



The science behind it's amazing benefits.

The ancient Greek physician Hippocrates was famous for claiming, “All disease begins in the gut.” We believe that the inverse is also true: a healthy body begins in the gut. The modern diet is packed with sugar, processed foods and other additives that are difficult for body to process. This impairs the functions of the body, prevents nutrients from being properly absorbed and introduces toxins and other negative elements into the body. ACTIVZ LINQ is formulated to improve health through the gut/brain axis and activate multiple beneficial functions throughout the body. LINQ’s unique, proprietary formula is designed to supplement the body’s butyric acid (BTA) while simultaneously helping the body produce its own BTA in the large intestine.

The result is an optimal level of BTA that sets off a chain reaction of health benefits: increased metabolism, improve brain function and gastrointestinal health, optimized **epigenetic** impact on inflammation, a well-regulated immune system and healthy skin.

## LINQ Ingredients:

**BUTYRIC ACID** - A short chain fatty acid (SCFA) that is formed in the colon through the bacterial fermentation of carbohydrates like dietary fiber. It is the best source of fuel for the cells in the brain and throughout the entire body. BTA stimulates multiple functions within the body that keep you mentally sharp and feeling good. LINQ uses a molecular wrapping, patent-pending process to make LINQ more bioavailable, which means the body will absorb it in the right place at the right time. As an added bonus, this process also helps LINQ smell much better than any other BTA supplement.

**FRUCTOOLIGOSACCHARIDES, (FOS),**

**MANNAN-OLIGOSACCHARIDES (MOS),**

**DEGLYCYRRHIZINATED LICORICE (DGL)**

FOS, MOS and DGL are critical components to the LINQ formula. FOS and MOS are primarily added as food for the good bacteria in the large intestine. When fibers like FOS and MOS ferment in the gut, the byproduct is butyric acid. These ingredients help your body naturally produce its own BTA. DGL is added for its multiple health promoting benefits including its impact on hormone and mood balance as well as its adaptogenic

properties. A brief summary of studies of FOS, MOS, and DGL are at the end of this science summary of LINQ.

## LINQ Primary Benefits:

A short bullet list of 6 main benefits would be as follows:

- **INCREASES METABOLISM** - The ingredients in LINQ have been shown to **epigenetically increase the number of mitochondria** (the power plants of the cells responsible for energy production and metabolism), break down fat cells, and improve insulin sensitivity — all of which helps you create and use more energy. These ingredients also induce a hormone that makes you feel full faster, reducing your desire to overeat.
- **IMPROVES BRAIN FUNCTION** - By increasing the creation of brain cells (neurons), strengthening the blood-brain barrier, improving the connection between the brain and the gut (gut/brain axis) and restoring the health of the microbiome (gut/second brain), LINQ will not only allow your brain to function better, it will moderate mood disorders.
- **IMPROVES GUT FUNCTION** - LINQ uses epi-genetics to influence the genes (MUC2 genes, specifically) that are responsible for strengthening the lining of the gut and the stomach. The strengthening of the stomach and intestinal lining makes sure nutrients get absorbed properly and keeps harmful microorganisms from going where they don't belong. This also strengthens the link between the brain and the gut.
- **REGULATES THE IMMUNE SYSTEM** - LINQ regulates genes that have a positive impact on the immune system.
- **REGULATES INFLAMMATION** - LINQ helps control inflammation in the body by regulating the genes responsible for cytokines and t-cells.
- **BENEFITS THE SKIN** - The skin is the first barrier of the immune system – it lets good things in, and keeps bad things out. It also has its own immune system, the health of which is dictated by gene expression. LINQ not only encourages that healthy gene expression, it also induces collagen synthesis, which is what your skin needs to be strong and heal quickly.

## What Makes LINQ Unique:

Historically Butyric acid in LINQ has had such a horrible odor and terrible smell that it has been very hard to take. The developers of LINQ have discovered a way to molecularly wrap the molecules to allow them to be absorbed in the gut in the right place at the right time! Butyric Acid is best absorbed in the large intestine which is precisely what LINQ is designed to do. This dramatically reduces the smelliness of BTA, putting LINQ in a class of its own!

Butyric acid is a multifunctional molecule that has long been recognized for its distinct smell, its biting flavor, and—most importantly—its wide range of health benefits. Butyric acid is a [short-chain fatty acid \(SCFA\)](#): consisting of an acid “head” molecule linked to a

chain of carbon and hydrogen atoms. For the human body, there are two sources of butyric acid. First, it can come from diet, either through animal fats, plant oils, or nutritional supplements. In addition, butyric acid is directly synthesized by bacteria in the colon during the fermentation process for non-digestible fiber.

