

10 Health Benefits of Inulin Fiber + Side Effects & Dosage

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Inulin is a type of fiber found in plants that is made up of the simple sugar fructose. Research shows it can improve regularity, reduce cholesterol, and increase weight loss. We believe inulin is a great fiber to ingest and goes great with what we believe to be one of the healthiest diets to keep in shape and healthy, the lectin avoidance diet. Read on to see the other benefits of inulin and how to take it without experiencing side effects.

What Is Inulin?

Inulin (not to be confused with [insulin](#), which is a hormone that controls blood sugar levels) is a type of soluble fiber found in a variety of plants. **Fibers are compounds that are not digested or absorbed by the human gut.** Soluble fibers attract water and turn to gel during digestion [1].

Inulin is present in 36,000 plant species including those we consume in our daily diets such as [wheat](#), [onion](#), [bananas](#), [garlic](#), and [asparagus](#). They are also found in less common foods such as [Jerusalem artichokes](#) and [chicory](#), although [chicory](#) is the main source for commercial extraction of inulin [2].

Plants containing inulin use it to store energy and as a protection against cold temperatures. When exposed to cold temperatures, inulin acts as an antifreeze [3].

Components

Inulin is made up of a string of fructose molecules (like beads on a string) with glucose on either end. However, these molecules are linked in the chain by links that are not digestible by the human gut. Therefore, they move slower in the gut, absorb water and swell up like a gel which helps in forming softer stools. This makes them great for digestive health [4].

The number of fructose molecules in each string (beads) can vary from 2 to 60. Inulin is called high-performance inulin when it contains more than 10 molecules of fructose strung together. When they are manufactured commercially, the shorter chains are removed from the product. Chains that contain less than 10 molecules are called fructooligosaccharides (FOS).

Fructooligosaccharides have a sweet, pleasant flavor and are used to supplement foods with fibers [5, 5].

Mechanism of Action

Inulin's solubility allows it to absorb a lot of water. As it swells up it forms a gel that gathers fat particles along the way and takes them out of the body [4].

In addition, it increases the number of beneficial bacteria in your gut by acting as their food source [4].

Natural Sources

Natural sources of inulin are chicory root, Jerusalem artichoke, agave, garlic, jicama, yacon root, sprouted wheat, onions, banana, fresh herbs, and asparagus. Less common sources of inulin are dandelion root, coneflower, burdock root, and camas root.

Health Benefits of Inulin

1) Is a Prebiotic That Increases Good Bacteria

Inulin acts as prebiotic by being a non-digestible food ingredient that feeds good bacteria in the gut [2, 6].

The human gut contains trillions of beneficial bacteria ([probiotics](#)). Bifidobacteria are good bacteria that occupy the lower gut (colon). They ferment complex carbohydrates that cannot be digested in the upper gut and releases short-chain fatty acids (such as butyrate) that are essential for human health [7, 8, 9].

Inulin is basically food for bifidobacteria and stimulates their growth and activity. Good bacteria have a number of important functions in our bodies. They [9, 10, 5]:

- produce acetic acid and [lactic acid](#), which lowers the pH of the colon and prevents the growth of bad bacteria in the gut.
- stimulate the [immune system](#).
- aid the absorption of certain minerals.
 - increase the production of B vitamins, such as [folate B9](#), cyanocobalamin [B12](#), [thiamine B1](#), and [niacin B3](#).

Multiple studies have shown that inulin stimulates the growth of the bifidobacteria. Eight healthy subjects were given fructooligosaccharide instead of sucrose for 15 days and their stools were monitored. Although the total number of bacteria in their stool did not change, bifidobacteria became the predominant type [11].

In another study, 10 constipated elderly patients were given inulin for 19 days and their stools were monitored. These patients also showed an increase in the bifidobacteria numbers with a simultaneous decrease in harmful bacteria [12].

