

# INFLAMMATION

## The Silent Curse

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# INTRODUCTION

If you're in the habit of following health news headlines, you're likely aware of the ongoing discussion about how and why inflammation is so detrimental to the body. You may even have been wondering if and how exactly inflammation might be affecting you and what you can do to safeguard your own health.

Did you know that most health experts now believe that *chronic* or ongoing inflammation is the common thread contributing to the development of a host of ailments, including many aging-related health issues?<sup>1,2</sup>

In fact, Dr. William Joel Meggs – an inflammation specialist at the Brody School of Medicine at East Carolina University and the author of the book *The Inflammation Cure* – has made the bold claim that inflammation “may well turn out to be the elusive holy grail of medicine, the single phenomenon that holds the key to sickness and health.”<sup>3</sup>

But what exactly is inflammation? Why does it happen? And can it really have a substantial impact on your health? In this report, we'll take a closer look at what the latest scientific and clinical evidence has to say about inflammation.

# WHAT IS INFLAMMATION

The word inflammation originates from the Latin word “inflammatio” which means fire, since inflammation is typically characterized by heat, redness, swelling, pain, and impaired body functions.<sup>4</sup>

You may be surprised to learn, however, that inflammation isn’t all bad. It’s actually an essential, life-saving aspect of your immune system’s coordinated response to various types of bodily harm, including:

- ◆ injuries, wounds, and other physical trauma
- ◆ infections by bacteria, viruses, fungi, and other parasitic agents
- ◆ exposure to chemical irritants including automobile exhaust, cigarette smoke, and the many thousands of other toxins in the air and water that we are exposed to on a daily basis
- ◆ hypersensitivity or allergic reactions to relatively harmless compounds in the environment, such as various foods and pollen

Long story short, inflammation is designed to protect your body from harm by rapidly removing the cause of the problem at hand so that your body can begin the process of healing.<sup>5</sup>

“Acute inflammation is how your body fights invaders that may cause infection, as well as being a part of the healing process,” according to Dr. Andrew Luster, of the Center for Immunology and Inflammatory Diseases at Harvard-affiliated Massachusetts General Hospital. “In this way, inflammation is a good thing, because it protects the body.”<sup>6</sup>

The main goal of the inflammatory response is to bring immune cells and molecules, including specific proteins and enzymes, to the site of infection, trauma, or injury, thereby initiating a series of events that eventually leads to healing and recovery.

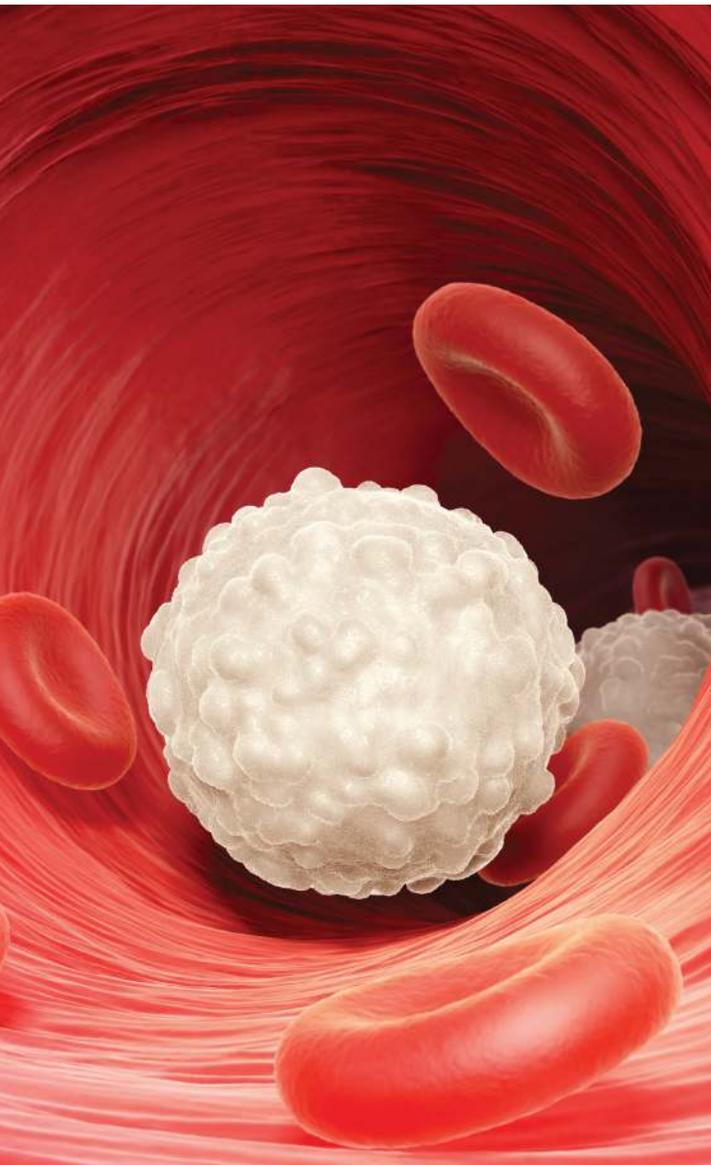
You could think of inflammation as the internal ambulance that rushes to the scene of an injury, stabilizes the victims, and helps to start the healing process.



## What Is Acute Inflammation?

When you suffer a cut or a wound, your immune system immediately responds with a complex series of coordinated physiological steps designed to repair the damage and heal the wound. This is the short-term or *acute* inflammatory process in action, which can last from a few seconds or minutes to as long as a few days.

Wound healing is a systematic process that includes four overlapping steps: hemostasis, inflammation, proliferation, and maturation.<sup>7</sup>



- ♦ **Hemostasis** – first, blood platelets arrive to help form a blood clot and stop the flow of blood from the cut or wound.

- ♦ **Inflammatory phase** – the inflammatory process is initiated by immune cells such as macrophages and mast cells that are already present in the tissues around the wound. Macrophages are a type of white blood cell that engulf and “eat” anything not seen as healthy or normal. They play a critical role in the initiation, maintenance, and eventual resolution of the inflammatory process.

Mast cells are another type of white blood cell that store inflammatory chemicals like histamine and heparin. [Note: Histamine, made by mast cells, is involved in the inflammatory response. It makes capillaries (fine branching blood vessels that form an intricate network between arteries and veins) more porous to large immune cells and specific proteins, to allow them to engage directly with pathogens in infected and injured tissues. Heparin, a naturally occurring anticoagulant, is also made by mast cells – it prevents clot formation and extension of existing clots.]

Next, your immune system sends an army of white blood cells, mainly neutrophils, which are usually the first to arrive at the site of an injury during the first 6 to 24 hours. Neutrophils literally swallow damaged cells and also release enzymes that kill them.

Depending on the seriousness of the injury, more macrophages may arrive at the scene, especially 24 to 48 hours after the event. These macrophages produce immune-signaling substances known as cytokines, including tumor necrosis factor (TNF) and interleukin-1 (IL-1), which help to recruit and activate other immune cells.