Functionally speaking, butyric acid is a highly versatile molecule, which is why it has such a wide range of benefits. Within the body, butyric acid can act in the following capacities:

- **Epigenetic regulator.** Epigenetic regulators are molecules that control where and when certain genes are expressed. Butyric acid is a histone deacetylase (HDAC) inhibitor, which means it is a type of epigenetic regulator that can block the function of proteins that make chemical changes to DNA and DNA storage molecules. Butyrate helps maintain “open” a productive state of genes by blocking a protein that takes off acetyl groups [R].
- **Energy substrate.** An energy substrate is the starting material for metabolic processes that generate energy in the form of Adenosine triphosphate (ATP): the energy currency of the cell. Butyric acid serves this purpose for both gut bacteria and human colon cells.
- **Transmembrane protein activator.** Butyric acid has been shown to activate several different proteins in the G-protein coupled receptor (GPCR) family. This protein family is involved in multiple cell signaling and communication processes, so it is no surprise that the benefits of butyric acid are so wide-ranging.
- **Weight Loss** - Butyric has gained popularity for its ability to possibly help people shed unwanted pounds. Scientific evidence has shown that people who are obese (as well as people who have type II diabetes) have a different composition of gut bacteria. Short chain fatty acids are believed to play a positive role along with probiotics in preventing **metabolic syndrome**, which almost always includes abdominal obesity. (3) Short chain fatty acids like butyric acid help regulate the balance between fatty acid synthesis and the breakdown of fats. In a 2007 animal study, after five weeks of treatment with BTA, obese mice lost 10.2 percent of their original body weight, and body fat was reduced by 10 percent. Butyric acid was also shown to improve insulin sensitivity, which helps guard against weight gain. (4)

## Butyric Acid Research:

## What Is Butyric Acid?

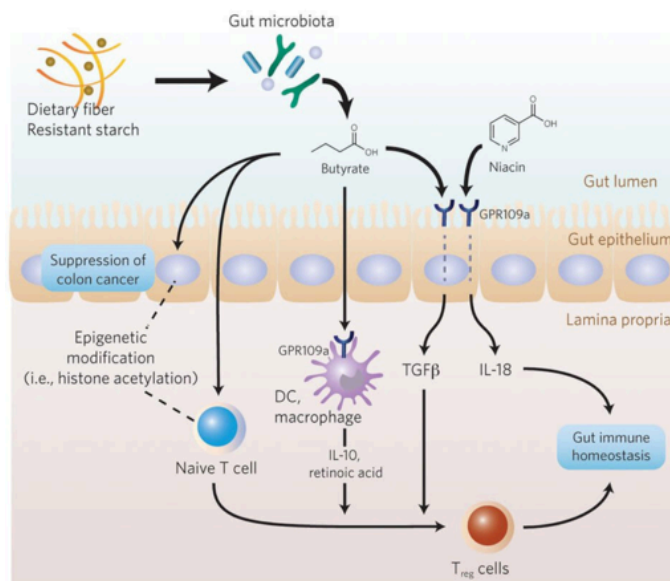
Butyric acid is a colorless liquid that is soluble in water. Scientifically speaking, its structure is four carbon fatty acids with the molecular formula  $C_4H_8O_2$  or  $CH_3CH_2CH_2COOH$ . Butyric acid has other chemical names, including butanoic acid, n-butyric acid, n-butanoic acid and propylformic acid. (14) Along with acetic and propionic acids, it account for approximately 83 percent of the short chain fatty acids in the human colon.

On its own, BTA has an unpleasant smell and bitter, pungent taste, with a somewhat sweet aftertaste. It occurs as esters in animal fats and plant oils. What's an ester? An ester is an organic compound that reacts with water to produce alcohols and organic or inorganic acids. Esters derived from carboxylic acids like butyric acid are the most common type of esters.

BTA is generated in the large intestine together with other short chain fatty acids from the fermentation of dietary carbohydrates, specifically **prebiotics** like resistant starches, fructooligosaccharides and other dietary fiber. (15)

The names “butyric acid” and “butyrate” are commonly used interchangeably even in scientific articles and studies. Technically, they have slightly different structures, but they're still very similar. Butyrate or butanoate is the traditional name for the conjugate base of butyric acid. Put simply, butyrate is almost identical to butyric acid, but it just has one less proton. Judging by scientific studies, they appear to be pretty much identical in their health benefits.