Therefore, **inulin improves gut health in humans by stimulating the growth of beneficial bifidobacteria.**

Some studies in bacteria grown in a lab show that inulin also increased bad bacteria such as *Salmonella* and bacteria that usually don't cause disease in normal individuals but do cause infections in people with weakened immune systems such as *Klebsiella* and *Escherichia coli* (commonly known as *E. coli*). However, other lab studies show that inulin suppresses the growth of bad bacteria like *Clostridium difficile* by increasing bifidobacteria growth [13, 14].

2) Reduces Constipation

Due to its ability to swell up after absorbing water, inulin is very effective in reducing constipation. A study was conducted in which 17 constipated children, 2 – 5 years of age, were given inulin and their stool consistency was monitored. Children who took these inulin-type fructans had softer stools [15].

Multiple studies have also shown that inulin increased the frequency of stools and their consistency in adults [16, 17, 18].

Inulins increase the bulk of the stool by forming a gel-like substance and **by increasing beneficial bacteria in the human gut** [19].

3) **Helps Reduce Appetite and Prevent Weight Gain**

Inulin, when added to low-calorie foods, **may be an effective way to suppress appetite and control food intake** [20].

A study in 40 women showed that consuming 16 g per day of inulin-type fructans in the morning for 7 days, **curbed appetite and helped reduce food intake during lunch** [21].

In another study with 125 overweight and obese adults, a snack bar containing inulin reduced hunger, appetite, and food intake over a 12-week period [22].

Inulin may help control appetite in several ways:

- By increasing the production of the appetite-suppressing hormone peptide YY [23, 24]
- By increasing **glucagon**-like peptide-1, a hormone released after a meal that helps in slowing down emptying of the stomach [24, 25]
- By altering the neuronal activity in the brain to suppress the appetite [26]

These are most likely the results of increased short-chain free fatty acids [23, 24, 26], but there are also studies that question their involvement [27].

4) **May Increase Weight Loss**

In a study of 44 individuals with prediabetes, **those who took inulin for 18 weeks lost significantly more weight than those taking cellulose** (plant fiber) [28].

Another study of 35 obese women found that inulin-rich yacon syrup decreased body weight and waist circumference [29].

5) May Reduce Blood Sugar Levels in Type 2 Diabetics

In a study of 49 type 2 diabetic women, **supplementation with inulin significantly reduced [fasting](#) blood sugar (by 8.5%) and [HbA1c](#) (by 10.4%), an indicator of the average blood sugar levels over the previous three months [30].**

A meta-analysis of 20 studies and 607 adults participants found that there was a tendency for reduced blood sugar levels in type 2 diabetic patients [31].

6) Reduces Cholesterol and Improves Heart Health

Inulin improves heart health by decreasing fat levels in the blood through various mechanisms. It [32]:

- decreases the production of liver enzymes that are responsible for making fats.
- increases enzymes that break down fats in muscles.
- enhances the production of short-chain fatty acids.
- alters the production of compounds that increase the production of peptides that make one feel full, and increases the removal of cholesterol in humans and rodents.

In a study of 49 type 2 diabetic women, inulin reduced total cholesterol by 12.9% and triglycerides by 23.6% [30].

A meta-analysis of 15 randomized controlled trials also concluded that **dietary inulin-type fructans significantly reduced triglycerides in the blood [33].**

There also seems to be a difference in the effect of inulin on normal subjects versus patients with high cholesterol. Inulin lowers triglycerides in the blood in normal subjects and lowers the cholesterol in patients with high cholesterol [34].

Since cholesterol clogging the arteries can lead to high blood pressure by making it harder for the heart to pump blood, inulin can be used to reduce or prevent high blood pressure (hypertension) by lowering the cholesterol levels [35].

7) May Prevent Colon Cancer Development

Rats that fed diets containing inulin had more beneficial bacteria, such as bifidobacteria while rats that fed on normal diets had more harmful bacteria. **Inulin prevented the incidence of chemically-induced colon cancer in these rats** [36].

Similar results were obtained in mice [37].

Inulin, when used in combination with beneficial microbes, also decreased colon cancer risk in rats [38, 39].

