

Feeding Your Microbes For a Healthy GI Tract

By Jo Ann Tatum Hattner, MPH, RDN

'Gut health' is a term increasingly used in the medical literature and by the food industry. It covers multiple positive aspects of the gastrointestinal (GI) tract, such as the effective digestion and absorption of food, the absence of GI illness, normal and stable intestinal microbiota, effective immune status, and a state of well-being.¹

Human Microbiome

Scientists have described us as more microbial than human. Our bodies are teeming with microbes with a population estimated to be more than 100 trillion cells. They reside throughout the body with the majority of bacteria inhabiting the large intestine. They appear to be sending out and receiving signals, which are believed to have an important influence on our individual state of health and disease. Justin Sonnenburg, a microbiologist at Stanford, suggests we regard the human body as "an elaborate vessel optimized for the growth and spread of our microbial inhabitants."²

The Gut's Impact on Health

The gut is the largest immune system in the body; it interfaces with the outside world and possesses defense mechanisms to protect us. The gut microbiota and the gut barrier are the two main components to preserving gut health. Gut microbiota regulate epithelial functions to maintain tight junctions and mucosal immunity preventing colonization of pathogens. W. Allan Walker, MD, of Harvard describes the gut as a balanced ecosystem: "Under normal colonized conditions, the large diverse gut intestinal flora exists in a balanced ecosystem where health promoting bacteria balance potential pathogens and there is no expression of disease."³

RDN Takeaway #1:

A healthy gut is a gut that digests, absorbs, and eliminates with ease and is free of illness.

Because gut health has such an important role in our overall health, it should be a priority to support the gut ecosystem in the best way we know. We can do this by caring for and feeding our microbial inhabitants. There are two food categories which have been extensively researched and have emerged as foods to be encouraged. They are probiotic and prebiotic food sources.

Probiotic Foods

Probiotic foods are those that provide beneficial live active cultures. Important to

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Fear of Fermentation

By Jo Ann Tatum Hattner, MPH, RDN

When nondigestible carbohydrates reach the large bowel, the fermentation process results in the production of acids and gases.

Advantages:

- Acids are produced that have beneficial effects in reducing the pH level of the colon, which is detrimental to the survival of the pathogenic bacteria;
- Short-chained fatty acids, which have numerous benefits, are produced;
- Mineral absorption is enhanced, especially calcium and magnesium; and
- Immunity is increased as the microbiota interact and communicate with cells lining the gut.

Disadvantages:

- Gas/Flatulence

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remember is that probiotics, whether ingested as a live culture in a food or as native probiotic bacteria in our gut, use the same mechanisms to enrich and stabilize the gut microbiota.

In 2002, the World Health Organization defined probiotics as, "Live microorganisms, which when administered in adequate amounts, confer a health benefit on the host."⁴

We know that microorganisms meet probiotic criteria when they are not harmful (pathogenic), remain viable during processing and shelf life, survive digestion, are able to bring about a response in the gut, and are associated with health benefits. Food sources of probiotics contribute to a diverse gut microbiota. The best sources of probiotic foods are yogurts and kefirs since these are made with and contain live active cultures. To learn more about food sources of probiotics, consult *Gut Insight*.⁵

RDN Takeaway #2:

The health of the gut microbiota is enhanced with a diet rich in foods that contain prebiotic substances, sources of nondigestible fermentable fibers, that the microbes use for energy and nutrients.

Prebiotic Foods

Prebiotic foods are those that contain prebiotic substances.

The complement to probiotics is prebiotics. The prebiotic definition has developed over the years. Prebiotic foods are those with nondigestible fermentable carbohydrates from listings of plant foods that have been analyzed for inulin and oligofructose content.^{6,7} These foods became known as "prebiotic foods" as they contain inulin-like fructans.⁵

Bifidobacteria and *lactobacilli*, two genus of gut bacteria that are potentially beneficial, have an advantage. They can utilize fructose, as well as glucose, for energy. The fermentation of inulin and other fructans stimulates and supports the health-promoting bifidobacteria and lactobacilli in the colon. This gives them an edge in that they can cultivate more rapidly than the bacteria in the large bowel which only utilize glucose.

The scientists who coined the term "prebiotic," Glen Gibson, of the UK, and Marcel Roberfroid, of Belgium, developed criteria for a food substance to qualify as a prebiotic. They have updated the criteria over the years as researchers were able to perform both in vivo and in vitro studies.

