

# Top 23 Butyrate Benefits [Top 23 Science-Based Butyrate Benefits that Better your Health \(dailyhealthpost.com\)](https://dailyhealthpost.com/top-23-science-based-butyrate-benefits-that-better-your-health/)

You'll be surprised to hear this!

## 1. Addiction

When it comes to substance addictions, butyrate is a double-edged sword. Evidence in rat models suggests that enzyme-inhibiting actions by butyrate in the cortical regions of the brain “strongly decreased excessive alcohol intake of dependent rats” and demonstrated a preventative effect on relapse of alcoholism. (3) Another rat study of butyrate’s effect on relapse after cocaine addiction found:

“... relapse results from lasting neuroadaptations that are induced in response to repeated drug administration. The adaptations require gene expression, some of which being under the control of stable epigenetic regulations. [Topics covered below explain butyrate’s role in this context.] We have previously demonstrated that pretreatment with histone deacetylase (HDAC) inhibitors [of which butyrate is one] reduces the cocaine reinforcing properties as well as the motivation of rats for cocaine. We show here that the same HDAC inhibitors, trichostatin A and phenylbutyrate, significantly reduced the cocaine-seeking behavior.” (4)

By the same chemical mechanism, butyrate may help forge the behavioral and physical changes that coincide with addiction, though not contributing to addiction itself. (5)

## 2. Allergies

Seasonal allergies are a common affliction. The intranasal application of a butyrate solution has been shown to reduce the symptoms of allergic rhinitis in mice. (6)

## 3. Antibacterial

Probiotics are beneficial bacteria that live in our bodies. Part of their job is to attack harmful bacteria. Butyrate has been shown effective in fighting several harmful bacterium families, including:

- Shigella – an infectious disease that causes fever, abdominal pain, and diarrhea (7)
- Helicobacter pylori – causes chronic inflammation of the stomach and intestinal linings, gastritis, and ulcers (8)
- Salmonella – food and water contaminated with this common bacterium cause fever, abdominal pain, and diarrhea (9)

Antimicrobial peptides (chains of amino acids) are synthesized by the immune system to generally fight off disease. They work by breaking down bacterial, viral, and fungal cells. Butyrate increases the production of these peptides, promoting proper immune

system function and protecting against infection. (10) Furthermore, (phenyl)butyrate strengthens the tissues that form the inner and outer layers of cells, creating barriers to pathogens. (11)

## 4. Anti-inflammatory

Butyrate supports the immune system by regulating cellular genes involved in an inflammatory response. It decreases inflammatory expression through protein mediation. In addition, oxidative stress is a known cause of inflammation. Butyrate increases antioxidant activity, thereby reducing stress and improving defense mechanisms. (12)

What's more, butyrate can reverse inflammation and other damage caused by alcohol consumption, support inflammation-blocking cells, and strengthen cellular membranes to keep pathogens at bay (13,14,15).

## 5. Arthritis

Rheumatoid arthritis is a systemic inflammatory autoimmune disease, while osteoarthritis is the result of the physical deterioration of joints and connective tissue. An association between gut inflammation and certain forms of rheumatoid arthritis has been established. It's known that people with certain forms of autoimmune conditions carry low levels of the bacteria that create butyrate. (16)

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IL-6 is a protein that has been identified as contributing to immune response and inflammation associated with rheumatoid arthritis and other inflammatory diseases, such as inflammatory bowel disease. Butyrate down-regulates IL-6, thus reducing inflammation. (17)

## 6. Autism

The causes of autism are complex and not confined to only one factor. What we do know is that the number of children diagnosed with autism spectrum disorders has increased in the last forty years from 1:5000 in 1975 to 1:68 in 2015.