8) May Help Manage Inflammatory Bowel Disease

Studies in humans and animals have shown that [inflammatory bowel diseases](#) result from some human bodies not tolerating the resident gut bacteria. In such cases, **prebiotics such as inulin can be used to reduce inflammation in the gut** [40, 41].

A study in mice showed that inulin reduced the inflammatory cytokine IFN-gamma while increasing the anti-inflammatory [IL-10](#). This reduced gut inflammation in these animals [42].

However, the results of clinical trials on using inulin to treat Crohn's disease, a type of inflammatory bowel disease are inconclusive [41, 43].

9) Increases Calcium and Magnesium Absorption

Two studies in 14 women and 9 men found that supplementation with inulin increased calcium absorption and retention [44, 45].

In a study of 15 postmenopausal women treated with either inulins or placebo for 6 weeks, **there was an increased absorption of [magnesium](#) in the inulin group** [46].

Inulin increased magnesium absorption and retention in rats [47, 48].

One of the reasons suggested for this is that **inulin causes the production of short-chain fatty acids which reduce the pH in the large intestine. This increases the solubility of calcium and magnesium, and they become more available for absorption** [49, 50].

10) May Improve Bone Health

In a study of 98 adolescents, inulin supplementation for one year increased calcium absorption and bone mineral density compared to controls [51].

Pregnant mice that were given inulin had thicker bones than mice supplemented with regular diet or a calcium-enriched diet. The offspring of mice given inulin also had increased bone mineral density compared to the offspring of mice in the other groups [52].

Side Effects & Precautions

Inulin is safe when used as recommended. It has a generally recognized as safe (GRAS) status from the US Food and Drug Administration (FDA).

In fact, due to its safety, it has been used to measure the filtration rate of kidneys in humans [53].

However, inulin might have certain side effects in sensitive individuals or if too large a dose is used.

These include:

- Intestinal discomfort, including flatulence, bloating, stomach noises, belching and cramping [54]
- Swelling of the colon [55]
- Diarrhea [55]
- Although rare, severe allergic reactions can occur. In some isolated cases, it has resulted in an allergic reaction, possibly linked to a food allergy response [56].

Also, not enough is known about the effects of inulin supplementation during pregnancy and breastfeeding.

Small intestinal bacterial overgrowth (SIBO) is a disorder where there is excessive bacterial growth in the small intestine. It has been thought that foods that are fermented in the gut, such as inulin, increase small intestinal bacterial overgrowth and should, therefore, be avoided. But recently, it has been shown that prebiotics, such as inulin, are actually beneficial in reducing the symptoms of small intestinal bacterial overgrowth, especially after an antibiotic treatment [57, 58, 59, 60].

It is better to consult with a physician before taking inulin and also start with a smaller dose and increase over time.

Liver Cancer Risk

In mice, inulin introduced in the diet caused liver cancer, but only in mice with a gut microbe imbalance. When given with a high-fat diet, it caused a gut microbe imbalance and liver cancer [61].

Limitations and Caveats

Inulin may not be suitable for all individuals. It is rapidly fermented in the colon by bacteria. The resulting product draws up the water in the colon and releases gas. This is particularly a problem for individuals with irritable bowel syndrome (IBS) who might experience gas and bloating [55].

For individuals with irritable bowel syndrome (IBS), low doses of inulin are recommended since they modulate the gut bacteria and reduce the symptoms. However, larger doses may have a neutral or negative impact on symptoms [62].

Supplementation

Forms

Inulin supplements are found in various processed foods such as protein and cereal bars, yogurts, baked goods, frozen desserts, table spreads, and dressings. They could be in the form of native inulin (usually extracted from chicory), high-performance inulin (containing only the longer chains), oligofructose (containing only the shorter chains) and fructooligosaccharides (containing short inulin molecules made from table sugar) [5, 5].

Dosage

In the United States, most individuals consume far less dietary fiber than the daily value (DV) set at 25 g. The average daily consumption for inulin and oligofructose is estimated to be between 1 and 4 g in the United States, with a higher intake of 3 g to 11 g seen in Europe [63].

Doses up to 10 g/day of inulin obtained from natural sources and up to 5 g/day of oligofructose were well-tolerated in healthy, young adults [64].