Criteria for classification as a prebiotic are: resistance

to gastric acidity, hydrolysis by mammalian digestive enzymes, and GI absorption; fermentation by intestinal microflora; and selective stimulation of the growth and/or activity(ies) of one or a limited number of intestinal bacteria beneficially associated with health and well-being.


According to Roberfroid, "Any dietary component that reaches the colon intact (or partly so) is a potential candidate for prebiotic attribute. However, it is the last of the three criteria (above) which is crucial but still is the most difficult to fulfill, and which is often ignored when citing ingredients as 'prebiotics.' The ultimate test for prebiotic activity—human volunteer trials—is lacking for the majority of these compounds. As for today, inulin-type fructans (ITF) and galacto-oligosaccharides (GOS) are the compounds most extensively tested in human trials and that have confirmed their prebiotic effects as evidenced by their ability to change the gut flora composition after a short feeding period at reasonably low doses."⁸

Investigators have reported that dry beans meet the first two prebiotic criteria and that bean components show some fermentation selectivity when tested in laboratory systems. What is needed to be classified as a prebiotic, according to Roberfroid, is demonstration of the third criteria, ideally in human subjects. Until then, they remain a "prebiotic potential."

Conclusion

Eating a plant based diet with frequent servings of beans has numerous health benefits, including ingestion of the fermentable fibers; improved cardiovascular health, blood glucose control, and colonic health including regularity; and the provision of numerous nutrients.

Feeding your microbes may well be the key to maintaining a healthy gut.

Starving your microbes by not eating fermentable carbohydrates may well result in unhealthy changes in your gut microbiota for, as is the suggestion in the literature, a low fermentable carbohydrate diet may result in less health-promoting bacterial populations than provided to those eating high levels of fermentable carbohydrates.^{9,10} 

About the Author

Jo Ann Hattner MPH, RDN has over thirty years of experience in clinical academic settings, primarily at Stanford University. As the author of *Gut Insight: Probiotics & Prebiotics for Digestive Health and Well-Being*, written with medical librarian Susan Anderes, Hattner provides a scientifically-based guide for both consumers and health professionals.

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Fear of Fermentation

It is the gas production that keeps many people from eating fermentable fibers, particularly dry beans. Raffinose and stachyose, both tetrasaccharides, are known as the gas producing carbohydrates which yield carbon dioxide, methane, and/or hydrogen in beans. Because these tetrasaccharides are relatively soluble in water and canned beans are packed in water and salt, some of the tetrasaccharides will leach into the water. Draining and rinsing canned beans will reduce the content of these highly fermentable carbohydrates.


In addition, simple cooking tips for dry beans to reduce gas include: soaking the beans before cooking, changing the water once or twice while they soak, draining the soaked beans, using fresh water for cooking, and rinsing after cooking.¹

RDN Takeaway #3:

If you want to tolerate beans, you need to eat beans. Studies demonstrate tolerance to beans is established with frequent ingestion.

Developing Tolerance

A study on beans and gas reported by Winham and Hutchins demonstrated tolerance with frequent eating of beans. Healthy adults were asked to eat one half cup of legumes (pinto beans, black-eyed peas, or navy beans) or carrots each day for 8–12 weeks. Initially, half the people reported increased gas, but after 8 weeks they were back to normal levels.

Less than 50% reported increased flatulence from eating pinto or baked beans during the first week of each trial, but only 19% had a flatulence increase with black-eyed peas. A small percentage (3–11%) reported increased flatulence across the three studies even on control diets without flatulence-producing components.² 

RDNs Love Bean Recipes

Every year in our reader survey, RDNs tell us how much they love beans and recipes. To help meet the needs of your colleagues across the country, please send your favorite bean recipe to us. We may print it in an upcoming newsletter. In particular, we are looking for dessert recipes using dry beans. Please send to DBQ@mail.com.

Smart Choice Recipe

By Diana Cullum-Dugan, RDN

Vegetarian Chili

While it seems like the ingredient list is long and the steps many, this chili is worth every bit of it. Thick, creamy, and hardy, your long winter night will be super warm. High protein and fiber ensured, it's hearty too! Serve with Southern cornbread for a well-rounded and complementary meal.