- ♦ **Proliferative phase** – so-called epithelial cells grow to form a barrier between the wound and the surrounding environment. New connective tissue grows, tightening and contracting the wound, while new blood vessels form to supply newly-forming tissue with oxygen and nutrients.
- ♦ **Maturation phase** – finally, the structural protein collagen makes tight connections with other collagen and protein molecules, strengthening the scar tissue being formed at the site of the injury.

Similarly, if you experience a physical trauma such as a bruised elbow or knee, neutrophils arrive at the trauma site within seconds to minutes. In this instance, blood vessels around the injury site rapidly dilate in response to histamine, thereby increasing local blood flow. As a result, the damaged area typically becomes red and warm.

The damaged tissues may also become swollen, due to the increased blood flow along with a local buildup of protein and enzyme-rich fluid that is part of the inflammatory response.

Finally, the area typically becomes painful – because as the tissues swell and expand, mechanical pressure is exerted on nerve endings in the area. Also, some of the immune components that congregate in the damaged area are pain mediators and signal the brain that the area is damaged, so that you “feel” pain.



Gaps begin to appear in the walls of blood vessels around the trauma site, allowing larger immune cells to enter the injured area from the bloodstream. Neutrophils and macrophages start digesting and engulfing dead and severely damaged cells. Once again, cytokines are released into the bloodstream by macrophages, further activating other immune cells to continue the healing process.



Depending on the extent of the injury, your body's metabolism may be adjusted – for example, by increasing blood glucose levels, along with symptoms such as fever, fatigue, and loss of appetite. Once the inflammatory process has begun, it continues until the trauma has been properly dealt with and the injury has healed substantially.

In case of a bacterial or other pathogenic infection, a specific group of blood proteins gets activated and induces inflammatory reactions that help destroy the infection. Activation leads to an enzyme cascade and the generation of multiple “complement proteins” that mediate the inflammatory response.

In all such instances of acute inflammation, blood levels of so-called “acute phase proteins” such as C-reactive protein (CRP) and serum amyloid A protein (SAA) are seen to rise steeply above normal.<sup>8</sup>

As we can see from these examples, short-term or “acute” inflammatory response is a necessary and important aspect of the body's natural healing process. Without it, injuries could linger on and harm us, while even minor infections could turn deadly.

**It is important to understand that the key to the inflammatory process being beneficial for your health is that it is only meant to last a short time. Once the body has dealt with and disposed of the immediate problem, the process of healing and repair begins.**



## What Is Chronic Inflammation and How Does it Affect Your Health?

Acute inflammation is usually a controlled, self-limited, and short-term response designed to protect your body from immediate harm. The ideal outcome is complete removal of the problem and a return to the original normal condition.<sup>9,10</sup>

**Unfortunately, the body's inflammatory response is also capable of damaging normal, healthy cells and tissues when uncontrolled, activated improperly, or left unresolved for a long time.**

In some instances, a mistaken immune response to a normal protein (known scientifically as an *antigen*) can lead to the immune system attacking tissues in the body, leading to various autoimmune diseases. Similarly, an ongoing, low-grade inflammatory response to a persistent irritant can also damage your body.

In such instances, an acute inflammatory response can turn into persistent or chronic inflammation and can lead to many adverse health conditions over time. In such situations, metabolic processes are suppressed and detoxification is impaired.

Ongoing inflammation – which has been linked to a number of external triggers – acts like a slow-burning fire, continuing to send out immune cells, proteins, and enzymes that eventually begin to attack even the healthy parts of the body.

“It’s a smoldering process that injures your tissues, joints, and blood vessels, and you often do not notice it until significant damage is done,” says to Dr. Andrew Luster.<sup>11</sup>

For example, the immune system sees visceral fat cells (this is the kind of fat that builds up in the abdomen and surrounds organs, usually in people who are overweight or obese) as a threat and triggers an inflammatory response. This means that the longer one remains overweight, the longer the body remains in a state of inflammation and suffers damage as a consequence.

Indeed, chronic inflammation is a silent epidemic that afflicts millions of unsuspecting Americans and millions more all over the world.

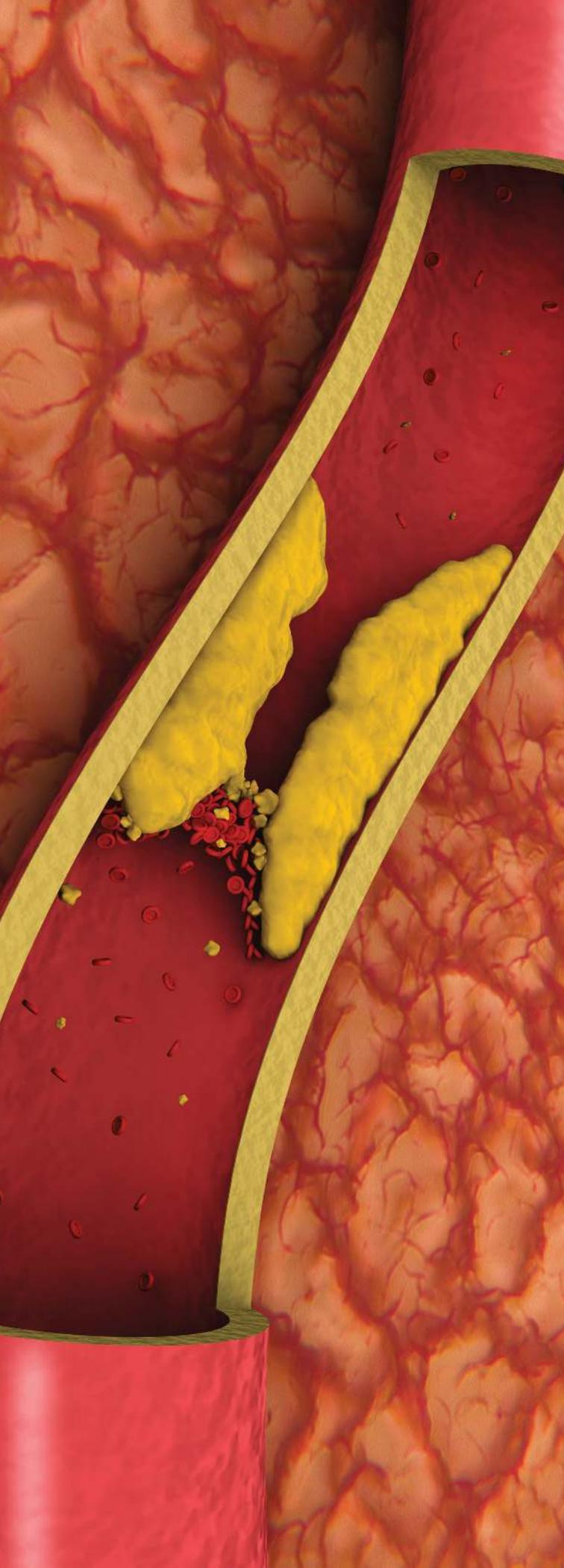
**Since it has no obvious symptoms, this type of inflammation can go on virtually unnoticed for years until a major health condition eventually manifests itself.**

Dr. Barry Sears, author of *The Anti-Inflammation Zone: Reversing the Silent Epidemic That's Destroying Our Health* states: "Silent inflammation attacks the heart, arteries, and even the brain, and you will not even know it. Obesity is the primary cause of silent inflammation and excess body fat is causing today's epidemic rise in countless health threats."<sup>12</sup>

For example, the health condition known as atherosclerosis is caused by layers, known as plaques, that build up inside of blood vessels and harden over time. Coronary artery disease refers to atherosclerosis in blood vessels that supply the heart muscle, but this condition can also affect other arteries in the body.