Two characteristics associated with autism are repetitive behaviors and difficulty with social communication. A 2016 study explored the use of butyrate to ameliorate these specific behaviors. Because butyrate is an epigenetic regulator (a non-gene substance that affects gene behavior) and enzyme inhibitor, it can influence brain activity and behavior. Excitatory neurotransmitters and activation genes in the prefrontal cortex were affected by the ingestion of a small dose of butyrate, resulting in the lessening of the measured behaviors. (18) Another study found that cognition deficits in mice with autism were also significantly reduced after administration of butyrate. (19)

## 7. Autoimmune Disorders

This type of disease occurs when the immune system attacks healthy cells, creating a chronic environment of imbalance, sickness, and pain. Butyrate is probiotic, supporting appropriate immune system response.

It has been beneficial in the treatment of:

- Crohn's disease (20)
- Ulcerative colitis (21)
- Irritable Bowel Syndrome (22, 23)
- Type 1 diabetes (24)

A lack of adequate SCFA allows other bacteria to proliferate out of control. People with encephalomyelitis (a/k/a multiple sclerosis, inflammation of the brain and spinal cord) or type 1 diabetes, for example, have been shown to have the described gut microbiota imbalance. (25)

To put things in perspective:

“The human intestinal microbial compartment includes at least 1,000 distinct bacterial species, totaling about  $10^{14}$  bacteria and containing 100-fold more genes than their human host...Most pathogens enter the body throughout the intestinal mucosa, and must be rapidly eliminated by a protective immune response...the intestinal immune system has to discriminate between invasive organisms and harmless antigens, inducing immunological tolerance towards the latter.” (26)

## 8. Blood Sugar

An imbalance of gut bacteria can lead to “leaky gut”, in which the intestines perforate and leak microbes, toxins, and undigested food into the bloodstream. Intestinal permeability is common in people with type 1 diabetes. (27) As we know, managing blood sugar is imperative with diabetes to prevent the horrible consequences.

Beta cells are responsible for storing and releasing insulin. Butyrate significantly increases beta cell growth and function in diabetics, improves glucose homeostasis by stimulating insulin production, and decreases blood glucose in the event of beta cell dysfunction. (28) A study published in the journal *Diabetes* found that butyrate improves insulin sensitivity and can even prevent insulin resistance in mice. (29)

## 9. Brain and Nerve Development

There is an undeniable link between gut microbes and the central nervous system. SCFA modulate protein synthesis, reduce oxidative stress, and are able to cross the blood-brain barrier. Observed effects of butyrate on brain cells and nerves after stroke (in which both are severely damaged) showed marked enhancement of

brain cell proliferation. (30) In fact, "... the metabolism of a high fiber diet in the gut can alter gene expression in the brain to prevent neurodegeneration and promote regeneration," writes one study. (31)

Taking butyrate before brain injury also improves recovery and cognitive outcomes (). Plus, the nutrient is beneficial in preventing hearing loss as well as damage caused by vascular dementia, spinal muscular atrophy, and amyotrophic lateral sclerosis (ALS) (32,33,34,35,36)

In addition, butyrate enhances learning and memory by increasing neural plasticity. (37)

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## 10. Cancer

Research has determined that on its own, butyrate inhibits cancer cell proliferation and causes apoptosis (cell death); however, it isn't robust enough as a cancer treatment. It can, however, be an effective component when combined with other anti-carcinogens. (38) With antioxidant properties and the ability to regulate enzyme function, butyrate also triggers gene activation that depresses cancer cells. (39)

Butyrate is not only created in the human gut but in animals as well. Butter (from where butyrate gets its name) and the cow's milk it's made from contains tributyrates, a butyrate derivative. When it comes to its effect on cancer cell apoptosis, tributyrates (also found in honey) is more potent. A remarkable phenomenon is tributyrates' ability to distinguish cancerous cells from healthy ones. (40, 41)

Alone or in combination with other nutrients, butyrate and its derivatives are effective in killing cancers of the breast, blood, colon, and prostate. In fact, one study found that incidences of colon cancer tumors were reduced by 75% in mice who consumed a high-fiber diet and had healthy levels of butyrate-producing bacteria (42). This is due to the nutrient's ability to kill cancer cells directly, cut off tumors from nourishment, and stimulate cancer-fighting T cells (43,44).