Ingredients

- ½ lb. dry pinto beans, soaked overnight
- ½ lb. dry cannellini beans, soaked overnight
- 2 lbs. onions, finely chopped
- 2 Tablespoons olive oil
- 1½–2 Tablespoons red chili flakes
- ½ oz. dried shiitake mushrooms, coarsely chopped
- 4 teaspoons dried oregano
- 1 package Trader Joe's meatless crumbles (or favorite brand)
- ¾ cup TVP (textured vegetable protein), reconstituted with ¾ c. boiling water
- ½ cup walnut halves, toasted
- 1–28 oz. can diced tomatoes, reserve juice after draining
- 3 Tablespoons tomato paste
- 1 jalapeno pepper, stemmed and coarsely chopped
- 6 garlic cloves, minced
- 1 Tablespoon low-sodium soy sauce
- 1–2 Tablespoons Worcestershire sauce
- 7–8 cups water
- 1 Tablespoon ground cumin
- 1–2 Tablespoons veggie broth powder
- 1 Tablespoon no-salt Spike seasoning
- 1–2 teaspoons Liquid Smoke
- 1 Tablespoon molasses
- 1 teaspoon adobo sauce
- ¾ cup frozen corn, thawed
- ¼ cup fresh cilantro, finely chopped, for garnish
- Greek yogurt for garnish

PREPARATION

1. Bring 4–5 quarts water and beans to a rapid boil in a Dutch oven or large stockpot. Remove from heat, cover, and let stand for 1 hour. Drain and rinse beans and set aside.
2. In a food processor, pulse the red chili flakes, dried mushrooms, and oregano until fine.
3. In the Dutch oven, sauté onions in olive oil until soft, then add in red chili flakes, mushrooms and oregano, and sauté until onions are translucent and spices very fragrant. Add the meatless crumbles and reconstituted TVP (pour boiling water over TVP and set aside until reconstituted, about 5 minutes) and sauté until heated through.
4. Meanwhile, puree the roasted walnuts in a small food processor for about 30 seconds and set aside.
5. Process the drained tomatoes, tomato paste, jalapeno peppers, garlic, soy sauce, and Worcestershire sauce in food processor until tomatoes are finely chopped, about 45–60 seconds; set aside.
6. In Dutch oven, combine beans, meatless crumble mixture, tomato mixture, water, cumin, veggie broth powder, Spike, Liquid Smoke, molasses, and adobo sauce and simmer covered for 1½ hours (up to 2 hours) until beans are very tender.
7. When beans are nearly done, add thawed frozen corn.
8. Spoon into bowls, garnish with cilantro and Greek yogurt if desired.

YIELD: 10 servings | **SERVING SIZE:** One bowl

NUTRIENT INFORMATION PER SERVING:

Calories: 527, Protein: 46g, Carbohydrates: 49g, Fat: 18g, Cholesterol: 0g, Fiber: 14g, Sodium: 4mg

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Managing Editor's Note: We're glad to share this feedback from DBQ readers. Please send us your thoughts and comments about dry beans to DBQ@mail.com.

“One of the best strategies I have found to encourage and increase consumption of beans is to create a variety of attractive bean dishes that can be featured on salad bars or offered as side dishes. Students are interested in a variety of tasty foods with eye-appeal. It's important to keep menus fresh, healthy, and fun.

“The new USDA school meal regulations require menu planners to include a minimum of one-half cup of dry beans/peas/legumes every week on school menus for grades K–12. So, I am always looking for new and creative bean recipes.

“My latest recipe find features marinated white beans. It is fantastic! The recipe steps are: 1) Saute sun dried tomatoes, chopped fresh rosemary, fresh garlic, and red pepper flakes in olive oil. 2) Add white beans to this mixture. 3) Add lemon zest, lemon juice, salt, and pepper. 4) Toss mixture and chill for at least two hours before serving.

“It's delicious and quite attractive. It can also be served on a bed of arugula as an entree salad.”

Mary Tolan-Davi, RDN, SNS
Manteca, CA

“Studies are important to our understanding of beans' many nutritive roles and folks should also know about the food science to reproduce the perfect bean dish from recipes. For example, the Asian sweet bean soup made with adzuki or mung beans is a delicious snack, with several variations of the recipe online. It can be served warm on a cold winter's day, or as cold soup or sweet bean ice popsicle in the heat of summer. Kitchen-tested recipes list sugar as the last ingredient to be added into the soup. The reason for this is because sugar arrests the softening of the bean by stabilizing the beans' starch structure during heating. So, if you add sugar too early, your beans will not “cook;” add sugar after cooking and you can reheat your beans without reducing them to a gelatinous glob.”

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