Butyric acid (also referred to as butyrate or BTA) . When it comes to the bacteria living in our colon, butyrate is their favored energy source, which may be one of the many reasons it has such a positive effect on [intestinal health](#) (2). But the benefits don't stop there. From inflammation to anti-cancer properties, butyric acid is proving to be the main attraction of the fatty acid show.



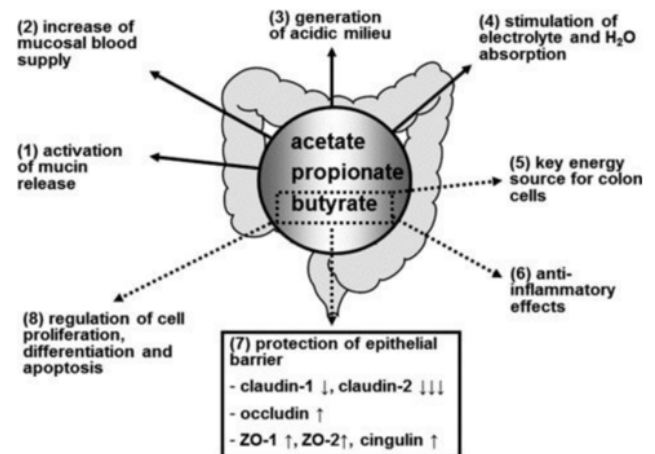
Supports the health and healing of cells in the small and large intestine

## 1. Alleviating Gastrointestinal Symptoms

Most of the scientific research on the benefits of butyric acid focuses primarily on the [GI tract](#), where it seems to have the most significant effects. That makes sense since butyric acid comes mostly from food and from fermentation in the gut microbiome. Studies have shown that butyric acid can have positive impacts on patients with both functional and inflammatory bowel disorders.

Functional bowel disorders, such as [irritable bowel syndrome \(IBS\)](#): can be characterized by a wide range of symptoms, including constipation, diarrhea, and abdominal pain, among others. Although clinical studies are limited, [several have shown](#) that taking butyric acid can lead to statistically significant reductions in abdominal pain and improvements in the normalization of bowel movements in IBS patients. The exact mechanism underpinning these effects is not fully understood. However, the presence of butyric acid in the gut can inhibit the growth of “bad bacteria” that negatively affect function and can cause infection, which may explain reduction of symptoms. Butyric acid may also impact water absorption in the gut, which is relevant for patients who experience diarrhea.

While clinical studies probing [the benefits of butyric acid for patients with inflammatory bowel diseases](#) like [Crohn's disease](#) are lacking, there are [in vitro studies](#) that support anecdotal evidence. Through its effects on gene expression, butyric acid indirectly impacts the activities of pro-inflammatory mediator proteins in the cell—most notably NF-KB—as well as the differentiation of T-regulatory cells. That means it can have important effects on the inflammatory aspects of the immune response and potentially reduce inflammation. Butyrate supplements resulted in improvements in 53% of Crohn's disease patients [\[R\]](#).



Additionally, [researchers](#) have found that exposing human colon cells to butyric acid also increased levels of glutathione (GSH): a powerful antioxidant, and reduced levels of reactive oxygen species, which suggests that butyric acid supplementation may be able to limit the oxidative damage that contributes to inflammation in the gut. Studies have shown butyrate supplementation improves symptoms of ulcerative colitis and

Crohn's disease, while another study stated that butyrate appears to be a "promising therapy" for irritable bowel syndrome (10, 11, 12). Keep in mind that most of these disease have inflammation at their root, which may be one of the reasons butyric acid shows such positive benefits.

In particular, patients with irritable bowel syndrome experienced a "significant decrease of pain during defecation" after just four weeks of butyrate supplementation. After 12 weeks, patients also experienced improvement in "urgency and bowel habit" (13).

Butyric acid has also been shown to be effective at helping reduce gut permeability or "leaky gut," which is a major factor in autoimmune-related digestive disorders like colitis (14).

## 2. Preventing and Treating Colon Cancer

One of the most intriguing possible benefits of butyric acid is the ability to prevent or even treat colorectal cancer. Some of the most famous studies done on butyric acid show its ability to fight cancer. This is especially true when it comes to colorectal cancer, with research finding that butyrate actually induces "death by apoptosis in colon cancer cells" (15).

