How Gut Bacteria Influence Your Metabolism

Analysis by Dr. Joseph Mercola ✓ Fact Checked

August 26, 2022
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STORY AT-A-GLANCE

- Any given individual will have around 160 different species of bacteria colonizing their gut. This individual combination is known as your gut microbiome, and can have a tremendous influence on health and well-being
- Obesity is associated with as much as a 40% decrease in bacterial diversity. Improving diversity through probiotic supplementation can help resolve metabolic defects, resulting in fat loss
- Research has demonstrated that probiotics — beneficial bacteria found in fermented and cultured foods such as yogurt — have a measurable effect on several metabolic pathways
- A link has also been found between gut microbiome and obesity; 8.5% of obese and 11.5% of severely obese individuals reported chronic diarrhea, compared to 4.5% of those with normal weight
- One hypothesis is that chronic low-grade inflammation is at play. Not only is chronic inflammation a factor in obesity, but it can also contribute to diarrhea

This article was previously published September 30, 2019, and has been updated with new information.

Before we review the evidence that your gut flora plays a role in regulating your metabolism and likely is a factor in the development of obesity, please understand that there is beyond overwhelming evidence that excess seed oils and an increase in linoleic acid is likely the primary factor contributing to the obesity epidemic as discussed in my interview with Tucker Goodrich.

Hippocrates once said that "all disease begins in the gut," and the more we learn, the more accurate that statement proves to be. As noted in a 2018 paper:[1]

> *"While often-quoted figures suggest that the microbes that live in and on the human body outnumber human cells by 10:1, a more recent estimate suggests that we are essentially one part human to one part microbe in terms of cell number.[2]*
>
> *These commensal microorganisms have a vital role in human health. They break down otherwise indigestible dietary fibers and other components of food, produce vitamins, promote the development and maturation of the immune system, and prevent pathogenic bacterial species from colonizing the gut."*

According to evidence cited in this paper, of the 1,000 or so gut bacteria we know of, any given individual will have around 160 different species of bacteria colonizing their gut. This individual combination is known as your gut microbiome, and can have a tremendous influence on health and well-being.

The diversity of your gut microbiome begins to be established when you are an infant, and is affected by genetics, whether you are breast- or bottle-fed, and your immediate environment. Later in life your microbiome is significantly affected by your food choices.[3]

Diets high in sugar and processed foods may reduce the diversity and your overall health, while diets high in whole foods high in fiber tend to have a beneficial impact. For example, a number of studies have found obese individuals tend to have a less diverse gut microbiome,[4] in addition to having greater numbers of certain harmful bacteria and fewer beneficial ones.

Studies have shown obesity is associated with as much as a 40% decrease in diversity[5] and that improving that diversity through probiotic supplementation can help resolve metabolic defects, resulting in fat loss.[6]

Obesity Associated With Frequent Diarrhea

There's also a link between abnormal bowel movements and obesity, according to research[7] published in September 2019. As reported by Medical Xpress:[8]

> *"In the most comprehensive analysis of the relationship between Body Mass Index (BMI) and bowel habits to date, published today in Alimentary Pharmacology & Therapeutics, a team of physician-researchers at Beth Israel Deaconess Medical Center (BIDMC) found a strong association between obesity and chronic diarrhea independent of an individual's dietary, lifestyle, psychological factors or medical conditions ...*
>
> *"While several previous studies have pointed to an association between obesity and bowel habits, all lacked data on whether dietary or other factors drive the connection," said corresponding author Sarah Ballou, Ph.D., a health psychologist in the Division of Gastroenterology, Hepatology and Nutrition at BIDMC.*
>
> *"Our research confirms a positive association between obesity and chronic diarrhea and reveals for the first time that this relationship is not driven by confounding factors such as diet or physical activity level."*

Looking at data from the 2009-2010 National Health and Nutrition Examination Survey, the researchers found 8.5% of obese and 11.5% of severely obese individuals reported chronic diarrhea, compared to 4.5% of those with normal weight. "Stepwise regression revealed that severe obesity was independently associated with increased risk of diarrhea," the authors say.

Unfortunately, this study cannot shed light on why this is happening. One hypothesis is that chronic low-grade inflammation is at play. Not only is chronic inflammation a factor in obesity,[9] but it can also contribute to diarrhea.

Systemic inflammation is also believed to be one of the leading triggers for other serious diseases, including neurological degeneration,[10] Type 2 diabetes[11] and cardiovascular disease[12] — all of which, by the way, are also associated with obesity.

Committing to making changes to your gut microbiome can do far more than improve your bowel habits. Your gut health is important to most aspects of your health, including reducing your risk for cancer, metabolic syndrome and depression.

Probiotics Shown to Alter Metabolism

Improving your microbiome can be as simple as increasing your intake of fermented foods or taking a quality probiotic supplement. Previous research has demonstrated that probiotics — beneficial bacteria found in fermented and cultured foods such as yogurt — have a measurable effect on your metabolism.

One such study,[13] published in 2008, found the bacterial strains Lactobacillus paracasei and Lactobacillus rhamnosus affected a number of different metabolic pathways, including the metabolism of:

- Hepatic lipids
- Amino acids
- Methylamines
- Short-chain fatty acids (SCFAs)

As reported by Science Daily:[14]

> *"Adding 'friendly' bacteria changed the makeup of the bugs in the gut, not only because this increased the number of such bacteria, but also because the 'friendly' bacteria worked with other bacteria in the gut, amplifying their effects.*
>
> *One of the many biochemical changes observed in the researchers was a change in how mice treated with probiotics metabolized bile acids. These acids are made by the liver and their primary function is to emulsify fats in the upper gut. If probiotics can influence the way in which bile acids are metabolized, this means they could change how much fat the body is able to absorb."*

While some claim taking probiotic supplements or eating fermented foods won't have a significant impact on your microbiome, this particular study found otherwise. As noted by corresponding author Jeremy Nicholson with the department of biomolecular medicine at Imperial College:[15]

> *"Some argue that probiotics can't change your gut microflora — whilst there are at least a billion bacteria in a pot of yoghurt, there are a hundred trillion in the gut, so you're just whistling in the wind.*
>
> *Our study shows that probiotics can have an effect and they interact with the local ecology and talk to other bacteria. We're still trying to understand what the changes they bring about might mean, in terms of overall health, but we have established that introducing 'friendly' bacteria can change the dynamics of the whole population of microbes in the gut."*

Can Probiotics Effectively Aid in Fighting Obesity?