As the plaque continues to build, the walls of the blood vessels become narrower, much like a blocked pipe. As a result, blood flow and oxygen supply to the heart muscle become compro-





mised. As these blood vessel walls become more and more damaged, the immune system responds by ramping up the inflammatory process – which contributes further to plaque formation and blood vessel wall damage. This is a vicious cycle that eventually leads to deadly consequences.

Such atherosclerotic plaques are typically covered with a layer of unstable tissue called a fibrous cap. When this cap becomes damaged, the plaque ruptures and its underlying components become exposed to the bloodstream, causing the formation of a blood clot further downstream inside the artery. Blood clots can cause partial or complete obstruction of blood flow, along with local damage to cells and tissues, culminating in one of many deadly heart-related health conditions.

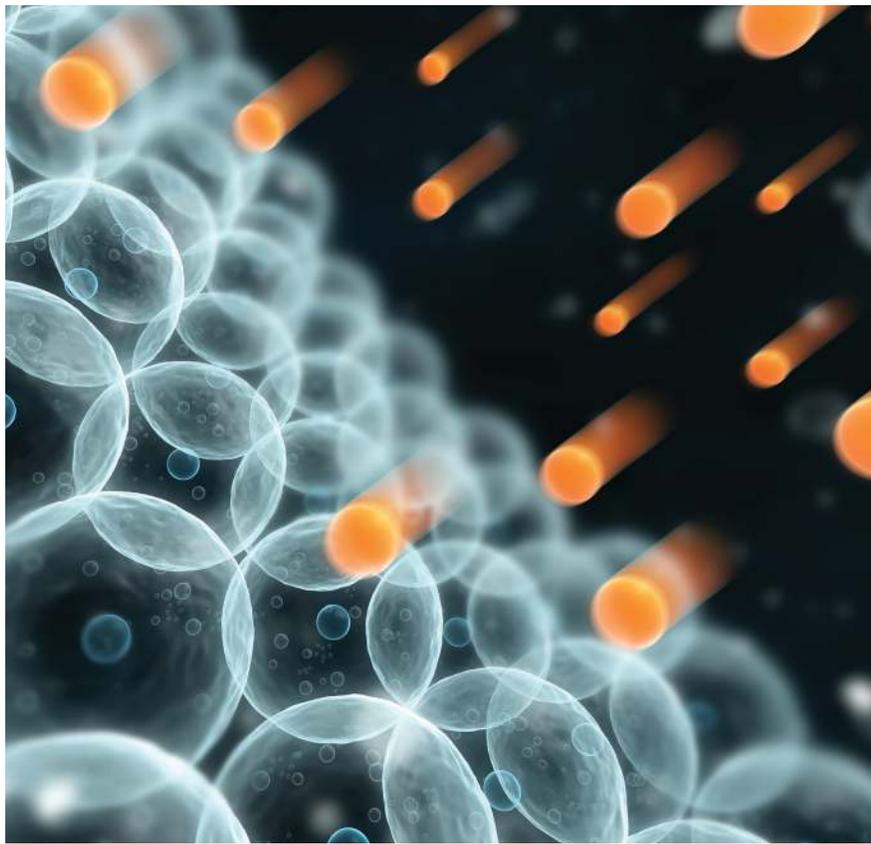
Scientific evidence clearly shows that inflammation plays a fundamental role in every stage of atherosclerosis, from initiation through progression and, ultimately, the formation of harmful blood clots.<sup>13</sup>

For instance, studies have shown that increases in levels of inflammation markers such as C-reactive protein (CRP) can predict outcomes in patients with heart-related health conditions and obese people have higher CRP levels.<sup>14</sup>

It is now clear that low-grade, long-term systemic inflammation increases the risk for many metabolic and heart-related health conditions.

## Free Radicals Fan the Flames of Chronic Inflammation

Free radicals, specifically reactive oxygen species (ROS) – believed to be created by the actions of the various types of immune cells activated by the inflammatory process and by the chemicals and enzymes they release – are now known to damage essential components in our body’s cells. In other words, ROS mediate (bring about) the harmful effects of chronic inflammation in our body.<sup>15,16</sup> [Note: Free radicals are molecules capable of independent existence and contain unpaired electrons, which make them unstable and highly reactive with their environment.]



Scientific evidence shows that ROS can initiate and also amplify the effects of inflammation by directly “switching on” multiple genes involved in triggering and maintaining the inflammatory response.

Different types of free radicals are constantly being made in your body’s cells during their daily metabolic activities. However, they are generated at much faster rates and can overwhelm your body’s defense mechanisms when you are exposed to pollution, cigarette smoke, and other toxins.

As long as a balance exists between the levels of ROS (and other toxic free radicals generated in your body) and your innate enzymatic antioxidant systems, you generally remain healthy. However, excessive levels of ROS and/or insufficient activity of your antioxidant defense systems can cause your body’s cells to experience an unhealthy condition known as *oxidative stress*.

Oxidative stress can damage cellular structures in the body, including the outer protective cell membranes, cellular proteins, lipids, and even DNA – thereby contributing to the development of many adverse health conditions, including those associated with aging.<sup>17-19</sup>

## Antioxidants Counter the Actions of Free Radicals

By definition, antioxidants are molecules whose main role is to prevent your cellular components – including lipids, proteins, and DNA, among others – from being damaged by free radicals.

They do so in three main ways:

- ◆ By preventing free radicals from being formed in the first place.
- ◆ By rendering them inactive.
- ◆ By causing their breakdown once they are made.

The body contains so-called “innate” enzymatic antioxidant systems such as superoxide dismutase, catalase, and glutathione peroxidase to break down and remove free radicals.<sup>20-23</sup>

Given that we are usually exposed to much higher levels of free radicals than our innate antioxidant systems can handle, we also need to consume non-enzymatic antioxidants either in our diet or as supplements. Thousands of such antioxidant molecules exist in the plant world. Some examples include vitamin C, vitamin E, bioflavonoids, polyphenols, carotenoids, allicin, piperine, curcumin, and many others.

In a nutshell, your ability to prevent or eliminate inflammation depends on the health and activity levels of your innate antioxidant systems, as well as the quality and amounts of dietary antioxidants you consume. Of course, this goes hand in hand with your ability to reduce or abstain from activities that trigger inflammatory processes in the first place.