The combination of a high fiber diet (which equals more butyric acid produced), healthy gut flora (which butyrate and resistant starch feed), and decreased inflammation that butyrate promotes appears to be the reason researchers state, "a high-fiber diet protects against colorectal tumors in a microbiota- and butyrate-dependent manner" (16). When it comes down to biochemistry, the results are clear: butyric acid can inhibit the growth and proliferation of colon cancer cells. That's largely because of the well-known "Warburg effect," which describes the tendency of cancer cells to generate energy almost entirely through anaerobic processes like fermentation—even in the presence of oxygen. Normal cells do not do this because anaerobic metabolism is less energy efficient. Using fermentation as a primary energy generation method leads to the production of unusually high levels of butyric acid. In turn, high levels of butyric acid increase its [gene-regulatory activities](#) in the cell, which causes a colon cancer cell to undergo apoptosis—that is, controlled cell death.

Similarly, there is [evidence](#) suggesting that butyric acid can promote the expression of a GCPR that induces cancer cell apoptosis. Normally, the GCPR is not active in colon cancer cells, but evidence indicates that when butyric acid is introduced, it can cause the GCPR to activate, which can cause the cancer cell to undergo apoptosis. This cell communication pathway is entirely separate from the HDAC-mediated pathway, which

makes butyric acid an even more exciting treatment possibility for researchers to explore in the future, since it may combat colorectal cancer through multiple pathways—which would make the treatment more effective by coming at the cancer from multiple directions.

Multiple studies have shown butyric acid's potential ability to fight cancer, especially cancer in the colon. It's actually shown an ability to “modify nuclear architecture” and induce the death of colon cancer cells. This is likely a huge reason why increased fiber intake has been linked with less colon cancer since higher fiber intake can typically equate to more butyric acid present in the colon. (5)

According to 2011 research published in the *International Journal of Cancer*, “the role of short chain fatty acids, particularly butyrate, in colon cancer therapy has been extensively studied, and its tumor suppressive functions are believed to be due to their intracellular actions.” This laboratory study further shows that butyrate treatment led to an increase in the programmed cell death of colon cancer cells. (6)

According to a 2014 scientific article, it looks like “a **high-fiber diet** protects against colorectal tumors in a microbiota- and butyrate-dependent manner.” (7) What does that mean? It means that most likely getting plenty of fiber isn't what fends off cancer on its own. It's eating a diet rich in healthy fiber AND having enough good gut flora AND enough BTA present in the body that can provides **cancer defense** in the colon.

### 3. Aiding in Weight Loss and Diabetes Management

Butyric acid has a nifty trick up its sleeve when it comes to weight loss. While many studies have only been done on animals, human research shows that short-chain fatty acids like butyrate have positive metabolic effects, helping improve insulin sensitivity and energy (glucose) balance (7). Other studies found that butyric acid also regulates weight by stimulating hormones in the gut and increasing the synthesis of leptin (a major player in appetite regulation) (8). In animal studies, butyrate caused obese mice to lose 10.2% of their original body [weight](#), and [body fat](#) was reduced by 10% [R].



Butyrate also improved various aspects of diabetes. People with diabetes have an imbalance of gut flora. A review of the evidence reported that butyrate had positive effects in both animals and humans with type 2 diabetes [R]. Human studies have also reported associations between fermentable fiber and improved blood sugar control, in addition to [insulin sensitivity](#) [R, R]. In young diabetic rats, sodium butyrate protected and supported insulin-producing cells, and prevented the release of sugar into blood [R]. In mice, butyrate increased insulin sensitivity [R].

Although the research on the potential for butyric acid to contribute to weight loss efforts is still in the early stages, animal studies suggest that there may be benefits of butyric acid for patients with diabetes, metabolic syndrome, and obesity. For instance, in [one study](#), a supplement of butyric acid significantly reduced obesity and insulin resistance in mice that were fed a high-fat diet. In rodent models of genetic or diet-induced obesity, supplementation of butyrate in the diet suppressed weight gain in part by inhibiting caloric intake, and by increasing energy expenditure [\[R, R\]](#). There is also [some evidence](#) suggesting that butyric acid may promote the release of hormones that suppress appetite. While it is clear that human studies will be needed before any strong conclusions can be drawn, butyric acid supplementation presents an exciting avenue for researchers and clinicians who are looking for innovative ways to help patients confront issues related to energy intake and metabolism.