So, can probiotics actually have a beneficial impact on obesity? A number of studies suggest the answer is yes. Among them is a 2013 animal study,[16] which found the probiotics Lactobacillus gasseri BNR17, found in human breast milk, act as an obesity inhibitor and antidiabetic.

According to the authors, "The administration of L. gasseri BNR17 significantly reduced the body weight and white adipose tissue weight regardless of the dose administered." Such findings jibe well with studies[17] showing breastfed babies have a significantly lower risk of childhood obesity.

In another study,[18] published that same year, obese participants with a fasting blood sugar level above 100 mg/dL were given either BNR17 or a placebo for 12 weeks. At the end of the study, the treatment group had shed more body fat than the controls. As reported by the authors, "Despite there being no change in behavior or diet, administration of only the supplement of BNR17 reduced weight and waist and hip circumference."

Lactobacillus gasseri has also been shown to ease symptoms of irritable bowel syndrome and ulcerative colitis,[19] thanks to its anti-inflammatory effects. L. gasseri is also one of four bacterial strains shown to help eradicate Helicobacter pylori,[20] a primary cause of stomach ulcers.

A more recent review,[21] published in the journal Nutrients in February 2019, sought to "present evidence ... demonstrating the effects of various probiotic strains and their potential efficacy in improving obesity and associated metabolic dysfunctions." As noted in this paper:[22]

> *"A large body of evidence has described several possible mechanisms by which the gut microbiota can contribute to, and/or influence, obesity.*
>
> *Although so much is still unknown and debatable, thus far there is a general consensus that the gut microbiota is implicated in obesity through dietary carbohydrate fermentation, lipogenesis, excess energy storage, and several other pathways including a vast array of metabolites, hormones and neurotransmitters, some of which are known to control food intake and the regulation of energy balance."*

How Gut Bacteria Can Influence Your Fat Stores

Three main phyla or groups of gut microbes make up the human microbiome and serve diverse structural, protective and metabolic functions:[23]

- **Bacteroidetes** — Porphyromonas, Prevotella and Bacteroides
- **Firmicutes** — Ruminococcus, Clostridium, Lactobacillus and Eubacteria
- **Actinobacteria** — Bifidobacteria (the most prevalent type)

As explained in the 2019 Nutrients review,[24] in your gut, these bacteria protect your health by "displacing harmful bacteria, competing with pathogens for nutrients and producing antimicrobial factors."

Structural functions provided by them include "developing the immune system, inducing immunoglobulin A (IgA), and reinforcing the mucosal barrier," while metabolic functions "benefit the host by synthesizing vitamin K, folate and biotin" and play a role in the absorption of minerals such as magnesium, calcium and iron.

Importantly, gut bacteria also help break down the foods you eat and ferment digestive-resistant starches, turning them into beneficial SCFAs, which help modulate your immune response and inflammation.[25] As explained in the 2019 Nutrients review:[26]

> *"Degradation of dietary polysaccharides and fiber by Bacteroides and Firmicutes in the gut results in the production of SCFAs, such as propionate, acetate, and butyrate.*
>
> *Propionate is an important energy source for the host via de novo synthesis of lipids and glucose in the liver. Acetate is used in peripheral tissues as a substrate for cholesterol synthesis while butyrate represents a rich energy source for the epithelial cells that line the colon.*
>
> *Furthermore, microbiota is involved in the control of energy balance, food intake, and satiety via gut peptide signaling, through hormonal effects in the blood or by modulating the nervous system directly. The appropriate balance of these regulatory peptides may be disrupted if the microbiota composition is altered ...*
>
> *SCFAs ... also serve as signaling molecules that can activate G-protein coupled receptors (GPRs), including GPR43 (also known as free fatty acid receptor 2) in adipose and intestinal tissues.*
>
> *In adipose tissue, SCFAs bind to GPR43, thus promoting adipogenesis and increasing energy expenditure. In intestinal tissue, SCFAs bind to GPR43 leading to secretion of anorexigenic peptides ... resulting in improved glucose tolerance and increased energy utilization."*

Since SCFAs play such an important role in fat accumulation, the two phyla that produce SCFAs, Firmicutes and Bacteroidetes, may be used as markers for obesity. As noted in the 2019 review, obese individuals tend to have higher proportions of Firmicutes and Lactobacillus and lower proportion of Bacteroidetes and Bifidobacterium compared to normal weight individuals.[27]

Studies have also linked specific strains to specific health problems. For example, high levels of Bacteroides vulgatus (which is abundant in the human gut) appear strongly associated with inflammation, insulin resistance and altered metabolism.

Low levels of certain bacteria in the Firmicutes phylum, including Blautia and Faecalibacterium, have been linked to the accumulation of trunk-fat specifically.[28]

How Probiotics Can Benefit Your Health and Weight

The 2019 Nutrients review also details the mechanisms by which supplementation with probiotics can improve your health and weight. Key areas of influence include:[29]

- Enhancing the integrity of your intestinal epithelial barrier
- Enhancing the adhesion of bacteria to your intestinal mucosa, thereby facilitating colonization
- Producing antimicrobial and other health-promoting substances
- Inhibiting antibiotic microbes by competitive exclusion
- Modulating your immune system

While individual strains of bacteria have been linked to specific health effects such as reductions in trunk fat or lowered inflammation, several studies have demonstrated that multi-strain probiotics may be more beneficial than single-strain ones, as they tend to create synergistic effects.[30]

An Easy, Inexpensive Way to Improve Your Gut Microbiome

While probiotic supplements are widely available, few can compete with traditionally fermented foods, in terms of the diversity and sheer number of probiotics.

Fermented foods are also your least expensive alternative, as you can easily make them at home. Using a starter culture will speed the process and ensure you'll end up with a consistent, high-quality product.

Remember, your diet is one of the easiest, fastest and most effective ways to improve and optimize your microbiome, so the good news is you have a great degree of control over your health destiny.

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Beginning August 8, I am happy to announce that Mercola.com will be celebrating its 25th year of providing you with the latest news and discoveries in the field of natural health. What started as a platform where I can share my views and recommendations has grown into the No. 1 ranked Natural Health website in almost two decades — a feat not possible without your support.

During this historic week, I'll be sharing some unique and insightful articles that will showcase different aspects of my life. I'll also be releasing a documentary that chronicles my day in the Mercola office, plus a special video on how to take back control of your health freedom. There are some fun surprises along the way so this is one week you won't want to miss. Click below to learn more!