# INFLAMMATION AND THE GUT

The gut (specifically the mouth, stomach, small intestine, large intestine, and rectum) is one of the first places where your body encounters potentially harmful pathogens such as bacteria, viruses, fungi, and others that can harm your health. As a result, every part of the gut has evolved a complex and tightly regulated immune system.<sup>24</sup>



For instance, the gut is connected to several types of lymphoid organs, which are collectively referred to as gut-associated lymphoid tissue (GALT). Lymphoid organs are part of the immune system's defense mechanism against invading pathogens and contain various types of white blood

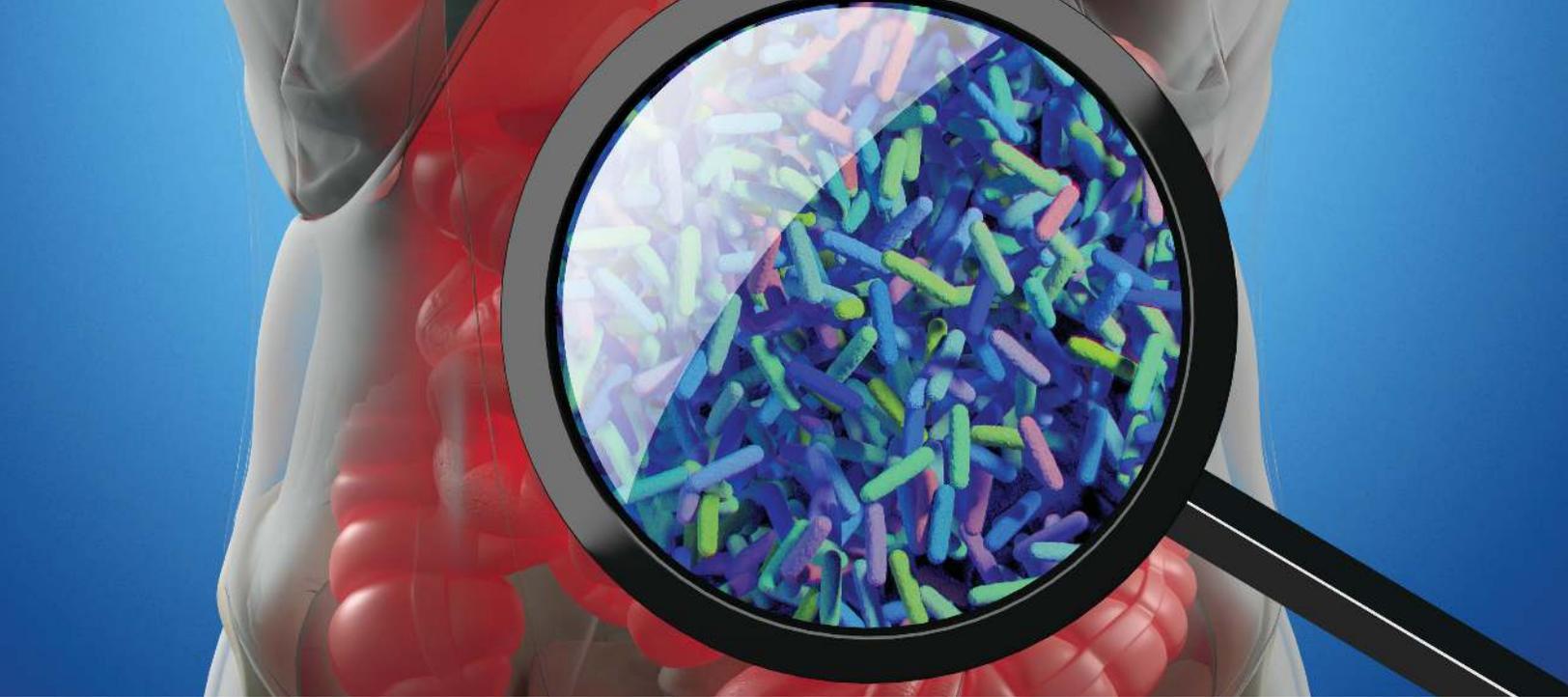
cells, especially lymphocytes. Lymphocytes are found mainly in the lymphatic system, and play an active role in protecting your body from pathogens.

Further, lymphatic fluid from intestinal tissues drains into the so-called mesenteric lymph nodes, which are key checkpoints that determine the exact location of various inflammatory responses in the body. [Note: Lymphatic fluid is collected from the spaces between cells in the body's tissues. It is taken first through lymph capillaries and then larger lymphatic vessels to lymph nodes to be cleaned by lymphocytes, before emptying back into the blood.]

To complicate matters further, every one of us harbors at least 160 bacterial species in our gut – with some species found in many individuals, while others are only found in a few.<sup>25</sup> Most are harmless, some are beneficial to our health, while others are harmful. Interestingly, the individual differences in gut bacterial populations between people appears to be smaller than the differences in bacterial populations between various habitats within the same individual.

So, for instance, the composition of gut bacteria in the mouth of every individual is very different from that of their rectum. Similarly, there is a significant difference between gut bacteria in the jejunum (a part of the small intestine) relative to the large intestine, or colon. The overall profile of gut bacteria within a particular individual's gut seems to be reasonably stable over time.

With all this in mind, what do we know about the role our gut bacteria play in maintaining our health – and how are they involved in inflammation?



## The Connection Between Your Gut Bacteria and Your Immune System

There is a complex relationship between your gut-based immune system and the various species of bacteria that reside in your gut, which is crucial for your body to be able to tell the difference between pathogenic (harmful) and non-pathogenic (harmless or beneficial) organisms that enter your body through your mouth.

That's because cells that line the inside of your gut – known as epithelial cells (which by the way also line the insides of your lungs, reproductive, and urinary tracts) – are capable of detecting specific proteins (known as antigens) that are expressed on the surface of pathogenic organisms.

When they encounter a pathogenic antigen, epithelial cells in the gut initiate suitable responses, including informing neighboring immune cells such as macrophages and lymphocytes about the presence of the pathogens.<sup>26</sup> This leads to a ramping up of the expression of pro-inflammatory genes, increased production of pro-inflammatory cytokines and interferons, and recruitment of more immune cells to deal with and destroy the invaders. [Note: Interferons are a group of signaling proteins made and released in response to pathogens, mainly to inform nearby cells so they can strengthen their own defenses.]

Therefore, it makes sense that the balance of beneficial to harmful bacteria in your gut plays a prominent role in determining the extent of inflammation in your system. In fact, health experts now believe that disturbances in the balance of gut bacteria may underlie many of the health problems that afflict us.

Reduced gut bacterial diversity and/or different degrees of overgrowth by more aggressive pathogenic bacteria may be responsible for inducing inflammation – leading to the development of adverse health conditions.<sup>27</sup>

Inflammation in the gut also lowers production of neurotransmitters, especially dopamine and serotonin, which can lead to depression, anxiety, and mood swings.

Helpfully, some of our gut bacteria do possess the ability to counteract inflammation, via one or more of the following actions:

- ◆ Preventing the growth and activity of inflammation-promoting bacteria, thereby lowering overall inflammatory tone.
- ◆ Tightening the gut wall barrier, allowing fewer inflammation-inducing components to enter the bloodstream.
- ◆ Interacting directly with and shutting down pro-inflammatory components of the immune system.



For example, many strains of a type of bacteria known as *Lactobacillus* can counteract the growth and activity of another type of bacteria known as *E. coli* (*Escherichia coli*). *Lactobacillus* is a so-called “gram-positive” bacteria that converts sugars to lactic acid and makes up a significant component of our gut bacterial population at a number of different sites. On the other hand, *E. coli* is a “gram-negative” bacteria that is well known to be harmful for our health.<sup>28</sup>

Similarly, consumption of the beneficial *L. plantarum* 299v (*Lactobacillus plantarum* 299v) has been shown to reduce inflammation, along with lowering levels of the pathogenic *C. difficile* (*Clostridium difficile*) in critically ill patients.<sup>29,30</sup>

# Gram-Negative Bacteria, LPS, and Inflammation

So, we can ask, which of our gut bacteria are responsible for causing inflammation?