Short chain fatty acids like butyric acid help regulate the balance between fatty acid synthesis and the breakdown of fats. In a 2007 animal study, after five weeks of treatment with BTA, obese mice lost 10.2 percent of their original body weight, and body fat was reduced by 10 percent. Butyric acid was also shown to improve insulin sensitivity, which helps guard against weight gain. [\(4\)](#)

Most of the evidence for linking BTA supplementation specifically to weight loss is based on animal research so far, but it does show positive effects in [treating obesity naturally](#).

#### 4. Neurological Health

Sodium butyrate, like exercise, places the brain into a state of “readiness for plasticity” and can benefit long-term memory [\[R\]](#). Butyrate is beneficial for protecting nerve cells [\[R,R\]](#). So far, most of the evidence-based benefits of butyric acid are tied to the gut microbiome and/or the GI tract, but the growing understanding of the gut-brain axis within the medical community has prompted researchers to consider a possible role for butyric acid for brain health. As a [group of researchers](#) from Weill College of Cornell University pointed out in a 2016 review, butyric acid may be an ideal candidate for treating complex neurological disorders, since it has such wide-ranging functionality.





A **stroke** model in mice showed that treatment with sodium butyrate after brain injury supported the development of new nerve cells in the damaged areas [R]. Also, treatment with sodium butyrate in mice that had brain trauma strengthened the barrier between brain and blood, which helped recovery [R]. The death of nerve cells obtained from mice with stroke-like injury was prevented by treatment with 3-hydroxy-butyrate (3-OBA) [R]. Mice pre-treated with a butyrate-producing bacterial species fared better in a model of brain injury [R]. These bacteria were also beneficial in a more complicated case of brain injury, such as vascular **dementia**, a disease where nerve cells die progressively due to blood vessel blockages [R]. Sodium butyrate has been helpful for **Alzheimer's** treatment [R, R]. Sodium butyrate also prevented the death of nerve cells in the spine in the model of spinal muscular atrophy in mice [R].

Butyrate is useful in with other types of nerve damage. For example, sodium butyrate was reported to protect nerve cells in the ear after treatment with antibiotics, thus preventing hearing loss [R].

Also [several studies](#) suggest that the sodium salt form of butyric acid can protect neurons from cell death in animal models of **Huntington's** disease [R]. and **Parkinson's** disease. Huntington's disease is a condition caused by damage in nerve cells that slowly begin to die out. Therapy with phenylbutyrate in mice with this condition improved their movements, body [weight](#), ability to recognize objects, and gene production [R]. The same beneficial effect was shown on the cell culture that carried the faulty gene causing Huntington's disease in humans, where the addition of sodium butyrate to the culture allowed the cells to live longer [R].

Many neurological disorders are also associated with a reduction in the availability of glucose in the brain, which may be directly impacted by the effects that butyric acid has on the expression of energy metabolism-related genes, as well as the compound's interaction with GPCRs that are involved in energy balance and metabolism. Interestingly, the Cornell researchers propose that butyric acid could also serve as an **energy** substrate for brain cells, the way it does for colon cells, which could potentially help restore energy homeostasis in patients with neurological disorders.

Sodium butyrate is beneficial against **depression** and other types of **mood disorders** [R]. In mice kept under chronic [stress](#), sodium butyrate has **antidepressant-like** effects [R]. It also had an **anti-manic** and **antioxidant** effect in rat models of mania [R]. One possible mechanism of such influence may be due to the fact that sodium butyrate

influences the processes in the hippocampus, the part of the brain responsible for emotions and emotional memory, as it increases several proteins that support nerve cell development [R]. Sodium butyrate alleviated **depression** and increased cognition ability in mice [R]. It can also **restore memory** formation when it is blocked with certain substances [R]. Sodium butyrate protects from **stress** in general. Some doctors prescribe sodium butyrate together with anti-seizure drugs because they are less effective if an afflicted person is under **stressful** conditions [R]

Addiction: Butyrate-containing drugs are a double-edged sword when treating **addiction**. In alcohol-addicted rats, supplementation of their diet with sodium butyrate lessened the quantity of alcohol the animals consumed [R]. Phenylbutyrate also reduced the desire for cocaine in a rat model of cocaine addiction [R]. On the other hand, there is increasing evidence that butyrate can act in concert with such drugs of abuse as cocaine, helping to establish certain behaviors caused by the addiction [R].