Cancer researchers are exploring different methods of administering butyrate as treatment, including orally and via intravenous injection. One novel approach is to inject butyrate directly into tumors. (45) You wouldn't do that with conventional chemotherapy drugs.

## 11. Cardiovascular Health

Atherosclerosis is better known as "hardening of the arteries". It occurs when plaque sticks to artery walls, narrowing them and making them less pliable. This is a major contributing factor of stroke and heart attack. Butyrate has been found to slow the progression of this condition by stopping plaque from sticking to artery walls. (46)

## 12. Cholesterol

SCFA regulate fat metabolism in the intestines. How the body manages blood cholesterol is partly genetic; research has identified nine key genes involved in regulating cholesterol synthesis. Butyrate acts on these genes and down-regulates their expression, which may alter one's predisposition in how cholesterol is metabolized. (47)

Chronically high low-density lipoprotein (LDL) or imbalanced cholesterol in the blood contributes to a variety of serious illness, including obesity, cardiovascular disease, diabetes, hypertension, and cancer.

## 13. Depression, Anxiety, and Psychological Disorders

By way of regulating enzymes that act on amino acids (the building blocks of protein), butyrate promotes the growth of brain tissues, particularly in the hippocampus. This is the part of the brain responsible for emotion. For psychological conditions like bipolar disorder and depression, butyrate has been shown to reduce stress, stabilize mood, and improve memory by up-regulating hippocampus cell activity. (48, 48, 49)

## 14. Gene Activity

Butyrate influences genetic signaling and DNA expression and repair. Butyrate's activity on cancerous cells, for example, has been shown to differentiate abnormal from healthy cells and stimulate expression of DNA repair proteins that inhibit abnormal cell growth. (50, 51)

## 15. Gut Health

Low pH in the lower digestive system is conducive to bacterial growth. Used primarily by the colon, butyrate (which is a fat) provides energy to colon cells. It is able to move through cell membranes, stimulate sodium and water absorption, and deliver nutrition. Butyrate supports the strength of intestinal cell walls, a healthy gut mucosa lining, increased blood flow, and facilitates the elimination of waste. (52)

It is known that a fiber-rich diet is important for digestive health and SCFA (short chain fatty acids) is why. Humans lack the enzymes to digest fiber and that's what the bacteria that produce butyrate live on. By breaking down digestive fiber, they regulate redox (oxidation) in the intestine. (53) Lack of adequate SCFA can contribute to colorectal cancer, diarrhea, and inflammatory bowel disease. (54,55,56)

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Studies show that butyrate can improve symptoms in 53% patients with Chron's disease and, when administered as an edema, reduce symptoms of Ulcerative Colitis by 13% (57,58).

## 16. Liver Support

Non-alcoholic fatty liver disease is completely preventable, as it is caused by diet and lifestyle. Regularly eating too much sugar (in its various forms) and refined flour are major factors in creating this condition. Its results can be life-threatening, such as liver dysfunction, cancer, diabetes, and heart attack. Fortunately, fatty liver can be reversed if the causes are removed so that your liver—supremely regenerative in its nature—will heal itself.

Other significant factors that contribute to a fatty liver are impaired intestinal barrier function (you see where we're going here) and insulin resistance. Research published in 2015 had this to say about butyrate and fatty liver disease:

“After 6 weeks [of being fed a typical Western diet], markers of liver damage, inflammation, toll-like receptor (TLR)-4 signaling, lipid peroxidation and glucose, as well as lipid metabolism, were determined in the liver tissue”, as well as a build-up of proteins in intestinal walls. (59)

That didn't take long.