Obviously, bacterial species that are already known to be harmful for our health are good candidates for promoting inflammation – including *E. coli* (*Escherichia coli*) and *B. fragilis* (*Bacteroides fragilis*), along with other related and unrelated species.

*E. coli* and *B. fragilis* often contaminate our food and contain a molecule known as lipopolysaccharide (LPS) in their outer cell membrane. The interaction of LPS with macrophages has been shown to lead to the release of pro-inflammatory cytokines and trigger inflammation. Not surprisingly, greater proportions of these two types of bacteria in the gut have been linked to inflammatory bowel disorders.<sup>31-33</sup>

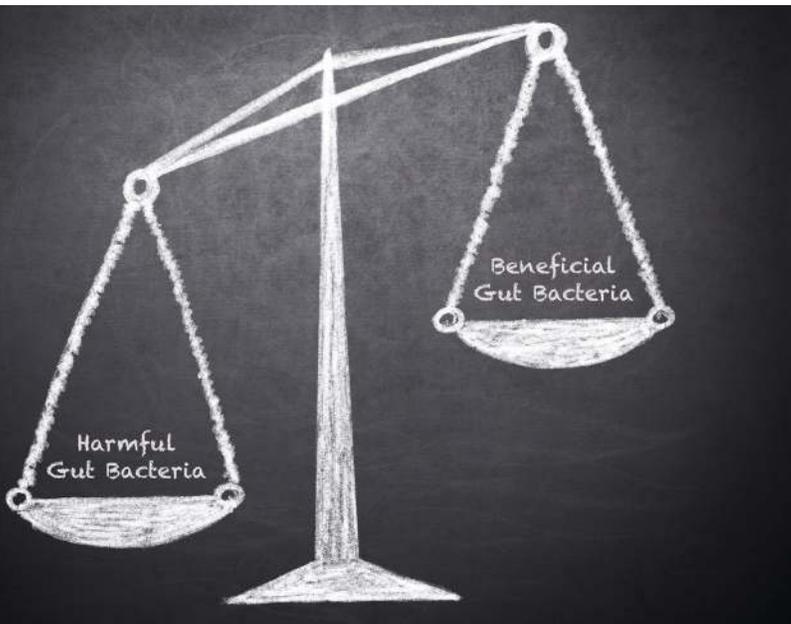
## The Benefits of Probiotics

If the composition of your gut bacteria is a significant factor when it comes to inflammation, consuming foods or supplements that favorably influence the balance of beneficial to harmful gut bacteria should be an effective strategy to counter inflammation.

For instance, the regular consumption of beneficial bacteria known as

probiotics has been shown to favorably influence the composition of gut bacteria. Probiotics may also have more direct positive effects on the immune system and gut wall permeability. Clearly, the more intact your gut walls are, the smaller the risk of pro-inflammatory molecules entering your bloodstream.

Originally, probiotics meant organisms or substances that contributed favorably to intestinal microbial balance.<sup>34</sup> However, today, the widely accepted definition is that “probiotics are live microorganisms which when administered in adequate amounts confer a health benefit on the host.”<sup>35</sup>





Specifically, lactic acid fermented foods such as yogurt, cheese, sauerkraut, salted gherkins, olives, and capers contain high amounts of live bacteria, often belonging to the same *Lactobacillus* species that are now mainly used for probiotics.

Yogurt was launched in Paris in 1906 on the basis of Elie Metchnikoff's theories.<sup>36</sup> He was the first to suggest that consumption of bacteria, specifically *Lactobacillus*, could contribute to improved health and a longer life.<sup>37</sup>

Similarly, in search of bacterial species with better resistance to the acidic pH of the stomach and the digestive juices of the duodenum (the first part of the small intestine), *L. acidophilus* (*Lactobacillus acidophilus*) was launched in the USA in the 1930s. *L. paracasei* started to be used as a probiotic in Japan during the same period.<sup>38</sup>

So, do these and other probiotics really help, or are they just another food fad?

Promisingly, research findings indicate that beneficial bacteria such as probiotics play an important role in our overall health, including helping to manage inflammation within safe levels.

For instance, enzymes made by some types of beneficial gut bacteria help to ferment complex carbs and fiber and break these down into their individual nutrients, so that the body can absorb them more efficiently.<sup>39</sup> Other gut bacteria make vitamins K, B1 (Thiamine), B7 (Biotin), B9 (Folate), and B12, which the body uses.

## Here are a few more examples of how gut bacteria can influence your health:

- ◆ The relative proportion of the bacterial species *Bacteroidetes* has been shown to be lower relative to *Firmicutes* in obese people than in lean ones. Also, a greater abundance of *Bacteroidetes* correlates with percentage loss of body weight.<sup>40</sup>
- ◆ Yogurt supplemented with *L. acidophilus* and *B. longum* (*Bifidobacterium longum*) was shown to increase blood levels of high-density lipoprotein (HDL, or “good”) cholesterol.<sup>41</sup> Further, blood levels of total cholesterol and low-density lipoprotein (LDL, or “bad”) cholesterol were seen to be lower after consumption of *L. plantarum* 299v.<sup>42</sup>
- ◆ In a randomized, double-blind, placebo-controlled human clinical trial, 40 healthy adults were given the probiotic *L. salivarius* (obtained from breast milk) for four weeks. At the end of the trial, their blood levels of natural killer (NK) cells and monocytes – both critical components of immune defense – were significantly higher than before, along with other improved immune parameters.<sup>43</sup> Also, consumption of *L. casei* for three weeks was shown to significantly increase NK cell activity.<sup>44</sup>
- ◆ In a randomized clinical study, patients undergoing surgery for ulcerative colitis were treated with a mixture of various probiotic bacteria for 12 months. At the end of the study, they were seen to have significantly lower levels of the pro-inflammatory cytokine interleukin-1 (IL) beta in their blood, along with a lower risk for a common post-surgical complication known as pouchitis.<sup>45</sup>





♦ In another study, 20 patients with inflammatory bowel disorders were given probiotic yogurt containing *L. rhamnosus* and *L. reuteri* for 30 days. Afterwards, these patients showed a significant increase in their blood levels of regulatory T cells. This type of T cell manages the immune response, prevents the immune system from attacking its own body, and is always on the lookout for abnormally-growing cells to attack and destroy. The probiotic yogurt also lowered blood levels of the pro-inflammatory cytokine interleukin (IL)-12, which is made in response to antigenic stimulation.<sup>46</sup>

♦ In a recent study, the intestinal content of *Lactobacillus* in elderly people was seen to correlate positively with their white blood cell count. In other words, their immune system got a boost. However, the higher their levels of *Lactobacillus*, the lower their levels of blood glucose and oxidized LDL-cholesterol. Both are risk markers for inflammation, as well as for metabolic and heart-related health conditions.<sup>47</sup>

Whole plant foods such as fresh, locally grown, non-irradiated fruit and vegetables, also lower systemic inflammation. This is because they are processed by beneficial bacteria in the gut, allowing them to proliferate relative to harmful bacteria.<sup>48</sup>

In conclusion, your gut is home to a complex and sensitive defense mechanism designed to protect you against pathogens that enter your body through your mouth. The balance of beneficial to harmful gut bacteria determines the extent of inflammation in your system – and disturbances in this balance may create, or contribute to, many health problems.



