

## What Helps the Immune system? You, Your Genes, And Your Best Immune Defense

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The year 2020 will be identified in history as the year the world went under lockdown because of the coronavirus pandemic. As the world closed its doors and individuals and scientists sought to find treatment for those inflicted, and prevention for those who were not, social media and the media itself blossomed with advice, most of it nutrient driven.

Every day a nutrient philosophy to help the immune system appeared in my newsfeed: IV Vitamin C. Take your Zinc. Take your Vitamin A. For goodness sake TAKE YOUR VITAMIN D. There was also iodine in the chorus too. As time passed, the voices would grow louder, and in fairness, nutrition advice is appropriately relevant. That being said, no human system thrives on mega-doses of any one nutrient and most of us were not working at the bleeding edge where clinical experts were fighting to save lives.

Standing back from the cacophony, five things became very clear to me

1. We are still approaching disease and critical care with a variety of single nutrient remedies. There is the idea that massively dosing individuals with one, two or a handful of nutrients at pharmacological levels is the right thing to do. (It's not.)
2. Pharmacological nutrient dosing is the same as providing medical advice (without a license).
3. We ALL respond to nutrients differently and our unique gene blueprint determines this.
4. NO ONE was talking about the impact of genes and genomics and their relevance to immune modulation.
5. NO ONE was providing a targeted nutrient-based prescription that utilized what we KNOW about how specific nutrients, and more importantly polyphenols, are integral to immune modulation.

If you want to know what helps the immune system, you have to think about genes. You have genes that directly and indirectly affect how your immune system works. These genes can be influenced by your nutrition and lifestyle. Yes, what you eat and how you live can improve the efficiency of these genes, or turn them off when their work is done. They help to modulate the balance we all need for a healthy immune response.

You deserve to understand the basics and a new way to navigate them. I am purposely choosing from a smaller basket of genes to keep this article succinct and simple. I fully acknowledge that this is simplistic, but I wish to make the point that perhaps—nutritionally—we may be missing the larger view. The immune system is indelibly complex.

So in this blog article, I will discuss six key bellweathers that help the immune system and what we know in science about how to modulate (or support) their impact with nutrition and foods.

## Begin at the Beginning: Immune System 101

The immune system is the largest system in your body and probably the most difficult to understand. And the biggest reason is that it is invisible to you.

The immune system's primary roles are to

- Protect you from pathogenic (disease-causing) organisms
- Get rid of damage and debris in your body
- Prevent growth of malignant (cancer) cells
- Develop learning systems that produce protective products when your body signals a defense requirement

Your immune system is designed to strike a balance between actively seeking out and dealing with invasive molecules, and supporting your body's routine day-to-day mechanisms. When the immune system is overstimulated or overactive, it causes oxidative stress (an abundance of free radicals). This leads to [inflammation](#). Inflammation manifests in many ways like pain, fatigue, soreness and visibly in the form of rashes or hives. The immune system may also signal sensitivity to certain foods which result in headaches and digestive disturbances.

## Innate Versus Adaptive Immune System

You're born with an immune system, one that is provided to you by your mother. It's called the **innate** immune system. This system gives you the ability to protect yourself from anything foreign or invasive until your **adaptive** immune system has a chance to get set up and mature to the new world of you. You keep both innate and adaptive immune systems for life. Both operate synergistically.

The innate immune system you were born with puts up the first fight. Curiously, it has no memory. It simply reacts to what's in front of it and uses phagocytes and natural killer cells as its front line.

Your adaptive immune system does have a memory. It's considered the second line of defense. Its T cells receive messengers from the front line phagocytes in your innate immune system and posts these messages on the equivalent of the immune system's billboard. B cells pick up these messages and start manufacturing **antibodies**—essentially immune system weaponry to fight pathogens. Each time new antibodies are made, their recipe is stored in the adaptive immune system inventory, ready to access should the same invader appear again. [Click here](#) for a nice graphic to explain how the adaptive and immune systems work together.

“You have two arms of your immune system: **innate** and **adaptive**. Both work synergistically together to fight pathogens. Your innate system puts up the first fight, then your adaptive system comes to help and remember this infection in case it happens again in the future.”

## Achieving Balance

As you now know, the immune system is essential to protecting the body from invasion by foreign species. It pulls on its tools to mount a defense and then stands down after the battle is over. It's all about balance. The challenge with modern life for so many of us is that our immune system may not

always get the message to put away its weapons. An overactive immune system can result in allergic reactions or autoimmune conditions.

