status using something called lymphocyte proliferation. Now, lymphocyte proliferation is a way of measuring whether or not your cells are storing adequate quantities of vitamins and minerals. From that storage that your cells are actually capable of replicating and making new cells. This is the functional component of a cell, is that it's capable of making new cells to take its place. This type of testing, it's a functional outcome test that allows you to assess your nutritional status a lot more accurately than measuring serum.

Remember when doctors measure serum, they're basically measuring your last meal. They're not measuring your internal body storage. When you're measuring lymphocyte proliferation, you're measuring your internal body storage on average of the last six months. It gives you this really lengthy window in which you can see what your nutritional status has been doing and where you're lacking and what you need to work on, both from a food perspective, but also from a nutritional supplementation perspective. Those tests you definitely want to have that conversation with the doctor who's treating you and make sure those tests are being run to assess your nutritional status.

Summarizing a lot of this up, and stay with me because I promised you I would talk to you about supplements that I think everyone with gluten sensitivity should take. I'm coming to that, I promise, but I want to summarize. Number one, gluten causes nutritional deficiencies. There's no doubt about that. As I've presented the research to you, it's very obvious. It's very clear. Number two, gluten causes inflammatory damage that leads to more nutritional deficiencies. Number three, medicines used to treat gluten-induced symptoms also can cause nutritional deficiencies and nutritional deficiency-related symptoms that lead to more medicines that can exacerbate the problem even further.

Number four, research shows that removing gluten from the diet does not always correct the problem. Number five, research shows that many with long-term gluten-induced damage need more nutrients for healing and repair. Should you supplement? The answer in my opinion, in my experience again, which is thousands and thousands of individuals is yes. You absolutely should supplement, and there are four supplements.

If your doctor won't run the testing and you can't find a doctor who's an expert in nutrition in your area and you just want to take some proactive measures to support

your nutritional status, there are four supplements that I believe that everyone with gluten sensitivity or a history of celiac disease should definitely take. Let's break those down. The first is a high-quality multivitamin. Why? Because a high-quality multivitamin is going to have the predominant quantity of essential nutrients. Now, it's not going to have mega doses of anything, but it's going to have supportive measures. Now, is a high-quality multivitamin multimineral something like Centrum or One A Day? No.

With a high-quality multi, you're going to get what you pay for, I promise. There's a lot that goes into nutritional science. The forms of the vitamins are important. Not all forms are created equally. Not all forms are absorbed by the body equally. Many of these over-the-counter multivitamin brands are junk. They put the cheapest form of the nutrients in there. They lacquer it with a coating that's almost impossible for a damaged gut to digest and break down. It's more like window dressing. You think you're doing something good, but really what you're doing is you're throwing your money out the door, because those types of multivitamins really don't have any place in the world. They're not adequate.

When I say "a high quality," what I would encourage you to do, we have several different versions. Go to glutenfreesociety.org and look at multi nutrients and look at ultra nutrients. The primary difference between the two formulations is multi nutrients is much higher in the B vitamins; whereas ultra nutrients is a little bit lower. Some people are super ultra-sensitive to B vitamins. Higher quantities causes an upset stomach or makes them have anxiety, keeps them awake at night. If you're that person, ultra nutrients is a better fit for you. If you want something a little bit more potent, multi nutrients is a better fit for you.

Both of those are formulations designed by myself in both of those are definitely grain-free formulations, where that's something else that you have to watch out for when you're supplementing and you're trying to maintain your gluten-free status is that many over-the-counter supplements are cross-contaminated with gluten, many supplements have gluten fillers and they don't make the claim on the label. You've got to be real, real, careful and real, real diligent when you're choosing which supplements that you want to use.

A high-quality multivitamin multimineral very essential in my book, in my opinion. I consider it nutritional insurance based on my experience in dealing with thousands of people with gluten issues over the last several decades. Another one that I would recommend highly is an omega-3 supplement. As I mentioned earlier, in my experience, the top five nutritional deficiencies, omega-3 is part of that. Now, most omega-3s are not included or inclusive in a multivitamin.

Whereas multivitamin is going to contain some of those other things. It's going to contain your B12 and your other B vitamins. It's going to contain some of your zinc. It's going to contain your vitamin K and your vitamin A and your vitamin D and your vitamin E, the things that we've been talking about, but it's not going to contain omega-3. Most people don't eat enough cold-water fish to get adequate quantities of omega-3 fatty acids in their bloodstream. An omega-3 supplementation very, very

critical. Again, it's one of the top deficiencies. One of the top five I've seen in people year after year after year.

A good quality omega-3, and a safe amount to take there is about two grams a day of concentrated omega-3. Make sure it's concentrated to contain two substances. One is called EPA, and another is called DHA. EPA and DHA combined, two grams per day, is a really safe amount to take to get your omega-3 levels suited to a level that's going to support your health overall. Another is a probiotic. I've got several different formulations that I have designed just depending-- First of all, in my nutrition practice, I test people. I look at their microbiome. I see what species are absent or present.