Learn More

Once again, I want to thank you, dear readers, for your support through these 25 years in this continuing journey to take control of your health.

Sources and References

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nothingsound
Joined On 8/13/2018 9:47:47 AM
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Has anyone noticed how many infants now wear that helmet to help shape their head? They are wearing it because they sit in a car seat, swing, or in a crib most of the day. No tummy time, no play time, no little if any interaction time ... they are in child care. Some are in child care at six weeks. Obesity because there is no time for play. To run and jump down those damn hard held games, use their imaginations indeed. Most of us think we need as much stuff that keeps both parents working! Two cars, everyone has a smart phone, eating out several times a week because there isn't time to cook, child care itself is expensive, and we all think we have to have it all. It's not working. I believe if our children were raised by us and not child care and schools, our children would be a lot healthier. Yes, I do agree with diets, breast feeding, and being very careful about what the vaccinations you choose to give your child. Raising your child is so much more important than any ladder, any home that is more than shelter, any car, and/or extra you may think you need.

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Pat Bell Smith
Joined On 3/21/2008 6:03:00 AM
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Nothingsoundwe well said! I agree completely! actually saw this coming when I was a little kid. I remember having a pit in my stomach when I realized it and that was 50 plus years ago.

Mark as Spam Posted On: 8/6/2022 5:52:46 AM
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SartoSarah
Joined On 7/31/2022 7:04:08 AM
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Yes! I'm noticing it more and more. Holy smokes.

Jeremiah.S
Joined On 5/5/2012 11:53:54 AM
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Amen and Amen.

Reply · Mark as Spam · Posted On: 8/6/2022 9:16:57 AM
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juststevo
Joined On 1/5/2012 11:13:54 AM
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For a strong functioning immune system humanity would be better served with inoculating our babies, children & selves with beneficial bacteria & the foods & fibers encouraging their growth. Instead we get a leaky gut direct deposit through vaccines & then promote an actual leaky gut with baby formula & a limited diet based on about 200 types of food. Then throw more fuel on an inflammation fire with an overuse of antibiotics & multiple chemical mixtures attacking our lives inside & out. Might it not be better to monitor our newborns gut integrity & to add multiple beneficial bacteria in it at appropriate times? Would there be additional plant fibers to use to support a proper balance? No doubt this is something critical in nature perhaps some better in the fast cycle, others in the in between & then the recharge cycle.

Home made Kim chi is fun to make. While a simple basic chi can be made with just a few key ingredients, it's a powerful punch when all kinds of goodies are added. Here Napa Cabbage is the main ingredient three other cabbages at right from the garden are also used. Pak Choi, Red Cabbage & regular green cabbage. At least three types of mushrooms are used. Onions, garlic, ginger, carrots, green, red, yellow & orange peppers, broccoli, beets, hot red cherry peppers, green onions including the greens, radishes, shrimp & anchovies are all in the mix. More than most people would want to mess with but it's a big bang for the gut. Love to add it to toasted salads or use like salsa on potatoes, cauliflower, broccoli, tacos etc. Ingredients are sliced, diced, or shredded as the nature of the vegetable demands to be of a size that will ferment. While all one time homemade juice can be a staple, once a consumer with organic grass fed, hormone antibiotic free milk is made, that will be back on the menu. Yogurt & Kim Chi seem to be King in my personal eating. Thanks Doc for shining a light on your vaccines - through the gut with food.

Reply · Mark as Spam · Posted On: 8/6/2022 5:27:28 AM
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Guillermao
Joined On 4/17/2015 8:47:48 AM
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Good advice JUST. Many studies have shown beneficial bacteria in the gut microbiota and other organs, such as the gut-brain axis, gut-liver axis, gut-lung axis, gut-bone axis, gut-heart axis, gut-skin axis, bidirectional communication between healthy gut microbiota and the lungs can significantly prevent respiratory tract infection in both acute and chronic COVID-19 viruses. Any alterations to the gut microbiota can cause immune dysregulation, which can affect the antiviral activity of the immune system against respiratory viruses such as severe acute respiratory syndrome coronavirus (SARS-CoV) and SARS-CoV-2.

more than 50% of patients with inflammatory bowel disease (IBD) and 33% of patients with irritable bowel syndrome (IBS) are susceptible to respiratory complications as a result of dysbiosis without a history of acute or chronic respiratory disease The intestinal microbiota also affects the digestion of food, the production of energy and vitamins (B1, B6, B12, K and folic acid), the decomposition of bile acids and other vital biochemical aspects of our lives. On the other hand, the microbiota has a remarkable impact on the activation and function of the immune cells.

Consequently, a persistent imbalance of the microbial community in the gut is known as dysbiosis, which increases the risk of infections and autoimmune diseases. The regulation of human metabolisms, inflammation and carcinogenesis are influenced by the intestinal virome. Recent evidence showed that bacteriophages play a role in human liver metabolism and modulation of the immune response. The gut microbiota can modulate systemic immunity by regulating innate and adaptive immune homeostasis through the development of antimicrobial metabolites and peptides against various pathogens.

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Guillermao
Joined On 4/17/2015 8:47:48 AM
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Short-chain fatty acids (SCFAs) are one of the common metabolites produced by the intestinal microbiota and rapidly absorbed by intestinal epithelial cells (IECs). SCFAs regulate immune cell functions such as glucose homeostasis, gene expression profiling, anticancer activity, and inflammatory response. SCFAs can also serve as an energy source for T cell differentiation (Th1, Th2, Th17, and regulatory T (Treg) cells). As one of the critical bacterial metabolites, butyrate regulates transepithelial fluid transport, reduces mucosal inflammation and oxidative stress, improves epithelial defense barrier, and controls visceral sensitivity and intestinal motility.

In addition, butyrate provides a critical line of immunological defense in the gut through induction of tolerance to DCs in the epithelium, which is associated with mucosal IgA production. Butyrate also suppresses mast cell degranulation in the intestinal mucosa and limits the production of circulating inflammatory mediators. The gut-lung axis plays a fundamental role in controlling the virulence of SARS-CoV-2.

The intestinal microbiota regulates immune and adaptive immunity through the production of bacterial metabolites (SCFAs) and antimicrobial peptides against different pathogens. In addition, they regulate mucosal barrier integrity and immune homeostasis. Bacteriophages can completely impact the balance and homeostasis of immune cells in the lungs and increase inflammatory cytokines such as IL, TNF- and IL-1, which could be the most important predisposing factor for severe infection by COVID-19.

