



ALIVE!

BUTYRATE AND THE BOWEL, PT 2

LAST MONTH WE BEGAN understanding one of the ways the community of microbes residing within impacts the health of its host organ, the colon, as well as other facets of human health. This community is composed of many members in various concentrations or percentages. There are thousands of varieties/species, some of which science is still discovering. They could be likened to family clans; the McCalahans, the De Lucas, the Gonzalezs, the Takahashis, different and unique from each other, yet dwelling in one community. The strains of microbes that flourish in this community are in part determined by what they are fed.

We learned that certain strains of bacteria ferment carbohydrates that have been thus far indigestible in the digestive system. As the bacteria break these indigestible carbohydrates down, they produce short-chain fatty acids that are secreted into the colon, byproducts of the fermentation process. Butyrate is one of these short-chain fatty acid byproducts. We observed that butyrate has made headlines in medical journals as a result of the intriguing results of research related to colon cancer, insulin resistance, and immunity, but it doesn't stop there.

OBESITY

The increasing incidence of obesity has fueled investigation as to how this public health concern can best be

approached. Research has found short-chain fatty acids, such as butyrate to favor energy expenditure, meaning increased calorie burning. Mice, supplemented with short-chain fatty acids including butyrate for four weeks, were simultaneously fed a high-fat diet. Typically a high-fat diet induces changes to the community in the bowel, leading to weight gain. Mice who did not receive the butyrate supplement gained weight steadily over time on the high-fat diet. Researchers found that weight gain was hindered with dietary supplementation of butyrate and propionate short-chain fatty acids. In fact, supplementation appeared to completely block the high-fat diet induced weight gain. At the end of the four-week study, researchers found improved oral glucose tolerance and fasting insulin with no weight gain as a result of supplementation. Butyrate led to a 22 percent reduction in food intake compared to a controlled diet.

It is suggested that butyrate inhibits weight gain by suppressing food intake and by inducing gut hormones to be released that result in suppressing hunger and the drive to eat.

INFLAMMATORY BOWEL DISEASE

A lack of short-chain fatty acids has been proposed to play an important part in the development of inflammatory bowel disease, including ulcerative colitis, and Crohn's disease. "Low concentrations of SCFAs (short-chain fatty acids) have been found in ulcerative colitis patients and treatment with SCFA enemas, especially butyrate, has been shown to reduce inflammation in this patient group. Interestingly, oral

administration of sodium butyrate was found to be safe and well tolerated in humans with Crohn's disease and ulcerative colitis; these studies showed a systemic anti-inflammatory effect and improved clinical improvement."¹

Ulcerative colitis is an inflammatory bowel disease that causes long-lasting inflammation and sores (ulcers) in the innermost lining of your large intestine and rectum.

With Crohn's disease, there is inflammation of the lining of the digestive tract that often spreads deep into affected tissues. The inflammation can involve different areas of the digestive tract; the large intestine, small intestine, or both.

Thirteen Crohn's patients were given enteric-coated sodium butyrate supplements for eight weeks. Sixty-nine percent of the group responded to treatment with the majority of those people achieving full remission. While this was a small study it gives evidence of the need for larger studies to be conducted to verify efficacy. Butyrate was observed to down-regulate inflammatory markers, decreasing mucosal inflammation, which is a core mechanism of Crohn's disease.²

Administering butyric acid in the rectum of mice during an acute phase of experimental colitis was found to reduce intestinal inflammatory parameters.³

IBS

Irritable bowel syndrome (IBS) is the most commonly diagnosed functional gastrointestinal condition. Rather than a disease it is "characterized by abdominal pain or discomfort relieved by defecation, and accompanied by changes in bowel habits such as diarrhea or constipation, which cannot be explained by structural, biochemical, or metabolic abnormalities."⁴ Altered functions involved in IBS include: "brain-intestine interactions, hypersensitivity of the lining of the intestine, abnormal motility, intestinal inflammation, post-infectious disturbances and alteration of microflora, altered composition or metabolic activity of the microbiota, increased intestinal permeability and impaired mucosal barrier function."⁵

A double-blind, randomized, placebo-controlled study was conducted in which 66 adult patients with IBS received microcapsulated butyric acid at a dose of 300mg per day or a placebo in addition to standard therapy. At four weeks, there was a statistically significant decrease in the frequency of abdominal pain in the butyric acid group. A six week

improvement in abdominal discomfort and bowel habits in addition to abdominal pain was observed in patients with IBS treated with microcapsulated sodium butyrate compared to those treated with a placebo. Patients treated with butyrate experienced a higher quality of life. No side effects were observed during treatment. Researchers have concluded that although the results seem to be promising, the effectiveness of butyrate in the treatment of IBS needs to be confirmed.

The microbiome community was investigated in 113 patients. There were 66 healthy controls. Two stool samples were provided one month apart. Worthy of noting, patients with IBS had significantly lower microbial diversity, which was associated with lower relative abundance of butyrate producing bacteria.⁶

It is becoming more apparent that when the microbial community within us is healthy, we are healthy. Whether we are referring to microbes or humanity, the byproducts, or fruits of a healthy community significantly impact the environment in which it lives. For this reason Christ has given gifts and function to the community for "the edifying of the body" (Ephesians 4:12). As each part does its own special work, it helps the other parts grow so that the whole body is healthy and growing and full of love (Ephesians 4:16, NLT). 🌱

1. Annick V. Hartstra, Kristien E.C. Bouter, Fredrik Bäckhed, Max Nieuwdorp, "Insights Into the Role of the Microbiome in Obesity and Type 2 Diabetes," *American Diabetes Association-Diabetes Care*, Jan. 2015, <http://care.diabetesjournals.org/content/38/1/159>.

2. A. Di Sabatino, R. Morera, R. Ciccocioppo, et al., "Oral butyrate for mildly to moderately active Crohn's disease," *Alimentary Pharmacology and Therapeutics*, Nov. 2005, <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2036.2005.02639.x/full>.

3. A. Załęski, A. Banaszekiewicz, J. Walkowiak, "Butyric acid in irritable bowel syndrome," *Gastroenterology Review*, June 2013, <http://doi.org/10.5114/pg.2013.39917>.

4. Kang Nyeong Lee, Oh Young Lee, "Intestinal microbiota in pathophysiology and management of irritable bowel syndrome," *World J Gastroenterol*, July 2014; 20(27): 8886-8897.

5. Ibid.

6. M. Pozuelo, S. Panda, A. Santiago, et al., "Reduction of butyrate- and methane-producing microorganisms in pp with Irritable Bowel Syndrome," *Scientific Reports*, Aug. 2015, <http://www.nature.com/articles/srep12693>.



RISË RAFFERTY, RDN

Risë is a Registered Dietitian Nutritionist. Her understanding of how significantly diet and lifestyle impact one's health and happiness fuels her passion to help, educate, and inspire others.