A series of clinical studies also show that up to 20 g/day of inulin and/or oligofructose is well tolerated and effective [63].

The best way to start taking inulin is to consume foods that are rich in inulin or oligofructose. If you need to supplement with additional inulin, you can start with 2 – 3 g per day for at least 1 – 2 weeks, after which you can increase the amount to 5 – 10 g a day depending on your tolerance. You can increase it up to 20 g/day based on the results of a clinical trial [63].

User Experiences

One user noted that after a few months of inulin supplementation, their triglycerides went down by 33% and their total cholesterol decreased slightly. They did, however, experience minor bloating and gas.

Another user noted that inulin caused brain fog and acid reflux in addition to bloating and gas.

Some users recommend starting off with a small dose (1 – 3 g) and gradually increasing it. They also note that the bloating and gas symptoms that occur at the beginning of supplementation slowly disappear after a few weeks of supplementation.

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About the Author



Will Hunter

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Will received his BA in Psychology from the University of California, Los Angeles.

Will's main passion is learning how to optimize physical and mental performance through diet, supplement, and lifestyle interventions. He focuses on systems thinking to leverage technology and information and help you get the most out of your body and brain.

B vitamins are a class of water-soluble [vitamins](#) that play important roles in [cell metabolism](#).

There are eight B vitamins — collectively called B complex vitamins. They are:

thiamine (B1),

riboflavin (B2),

niacin (B3),

pantothenic acid (B5),

pyridoxine (B6),

biotin (B7),

folate (B9)

and cobalamin (**B12**). Oct 11, 2018

Many of the following substances have been referred to as vitamins as they were once believed to be vitamins. They are no longer considered as such, and the numbers that were assigned to them now form the "gaps" in the true series of B-complex vitamins described above (e.g., there is no vitamin B4). Some of them, though not essential to humans, are essential in the diets of other organisms; others have no known nutritional value and may even be toxic under certain conditions.

Vitamin B4: can refer to the distinct chemicals choline, adenine, or carnitine.[37][38] Choline is synthesized by the human body, but not sufficiently to maintain good health, and is now considered an essential dietary nutrient.[39] Adenine is a nucleobase synthesized by the human body.[40] Carnitine is an essential dietary nutrient for certain worms, but not for humans.[41]

Vitamin B8: adenosine monophosphate (AMP), also known as adenylic acid.[42] Vitamin B8 may also refer to inositol.[43]

Vitamin B10: para-aminobenzoic acid (pABA or PABA), a chemical component of the folate molecule produced by plants and bacteria, and found in many foods.[44][45] It is best known as a UV-blocking sunscreen applied to the skin, and is sometimes taken orally for certain medical conditions.[44][46]

Vitamin B11: pteryl-hepta-glutamic acid (PHG)

List of B vitamins^[edit]

B number	Name	Thumbnail description
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B number	Name	Thumbnail description
Vitamin B₁	thiamine	A coenzyme in the catabolism of sugars and amino acids.
Vitamin B₂	riboflavin	A precursor of coenzymes called FAD and FMN, which are needed for flavoprotein enzyme reactions, including activation of other vitamins
Vitamin B₃	niacin (nicotinic acid), nicotinamide, <u>nicotinamide riboside</u>	A precursor of coenzymes called NAD and NADP, which are needed in many metabolic processes.
Vitamin B₅	pantothenic acid	A precursor of coenzyme A and therefore needed to metabolize many molecules.
Vitamin B₆	pyridoxine, pyridoxal, pyridoxamine	A coenzyme in many enzymatic reactions in metabolism.
Vitamin B₇	biotin	A coenzyme for carboxylase enzymes, needed for synthesis of fatty acids and in gluconeogenesis.
Vitamin B₉	folate	A precursor needed to make, repair, and methylate DNA; a cofactor in various reactions;

B number	Name	Thumbnail description
		especially important in aiding rapid cell division and growth, such as in infancy and pregnancy.
Vitamin B₁₂	various cobalamins ; commonly cyanocobalamin or methylcobalamin in vitamin supplements	A coenzyme involved in the metabolism of every cell of the human body, especially affecting DNA synthesis and regulation, but also fatty acid metabolism and amino acid metabolism .