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Guillermao
Joined On 4/17/2015 8:47:48 AM
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Beginning the integrity of the intestinal barrier, innate and adaptive immune cells can become activated and secrete pro-inflammatory cytokines into the circulatory system, resulting in systemic inflammation. COVID-19 patients who suffer from diarrhea and have elevated serum interleukin (IL) levels show higher concentrations of cytokines. Calprotectin is a clinical biomarker of inflammatory bowel diseases and has immunogenicity functions that could potentially play a role in disease monitoring in diagnosis and especially in monitoring COVID-19 related diarrhea. Furthermore, diarrhea may be caused only by virus induced inflammation due to the access of inflammatory cells to the intestinal mucosa, such as neutrophils and lymphocytes, which alters the intestinal microbiota. www.ncbi.nlm.nihn.gov/ ...17434128.2021.1991511 (2021) www.nature.com/ ...s41586-021-03661-8 (2021) www.frontiersin.org/ ...full (2021) www.ncbi.nlm.nih.gov/ ...PMC8927624 (2022)

Reply · Mark as Spam · Posted On: 8/6/2022 5:08:40 AM
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juststevo
Joined On 1/5/2012 11:13:54 AM
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Just - the Gut Microbiog - perhaps not only different food/fiber sources to feed health enhancing probiotics maybe there are sources of microbial fungus, change the different mushroom mixes also work in a dance to promote a more complete health outcome? Recently in the garden along with the Eden Gardening methods expanding in my experiment I've taken to making trenches to add mostly decaying white birch, along with other species of tree limbs and debris, in the bottom to cover with garden soil, and then to top with Eden Shrub. One expectation is to mimic forest soil conditions to ramp up soil healing and introduce the many microbe species in the Garden. To possibly create a more complete soil profile may also create more complete soil compounds for a fuller profile of plant compounds in the food. It's also hoped as the debris gets broke down it will help hold more water, keep minerals, & soil life.

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Guillermao
Joined On 4/17/2015 8:47:48 AM
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Thank you Just. A great example of the power of the earth, producing healthy food that feeds the intestinal flora. Increasing evidence suggests that alterations in the gut microbiota (GM) play a fundamental role that could represent the causal link between environmental factors and the onset of obesity. The beneficial effects of GM are mainly mediated by the secretion of various metabolites. Short-chain fatty acid acetate (SCFA), propionate, and butyrate are small organic metabolites produced by the fermentation of dietary fibers and resistant starch with broad beneficial effects on energy metabolism, intestinal homeostasis, and regulation of the immune response.

Aberrant SCFA production has emerged in obesity and metabolic diseases. Hygiene and antibiotic use, along with "Westernization" of lifestyles, are associated with an unbalanced GM in industrialized societies, which can lead to suppression of butyrate production. Voluptuous habits such as smoking or drinking alcohol could also lead to reduced butyrate production, due to a decrease in its fermentation by gut microbiota producers in the GM. Different dietary patterns, in particular the macronutrient and micronutrient composition of the diet and the nutritional sources of foods, contribute to GM remodeling.

Simple sugars (eg, sucrose, fructose) have been shown to cause rapid dysregulation of transgenics and thus metabolic dysfunction in the food, also, contrary to popular belief, nonnutritive artificial sweeteners (eg, saccharin, sucralose, acesulfame, cyclamate, neotame, and aspartame potassium), which are promoted as substitutes for high-sugar, high-calorie foods and beverages, may considered unhealthy for reporting both dysbiosis and disruption of metabolic homeostasis, such as glucose intolerance in a GM-dependent manner.

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Guillermao
Joined On 4/17/2015 8:47:48 AM
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Among the factors that positively affect butyrate production are dietary patterns characterized by a high consumption of plant foods, a source of fiber, resistant starch and polyphenols, substrates necessary for butyrate production. In addition, positive modulators include nutritional supplementation with probiotics (which can serve as substrates for bacterial fermentation in the colon to generate butyrate) and/or prebiotics, live cultures of specific strains of bacteria that colonize the intestinal tract to promote the generation of SCFA (food sources of probiotics are yogurt, fermented cheese, etc.)

Butyrate is also formed as a fermentation product of peptides and amino acids from protein foods. although the number of amino acid-fermenting bacteria has been estimated to constitute less than 1% of the large intestine microbiota, SCFAs represent its catabolism metabolites as such. Butyrate is found in dairy products in considerable quantities, for example, butter, cheese (especially goat cheese, Roquefort cheese, whole cow's milk, due to microbial anaerobic fermentation of fibers, including cellulose, in the intestine of Ruminants Human milk (HM) has also been examined as a potential source of butyrate for infants, modulating their colonic microbiota.

SCFA concentrations decrease throughout the day, particularly butyrate, because the numbers of Roseburia and Eubacterium, bacteria that produce butyrate, decrease throughout the day. Butyrate could act as a regulator of body weight: a reasonable speculation is that it acts on the components of the energy balance, promoting energy expenditure and/or reducing energy intake.

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Guillermao
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Butyrate supplementation was found to have multiple metabolic benefits, including prevention of obesity and obesity-associated diseases in the animal model. In addition to its preventive actions in diet-induced disease models, butyrate is also effective in the treatment of obesity through promotion of energy expenditure and induction of mitochondrial function: the mechanism of action of butyrate for obesity is related to AMPK activation, increasing ATP consumption, and induction of PGC-1 activity, the molecular mechanism by which butyrate stimulates mitochondrial function in association with the upregulated expression of genes involved in lipolysis and the oxidation of fatty acids.

Adipose tissue is an endocrine organ that constitutes the body's largest energy reserve and plays an important role in energy homeostasis. Therefore, increasing fat mobilization in adipose tissue is an attractive potential strategy for the management and treatment of obesity. Butyrate-mediated regulation of thermogenesis and energy homeostasis was also demonstrated in a recent study in mice. It promotes thermogenesis in brown adipose tissue (BAT) through activation of lipine-specific demethylase (LSD1), a histone demethylase important regulator of thermogenesis.

In addition, adrenergic receptors, which are highly expressed in adipose tissue, play a fundamental role in lipolysis. Another speculation by which butyrate could induce fat burning is the activation of 3-adrenergic receptors in the white adipose tissue of mice, which may promote the possible application of butyrate against obesity in humans.