## INFLAMMATION DO'S & DON'TS

As you have seen, inflammation is an essential component of your body's immune response, whose job is to protect your body from infections and heal your body after injury. However, the inflammatory response is only meant to last a short time. When it goes on for too long or goes out of control – known as “chronic” inflammation – it can lead to serious health problems.

Unfortunately, the current mainstream medical approach to managing chronic inflammation and its consequences can best be described as symptomatic. The intent is merely to dampen the inflammatory response using immune-suppressive agents and/or steroids, both of which only reduce the extent of inflammation instead of completely eliminating it.

More importantly, such “solutions” don't address the underlying processes that created the inflammatory process in the first place. They also don't allow damaged cells and tissues to heal properly. Unless we tackle the underlying causes of inflammation, all we are really doing with such solutions is suppressing the body's natural healing processes, while allowing inflammation to continue damaging the body.

Thankfully, there is a much simpler and more effective method available to us. Many health experts agree that managing your diet and lifestyle can be a powerful tool to both prevent and combat inflammation.

For example, Dr. William Joel Meggs recommends “anti-inflammatory eating” which he describes as plenty of fruits and vegetables, fish three to five times a week, olive oil, moderate to low consumption of animal products, green tea, and turmeric, the yellow spice “shown to have potent anti-inflammatory properties.”<sup>49</sup>

Similarly, Dr. Frank Hu, professor of nutrition and epidemiology in the Department of Nutrition at the Harvard School of Public Health says: “Many experimental studies have shown that components of foods or beverages may have anti-inflammatory effects.”<sup>50</sup>

Dr. Andrew Luster also agrees that managing diet and lifestyle are the two best ways to keep inflammation under control.<sup>51</sup> Let’s look at some simple do’s and don’ts that may aid you in keeping inflammation within safe levels and getting (or staying) in the best health possible.





## Inflammation Do's

- ◆ **Do get sufficient sleep** – Insufficient sleep is considered a public health epidemic by the Centers for Disease Control and Prevention (CDC), while sleep disturbances such as insomnia have been linked to a greater risk of inflammation and adverse health consequences.<sup>52</sup>

For instance, a recent meta-analysis carried out by researchers at the UCLA Semel Institute for Neuroscience reviewed 72 existing studies with a total of over 50,000 participants. They were looking for associations between sleep duration and quality and known inflammatory markers, including C-reactive protein (CRP) and interleukin-6 (IL-6).<sup>53</sup>

Their analysis showed that sleep disturbances and surprisingly, sleep durations of more than 8 hours, were associated with increased levels of both CRP and IL-6. Shorter sleep durations were also associated with higher CRP levels. This suggests that sleep disturbances, including insomnia, are behavioral risk factors for inflammation – and that treatments targeting sleep behavior could potentially reverse inflammation and its health consequences.

Unfortunately, the sleep practices of the modern American family and their school-aged children leave a lot to be desired. According to the 2014 Sleep in America® Poll conducted by the National Sleep Foundation, while more than 90% of parents in the U.S. agree that sleep is either very important or extremely important, less than half of their children obtained 9 hours or more of sleep per night.<sup>54</sup> Shorter sleep durations were more common in older children.

Part of the reason was a busy daily schedule, both for the parent and the child. Electronic gadgets in the bedroom were another reason. When children left them on past their bedtime, the duration and quality of their sleep inevitably suffered. Electronic gadgets have the potential to disturb sleep through light and noise, harmful EMF radiation, along with providing a distraction that can lead to delayed bedtimes.

Clearly, the key to getting a good night's rest for both parents and children include going to bed at scheduled bedtimes, removing electronic gadgets including cell phones and TVs from the bedroom, and ensuring that the bedroom is dark, sound-free, and neither too cold nor too warm.

Additionally, some people find that drinking a glass of warm milk just before bedtime helps them sleep better. Others prefer herbal teas such as valerian and chamomile. Melatonin supplements have also been shown to aid sound sleep.

- ◆ **Do manage stress effectively** – Major life stressors are believed to trigger inflammation and lead to mood suppression, an inability to feel pleasure, fatigue, and social withdrawal.

Eastern practices such as yoga and meditation have been demonstrated to slow the harmful physical effects of stress and chronic, low-grade inflammation. For instance, in a 2017 study, 12 weeks of yoga and meditation slowed cellular aging, lowered inflammation levels, and significantly reduced levels of the stress hormone cortisol in the participants.<sup>55</sup> This program consisted of 90 minutes of yoga practice – including postures, breathing, and meditation five days a week over 12 weeks.



Similarly, in another recent study, a three-month yoga and meditation retreat was seen to lower inflammation and stress in the retreat participants.<sup>56</sup> Here, the participants engaged in physical postures, controlled breathing practices, and seated meditations. At the end of the retreat, levels of protective anti-inflammatory markers were higher, while levels of harmful pro-inflammatory markers were lower. Overall, the participants reported feeling less depressed, less anxious, and had fewer physical symptoms.



Both these and many other studies suggest that yoga practice can slow down the harmful mental and psychological effects of chronic stress. They also indicate that the anti-inflammatory benefits of yoga practice are enhanced when physical postures are combined with yoga breathing and meditation, or deep relaxation.

- ♦ **Do eat plenty of organic, antioxidant-rich, plant foods** – Consuming fresh, locally grown, organic fruits and vegetables that are naturally antioxidant-rich is a simple yet very effective way to manage inflammation. The brighter the colors and the more varied and nutritious the choice, the better inflammation is managed. This is because many of the pigments that give fruits and vegetables their color are also powerful natural antioxidants. Studies show that consuming antioxidant and nutrient-rich foods can reduce the risk of developing various age-related health conditions.



Typical examples of plant-based dietary antioxidants include curcuminoids, sulforaphane, green tea catechins, vitamin C, vitamin E – and there are literally many thousands more. Let's take a quick look at the root spice turmeric, cruciferous vegetables, and green tea, all of which contain powerful antioxidants and are proven dietary inflammation fighters.

### **Turmeric**

One of the key components in this common South Asian spice is a volatile oil known as aromatic turmerone, or ar-turmerone, which has been shown to support healthy inflammation levels in brain cells (known as neurons), reverse memory loss, and limit brain damage. Turmeric also contains the curcuminoid compounds curcumin, 5'-methoxycurcumin, and dihydrocurcumin.

