

Resistant Carbohydrates in Dry Beans: Friend of Colonic Probiotics, Foe of Colorectal Cancer

By Robin B. Dahm, RD, LDN

Dry beans are a nutritious, health-promoting food. Besides being a rich source of vitamins and minerals, dry beans contain polyphenols¹ and fiber.² This versatile and inexpensive food provides high-quality protein while being low in fat.¹ Additionally, research has shown that dry beans contain resistant starch that supports colonic probiotics¹ and reduces the risk of colorectal cancer.³

Positive Effects in the GI Tract

All the positive benefits of dry beans begin in the GI tract. Digestion in the mouth and small intestine breaks down the beans and releases many of their numerous beneficial components, such as vitamins, minerals, and proteins. After absorption at the brush border, these components then travel via the hepatic portal to the liver, where they are used in a number of daily, standard biochemical processes.



Other components of dry beans are not absorbed in the small intestine. For example, some of the fiber in dry beans resists digestion and thereby increases stool bulk,³ which serves to dilute,^{2,3} bind,³ and decrease³ the transit time of potential carcinogens through the GI tract.^{2,3} Fiber can also affect the amount of secondary bile acids and salts in the tract,² which are cytotoxic and carcinogenic,⁴ by binding

them; or by lowering the colonic pH, which might slow the conversion of bile acids and salts from primary to secondary.²

Non-digestible carbohydrates such as resistant fiber (RF) and resistant starch (RS) are thought to have a positive influence on health⁵ once they reach the colon. Whereas most starch is very digestible throughout the intestinal tract,⁵ RS is the part of starch that is not digested by pancreatic alpha-amylase in the small intestine.⁶ Additionally, the form of the food containing the starch also determines its resistance to digestion.⁷ For example, large and/or intact starch granules are more resistant than are small and/or fragmented granules.⁷ Additionally, starches in whole grains are believed to be more resistant than refined starch.⁷ Whereas some grains are mechanically altered during processing, beans remain intact during processing and can be viewed as a “whole” food whose resistant carbohydrates are mostly intact before consumption. Dry beans are an excellent source of RS,¹ representing as much as 35 percent of the legume.⁸

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Supermarket RDs: Guiding Consumers To Health Aisle by Aisle

By Carrie Taylor, RD, LDN

Leading a nutrition tour through a grocery store can be a game of dietetics rapid fire. Questions range from “What is the healthiest cookie in the cookie aisle?” to “Should I eat farm-raised or wild-caught salmon?” It’s imperative that the supermarket RD understand the science behind hundreds of different topics while also being able to answer questions immediately in consumer-friendly terms.

A handful of retailers and dietitians have been paving the path of supermarket dietetics for over twenty years. Some retailers collaborated with local hospitals, like Piggly Wiggly Supermarkets did with Eileen Myers, RD, while she worked at St. Francis Xavier Hospital in Charleston, SC. Others have joined forces at the corporate level, such as Jane Andrews, MS, RD and Wegmans Food Market, Inc., of Rochester, NY.

According to the Food Marketing Institute (FMI), “supermarket dietitians have an array of responsibilities and often don’t have a single focus, impacting corporate health and wellness strategy while also serving as a regional consultant to many stores.”¹ Some supermarket dietitians provide evidence-based nutrition education to consumers in the community with newspaper columns, radio and television spots, as well as internet and social media content. Others provide shoppers with tours, food demonstrations, classes and one-on-one counseling. Many work directly with quality assurance departments ensuring products and packaging meet national standards. Others work in marketing and advertising,

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References

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Prebiotics, Probiotics, and Synbiotics

RF and RS are both prebiotics.^{3,9} Prebiotics are undigested food ingredients that support the growth and activities of certain bacteria (probiotics) in the colon.⁹ These bacteria then provide health-promoting effects for the host.⁹ RS and RF are fermented by colonic probiotics^{3,5} into short-chain fatty acids (SCFAs) such as acetate,⁷ propionate^{1,7} and butyrate.^{3,5,7} The SCFAs produced by the probiotic fermentation of prebiotics are associated with health benefits,¹ such as a decreased risk of colorectal cancer in humans.³

Diet plays a major role in the kinds of bacteria populating the colon, as well as their ability to benefit their host. The probiotic species that live in the human colon are extremely diverse.⁵ Not only are there hundreds of different kinds of phylotypes in general, the ones present in one person can differ significantly from those in another person.⁵ The fermentable dietary fiber² of legumes in its prebiotic role promotes the growth of a variety of probiotics in the colon.^{3,5} Studies where the total carbohydrate intake of obese subjects was reduced have shown significant changes to the colonic probiotics and their outputs, believed to be associated with the change in the amount of fermentable compounds.⁵ Prebiotic supplementation has also been shown to promote the growth of specific groups of probiotics, including bifidobacteria.⁵

Bifidobacteria produce lactate⁵ and folate,^{4,9} both of which are associated with improved bone mineral density and bone mineral content in postmenopausal women.⁹ *Bifidobacterium lactis* Lafti B94 is known to ferment a variety of prebiotics, including RS.⁹ Additional probiotics include *E. rectale*, which increases with a RS diet⁵ and is a major contributor in intestinal butyrate production.⁵

Food For a Healthy Colon

Probiotic therapies have been shown to have important clinical benefits for a number of conditions, in particular those associated with the gastrointestinal tract: gastrointestinal dysbiosis such as antibiotic-associated diarrhea, necrotizing enterocolitis, and recurrent pouchitis.³ Probiotic synthesis of folate and biotin, which are involved with epithelial proliferation,⁴ may have a protective effect against cancer.