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Guillermao
Joined On 4/17/2015 8:47:48 AM
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Butyrate promotes energy expenditure, possibly reducing obesity through enhancement of mitochondrial activity (activates AMP-activated protein kinase, increases adenosine triphosphate (ATP) consumption, and induction of mitochondrial uncoupling of the one of peroxisome proliferator-activated receptor gamma (PGC-1)), in association with upregulation of the expression of genes involved in lipolysis and fatty acid oxidation. Butyrate supplementation in mice maintained on a high-calorie diet has been shown to prevent the development of obesity through promotion of energy expenditure and induction of mitochondrial function: the mechanism of action of butyrate for obesity is related to AMPK activation, increasing ATP consumption, and induction of PGC-1 activity, the molecular mechanism by which butyrate stimulates mitochondrial function in association with the upregulated expression of genes involved in lipolysis and the oxidation of fatty acids.

Butyrate may reduce energy intake by inducing an anorectic host response by increasing plasma levels of glucagon-like peptide 1 (GLP-1), glucose-dependent insulinotropic polypeptide (GIP), and PYY. Butyrate could regulate lipid metabolism in the liver and intestine, and several findings showed that it exerts beneficial effects on liver diseases. It is able to down-regulate the expression of nine key genes involved in the intestinal cholesterol biosynthesis pathway and thus can inhibit hypercholesterolemia. Butyrate administration ameliorates HFD-induced hepatic steatosis in mice, through a reduction in intrahepatic lipid accumulation (triglyceride and phospholipid content) and a reduction in liver weight.

In-depth liver-focused mechanistic research showed that liver mitochondria are the primary target of butyrate's beneficial effect in reversing fat accumulation in diet-induced obesity; lipids are known to express butyrate receptors GPR41 and 43, indicating that it might be involved in lipid cell metabolism and function, as evidenced by the effects of butyrate peroxisulfate on ameliorating diabetes. induced. histological alteration of the islets and functional damage.

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Guillermao
Joined On 4/17/2015 8:47:48 AM
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Butyrate is capable of stimulating the release of GLP-1 from intestinal L cells. GLP-1 has the ability to reduce apoptosis and induce regenerate and regeneration of pancreatic cells, as well as to induce insulin synthesis and secretion. The concentration of SCFA throughout the gastrointestinal tract has two gradients: one from the proximal to the distal colon and one from the base to the top of the colonic crypt. Several studies have estimated that, theoretically, between 100 and 400 mmol of SCFA can be produced daily from the consumption of 10 g of fiber. Butyrate accounts for approximately 25% of total SCFA production.

The proximal colon, particularly the cecum, has the highest SCFA concentrations as the availability of substrates for saccharolytic fermentation is highest here. As the availability of carbohydrate-based substrates decreases toward the distal colon, SCFA concentrations decrease and the amount of SCFA obtained from proteolytic fermentation increases. Proteolytic fermentation produces other byproducts in addition to SCFAs, including ammonia and branched SCFAs such as isobutyrate and isovalerate. Therefore, although butyrate is an isoform of butyrate, it is formed from other substrates, mainly valine, by different microbial pathways and therefore may have metabolic effects other than butyrate.

Isobutyrate is less readily absorbed and metabolized compared to butyrate, but can act as an alternative energy source when butyrate levels are low or butyrate oxidation is abnormal. www.nature.com/ ...7bim (2021) www.sciencedirect.com/science/article/abs/pii/S1043276020302526 (2021) hyperlipidemia www.tandfonline.com/doi/full/10.1080/19490976.2021.1914911 (2021) pubmed.ncbi.nlm.nih.gov/ ...nbs/13898/ (2022)

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juststevo
Joined On 1/5/2012 11:13:54 AM
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Whoa Gui, when so much of our immune & mental function is influenced by gut health, the massive disruption in our gut from the results dead sterile foods plus chemical toxins from growing to processing is preventing basic foundational functions from happening, then add on insult to the injury, a medical system chasing dollars addressing an ever-growing landscape of symptoms, running away from any possibility of health.

Reply · Mark as Spam · Posted On: 8/7/2022 4:21:49 AM
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Krafter
Joined On 6/23/2019 9:47:39 AM
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Having been diagnosed with IBS in 1987, I became an early adopter of probiotics when they first became available. I have to say I found them to be little help. Even the more recent products with much higher levels and vastly greater diversities of cultures, seem to have little or no effect. Having said that, what I find helpful in eliminating sugars and dropping my fruit intake dramatically while also reducing starchy foods. In other words, taking away food sources for the pathogenic strains. Then I increased the diversity and amount of fiber in my diet to serve as prebiotics for the beneficial probiotics to feed on. I often wonder if some of those good cultures that I've taken over the past 35 years found a few cousins in the human flora to make my gut, but weren't able to flourish until I made those dietary changes.

Reply · Mark as Spam · Posted On: 9/30/2019 8:55:15 AM
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datadragon
Joined On 6/13/2015 6:50:55 PM
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Sounds like you are doing many of the right things. Butyrate is found in foods like grass fed butter and to lesser extent, other foods that contain some dairy fat. The fatter the food, the more butyrate it will have, so whole organic or raw milk has more than skim milk, and cream has more than either. In one of the reasons why full-fat dairy is actually associated with lower BMI, not higher and is good for the gut tissues, the anti-inflammatory properties of butyrate have been shown to be mediated by several mechanisms including the reduction of pro-inflammatory cytokine expression (interferon gamma [IFN-γ], tumor necrosis factor-α [TNF-α], interleukin-18 [IL-18], IL-6, IL-8, IL-1β, the elevation of IL-10 and transforming growth factor-β (TGF-β) expression and signaling, the inhibition of nitric oxide synthase and metalloproteinases, and the reduction of lymphocyte proliferation and activation.

Gut flora can also make it provided you eat enough fiber and good gut flora isn't decreased such as antibiotics or lacking zinc. Eating fiber increases production of butyrate, which might be one of the reasons why fiber intake is so strongly associated with reductions in inflammation and improvements in gut health. It's not the fiber per se it's the butyrate that your gut flora make with it. Almost all fruits and vegetables are high in fiber. A particularly powerful type of fiber is resistant starch, but if you're not used to it, you may feel gas and bloat at first. Sugar free gum, mints, and gum almost any which plant food... Sugar has the opposite effect and very sugar without fiber such as juice can feed the other bacteria and inflammation. Its always a balance, some may need more due to inflammatory conditions and stressors but you can also overdo the anti inflammatory as well. Zinc by the way retrieves the mTOR levels to the same levels of the control group even after 24 hours.
www.researchgate.net/publication/264904391_SB_Prenatal_zinc_prevents_m...