Literally thousands of scientific studies show that these compounds possess remarkable antioxidant activity and interact with multiple molecular targets involved in inflammation to help suppress it.<sup>57, 58</sup>

### **Sulforaphane**

Cruciferous vegetables such as Brussels sprouts, kale, broccoli, cabbage, and cauliflower contain a powerful natural chemical known as sulforaphane. This compound has been shown to reduce levels of inflammatory markers such as CRP and IL-6 in laboratory experiments.<sup>59, 60</sup>

### **Green tea catechins**

Green tea contains polyphenolic compounds known as catechins, which are believed to be responsible for many of its health benefits. Of these, epigallocatechin-3-gallate (EGCG) is the most abundant and a powerful antioxidant, as established in multiple laboratory studies – suggesting a potential therapeutic role for EGCG in helping to manage inflammation and its health consequences.<sup>61-63</sup>



♦ **Eat foods rich in omega-3 fatty acids** - Omega-3 and omega-6 polyunsaturated fatty acids (PUFAs) are “essential” fatty acids, which means they are necessary for your health and wellbeing. “Essential” means your body cannot make them on its own – so you have to get them from your diet.

The omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA) – found mainly in oily fish – have been shown to block a number of components of the inflammatory process. Not surprisingly, they have been shown to ease symptoms in people with joint-related problems.<sup>64</sup>

Unfortunately, present-day Western diets are usually deficient in omega-3 PUFAs, while also containing way too much omega-6 PUFAs. This unfavorably high ratio of omega-6 to omega-3 PUFAs is believed to contribute to the development of inflammation and associated health disorders. Many people are consuming around a ratio of 16:1 of omega-6s to omega-3s. (In other words, for every gram of omega-3 fats, they’re consuming around 16 grams of omega-6 fats.)

If you can lower your ratio, health benefits generally follow. For instance, a ratio of omega-6 to omega-3 PUFAs of 4:1 has been linked to a 70% reduction in the incidence of death in patients with heart problems. Similarly, a ratio of 2 to 3:1 was seen to suppress inflammation in patients with joint-related problems. A ratio of 5:1 had a beneficial effect on asthma patients, whereas a ratio of 10:1 had adverse consequences.<sup>65</sup>

- ◆ **Detox regularly** – According to environmental experts, more than 80,000 hazardous chemicals pollute the air we breathe, the water we drink and wash with, the food we consume, the skin and hair care products we use, and cleansing products we protect ourselves with. Any one of these toxins alone, even at levels of a few parts per million, can affect your health.



The U.S. Environmental Protection Agency (EPA) currently lists 188 toxic air pollutants.<sup>66</sup> Unfortunately, airborne levels of toxic chemicals can be 2-5 times higher inside a typical U.S. home, relative to the outside!

Similarly, toxins in water may enter our bodies when we bathe and shower, chlorine and fluoride may contaminate the tap water we drink, and lead can leach into our water supply from pipes. Mineral water can be polluted if stored in plastic containers and water bottles. Bisphenol A (BPA) leaches from plastics and resins when they are exposed to hard use or the high temperatures seen in microwaves or dishwashers. BPA binds to the same receptors in our body as natural female hormones, and has been shown to contribute to serious health problems.<sup>67</sup>

Even our food is not safe from toxins. Growth hormones and antibiotics are routinely used in livestock and poultry farming. Food is irradiated to make it “safer” for consumption. Spraying food crops with toxic herbicides and pesticides is standard practice.

**We may not be able to stop these harmful chemicals from entering our bodies and triggering inflammation – but we can ensure that they leave our bodies, by detoxing regularly.**

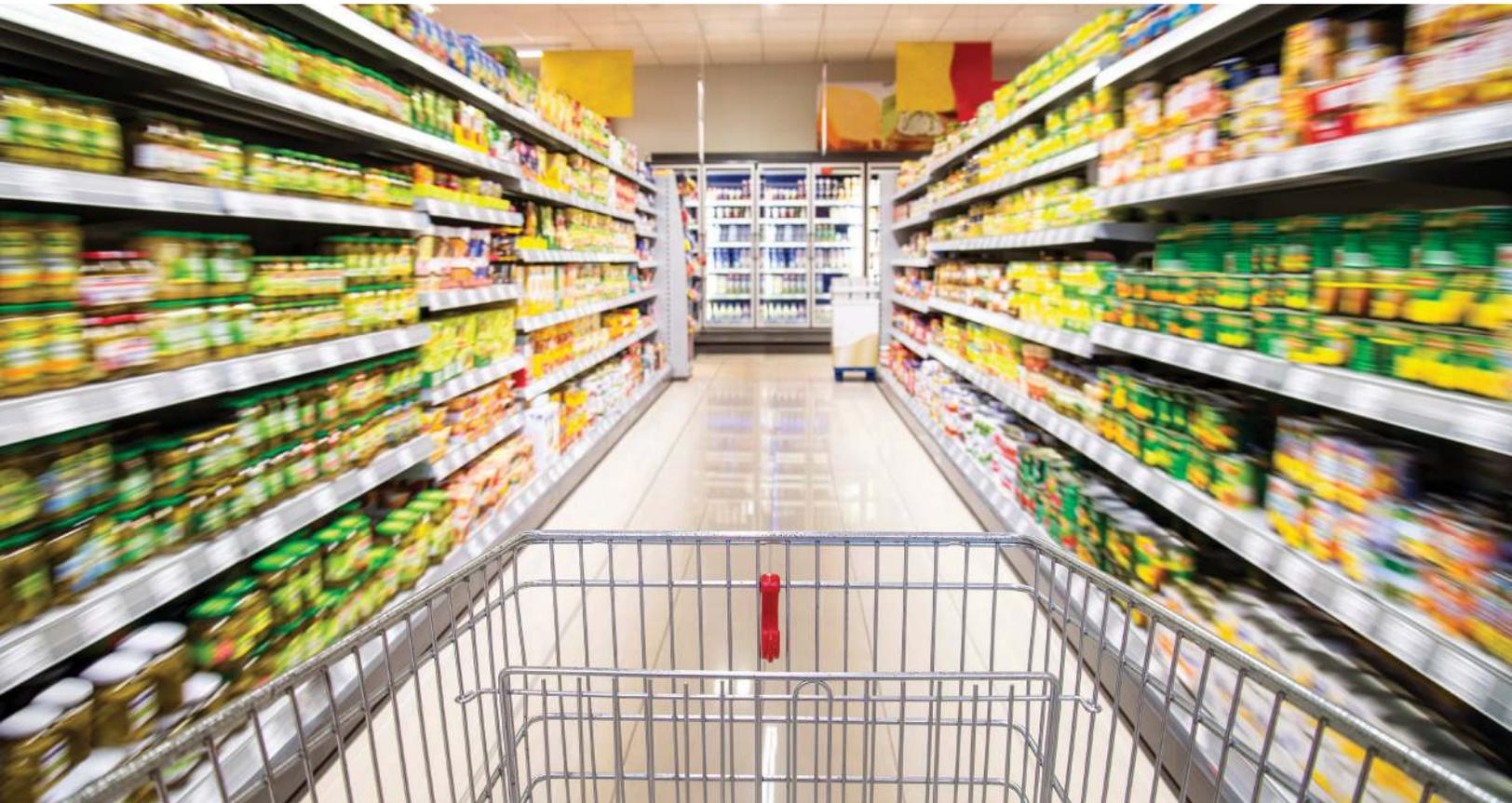
Toxic wastes need to be expelled from the body via the bowel, urinary system, lungs or the upper respiratory system, and skin. All four of these exits need to be detoxed in the right sequence over a sufficient period of time to ensure that toxins are completely eliminated and to minimize inflammation and its consequences caused by these pollutants.