Genomic science helps us understand more about which genes help the immune system function optimally. Some genes truly function as **activators**. They are not interested in putting their weaponry down. Other genes (and nutrients) can play a dual role, both as activators and **deactivators**. This is where Vitamin D and its receptor (encoded by a gene) is so interesting.

Trust me, the immune system is incredibly complex to navigate. That being said, certain influential genes surface over and over again in the scientific literature. It's useful to understand how they work in the immune system, and importantly what we can do through diet and lifestyle to improve their efficiency, or turn them off, if and when we need to.

*"The immune system is essential to protecting the body from foreign species. It pulls on its tools to mount a defense and then stands down after the battle is over. It's all about balance."*

Join me to look at some bellweather genes for your immune system.

## **Immune System Bellweather 1: IL-6 (interleukin-6)**

IL-6 helps the immune system in two ways. It is designed to create balance by activating or deactivating ignition switches for your body's inflammatory defense against pathogens.

In acute inflammation or when the immune system is under significant stress, IL-6 prompts the activation of those T cells and B cells (in your adaptive immune system). IL-6 also manages the manufacture of C-Reactive Protein (a major inflammatory flag) and other immediate immune system responses we call acute phase reactants (innate immune system).

IL-6 receives messages from receptors on your cells called TLR (Toll-like Receptors). Think of TLRs as samplers that send vital information to the IL-6 immune system project manager.

IL-6 is activated by foreign invaders, but also by dietary signals from diets high in saturated fat or sugar, both of which alter your body's own homeostasis (balance). IL-6 is also activated by environmental or toxic signals which again suggest to your immune system that something is out of balance. These subtle dietary and environmental signals alongside obvious infectious species can put your immune system in overdrive and if not managed, will result in autoimmune conditions.

Interestingly, IL-6 also has an anti-inflammatory role. You've just learned that it turns on acute responses, but to strike balance, it can suppress the production of TNF-alpha (which you'll learn about shortly) and IL-1 beta, both of which are acute ignition switches in the immune system. So IL-6 is a gene designed to create a balance in the immune system. **However, variants in IL 6 (we call these SNPs), can impact its efficacy, perhaps leaving it in overdrive when it needs to switch off.**

*"IL-6 is a gene designed to create balance in the immune system. It can activate or deactivate ignition switches for your body's inflammatory defense. Variants in the gene that codes for IL-6 can impact its efficacy, perhaps leaving it in overdrive when it needs to switch off."*

## Managing the IL-6 Bellweather

We need IL-6 to do the job it was designed to do, but also need to turn it off when not needed. Here's what we know. Modulators of IL-6 include exercise, calorie control (fewer calories are better than too many) and a dietary approach that mirrors the [Mediterranean diet](#).

Researchers conducted [a 3 year study](#) of 180 patients with metabolic syndrome at an Italian hospital in 2001-2004. Half of them followed a diet comprising whole grains, fruit, vegetables, nuts and olive oil. The other half followed a "prudent" diet that didn't specify the type of food. Instead, it was 50-60 percent carbohydrates, 15-20 percent proteins and up to 30 percent total fat. The study showed participants following the Mediterranean diet had significantly reduced serum concentrations of inflammatory markers IL-6, IL-7, IL-18, CRP and insulin resistance (itself an inflammatory marker). More on the Mediterranean diet shortly.

IL-6 can also be switched off with another gene called PPAR-alpha. And what switches PPAR-alpha on? [A lower energy environment](#), AKA hunger or fasting! Yes, PPAR-alpha is activated when cellular energy is low. When activated, PPAR-alpha turns on your fat burner and also [stimulates ketogenesis!](#)

PPAR-alpha is a pretty useful gene and we know a lot about it through studies on intermittent fasting! Do you see the connection between lower energy (caloric intake) and IL-6 and PPAR-alpha? Both genes respond to a lower caloric environment. Time and time again, health comes back to eat prudently and not too much. A concept we know as "[Hari Hachi Bu](#)."

Other research suggests that quercetin, p-coumaric acid and resveratrol can also block (or reduce) activation of IL-6. I write about quercetin and resveratrol in the next gene section. P-coumaric acid is found in those typical Mediterranean herbs I talk about, but also in olives (Mediterranean!), kiwi, pomegranate and in the spices: cloves and cardamom.