Reply · Mark as Spam · Posted On: 9/30/2019 9:02:45 PM
Like · Dislike

keepy2
Joined On 8/6/2009 11:27:08 AM
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I had what seemed like 100 for many years and nothing controlled it. I know it was stress related. Some years ago when I was looking for a breakfast that would enable me to go 6 hours without eating I stumbled on lentils. Lentils Food my IBS symptoms almost 100%. Eating 1/4-1/2 cup almost daily has resolved that problem, even when I'm stressed.

Reply · Mark as Spam · Posted On: 10/1/2019 12:47:30 PM
Like · Dislike

grufo
Joined On 1/17/2012 8:03:55 AM
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"data", A particularly powerful type of fiber is resistant starch, but if you're not used to gas and bloat you can add potatoes or raw bananas, just about any whole plant food..." Depending on who one talks to, is it German or Mediterranean potato salad, made with oil and vinegar, (no mayo), is the answer. And I find green(ish) bananas very tasty as long as they are somewhat ripe, cue if they are too green, they have the texture of balsa wood without any flavor. yuk.
www.themoldtheorymadeeasy.com/bobbie-eastern-spicy-potato-salad-recipe... ~~~~
www.yummly.com/ .../German-Potato-Salad-441570

Reply · Mark as Spam · Posted On: 8/6/2022 2:42:00 PM
Like · Dislike

mannyvelch
Joined On 11/19/2018 8:08:17 AM

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It's no wonder that youngsters are all overweight or obese! Has anyone been to the school cafeterias lately? GOOD GRIEF! They are feeding the kids nothing but garbage in most cases! And the kids have too little time to eat the stuff they are serving! What they get in the cafeteria is not in the least nourishing and they have to gulp it down without much chewing! No wonder they are all prone to illnesses and obesity! It is atrocious what they put out for these kids and are calling it a "meal"! Hate to say it but when I was a kid we actually had people working in the cafeteria who were "COOKING" The stuff that passes for "food" now-days is nothing but processed garbage!!! And the "powers that be" are still scratching their heads wondering why our kids are so prone to diabetes and other illnesses that used to NEVER affect children!!!!

Reply · Mark as Spam · Posted On : 9/30/2019 8:46:42 AM
Like · Dislike

askershaw
Joined On 7/8/2013 3:01:14 PM
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Michael Moore's movie "Where to Invade Next" has a segment in a French school cafeteria. My daughter, a school nurse, watched it with me. We were both amazed and envious of the food those children were routinely offered and the amount of time they were allowed to eat. Another segment follows a family of Italian factory workers from the lunch. They get 2 hours for lunch. They have a home made family oil down lunch. It is no wonder the Italians and French are more productive workers and healthier than Americans. It starts with meals and time to enjoy them.

Mark as Spam · Posted On : 9/30/2019 9:50:35 AM
Like · Dislike

Bubba52
Joined On 1/9/2016 1:56:18 PM
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You are ABSOLUTELY CORRECT in what you're saying about SCHOOL LUNCHES!!! I've gone to eat w/ my kids on a few occasions and was shocked at what these kids were being fed at school.... nothing but GARBAGE.... and they try to teach kids at school to avoid fast food and to exercise (at least the years between dawn) but the ****TRUTH**** is that the kids should avoid SCHOOL LUNCH as much (or as bad) as FAST FOOD ********** ****TRUTH**** It's literally no different..... all processed JUNK FOOD..... unhealthy sugar laden..... in regards to this article today..... everything kids are being fed today at SCHOOL is everything that feeds the BAD BACTERIA in the gut (excess sugar/carbs)

Mark as Spam · Posted On : 9/30/2019 2:00:48 PM
Like · Dislike

grulla
Joined On 1/17/2012 8:03:55 AM
Add as Friend · Send Message

I assume the French school cafeteria's extended lunchtime does not include a glass of wine. :-)

Mark as Spam · Posted On : 8/6/2022 6:57:37 AM
Like · Dislike

Jeremiah_S
Joined On 5/31/2022 10:37:56 AM
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They're not scratching their heads. It's planned. Fat, tired, addicted people are easy to control. Just dangle the nuggets and they will do anything. Schools, hospitals and prisons. The most formable institutions on the planet are intentionally malnourishing their victims. Makes perfect sense.

Mark as Spam · Posted On : 8/6/2022 9:29:31 AM
Like · Dislike

bulletline
Joined On 7/1/2013 6:58:01 AM
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As a personal trainer, I often give nutritional information/support to clients trying to lose weight (within my scope of practice of course). I give them a print out of what is good/healthy and what is not. Whole foods, organic, non-GMO, grass-fed, etc... What may seem natural and easy for most of us on this site can seem overwhelming to others who are used to eating the SAD. So I tell them to make at least one change in their diet for a month ... then try another, and so on. For the majority of people, I feel weight loss and optimal health can be VERY EFFORTLESS once a person adopts whole foods and cleaner eating habits. They just need to be educated on it, but unfortunately MSM suppoits otherwise ... it's very sad.

Reply · Mark as Spam · Posted On : 9/26/2019 8:54:04 AM
Like · Dislike

askershaw
Joined On 7/8/2013 3:01:14 PM
Add as Friend · Send Message

The SAD diet is no accident and like opioids is very addictive, biologically. The shameful food corporations and the scientists they hire know what they are doing. For instance they use refined salt. NaCl does not occur in nature in isolation. It is always accompanied by other essential minerals. There are 84 in the ocean. The humans and other mammals have a natural craving for salt, but that craving is tempered when all the essential minerals are in sufficient supply in the body. Cows and horses love their salt blocks but they do not constantly lick them. Veterarians and animal feed manufacturers know this and make salt block with many minerals. A well-nourished person with all the essential minerals has little desire for salt. Industrial food manufacturers know this too so only use refined salt. Hence the "Bet you can't eat just one."

Mark as Spam · Posted On : 9/30/2019 11:04:25 AM
Like · Dislike

Sue275
Joined On 7/16/2021 3:03:58 AM
Add as Friend · Send Message

Love your comment BC, so sensible. And love your profile pic Maofield Parrish. I had his prints on my walls in uni, brings back memories

Mark as Spam · Posted On : 8/6/2022 7:41:24 AM
Like · Dislike

el-graf
Joined On 9/11/2008 11:47:42 PM
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The other main reason for obesity is 'refrigerators'.