## Inflammation Don't's

- ◆ **Don't eat overly refined foods** – Bread, crackers, pretzels, noodles such as spaghetti and macaroni, and cereals such as corn flakes are all examples of refined foods that should be consumed at a minimum or not at all.

That's because refined, high-carbohydrate foods have a high glycemic index (GI) – which is a measure of how quickly a carb food causes our blood sugar to spike, usually followed equally rapidly by a crash.<sup>68</sup> Generally speaking, high GI foods increase inflammation levels, leading to a greater risk of health disorders. They also contribute to unhealthy weight gain, which is an independent risk factor for inflammation.

Consumption of low GI foods result in smaller fluctuations in blood sugar levels and has been shown to have protective effects against metabolic and heart health-related conditions. They have also been shown to reduce levels of the inflammation markers CRP and plasminogen activator inhibitor type 1 in clinical studies.<sup>69</sup>



- ◆ **Don't consume trans-fats** – Trans-fats are unnatural synthetic products, created by artificially adding hydrogen to liquid vegetable oils in order to give them a longer shelf life. Also known as “partially hydrogenated oils,” trans-fats are difficult for the body to process and end up triggering inflammation and contributing to metabolic and heart-related health problems.<sup>70,71</sup>



In 2013, the U.S. Food and Drug Administration (FDA) determined that partially hydrogenated oils are no longer Generally Recognized as Safe (GRAS) in human food. Ideally, consumption of any and all foods and food-related products containing trans-fats should be completely avoided.

- ◆ **Don't consume low quality saturated animal fats** – Consumption of saturated animal fats has been linked to a greater risk of developing inflammation and associated health disorders. However, many leading-edge health experts believe this is because of the quality of the animal fats consumed, not because of the saturated fat itself. Conventionally-raised animals consume a diet high in inflammatory omega-6 fatty acids. These omega-6s are then passed along through their fat to the end consumer. The fat from animals that consume their natural diet (e.g. grass-fed and finished beef) has a much different nutritional profile.



♦ **Don't consume excess alcohol** –

Any alcohol you consume is broken down in your liver into by-products that are even more damaging to our health than alcohol itself. These by-products damage liver cells, promote inflammation, and weaken the immune system. Eventually, other organs may also be damaged.<sup>72</sup>

Heavy drinking, even for just a few days at a time, can cause fat to build up in the liver – a condition known as steatosis, or fatty liver. This is the earliest stage of alcoholic liver disease. The extra fat makes it more difficult for the liver to function properly and leaves it vulnerable to alcoholic hepatitis, with symptoms including fever, nausea, appetite loss, abdominal pain, and even mental confusion.

Another liver condition associated with excessive alcohol consumption is fibrosis, which causes scar tissue to build up in the liver. Continued alcohol consumption causes more buildup of scar tissue and eventually cirrhosis, which is a slow deterioration of the liver. Cirrhosis prevents the liver from performing critical functions. These include managing infections, removing harmful and toxic substances from the blood, and absorbing nutrients.<sup>73</sup>



- ♦ **Don't smoke or spend time around second-hand smoke** – Cigarette smoke is extremely harmful to your health. Toxins in the smoke interact with your immune system, triggering massive levels of inflammation in the epithelial cells that line your mouth, gut, and lung cavities.<sup>74</sup>

Cigarette smoke is the leading cause of a deadly condition known as chronic obstructive pulmonary health disorders (COPD), which is a leading cause of death all over the world.<sup>75</sup> Along with cigarette smoke, long-term exposure to pipe, cigar, and other forms of tobacco smoke, air pollution, chemical fumes, or dusts can also contribute to COPD.

Cigarette smoke impairs your innate defenses against pathogens, interferes with antigen recognition by your immune system, and promotes the development of autoimmune disorders. It also impairs immunity in your mouth, setting the stage for future gum disease – with sore, bleeding gums, painful chewing problems, and even tooth loss being the eventual consequences.



# TURMERIC 3D...

## The #1 Spice for Healthy Inflammation Levels

Now you know just how damaging chronic inflammation can be... and how it plays a role in many serious health problems.

As you've discovered, many surprising things can contribute to chronic inflammation including obesity, bad gut bacteria, and more. When you ignore inflammation, you can suffer from poor digestion, heart issues, autoimmune problems, brain fog and more.

That's why it's so important to do all the right things every day. Be sure to fit in enough sleep. Load your plate with plenty of fruits and vegetables, and avoid things like processed foods. Take time to manage your stress levels. Detox regularly. And be sure to find an exercise program you enjoy.

In addition to all these great lifestyle changes, there's also a new all-natural way to support healthy inflammation levels!

### **Turmeric 3D** from **Organixx**.

Just 2 capsules a day delivers a powerful inflammation-fighting blend of whole-food turmeric, vitamin D3, Turkey Tail mushroom extract, ginger, and the adaptogenic herb, Ashwagandha.

But one of the challenges when it comes to anti-inflammatory nutrients is low bioavailability. Often these nutrients aren't absorbed and used by your body. That's why we supercharged this unique formula in 3 scientifically-proven ways. We harnessed the dual powers of fermentation and fulvic acid to unlock each ingredient's fullest healing potential. And then topped that off with piperine, an ancient Indian spice that increases these nutrients' effectiveness by 2000%!

That makes **Turmeric 3D** the most cutting edge turmeric supplement anywhere in the world today. To support healthy inflammation levels, try **Turmeric 3D**. Each bottle comes with our iron-clad 100% ONE YEAR Money-Back Guarantee. If you're not happy with the results, just call us for a full refund of the purchase price. No questions asked.



To learn more about Turmeric 3D, go here:  
[Organixx.com/Turmeric-3D](https://www.organixx.com/Turmeric-3D)



## OUR VISION AND UNIQUE DEDICATION TO YOU

There is some very important and exciting news you need to know: a deep and fast-growing body of research is now showing that regardless of your genetic makeup, you have the ability - a tremendous ability - to positively shift your “gene expression” through proper nutrition and other health choices you make.

In other words, even at the genetic level, you CAN take control of your own health.

This is what the science of “epigenetics” is all about.

And here at Organixx, empowering you to take that control and make a profoundly positive impact on your health is the driving force behind everything we do.

Toward that end, it is our mission to provide you with a complete line-up of the world’s purest and most effective nutritional supplements that can truly make a powerful difference in your health and well-being.

Furthermore, we’re dedicated to providing these supplements to you at the fairest possible price. Yes, to ensure maximum effectiveness and safety we use only the world’s purest and best natural ingredients, and we employ very careful and exacting production processes, so our base costs are higher than “industry averages.” However, our price to you reflects mark-ups that are far lower than industry averages, because we genuinely want as many people as possible to benefit from these best-in-class supplements!

The choices you make really do play THE key role in helping you live a long, healthy, and high-quality life. At Organixx, we’re committed to providing you with the world’s best supplements, and the most beneficial health insights, so you can continue to make the best health decisions for yourself.

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