Besides its role as a prebiotic, RS can be viewed as synbiotic,⁹ which is a “product containing prebiotics and probiotics and in which the prebiotic compound selectively favors the probiotic compound.”⁹ Synbiotics may help the microorganisms travel through the small intestine and reach the colon,⁹ where they can impart their benefits to the host. RS as a synbiotic⁹ helps the probiotics colonize the colon via physical transport: Bacteria can adhere to the RS surface as the RS travels

through the GI tract.⁹ It may also increase the length of probiotic viability in adverse food environments and boost the number of probiotics living in the colon.⁹

Butyrate is essential for the health of the colon.⁴ A preferred food of colonocytes,^{3,4,7} butyrate is produced by the colonic probiotics, specifically *Clostridia* and *Firmicutes*,⁴ from RS⁵ and dietary fiber such as that provided by legumes.² Butyrate has potent anti-inflammatory, anti-proliferative, and antineoplastic properties against colon cancer.^{2,4} In terms of CRC, butyrate supports cellular differentiation and reduces proliferation; it also lowers the pH in the lumen, which is associated with a decreased risk of CRC.³ In terms of colon cancer, butyrate halts epithelial proliferation, a marker of cancer risk.⁴ Butyrate may do so in part by influencing the expression of certain genes such as CDKN1A, which is a cell-growth regulator.³

Conclusion

The typical American diet lacks adequate amounts of fruits and vegetables needed to maintain general health, let alone stave off disease states such as type 2 diabetes and CRC. For example, RS in amounts exceeding 20 grams a day are associated with improved bowel health, an increased absorption of nutrients, and improved blood-sugar control.⁶ Americans aged 1 year and older⁸ are estimated to consume on average only 4.9 grams of RS daily.^{6,8} Increasing the amount of foods rich in fiber³ and RS,⁵ such as dry beans,¹ could decrease an individual's risk of colorectal cancer.³ [*Editor's Note:* A 1/2-cup serving of cooked pinto, navy, or black beans provides approximately 25–30 grams of resistant starch.]

People who eat dry beans benefit not only from the nutrition provided directly by the beans, but also from the beneficial compounds created by the colonic probiotics. Most impressive is the fact that diet-driven changes in intestinal bacteria happen swiftly and are detectable within three or four days.⁵ This speedy response of the colonic probiotics strongly suggests that within days of an increased consumption of dry beans, an individual may have already begun to reduce his or her risk of colon cancer. For its many protective effects, the consumption of dry beans should be encouraged.¹ 

About the Author

Robin Dahm, RD, LDN, holds a bachelor of science degree in nutritional science from Rutgers University. Her work as a clinical dietitian has focused on the nutritional needs of older Americans. She is editor in chief of *The Spectrum*, the quarterly newsletter of the Healthy Aging Dietetic Practice Group, a part of the Academy of Nutrition and Dietetics (formerly the American Dietetic Association).

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providing ad circular and magazine content, and still others work with in-store signage and shelf tag programs.

Truth be told, though, most supermarket dietitians provide a mixture of all of these services.

The demand to have dietitians at supermarkets keeps growing. *Shopping for Health 2012* cites “one-third of shoppers report that they are buying more foods based on nutritional components than they were in 2010.”² That said, when asked if they had to choose one type of expert to help them live healthier, 40 percent of shoppers chose a personal nutritionist/meal planner. According to FMI, 79 percent of supermarkets provide store tours with specific diseases and healthy foods as the top themes.

By providing dietitian services to shoppers, retailers have gone above and beyond their traditional offerings at point of purchase. John Schnepf III, director of advertising for Big Y Foods, Inc, has seen first-

hand how dietitians can cultivate customer loyalty and bring in new customers. “Having dietitians on staff to answer customer questions, provide nutrition education in the media, and highlight better-for-you products helps set us apart from our competitors,” Schnepf said.

A career in the supermarket industry is not for everyone. Although members of the current class of supermarket dietitians have a variety of specialties, years of experience, and levels of academic training, the industry is fast-paced and ever evolving. To succeed, one must step effortlessly into a world of business, marketing, media, and sales while holding firmly to the skills, expertise, and integrity acquired as a health care provider.

To gain more insight into the world of supermarket dietetics, you might consider attending this year’s supermarket dietitian session at the Academy of Nutrition and Dietetics 2013 Food & Nutrition Conference & Expo in Houston, TX. 🌿

About the Author

Carrie Taylor, RD, LDN, has been the lead dietitian for a family-owned supermarket chain for the past eight years. Previously, she served as lead nutrition educator for UMass Extension’s Family Nutrition Program. She has a bachelor of science degree from Virginia Tech with concentrations in exercise science and dietetics.



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