Reply · Mark as Spam · Posted On : 9/26/2019 2:38:39 AM
Like · Dislike

Kiwifer
Joined On 6/3/2015 9:47:59 AM
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Lots of truth there. Most diabetes/obesity/chronic illness issues began with the advent of refrigeration... a mere 100 years ago. Even as late as my birth date in 1953... we lived on a farm where rural electrification had not yet reached - which meant no refrigeration. We had a root cellar instead. Photos from that era show a world of slim people.

Mark as Spam · Posted On : 9/30/2019 12:46:18 PM
Like · Dislike

benjay3
Joined On 8/8/2009 11:27:08 AM
Add as Friend · Send Message

not lifestyle? most of us are not farmers or ranchers or do any physical work anymore! We are imprisoned in offices and stressed half to death with 8+ hour work days, sitting, with corporations pushing us to work harder and harder constantly and then they tell us sacrifices we have to "multi-task" adding stress. And we all know today that stress is a major factor in weight gain and poor diet. then we have the cheap hamburgers available at fast food joints on almost every corner - while a salad costs 3 times what the burger does. This is a social problem. Yet we blame the individuals.

Mark as Spam · Posted On : 10/1/2019 1:03:02 PM
Like · Dislike

grulla
Joined On 1/17/2012 8:03:55 AM
Add as Friend · Send Message

"The other main reason for obesity is 'refrigerators'. Oh, you mean like this:
4.bp.blogspot.com/-_OWQbkAAPRI/ec7TNc3HdoEPc/AAAAAAAAJE8/5U4QFpLoHeA/s16...

Mark as Spam · Posted On : 8/6/2022 2:55:05 PM
Like · Dislike

BrianDoesOMD
Joined On 4/4/2020 7:24:22 AM
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First listen to your body!!! My story is long, almost died,I lost the ability to digest fruits and vegetables and grains at age 48. I got my life back after being forced to eat only meat because it's all I could digest. I was eating a lot of chicken a day and still fat and going #2 all the time. My body was trying to protect me from the toxic food I was eating!!! I tried everything I was told. I used to run 6 miles a day and fast for days but still kept gaining if I ate even small amounts of food. I developed a lot of health issues over the 43 years it took to get where I was. Intestinal bleeding, chronic diarrhea, sleep apnea, diabetes, delayed wound healing, arthritis, chronic fatigue, depression, anxiety,brain fog, poor memory,I even lost my voice if I talked or sang,just a few songs !!!

By eating mainly fatty meat and eggs and a lot of butter I lost 70 pounds in seven months, all my health problems have now healed and I'm been 8 years. My resting heart rate is 48 beats per minute, BP is 110/70 and I can do whatever ever I wanit!!! I do eat some root vegetables now that I've healed for prebiotics which I handle ok as long as there's lots of butter!!!

I also resonant breath as much as I can and read Dr Mercola every day!!! Hope my life time of pain can help someone prevent it in them!!! I put my 7 month before and after pic as my avatar so you can see my success and did this while doubling my calories from 1000 to 2000 with minimal exercise because I was so sick exercise made me feel like I had the flu and seemed to state my weight loss good luck and my theory is if you don't feed the bad bacteria then they can't survive and if they can't survive they can't cause diseases!!! Feed me and starve them!!!

Reply · Mark as Spam · Posted On : 8/6/2022 6:38:45 AM
Like · Dislike

lesabersi
Joined On 6/17/2008 10:08:01 PM
Add as Friend · Send Message

Consumption of wide variety of natural foods provide prebiotics which proliferate variety in microbiome. Avoiding artificial sweeteners, pesticides and antibiotic overuse can help.

Reply · Mark as Spam · Posted On : 8/6/2022 1:53:43 AM
Like · Dislike

amedro
Joined On 9/30/2019 9:37:31 PM
Add as Friend · Send Message

Try Natto, this is a Japanese fermented soy Bean. Try every other day. It is amazing.

Reply · Mark as Spam · Posted On : 9/30/2019 10:00:25 PM
Like · Dislike

Pat Bell Smith
Joined On 2/15/2008 6:05:00 AM
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What is Natto good for? Does it help with getting good gut flora? I just cannot lose weight!!! on a strict whole food diet, no desserts or pasta and just started adding in the resistant starches (potatoes & green bananas) & fermented cabbage. I've been reading up on gut flora to figure out if that's my problem. Still, no weight loss at all. I'm a 60 year old female and had no weight losses until after I did a colon cleanse at around age 45. I fallooowed up during the colon cleanse (Dr. Natura) and have had weight problems ever since. Also I was on tetracycline many years for bladder infections. Off all prescription drugs for years through so I got rid of bladder infections by eating a lot of fruit. Trying to figure out the weight problem.If anyone has any suggestions I'd really appreciate it!

Mark as Spam · Posted On : 8/6/2022 6:08:24 AM
Like · Dislike

11sweeter11
Joined On 12/20/2017 1:43:19 PM
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Our gut bacteria gives off 5000 times more light than our cells which as you can guess is very important. Foods and supplements have little effect. The environment plays the major role. Look up Jeff Leach research on the Hazda people for more support.

Mark as Spam · Posted On : 9/30/2019 1:47:06 PM
Like · Dislike

billsteli
Joined On 6/8/2008 9:16:45 PM
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"beneficial bacteria found in fermented and cultured foods such as yogurt — have a measurable effect on your metabolism", quoted from this article. Do fermented supplements have the same effect? Dr Mercola's store has many different fermented organic supplements. Can a large variety of fermented supplements take the place of eating a much smaller variety of fermented foods? An example of what I think works is buying dried yogurt culture powder and making your own. If that works, I am guessing fermented supplements work. But I don't know.

Any studies been done on fermented foods that are dried into compressed tablets and then eaten producing a wider variety of gut florals compared to unfermented versions of the same foods? For example, beets, broccoli, apple cider vinegar, and many others. For example, is fermented beets in tablets more beneficial than fresh beets grown in my garden and boiled/steamed in a pan on a stove? The tablets can easily be consumed daily but availability from the garden is seasonal unless processed for long term storage, for sample cooking and then freezing or canning.

Reply · Mark as Spam · Posted On : 8/6/2022 11:26:39 AM
Like · Dislike

seastars
Joined On 12/29/2018 2:11:59 PM
Add as Friend · Send Message

I wish Mercola would write about L Reuteri yogurt. Seems like a miracle product that you can make. Requires special instructions. Ben Greenfield (been a guest on Mercola and vice versa) just did a podcast on it yesterday. Dr. William Davis has a new book out explaining it and how to make it. Donna Schwab, has a site explaining it all in a much simpler lingo. Would love to know what Mercola's take on it is. I think we are going to hear more and more about it.