<https://www.sciencealert.com/inulin-is-being-added-to-many-foods-but-it-could-be-causing-stomach-problems>

HEALTH

What Is Inulin And Why Is It Being Added to So Many Foods? A Nutritionist Explains



CHRISTY BRISSETTE, THE WASHINGTON POST

15 JUNE 2019

Fiber is "the new protein", according to market research firms. But it could also be the new pain in your stomach.

If you're like most Americans, you're trying to add more fiber to your diet. That's a good thing, because the average American gets only half the recommended amount of fiber each day.

Manufacturers are responding to consumers' wishes by adding fiber to a plethora of foods and beverages, including cereals, energy bars, protein supplements, "healthier" cookies, diet ice cream and even bottled water.

One of the most prevalent fiber-boosting ingredients is inulin. Like any fiber, it can cause gas, bloating and abdominal pain if consumed too quickly or in large quantities. Many of my clients who have complained about digestive discomfort don't realize how much inulin they're consuming each day. Most of them have never even heard of it.

Here's what you should know about inulin, including how much you need and how to determine how much you are getting.

What is inulin?

Inulin is a type of prebiotic, a substance that's used by the microorganisms in your digestive tract and positively influences health. At this point, there is evidence that three prebiotics can provide health benefits: inulin, also referred to as **long-chain inulin; fructooligosaccharide (FOS)**, a short-chain inulin that's also called oligofructose, and **galactooligosaccharide (GOS)**.

Both inulin and FOS are extracted from chicory root fiber, a natural dietary fiber that is extracted using hot water from a plant **that's part of the dandelion family**. GOS is produced from lactose, which is sourced from animals. It also isn't as well-studied as the other two.

Inulin is also found in smaller amounts in whole wheat and some vegetables and fruits, such as asparagus, garlic and bananas. Data from 1999 (the most recent available) puts the average American intake of inulin naturally occurring in food at 2.5 to 3.5 grams a day.

Longer-chain inulin has a creamy mouthfeel, so it's often used to help reduce the fat content in products. Short-chain inulin (FOS) tastes slightly sweet, so it's used to help reduce some of the sugar and sugar substitutes in foods and beverages.

Inulin supplements and some foods and beverages will use a blend of short- and longer-chain inulin. These blends are also commonly used in research.

Digestive pros and cons

Chicory root fiber passes through your small intestine and then is fermented by the bacteria in your large intestine. As noted above, taking in too much too quickly can lead to digestive discomfort - which can happen with any fiber. In addition, some people seem to be more sensitive to inulin and FOS than others, and may need to limit their consumption.

Inulin does have some digestive benefits. A blend of short- and long-chain inulin has been shown to reduce discomfort and help with constipation. The fiber increases the amounts of beneficial Bifidobacteria and Lactobacilli bacteria in the gut.

The European Food Safety Association has approved the claim that consuming at least 12 grams of chicory inulin or FOS a day eases constipation. (There isn't enough research to state this about GOS.)

Other health benefits

Inulin and FOS also may reduce our calorie intake and blood-sugar levels and increase calcium absorption.

Chicory root fiber seems to slow down stomach emptying and suppresses appetite signals in the brain, which could help you eat less. In small studies, adults and children of both normal and excess weight who took a supplement of 12 to 16 grams a day consumed fewer calories.

[A weight-loss study](#) of 44 people with pre-[diabetes](#) who were receiving counseling from a dietitian found that the group taking inulin supplements for 18 weeks had a weight loss of 7.6 percent of body weight, compared with a weight loss of 4.9 percent in the group taking cellulose, another type of fiber.

Inulin also seems to lower glucose and insulin levels after meals in average-weight and overweight people. And a study of 49 women with Type 2 diabetes found that taking 10 grams of inulin a day compared with 10 grams of maltodextrin (a refined carbohydrate) over eight weeks was associated with a significant reduction in fasting blood sugar and A1C (an average of blood sugars over three months) and insulin levels.

