



Treat your bug right

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A commentary on

Microbial induction of immunity, inflammation, and cancer

by Greer, J. B., and O'Keefe, S. J. (2011). *Front. Physiol.* 1:168. doi: 10.3389/fphys.2010.00168

There is growing awareness of the importance of gut bacteria in human health by both researchers and the general public. The recent release of a human gut microbial gene catalog of more than a thousand bacterial species from a European cohort (Qin et al., 2010) exemplifies the rapid expansion of our knowledge of the other genome in humans – the gut bacterial genome. Highlighted in the review by Greer and O'Keefe (2011), the constitution of enteric microbiota is more diverse in rural African than European children (De Filippo et al., 2010), underscoring the evolution and adaptation of the gut flora within the environment of the human host. Cellular and molecular evidence to support the role of the microbiota in inflammatory and other human diseases has been well documented (Table 1 of the Greer and O'Keefe, 2011).

Previous studies to delineate the interaction between pathogenic bacteria and the host mucosal immune system have identified several molecular targets, termed pattern recognition receptors (PRR), which include toll-like receptors (TLR), Nod-like receptors, and RNA helicase family members (Fukata and Abreu, 2009). Membrane-bound TLRs, in particular, have been extensively characterized to construct plausible mechanistic pathways by which pathogens elicit immune responses and

compromise gut immunity leading to mucosal dysfunction, inflammatory bowel disease, and cancer.

The present review addresses gut bacterial–host interactions and their benefits, including the influence of maternal and postnatal adaptive nutrient metabolism, the lack of beneficial bacteria resulting from a Western diet, and hygienic practices. Interestingly, the authors cite butyrate as a specific example to demonstrate its beneficial role in several of these processes. Butyrate, a short-chain fatty acid (SCFA), has been shown to be involved in the regulation of energy consumption and immune function as well as cell growth and apoptosis in intestinal mucosa. Of note, many SCFAs, including butyrate, may act by signaling mechanisms involving a membrane-bound G-protein coupled receptor, GPR43, to modulate functions of endocrine (Maslowski et al., 2009) and enteric neuronal cells (Soret et al., 2010).

This review raises several salient points pertinent to microbial-induced physiologic and pathological responses. In particular, topics include (i) the effect of the Western diet and feeding behavior on food metabolism by gut bacteria resulting in increased disease risk; (ii) a plausible hygiene hypothesis based on well-recognized altered bacterial exposure and compromised gut immunity; and (iii) the potential beneficial role of butyrate in maintaining gut health and preventing GI diseases. Finally, the authors' suggestions to modify unfavorable dietary and hygienic behaviors through medical practice and public education are potential useful steps toward a harmonic coexistence of people with their gut bacteria.

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