



# ALIVE!

## BUTYRATE AND THE BOWEL, PT 3

**CROSSTALK IS A TERM** that can pertain to telecommunications, when distinguishable signals leak from one connection to another. In electronics, crosstalk is a phenomenon by which a signal on one circuit or channel of a transmission system creates an effect on another circuit or channel. The term has been borrowed and used in reference to the human body, when communication signals in one body system “leak out” and communicate to another seemingly unrelated body system. For example, science is suggesting that crosstalk exists between the bowel and the brain via butyrate.

We have been looking at the short-chain fatty acid butyrate the past couple months and have seen what a significant role it plays in bowel health, immune system function, obesity, and diabetes. “Indeed, it is clear that host energy metabolism and immune functions critically depend on butyrate as a potent regulator, highlighting butyrate as a key mediator of host-microbe crosstalk.”<sup>1</sup> But even beyond this crosstalk between host and microbe, the suggestion that butyrate crosstalks with the brain has led to research revealing evidence that brain function and behavior are influenced by the byproducts of the microbes that inhabit the bowel.

Large oral doses of butyrate as a potential therapy for neurological disorders ranging from depression to

neurodegenerative diseases and cognitive impairment are being used in experimental trials. Research has indicated that butyrate plays a role in decreasing inflammation in the brain. It has been observed that children on a high-fiber diet demonstrate better cognitive control with multitasking, working memory and maintaining focus than children who typically eat a low-fiber diet. Rats supplemented with probiotics that increase butyrate-producing bacteria reduced anxiety levels in the rats and was also found to lower psychological stress in human subjects.<sup>2</sup>

With all the possible benefits from butyrate, is anyone asking yet how they can get some? Butyrate is produced by certain strains of bacteria. These bacteria flourish when they are supported nutritionally and environmentally. What environment does butyrate-producing bacteria like? According to one study, Africa, or at least the bowels of those who live there.

A study was conducted in which African Americans were compared with South Africans. The diets of both groups were found to be different in preparation, cooking, and composition. “Animal protein and fat intake was two to three times higher in Americans, whereas carbohydrate and fibre, chiefly in the form of resistant starch, were higher in Africans.”<sup>3</sup> African Americans consume higher animal protein and fat, less fiber, and have lower quantities of short-chain fatty acids in the colon than those who live in Africa. Colonoscopies revealed that African Americans had more polyps and more biomarkers of colon cancer risk.

“Profound” differences were also observed in the strains of bacteria that inhabited the bowel. There were “higher levels of starch degraders, carbohydrate fermenters and butyrate producers and their metabolites” in the South Africans.<sup>4</sup> The African Americans had higher levels of potentially pathogenic bacteria.

For two weeks the two groups swapped diets. Those from South Africa were fed a high-fat, low-fiber Western-style diet, under close supervision, while the African American volunteers were fed a high-fiber, low-fat African-style diet. “In comparison with their usual diets, the food changes resulted in remarkable reciprocal changes in mucosal biomarkers of cancer risk” as well as changes in the community of microbes inhabiting the colon.<sup>5</sup> Feeding African Americans a South African type diet resulted in increased butyrate production and decreased production of products known to be carcinogenic in the African Americans. These changes were associated with a significant reduction in colonic mucosal inflammation and cancer risk. “In stark contrast, the diet switch in rural Africans to a high-fat, low-fibre diet resulted in reverse changes in all these parameters.”<sup>6</sup>

What do butyrate-producing bacteria thrive on? Fiber. Typically, the general populace thinks of fiber in terms of Metamucil, something that aids elimination. In reality there are a variety of fibers that benefit our health in a variety of ways. Promoting butyrate production is one of them. We tend to think of fiber in terms of soluble and insoluble but there are resistant starches, fructo-oligosaccharides (FOS), inulin, pectin, cellulose and so on.

Just as it sounds, resistant starches resist digestion in the small intestine and are not absorbed. Resistant starch has been found to particularly enhance butyrate production. A diet rich in highly processed, low-fiber foods, and rich in simple sugars has been found to result in low levels of butyrate production. When these resistant starches enter the large intestine they become food for the microbes that live there and in this way act as prebiotic fibers. The intestinal bacteria slowly ferment these resistant starches and produce beneficial short-chain fatty acids such as butyrate. Even within this subcategory of fiber there is variety. One kind of resistant starch can be found in grains, seeds, and beans. Another is found in unripe bananas, plantains, and raw potatoes. A third type is produced when certain starches are cooked and then cooled. Cooked and cooled potatoes, rice, and pasta would contain this type of resistant starch.

Unmodified potato starch has been used as a supplement to increase butyrate production. In one study, those who received potato resistant starch as a supplement experienced the greatest increase in butyrate production, and had more resident resistant starch degrading microorganisms. In other words, those who had more microbes that degrade resistant fiber and convert it into butyrate had the greatest increase in production when resistant starch was supplemented.<sup>5</sup> Additionally, different sources of fiber yield varying levels of butyrate. Hi-maize resistant starch is another source that has been effectively used in studies. Hi-maize flour was shown to lower post-meal glucose and insulin levels, increased satiety, and decreased hunger after a meal. I advise finding an organic source.

Scripture says that God, the Originator, Designer, and King of the universe, at different times and in different ways, communicated in the past through messengers. He turned up the volume, and made His communication signals even clearer by communicating to us through His Son. From the throne room headquarters of the universe Jesus came, Crosstalk from heaven. His connection with the Father resulted in byproducts so radically different from the harvest of the selfish system of planet earth. His connection with man allows those signals to have access to every heart. 🕯

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2. Megan W. Bourassa, Ishraq Alim, Scott J. Bultman, Rajiv R. Ratan, “Butyrate, neuroepigenetics and the gut microbiome: Can a high fiber diet improve brain health?,” *Neuroscience Letters*, Volume 625, 20 June 2016, <http://www.sciencedirect.com/science/article/pii/S0304394016300775>.
3. Stephen O’Keefe, et al., “Fat, fibre and cancer risk in African Americans and rural Africans,” *Nature Communications* 6, Article number: 6342 (2015), <http://www.nature.com/articles/ncomms7342>.
4. Stephen J.D. O’Keefe, et al., “Fat, Fiber and Cancer Risk in African Americans and Rural Africans,” *Nature Communications* 6, Article number 6342 (2015), <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4415091>.
5. Ibid.
6. Ibid.



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