Though these findings are exciting, there needs to be more research on the effects of inulin on individuals with pre-diabetes and Type 2 diabetes to know whether it can be helpful in these populations.

[Regarding calcium, research suggests](#) that getting 8 grams of chicory root fiber a day improves absorption. Chicory root fiber makes the colon more acidic, which increases the surface area that can absorb nutrients and makes more proteins that bind to calcium.

A year-long randomized control trial in 100 adolescents conducted at the Agriculture Department's Children's Nutrition Research Center at the Baylor College of Medicine found that the teens taking 8 grams a day of chicory root fiber had higher levels of calcium absorption and higher bone mineral density, showing that the additional calcium that was absorbed was deposited into bone.

How much inulin to aim for

[In prehistoric times](#) - when we were eating far more vegetables and gnawing at roots - it's estimated that our ancestors consumed about 135 grams of inulin a day. I wouldn't recommend aiming for those levels, given what our digestive levels are now accustomed. But we can realistically reach much lower levels that promote health benefits.

Based on research, aim for 5 grams of inulin a day to boost the growth of the probiotic Bifidobacteria in your gut. For better calcium absorption, you want to get 8 grams or more. Getting 12 grams of inulin and FOS a day has been shown to help promote regular bowel movements.

Any time you increase your fiber intake, do so gradually to give your body a chance to adjust. Be sure to drink plenty of water to help prevent constipation.

Randal Buddington, professor at the University of Tennessee Health Sciences Center, likens increasing your inulin intake to exercising more. "If a couch potato starts exercising with a very intense workout, the pain and agony may very well keep them from continuing. If they start slow, and gradually build up, the benefits will increase and the person will continue."

The amount of inulin that's tolerated seems to vary from person to person. Research suggests that long-chain inulin is better tolerated than FOS. Most healthy people do well with up to 10 grams of inulin and 5 grams of FOS a day.

Hannah Holscher, registered dietitian and professor at the University of Illinois, recommends a gradual increase every two weeks. "Let's say there's [an energy] bar you like that's high in inulin that you seem to be sensitive to.

You might start eating a quarter of the bar for a week or two, then one-half for a couple of weeks, and work up to having the full bar."

How much has been added?

Companies aren't required to specify the amount of inulin in their products on the label; it will be included in the total amount of dietary fiber in the Nutrition Facts table.

If a food or beverage that doesn't usually contain fiber, such as yogurt or flavored water, lists inulin as the only fiber ingredient, then the amount of dietary fiber tells you how many grams of inulin have been added.

If a food is made with whole grains or other fiber-rich ingredients, such as a cereal or granola bar, it can be tough to tell how much of the fiber is coming from inulin. In this situation, you can look at the ingredient list to see where the inulin appears (it could be listed as inulin, oligofructose, oligofructose-enriched inulin, chicory root fiber, chicory root extract or fructooligosaccharides).

Because ingredients are listed by weight, if inulin shows up early, that means higher amounts of it have been added. If it's still not clear, you can also contact the manufacturer to find out how much chicory root fiber is being added and which types.

The bottom line

Though inulin offers benefits as a fiber source and as a prebiotic, keep in mind that the majority of your fiber should be coming from whole foods that provide other nutrients. The goal is to get 25 to 38 grams of fiber a day from food rather than supplements.

Holscher suggests keeping it simple. Focus on getting enough fiber overall rather than worrying specifically about getting enough inulin. Including plenty of plant-based foods in your diet will help you get some inulin along with other fiber types.

If you're trying to eat fewer calories or boost calcium absorption, I recommend starting with the basics before adding high-inulin foods and beverages or supplements to your routine.

To take in fewer calories, eat plenty of non-starchy vegetables, increase your overall fiber intake via pulses and small portions of whole grains, consume lean protein sources and up your water intake.

For better calcium absorption, make sure you're taking it with vitamin D. Then you can think about whether chicory root fiber is something that could enhance your diet.

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