*"What helps your immune system is how much you eat and what you eat. Eating enough (and not too much) is one key to an optimal immune response. Another is a Mediterranean diet, rich in olives, herbs and pomegranate which can reduce inflammation. Kiwi, cloves and cardamom also contain key bioactives that can help."*

## Immune System Bellweather 2: Nf-κB

If you read about the immune system, inevitably you will learn about Nf-κB. It seems that all roads lead to this gene which, like IL-6, is implicated when the immune system is activated or over-activated. NF-κB responds to signals through stress, free radicals, environmental toxins as well as bacteria and viruses. Nf-κB is necessary, but you also need to turn it down when the immune response has things under control.

Fortunately, this is a [well-studied gene](#). We know that curcumin can block the signals and pathway that activates Nf-κB. Resveratrol, found in red grapes (and boiled peanuts, as it happens), can also reduce activation. My best friend quercetin is also an effective blocker. Look for quercetin in the allium family, capers, Mediterranean herbs such as rosemary, thyme and sage, as well as radishes and elderberries. You'll find quercetin well represented in the [Genomic Kitchen Ingredient Toolbox](#) (Master Ingredients) precisely because it helps the immune system by blocking Nf-κB and its inflammatory effects.

[Epigallocatechin gallate \(green tea\) and genistein \(soy\)](#) also have Nf-κB blocking attributes. Galangin, also known as Mexican Oregano also has Nf-κB blocking abilities.

You should be starting to see a pattern in these foods. Many of the blocking capabilities are related to polyphenols (bioactives), and many of these polyphenols are found in herbs and spices, foods that are abundant in the Mediterranean diet.

“To reduce the overactivation of Nf-κB in your immune system, eat curcumin, red grapes, boiled peanuts, capers, onions, herbs, radishes, elderberries, green tea and soy.”

I have written extensively about Nf-κB both in my blog and also in my [Genomic Kitchen book](#). You can learn about it in my [Genomic Kitchen courses](#) as well.

### Immune System Bellweather 3: TNF-alpha

TNF-alpha is another gene that helps your immune system. TNF-alpha plays a role in many biological systems including cell growth, differentiation and death, as well as lipid metabolism and coagulation. Its most familiar role is as a pro-inflammatory gene whose job is to promote cytokines (like IL-6) to mount an immune response. Elevated levels, or hyper-activity, of TNF-alpha is often associated with chronic diseases such as Type 2 diabetes, cancer and also auto-immune disease because, as you can see, it is an inflammation provoker.

Interestingly, TNF-alpha often works in tandem with Nf-κB to induce the immune system to include IL-6 and other cytokine activation. Like Nf-κB, it helps the immune system, but similarly we do not want TNF-alpha left in the *on* position.

“TNF-alpha helps your immune response by provoking inflammation. This is why we want it to shut off when its work is done.”

#### Managing TNF-alpha

Because we want it to shut off when its work is done, there is a lot of research into attenuating TNF-alpha. Most of it has been conducted in animal and human cell cultures as well as in animal models. Much of it involves use of polyphenol extracts to inhibit TNF-alpha—and with excellent outcomes. That being said, we are interested in what we know works in humans through active research. Here is what we do know about which polyphenols have demonstrated inhibitory activity in humans.

We definitely know that quercetin—yes, once again this powerful polyphenol—can do this.

Promising polyphenols with demonstrated downregulation (blocking) of TNF-alpha in animal and human cell cultures and animal models. There is no reason not to include any of these polyphenols in your diet! And take a close look at the foods associated with these polyphenols. So many are integral to traditional Mediterranean diets. Again!!

- **Oleuropein:** one of the many polyphenols in olives and olive oil exhibiting significant antioxidant activity
- **Luteolin:** sage, thyme, Mexican oregano, rosemary, olives, Globe artichokes
- **Hesperidin:** oranges, lemons, limes, tangerines, peppermint
- **Resveratrol:** grapes

- **ECGC:** green tea
- **Chrysin:** honey, propolis, passionflower, chamomile
- **Ellagic Acid:** raspberries, blackberries, pomegranate, walnuts, chestnuts

“Because we want TNF-alpha to stand down after its inflammatory work is done, research has shown that bioactive compounds called polyphenols can help! These are found in many foods such as olives and olive oil, citrus, green tea, grapes, berries, honey, and herbs.”