At this juncture in the study, the mice with liver damage were given an oral butyrate supplement, which then significantly reduced liver inflammation. (60)

## 17. Mitochondrial Support

Mitochondria are microscopic components of cells that convert nutrients and oxygen into energy. They make life possible in all organisms larger than a microbe. Exposure to radiation, either from nuclear energy production or cancer therapy, can often damage or kill mitochondria. Butyrate, thanks to its antioxidant and epigenetic actions, protect mitochondria from radiation damage. (61)

## 18. Mood

The food we eat is responsible, at least in part, for the brain's secretion of mood-regulating hormones serotonin, norepinephrine, dopamine, and gamma-aminobutyric acid (GABA, a butyrate relative). GABA is a neurotransmitter that counteracts the effects of glutamate, an excitatory neurotransmitter, thereby quelling feelings of anxiety. Additionally, butyrate turns on the genes responsible for the regulation of the enzyme tyrosine hydroxylase, which has a role in the control of stress hormones and brain opioid production, influencing neuronal plasticity, stress, and cardiovascular functions. (62, 63)

## 19. Neurodegenerative Disease

Brain disorders such as Huntington's, Parkinson's, and Alzheimer's disease occur when brain cells stop talking to one another and prematurely die. We've already mentioned

that SCFA can penetrate the blood-brain barrier and that butyrate affects enzymes that break down proteins and is epigenetic in nature.

A 2015 study begins with this premise: “Probiotics actively participate in neuropsychiatric disorders.” In other words, the health of your digestive system and gut microbiota is directly related to brain health. Administration of butyrate to mice with induced brain impairment proved neuroprotective effects, improvement in cognition, and a drastic reduction in brain cell death, suggesting applications for vascular dementia. (64)

Other research for butyrate’s effects on Huntington’s and Alzheimer’s disease and amyotrophic lateral sclerosis (ALS, “Lou Gehrig’s disease”) found similar results, improving memory, cognition, staunching brain cell apoptosis, and turning off genetic triggers that contribute to these conditions. (65, 66, 67, 68, 69)

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## 20. Pancreas Support

The pancreas is a gland that secretes several hormones—primarily insulin. Insulin is responsible for regulating blood sugar and if it isn’t working properly, you’ve got diabetes. Pancreatitis is extreme inflammation of the pancreas and can be excruciatingly painful. If left untreated, this inflammation can seriously damage the pancreas.

Butyrate effectively reduces pancreatic inflammation, preventing permanent injury. (70)

## 21. Sickle Cell Disease

Hemoglobin is the protein in blood that transports oxygen throughout the body. Sickle cell disease is a hereditary disorder that results in abnormal hemoglobin. Because the hemoglobin is irregular, cells aren’t provided their necessary oxygen. This results in severe pain and fatigue, which can become chronic. In the long term, sickle cell disease can cause organ damage due to lack of oxygen. Because it is genetic, this is a life-long illness. (71)

Epigenetic actions upon the faulty genes that cause sickle cell disease can help to reduce its severity. Butyrate is effective at stimulating normal hemoglobin production by turning off the genes that cause its irregularity. Butyrate’s effectiveness is remarkable, at 50-85% of the patients involved in a 1995 study published in *Current Opinion in Hematology*. (72)

## 22. Weight Loss

It’s no secret that dietary fiber is essential for maintaining a healthy weight, but it can also boost weight loss. In fact, one study found that butyrate triggered a 10% fat loss in

obese mice. It works by both inhibiting calorie intake and increasing energy expenditure (73).

## The Bottom Line

From all these case studies, we see that dietary fiber is crucial for overall health, not only for its ability to aid digestion but also the subsequent chemical reactions that occur when you eat it. Many of us don't get enough fiber and eat too many processed and refined foods. Increasing the amount of fiber you eat isn't difficult or unpalatable. All fruits and vegetables contain fiber.

Some foods especially rich in dietary fiber include:

- Acorn squash
- Apple
- Artichoke
- Avocado
- Banana
- Barley
- Beans
- Berries
- Broccoli
- Brown rice
- Brussels sprouts
- Buckwheat groats
- Carrot
- Cauliflower
- Chia seeds
- Coconut
- Fig
- Flax seeds
- Hemp seeds
- Kale
- Lentils
- Millet
- Nuts
- Oatmeal
- Okra
- Parsnip
- Pear
- Peas
- Prune (or any dried fruit)
- Sweet potato
- Turnip greens



While eating butter and other dairy products may not be an option for everything, it is another way to up your butyrate levels. Just make sure to consume only organic dairy products.