## 5. Irritable Bowel Syndrome (IBS) Relief

In general, butyric acid can have a very positive impact on gut health, which greatly affects the health of your entire body. Short chain fatty acids like butyric acid can help keep the gut lining healthy and sealed, which prevents **leaky gut syndrome** and all kinds of issues linked to a leaky gut like **IBS symptoms**. This is a type of digestive disorder that's characterized by a group of common symptoms, including changes in bowel movements and abdominal pain.

A scientific article published in the *Gastroenterology Review* looked at butyric acid's potential as an IBS therapy based on numerous studies conducted to date. Researchers conclude that "butyrate supplementation seems to be a promising therapy for IBS." (8)

Some notable 2012 research included in the article was a double-blind, randomized, placebo-controlled study involving 66 adult patients with IBS who were given microencapsulated butyric acid at a dose of 300 milligrams per day or a placebo in addition to receiving standard therapy. After four weeks, researchers found that subjects who took the butyric acid had a statistically significant decrease in the frequency of abdominal pain during bowel movements. After 12 weeks, subjects in the BTA group experienced decreases in the frequency of spontaneous abdominal pain, postprandial abdominal pain, abdominal pain during defecation and urge after defecation. (9)

## 6. Crohn's Disease Treatment

**Crohn's disease** is a type of inflammatory bowel disease (IBD) characterized by inflammation of the lining of the GI tract, abdominal pain, severe diarrhea, fatigue, weight loss and malnutrition. Again, this is a disease related to a leaky gut. A 2005 study published in the journal *Alimentary Pharmacology & Therapeutics* was small, but it found that "oral butyrate is safe and well tolerated, and may be effective in inducing clinical improvement/remission in Crohn's disease." (10)

Another 2013 study showed that butyric acid can reduce pain during bowel movements and inflammation in the gut, both of which are extremely helpful to Crohn's disease and other inflammatory bowel diseases. (11)

Short chain fatty acids like BTA truly play a crucial role in the maintenance of gut barrier integrity, which can help ward off a leaky gut and avoid an IBDs like Crohn's.