In that situation, if you've got a doctor willing to test you, you can get much more specific. If you're just looking to take, again, a general probiotic, you want to make sure you take something that's worthwhile and not something that, again, you're just peeing money down the toilet. Most probiotic strains over the counter are going to be anywhere from 10 billion colony-forming units or less. They're also, generally speaking, the way that they're labeled is they're labeled almost in a deceptive way. Let me explain what I mean. When you look at a label for a probiotic, it'll tell you-- generally the label is in something called CFUs. That stands for colony-forming units.

For example, a probiotic might contain 10 billion colony-forming units of a certain strain of bacteria like bifidobacterium as an example. Now, the way that manufacturer labels that is they label that strength. If it's got 10 billion colony-forming units, that's how many colony-forming units were present on the day the product came off the shelf and was analyzed. Meaning on the day the product was formulated and came off the assembly line, it contained 10 billion colony-forming units.

Here's the problem, if that product sits on the shelf for three months or six months, that probiotic begins to deteriorate. The power of that probiotic starts to deteriorate. That 10 billion by the time it makes it to your house, that 10 billion might be 8 billion. You're getting a 20% potential reduction or more, depending on how that probiotic was stored, how it was treated, whether it was heat stable, whether it was refrigerated, et cetera. You're getting the potential for it to be a lot less than what the package says. Most packages are labeled, again, based on the quantity that they could guarantee the date of production. We don't label them that way at Gluten Free Society. We label them based on the date of expiration. We're guaranteeing the amount on our label the date that product is expired. Our probiotics have a two-year shelf life. On that two-year shelf life date of expiration, we're still guaranteeing the quantity that's on the label.

It's important to understand that because, again, a lot of supplements they have fancy labels. They can be easy to trick you. I would recommend-- there's a couple of different formulations. One, if you're brand new to the gluten sensitivity realm and you're really struggling to overcome, you should look at UltraBiotic Defense as an option. It's a much higher and a much stronger probiotic. It's guaranteed on date of expiration to contain more than 200 billion colony-forming units of bifidobacterium

and lactobacillus, many of the strains and species that we've talked about in research tonight.

If you're just looking for something to kind of maintain a good level of probiotic support, then I would recommend just the regular strength biotic defense, which contains about 45 billion colony-forming units per capsule. Those two are the ones that I would recommend, again, if you're looking for a guaranteed gluten-free analysis probiotic. You don't have to worry about cross-contamination, but you're also getting a solid probiotic that has meaningful strains in it, because, again, the strains also matter. Gluten can reduce certain species of bacteria. These are formulated to help your body repopulate some of the species that we know gluten can impact and affect.

Not all probiotics are designed for people trying to overcome a gluten-related health issue, but these ones are. The fourth supplement that I would recommend, again, as a general rule of thumb, is a digestive enzyme, but specifically, a gluten degrading digestive enzyme, one that's been shown to help to break down gluten. Why? For several different reasons. You're going to travel. You're going to potentially eat other people's food that may have the risk of cross-contamination, so you want to have some level of digestive support so that if there is a gluten cross-contamination issue that you're kind of trying to mitigate, minimize that damage to as much as you possibly can.

My formulation that I've created to help with this, it contains different strains of enzymes that have been shown to degrade effectively the gluten-based proteins. It also contains a probiotic that has been shown to help hydrolyze gluten proteins. I talked about that earlier, and so it contains both. The name of it is called Gluten Shield, and again, it's not designed for you to go out and eat gluten and just take more Gluten Shield so that you can eat gluten.

It's designed to help you when you're traveling or, again, when you're out and about, when you're having that potential possibility that you might get gluten exposure, even though it's not being done on purpose, that you have some degree of digestive support to help potentially mitigate or minimize the inflammatory damage that gluten might create. Those are my top four. Now, I want you to stay tuned. Those of you who decide to purchase the Glutenology Health Matrix, we've got some added bonus videos for you.

Again, those of you who stay on and purchase, we've got an entire nutritional library that discusses the different nutrients and what symptoms to look for and what lab tests are best and what quantity should you take if you suspect a deficiency, et cetera. It's our masterclass library on nutritional deficiencies. We also have some great benefits to the purchase. You get coupon codes to purchase some of our gluten-free essential supplements that we've talked about here in this module.

Additionally, we're adding modules on leaky gut, supplements to help support the overcoming of leaky gut, supplements to help those of you that have potential yeast issues or other autoimmune problems, or other health issues. We've got some bonus videos that are being put and curated into that library for those of you who do decide

to purchase. Now, I want you to stay tuned for Module 8. Module 8, we're going to talk all about gluten mimickers, the things that you might be eating or doing that have the potential to mimic gluten and set off a reaction, even though you might be 100% gluten-free. So stay tuned and we'll talk about, again, gluten mimickers in Module 8.

Thanks so much for spending time with me in Module 7. I hope it's been helpful for you. This is Dr. Osborne with the Gluten Free Society, wishing you excellent health.

[01:55:27] [END OF AUDIO]