

# Western lifestyle may limit the diversity of bacteria in the gut

April 16 2015

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Papua New Guinea residents prepare a meal. Credit: Andrew Greenhill

Bacteria that naturally reside in the gut are important for health, but recent studies consistently show that a modern lifestyle depletes the gut's collection of microbes. How lifestyle affects the diversity of this gut

"microbiome" is unclear, but an analysis of the gut microbiomes of Papua New Guinean and US residents in *Cell Reports* now suggests that western lifestyle may diminish the variety of bacteria in the gastrointestinal tract by limiting their ability to be transmitted among humans.

"There are several aspects of western lifestyle that have been hypothesized to alter the gut microbiome and decrease diversity," explains senior author Jens Walter of the University of Alberta Department of Agricultural, Food & Nutritional Science. "These include diet, sanitation, and clinical practices such as antibiotic use and caesarean sections, but we lack a conceptual understanding of how our microbiomes are altered."

Walter and his colleagues compared the fecal bacteria of adults from two rural, non-industrialized regions in Papua New Guinea with those of US residents. Papua New Guinea remains one of the least urbanized countries in the world, and the individuals who were studied live a traditional, subsistence agriculture-based lifestyle.

The research team found that Papua New Guineans have microbiomes with greater bacterial diversity, lower inter-individual variation, and vastly different compositional profiles compared with US residents. US residents lacked approximately 50 bacterial types that belonged to the core microbiome in Papua New Guineans. Their analysis found that the relative importance of ecological processes that structure the [gut](#) microbiota differ in westernized and non-industrialized societies. Specifically, bacterial dispersal, or the ability of bacteria to move from individual to individual, appears to be the dominant process that shapes the collection of [gut bacteria](#) in residents of Papua New Guinea but not those in US residents.

"These findings suggest that lifestyle practices that reduce bacterial

dispersal—specifically sanitation and drinking water treatment—might be an important cause of microbiome alterations," Walter says. "We propose a model based on ecological theory that fits the data and provides an explanation for the decline of microbiota diversity in urban-industrialized societies."



This is a photograph of the Papua New Guinea landscape. Credit: Andrew Greenhill

The information obtained in this study has implications for human health, given that microbiome alterations associated with westernization might contribute to increases in noncommunicable chronic diseases occurring in industrialized countries. The investigators noted the

importance of caution when questioning specific modern lifestyle practices, though, because overall, health and life expectancy is higher in westernized societies.

"However, we can think about how we can reduce the collateral damage of modern lifestyle practices on the [gut microbiome](#) without jeopardizing the benefits," says co-author Andrew Greenhill, a senior lecturer in microbiology at Federation University Australia. "The findings from this study provide information that could be used to develop strategies to prevent and redress the impact of westernization and potentially support the dispersal and transmission of microbes that have been eradicated."

Additional research is needed to determine the specific lifestyle and cultural factors that impose microbiome differences, their relative importance, and the underlying mechanisms by which microbiomes are altered. In addition, the impact of bacterial types absent from western populations on human health should be studied. "Such research might provide important information on the causes of western lifestyle diseases and a basis for the development of therapies for their treatment and/or prevention," Walter says.

**More information:** *Cell Reports*, Martinez et al.: "The gut microbiota of rural Papua New Guineans: Composition, diversity patterns, and ecological processes" 10.1016/j.celrep.2015.03.049

Provided by Cell Press

Citation: Western lifestyle may limit the diversity of bacteria in the gut (2015, April 16)  
retrieved 2 May 2024 from  
<https://medicalxpress.com/news/2015-04-western-lifestyle-limit-diversity-bacteria.html>

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