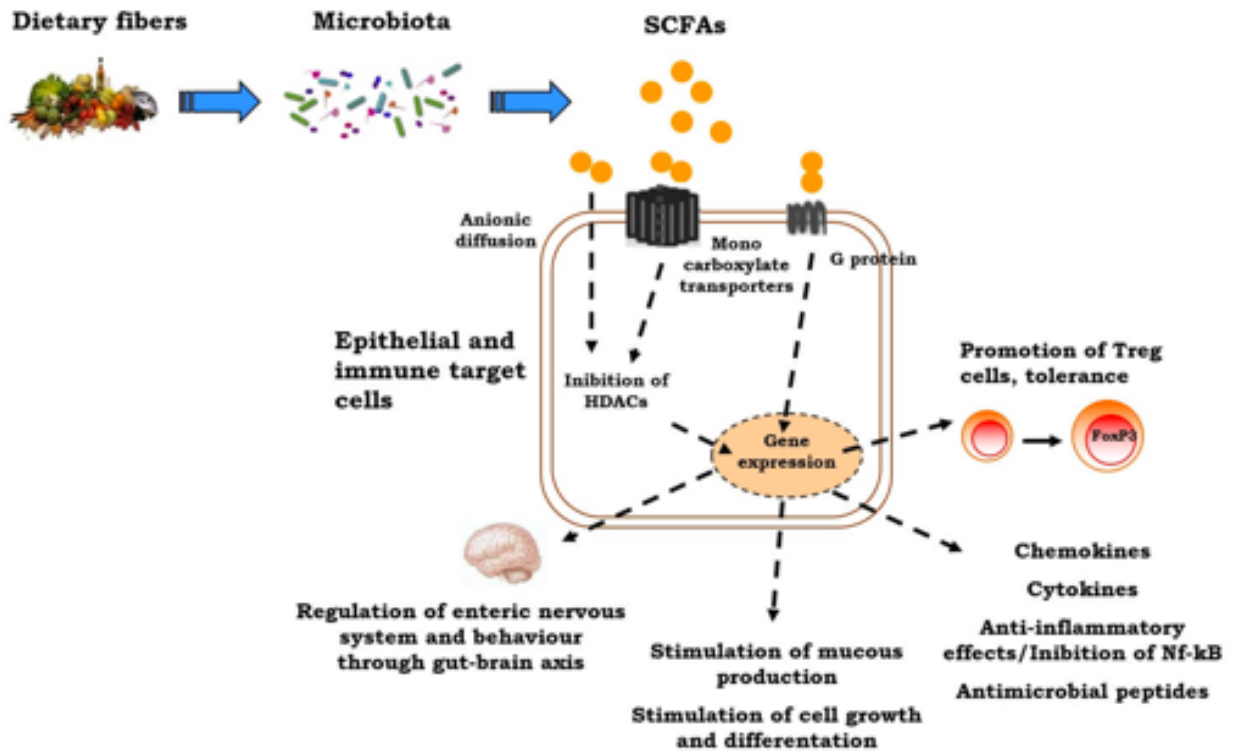
## 7. Combats Insulin Resistance

A 2009 study published by the American Diabetes Foundation looked at butyric acid's effect on the regulation of insulin sensitivity in mice consuming a diet high in fat. The study concluded that "dietary supplementation of butyrate can prevent and treat diet-induced insulin resistance in mouse." Researchers also found that the mice treated with butyrate did not have any increase in body fat and the butyrate supplement actually appeared to prevent obesity. (12) butyrate supplementation was found to improve glucose balance, improve insulin sensitivity, and even improve mitochondrial function (17, 18).

Human studies on fermentable fibers have been shown to improve insulin sensitivity (19). Not to mention, researchers have linked an imbalance in gut bacteria to diabetes, reporting that butyrate-producing bacteria was *lower than normal* in individuals with **type 2 diabetes** (20).

## 8. General Anti-inflammatory Effects

Studies have shown the broad anti-inflammatory powers of butyric acid. It's believed that not only can BTA help inflammatory conditions, but it might also have a helpful ability to manage immune responses. (13) As I've said before, **inflammation** is the root of most diseases, which is why having more butyric acid in your body could likely benefit many people with various health problems with inflammatory roots. Butyrate suppresses the activity of cells and proteins driving inflammation [R]. In mice, supplementation of their diet with butyrate-producing fibers **counterbalanced**



**inflammation caused by bacterial toxins [R].** Butyrate is also good for **reversing alcohol damage**. Mice given butyrate before being injected with high doses of ethanol had less inflammation and damage to the inner organs compared to controls [R]. These anti-inflammatory properties may be partly connected to the ability of butyrate to support the development of specific immune cells that block inflammation in the lining of the end gut in mice [R]. Butyrate also strengthens barriers between the cells, thus preventing invasion of microbes [R].

## 9. Possible Help for Autism

There are at least 2 studies on mice demonstrating that treatment with sodium butyrate is good for autism [R,R]. It was shown in mice that addition of sodium butyrate improved autistic behavior [R]. Another study showed sodium butyrate helped autistic mice to recognize objects better [R].

## 10. Liver, Pancreas, and Heart

Butyrate helped improve liver disease in animals [R]. Sodium butyrate was also reported to protect the pancreas from damage [R]. Sodium butyrate can prevent atherosclerosis [R]. Butyrate is thought to interact with key genes that make cholesterol, possibly reducing cholesterol production [R].

## 11. Red Blood Cells

Due to butyrate's gene-influencing activity, it can switch on the hemoglobin gene that works during the development of the child in the womb, thus ensuring the appearance of properly working red blood cells [R]. Moreover, butyrate can directly influence gene activity in Salmonella, making the bacteria less dangerous and vulnerable to killing [R].

## 12. Kill Certain Bacteria Directly

Studies show n-butyric acid can directly kill **Salmonella** (a bacteria that causes salmonellosis and severe diarrhea) and Clostridia perfringens (which causes **gangrene**) [R]. Recently, researchers discovered butyrate can destroy the cell wall in H. pylori – a bacteria that causes gastritis [R]. Butyrate can also kill bacteria indirectly by increasing the production of specific antimicrobial proteins that help the organism to destroy bacteria. This is also true for phenylbutyrate [R].

## Future Explorations of the Benefits of Butyric Acid

Future explorations of [the benefits of butyric acid](#) will likely proceed in many different directions, but the early laboratory and clinical evidence clearly indicates that butyric acid can have positive impacts on patients with a wide range of conditions. Given the strong biochemical support for the potential efficacy of butyric acid for preventing and treating gastrointestinal, [neurological](#), and metabolic disorders, researchers and clinicians alike are looking ahead to larger-scale clinical studies that support the growing body of anecdotal evidence on the real-world benefits of [butyric acid supplementation](#) for patients. Some are already recommending it to their patients, and many well-informed patients are discovering it for themselves as well.<sup>1</sup>

---

<sup>1</sup> <https://www.foundationalmedicinereview.com/blog/exploring-potential-health-benefits-butyric-acid/>

## FRUCTOOLIGOSACCHARIDES, (FOS),

Fructooligosaccharides (FOS) are composed of short fructose chains. They are a type of carbohydrate called oligosaccharides. FOS is typically listed on food labels as part of dietary fiber, under the total carbohydrates number. It is an ingredient in some brands of yogurt, nutrition bars. Because they are not digestible, FOS travels intact through the small intestine to the colon (large intestine), where they support the growth of healthy bacteria in the digestive tract.