## Immune System and Digestive System Bellweather 4: IL-10

So we come to IL-10 and can gently exhale! We can exhale because unlike the genes we have discussed thus far, IL-10 is not pro-inflammatory. We like to think of it as the brake in the immune system. It's the gene that wants to get all stakeholders to play together nicely for smooth sailing. Importantly, IL-10 can BLOCK Nf-kB, a ringleader in immune activation as you have already read.

[Research](#) has shown that polymorphisms (variants in the gene) that impact IL-10 correlate with intestinal inflammation, gut-related and auto-immune diseases. This is because IL-10 is not only integral to the health of the gut (epithelial) lining, but also to immune system modulation. Both are connected. Failure to maintain a healthy gut lining creates seepage of molecules across this important barrier. Foreign molecules induce an immune response. IL-10 is pretty important!

“IL-10 helps to stop the immune system’s inflammatory response once its work is done. IL-10 is also important for gut health.”

### Supporting IL-10

IL-10 also helps the immune system. Activation of IL-10 is connected to short chain fatty acids (SCFA). Say what? SCFAs such as butyrate and acetate are produced when your gut bacteria feed on the specific fibers found in prebiotic-rich food.

What does this mean? It means, you have to have the right bacteria in your gut and the right food to produce the SCFAs to activate IL-10. When you have all these ducks in a row, you can not only improve the barrier of your gut, but you can activate a master peace maker in your immune system.

So by eating probiotic-rich food, you SEED your gut with the right bacteria. Then you can FEED your gut bacteria with the right kind of (prebiotic) food. This ensures you have the activator molecules for IL-10 to help your immune system.

Read about probiotics and prebiotics in [my Genomic Kitchen book](#) (I call these Enabler Ingredients). These include asparagus, bananas, garlic, onions, and whole wheat.

“Your gut microbes help activate IL-10 by making short chain fatty acids. You can help your microbes by eating (and, thus, feeding them) prebiotic fibers such as asparagus, bananas, garlic, onions, and whole wheat.”

Try some of our [probiotic and prebiotic-rich recipes](#)

Among the bioactive polyphenols we have been talking about, quercetin and catechins (strawberries, grapes and stone fruit) have demonstrated their ability to activate IL-10 and de-activate TNF-alpha in laboratory models.

“Strawberries, grapes and stone fruit have special bioactives that can activate IL-10.”

## Immune System Bellweather 5: VDR

We are all in a heightened state of alert about Vitamin D and how it is integral to an effective and healthy immune system. Vitamin D's principle role in [nutrigenomics](#) is as a signaling or communication molecule. **VDR** is the Vitamin D Receptor that allows Vitamin D to do its good work.

In the innate immune system, [Vitamin D activates front line anti-microbial responses](#) to eliminate invasive bacteria or viruses. In the adaptive immune system, Vitamin D appears to regulate T and B cell responses, in effect preventing their overstimulation.

Vitamin D helps the immune system by playing a modulating or balancing role. It enables an appropriate defense to be mounted, while at the same time preventing overstimulation that can lead to auto-immune diseases.

The VDR is a docking station which allows Vitamin D to communicate with the immune system. Variants in the gene that codes for VDR can change its structure, therefore impacting Vitamin D's ability to function to its greatest extent.

“Vitamin D helps to balance the immune system by enabling an appropriate reaction and helping to prevent overstimulation. It works via the Vitamin D Receptor which may not allow for optimal Vitamin D action if its gene contains certain variants.”

### Supporting Vitamin D

The VDR functions in conjunction with another receptor called the RX Receptor (RXR). RXR needs Vitamin A. This is why you need both Vitamins D and A for effective immune communication. So, to support vitamin D, you need to include foods that are rich in both Vitamin D and Vitamin A. (Vitamin A comes in an active form, retinol, and a non active form, beta-carotene. Ideally, you would include the active retinol form.)

To be frank, foods that are the richest sources of both of these vitamins are often eschewed or thrown away. They include offal (animal organs) like liver. They also include animal proteins, some seafood and eggs. Mushrooms are a good source of Vitamin D2 which must be further transformed to the active Vitamin D3 form (1,25-OH or 1,25-dihydroxycholecalciferol).

This is why many kids were given a dose of cod liver oil a few decades ago to get their Vitamin D! Is it any wonder that many of us are walking around with low levels of Vitamin D? We are not eating foods that are traditional sources. And, relying on sunlight is NOT enough for many of us. We have gene variants that prevent the conversion of 7-dehydrocholesterol (vitamin D's precursor) to its active form that binds to the VDR. **You see, you have the potential to have lower levels of vitamin D simply because of your gene blueprint.** This is the insight we get from DNA testing. Trust me, I review DNA information daily.