Mark as Spam · Posted On : 8/6/2022 12:42:25 PM
Like · Dislike

SanSaSarah
Joined On 4/21/2022 7:04:08 AM
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This is my life. In fact, I just finished writing an article about this. I lost 30 pounds doing intermittent fasting, but I still had chronic diarrhea. I found a natural healer who healed my gut and relieved my chronic headaches. Once I had all that inflammation in my intestines and other parts of my body, I lost an additional 10 pounds and the diarrhea vanished. I love having a natural healer in my life. My body makes sense now.

Reply · Mark as Spam · Posted On : 8/6/2022 7:57:43 AM
Like · Dislike

thewaijones
Joined On 10/8/2010 5:39:47 PM
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Please tell us more. What did you do?

Mark as Spam · Posted On : 8/6/2022 8:06:35 AM
Like · Dislike

Kitara
Joined On 7/26/2007 6:24:19 PM
Add as Friend · Send Message

One of the reasons for poor quality gut bacteria being is antibiotics - and if you are every offered fluoride antibiotics there is a high chance if IBS.

Reply · Mark as Spam · Posted On : 9/30/2019 12:40:07 PM
Like · Dislike

billsteli
Joined On 6/8/2008 9:16:45 PM
Add as Friend · Send Message

Dr. Mercola once said that it takes up to two years to fully recover the gut after taking one round of antibiotics. I assume the real amount of time would be based on the antibiotic taken and the length of time they were taken. I think if my doctor ever prescribes antibiotics, I would ask if he can do lab tests to see if I really need the antibiotic. For example, a throat culture before taking antibiotics for possible strep throat or a seven case of the common cold or for Covid. A two year recovery period is a long time to be stuck with chronic gut issues caused by antibiotics that were not really needed. Last time I took antibiotics for a higher than desired PSA, my doctor told me not to take probiotics for the 21 day course of antibiotics.

Now when my PSA is a bit higher than my doctor can tolerate, I find that skipping the antibiotics and retest a month later the PSA always drops down enough to satisfy my doctor. Antibiotics rarely drops PSA unless you actually have an infection which for many of us would be very rare. If there was an infection that has no evidence except high PSA, a healthy gut might allow the body to cure it on its own without 3 weeks of gut destroying antibiotics that might require a two year healing process.

Mark as Spam · Posted On : 8/6/2022 11:50:25 AM
Like · Dislike

jowandonna
Joined On 6/1/2011 9:14:26 PM
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WOW! The health article on vision today is superb, Dr. Mercola. I learned SO much.

Reply · Mark as Spam · Posted On : 9/30/2019 9:14:17 AM
Like · Dislike

Cabochon
Joined On 10/7/2018 12:45:48 PM
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Probably the most valid explanation of the obesity pandemic that this website has ever produced and finally answers the conundrum, rarely addressed by so called "experts" on the topic about why even those who follow a healthy diet, avoid processed food and control their kcal intake still develop metabolic syndrome or may have done so at some point in the past. So even if you eat less, you may still be consuming more calories as a result. The microbiota of the obese person are altered and some species have become dominant allowing, amongst other effects a greater "energy harvest" from the foods consumed i.e. more calories which puts to rest the ridiculous notion that calories do not matter.

The other major factor often ignored is intestinal permeability, or "leaky gut" which is the breakdown of the mucosal barrier, allowing not so friendly bacteria such as lipopolysaccharides (LPS) into the bloodstream, alerting the innate immune system to trigger inflammation. Interestingly, one reference here implicates a high fat diet in this scenario resulting in reduced levels of friendly bacteria, increased systemic inflammation and metabolic changes, which may have implications for certain fashionable diets. As fats have a higher caloric content than other macronutrients, there could be a link there. The next step here would be to identify exactly which fats are involved in metabolic endotoxaemia.

There is no guarantee unfortunately that simply chucking probiotic supplements down your throat will have any lasting impact. Effective colonisation depends on many factors including the strength of the epithelium and competition between various inhabitants in adhering to the gut wall. Probiotics and supplements that promote mucous secretion and exclude pathogens should help. "Surprisingly simple" - no, on the contrary, unsurprisingly complex and we gave reached only the frontier of our understanding.

Reply | Mark as Spam | Posted On 9/30/2019 5:39:34 AM
Like Dislike

rrealrose
Joined On 11/10/2011 8:59:01 AM
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Hi Cabochon, My experience is the newest soil-based probiotics work, but only for a short time. How do I know? My system calms down for a few days afterwards. Also occasionally been snarfing down batches of kefir, but 1) started fermenting grass-fed half and half instead of milk and 2) switched recently to Donna Gates' Body Ecology kefir grains, which work better for me than much of the prior batches and 3) started blending in fruits like ripe mango...to down more kefir than the plain variety alone. As weather cools, shifting over to more bone broth.

During cooler months, cooked foods, broths, soups seem far more important than cold salads. During warmer weather, fermenting coconut water (from young coconuts - if possible) using probiotics for fermentation starter, then adding in fresh aloe vera (from the leaf). Constantly shifting repertoire, including chia puddings in coconut milk and flax or hemp-based smoothies seems needed depending on stress level, seasonal availability and time to prep. Shifting throughout the year to maintain some semblance of order...this is why I go nutz reading about trials stuck on one type of solution. Plain insufficient to simply look for (1) silver bullet.

Mark as Spam | Posted On 9/30/2019 10:47:43 AM
Like Dislike

ste9555
Joined On 11/11/2013 11:55:29 AM
Add as Friend | Send Message

As far as diarrhea as a symptom of obesity, my suspicion would be the main cause is a misalignment of the lumbar spine: L1 in particular. Losing the weight would improve alignment and likely resolve the symptom, though increased exercise might also be needed, in order to improve the tone of supporting muscles.

Reply | Mark as Spam | Posted On 9/30/2019 8:07:24 AM
Like Dislike

hlahore
Joined On 12/22/2009 7:19:57 AM
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Obese people went on a low-calorie diet with exercise. Those who in addition were given $10 of vitamin D lost 3X as much weight (19 lbs) vitamindwiki.com/tiki-index.php

Reply | Mark as Spam | Posted On 9/30/2019 5:44:58 AM
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