May Protect against unhealthy bacteria - As reported in [Digestive and Liver Disease](#), FOS helps suppress *Clostridium perfringens*, a toxic bacteria associated with food poisoning. One animal study reported in [The Journal of Nutrition](#) indicated that FOS may also provide some protection against salmonella, another food-borne illness.

May decrease cholesterol - An [overview](#) of animal studies indicated that FOS are able to reduce both weight and cholesterol levels in rats and dogs, and that these findings may also be relevant for humans. (<https://www.ncbi.nlm.nih.gov/pubmed/26016937>)

Good source of fiber - FOS are a good source of soluble, dietary fiber. According to a [study](#) reported in the journal *Nutrients*, FOS have been shown to reduce, or eliminate constipation.

## MANNAN-OLIGOSACCHARIDES

Mannan-oligosaccharides are a glucomannoprotein complex that are sourced from certain fungi including *Saccharomyces cerevisiae* using enzymatic hydrolysis. MOS has been shown in vivo animal studies to inhibit bacteria with type one fimbriae (opportunistic *E. coli* and *Salmonella* are examples) from adhering to the intestines so that they can propagate. MOS's have also been shown to limit *Clostridium* populations in the gut as well. MOS's are known to block the opportunistic bacterium *Clostridium perfringens* from adhering to the intestines, which is a known cause of foodborne illness. Finally, MOS supplementation has been found in vivo animal studies to increase villi and intestinal mucosal health by stimulating SIgA. <sup>7</sup>

In humans, mannan-oligosaccharides have primarily been studied in the relief of bacterial urinary tract infections. The use of MOS in the relief of bacteria UTI's has been recommended in studies. The relief occurs by blocking bacteria from adhering to the urinary tract thus eliminating them from the body.

## **DEGLYCYRRHIZINATED LICORICE (DGL)**

**Deglycyrrhizinated licorice.** **Deglycyrrhizinated licorice**, or **DGL** is an herbal supplement typically used in the treatment of gastric and duodenal ulcers. It is made from licorice from which the glycyrrhizin has been removed. Licorice has been used in many forms at least since 500 BC by many cultures. Traditionally, the licorice root is used for hormonal issues, gut and throat issues, respiratory issues, and fatigue issues. We know now that the glycyrrhizin in licorice root can cause issues with hypertension, edema, and possibly effect a hormonal component of our renal regulation called aldosterone regulation. So, there is definitely a concern for long-term use in regards to licorice root.

But the deglycyrrhizinated licorice version has the substantial parts of glycyrrhizin removed, therefore is a safer option for long-term use if needed.

Dr. Julie Chen, M.D. states "One main reason I use DGL in my patients is for gastrointestinal issues. In my clinical experience, patients who have heartburn, peptic ulcer disease, or gastritis find great relief from DGL."

There was a study published in the *British Medical Journal* comparing an over-the-counter medication for peptic ulcer disease and DGL for 82 patients who had endoscopically healed peptic ulcer. Patients were given two tablets of DGL twice daily compared to a regular dosage of the over-the-counter medication for peptic ulcer disease. After two years on this regimen, the recurrence rate for gastric ulcers for the two groups was relatively similar. However, after both groups went off the medication or DGL, the recurrence of peptic ulcers occurred. This study demonstrates DGL as an effective potential alternative to taking over-the-counter stomach ulcer medications if you have any concerns about these medications.

Dr. Chen further states, "For many of my patients, they find that DGL also helps with fatigue because it has traditionally been used for adrenal support as well. Some of the more important takeaway points are that even though most of the glycyrrhizin is out of the DGL, you should still check your blood pressure daily at the start of using this supplement. Once you have been using the DGL for a while and are being monitored by a doctor for the long-term usage of this, you should still check your blood pressure once

or twice every week to make sure that your blood pressure remains in your normal range.”



<https://www.foundationalmedicinereview.com/blog/exploring-potential-health-benefits-butyric-acid/>

<https://www.ncbi.nlm.nih.gov/pubmed/19366864>