

Understanding social distancing and microbial health

September 17 2020



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Social distancing is a key component of the expert-recommended strategy to reduce the spread of COVID-19. According to the World Health Organization, the SARS-CoV-2 virus passes from person to

person primarily through saliva or airborne respiratory droplets. Protective precautions like wearing masks, washing hands, and avoiding close contact with other people can prevent the spread of droplets.

Avoiding contact with others, however, may have repercussions in a person's gut microbiome. In a perspective published this week in *mSphere*, an open-access journal of the American Society for Microbiology, a group of microbiologists in Portugal call for scientists to more closely examine the ways in which COVID-19—and our response to it—interact with microbial health. A more thorough analysis of that relationship, they argue, is needed to prepare for long-term health consequences and to develop comprehensive control strategies.

"Our behaviors have consequences," said lead author Teresa Nogueira, Ph.D., microbiologist at the National Institute for Agrarian and Veterinary Research and Centre for Ecology, Evolution and Environmental Changes at the University of Lisbon. "We are doing social distancing, which makes sense during the pandemic. But in the long term, social distancing can have consequences on the biodiversity of our microbiota."

In the paper, Nogueira and her colleagues highlight 2 critical ways to look for the effect of social distancing on the microbiome. One may be harmful, and the other helpful, leading the authors to describe the effects as a "double-edged sword."

First, they worry that social distancing may worsen the prognosis for individuals with many diseases, including COVID-19. Their hypothesis is based not on new findings, but on drawing conclusions from previous ones. Recent studies connect social isolation to less bacterial diversity. Extreme lack of diversity can lead to an imbalance called dysbiosis, which is associated with reduced numbers of protective bacteria. Previous studies have connected dysbiosis to higher risk of opportunistic

infections; it's also been shown to increase the risk of influenza infections in the lung. Preliminary studies from the last few months similarly suggest that a person's microbiota influences their response to COVID-19, and that hospitalized COVID-19 patients do face increased risk of dysbiosis.

Given what's known about the virus and the microbiome, Nogueira and her colleagues hypothesize that social distancing favors dysbiosis and thus worsens a person's response to COVID-19. It could produce a loop, where dysbiosis triggers poorer responses, which leads to more widespread social distancing, which can exacerbate dysbiosis.

But, she cautions, rigorous studies haven't yet been done to support this hypothesis.

The second way that social distancing may influence the microbiome is by limiting the transmission of antibiotic resistant microbes between people and the exchange of resistance genes between microbes. Taking antibiotics leads to an increase in antibiotic resistance genes among a person's microbiota. Recent studies by Nogueira's group, however, show that the diversity of these genes increases in time by spreading from person to person. Social distancing limits personal contact, which means it likely limits the transmission of antibacterial resistance as well, Nogueira said.

"In situations where people avoid one another, we would expect to break this transmission," she said. "In these populations, the resistant bacteria tend to disappear over time." However, as in the case of the connection with dysbiosis, she said that studies haven't rigorously demonstrated that social distancing will reduce antibiotic resistance.

Recent years have shown that the microbiota plays a critical role in many aspects of human health, and the authors of the *mSphere* perspective

urge researchers to better probe how the bacterial balance may be affected by social distancing in the short and long term.

"We're not suggesting any changes to control strategies," Nogueira said. "We want to ask the scientists working in the field to check for this. This is the window of opportunity to do so."

More information: Célia P. F. Domingues et al, The Social Distancing Imposed To Contain COVID-19 Can Affect Our Microbiome: a Double-Edged Sword in Human Health, *mSphere* (2020). [DOI: 10.1128/mSphere.00716-20](https://doi.org/10.1128/mSphere.00716-20)

Provided by American Society for Microbiology

Citation: Understanding social distancing and microbial health (2020, September 17) retrieved 25 April 2024 from

<https://medicalxpress.com/news/2020-09-social-distancing-microbial-health.html>

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