To support vitamin D, understand where your levels are NOW. If you need more, your first step is to seek out rich food sources of Vitamin D and A. After retesting, if your vitamin D levels have not budged you MUST start supplementation. See a licensed nutrition or health expert to help you with this.

“For Vitamin D to work effectively with the immune system, you also need enough Vitamin A. These are found in foods such as organs (liver), animal proteins, some seafood, eggs, and some mushrooms. Knowing your Vitamin D levels (and whether you have the genes for maximum activity) is important. See a licensed nutrition or health expert if you feel you need testing or supplements.”

## Digestive System Bellweather 6: FUT2

As we've seen already with IL-10, immune health is linked with gut health. Some of your genes code for enzymes that can help your gut microbes work in tandem with your immune system. For example, *FUT2* encodes the  $\alpha(1,2)$  fucosyltransferase enzymes. This enzyme synthesizes the H antigen (the precursor of the ABO histo-blood group that codes for your blood type). These antigens are found in body fluids and on the surface of your intestinal mucosa (gut).

These ABO blood-group antigens are a source of food for various gut bacteria in our microbiome. They can also provide some protection against pathogenic bacteria by preventing their adhesion to the gut lining. Some are active secretors of these enzymes, and some are not.

When you feed certain bacteria, this can affect the diversity of our microbiome. For example, *bifidobacteria* is the dominant intestinal microbiota in infants and also abundant in adults. It comprises up to [6 percent of our intestinal microbiota](#). This in turn can have significant effects on how the immune system modulates itself and inhibits pathogens. Gut bacteria are remarkable in their ability to de-amplify pro-inflammatory cytokines within the immune system, turning down the impact of cytokine IL-6 and the Nf- $\kappa$ B gene which are bellweather “master conductors” of the immune response.

Does this mean that you are immune-compromised if you are a non-secretor? Not necessarily so, but when I see this on a DNA test it prompts me to ask about your gut health, and also to emphasize the role of probiotics and prebiotics in your diet. Both of these shore up your gut ecology and help the immune system defenses you have in your gut.

“Your immune health is linked with your gut health. Some of your genes code for enzymes that can help your gut microbes work in tandem with your immune system.”

## Your Gene Blueprint is the Mirror of Who You are

In this blog article, I have shed light on a tiny handful of genes that help your immune system. In truth, not only are there many more genes, but also many other vitamins and minerals that help your immune system. One I did not mention here, but have many times before is NrF2. If you have read my book, you know that is technically not a gene, rather a “Transcription Factor” - or aide to gene expression. Of all the powerhouse genes we have, this one in my mind has probably the most impact and is easy for you to put into action. I call it the fire extinguisher because it literally ignites genes that produce the most powerful extinguishers of those troublesome free radicals. [Be sure to read about its powerful impact here.](#)

Understanding how your immune system and your human operating system functions is where genomics and DNA test information is so powerful. With one test, I can scan your gene blueprint and identify not only the strengths and influence of your genes, but also see where the potential weaknesses are.



From here, I create a roadmap in which I prioritize the areas of your health we want to examine further. Maybe you have a number of genes that suggest you may be immune compromised. Or I can see where you may absolutely be experiencing lack of energy, brain fog, mood swings or more. Sometimes I can see areas we might want to investigate and you have no symptoms at all. DNA information tells us where to look to decide if there is an issue to support through specific nutrients, exercise, lifestyle modification or not. It removes the guesswork so that you can lead a fully informed and healthy life in unison with the genes you were born with.

## To Learn More About The Power And Potential Of Your Genes

### Health-Seeking Individuals

- Read my [book](#) The Genomic Kitchen
- If you're interested in exploring how genes influence your health, take my [free mini-course](#): **You. Your Genes. Your Health.**
- Or dive deeper with my [Genomic Kitchen Express Course](#)
- [Talk to me](#) about our work in DNA Testing

### Health Professionals/Clinicians

- Download the clinicians copy of this article that contains more detail on how these immune system compounds and genes interact with nutrients.
- Take one of my [courses for health professionals](#)
- [Talk to me](#) about personalized mentoring in Genomics, Nutrigenetics and Nutrigenomics

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