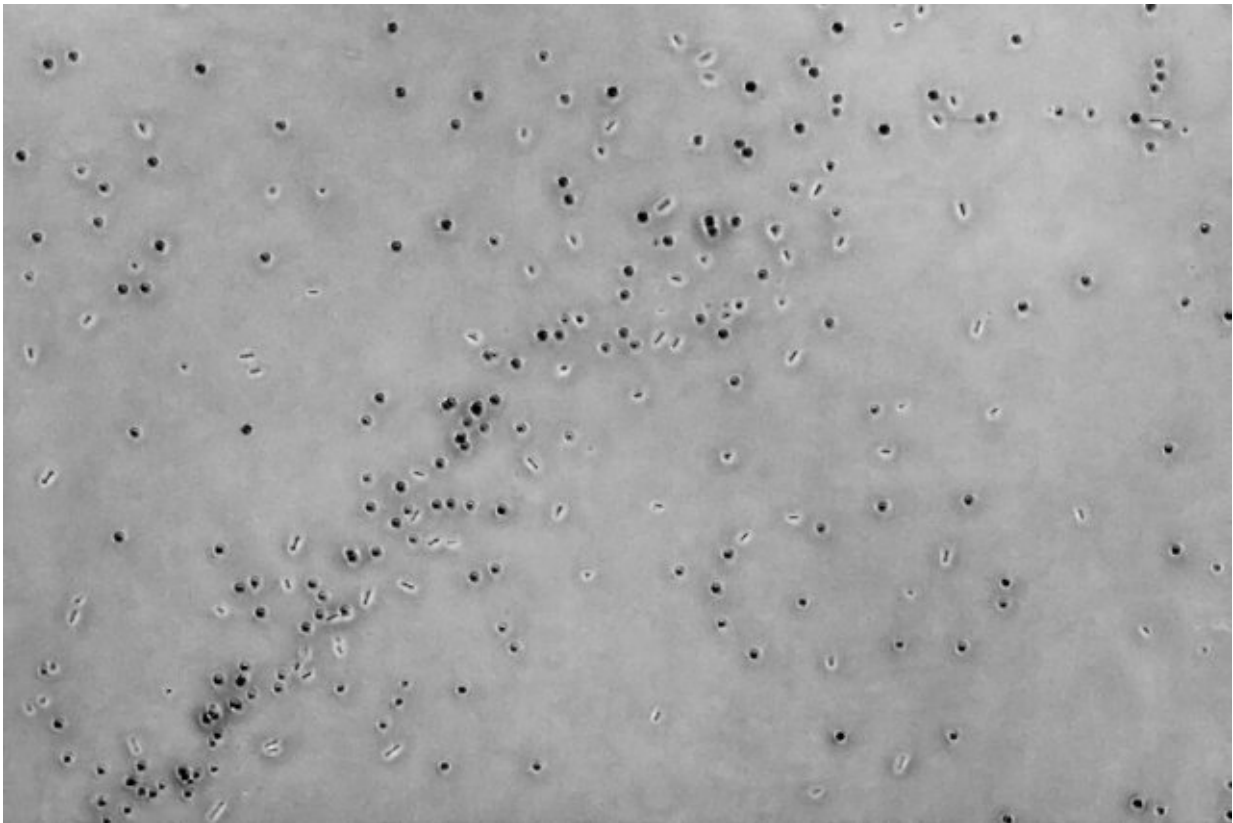


Why *C. difficile* infection spreads despite increased sanitation practices

February 13 2020, by Maria Iacobo



A microscopic image shows a culture of *C. difficile* cells and spores. MIT research suggests the risk of becoming colonized increases immediately following gastrointestinal disturbances that result in diarrhea. Credit: Dave VanInsberghe

New research from MIT suggests the risk of becoming colonized by

Clostridium difficile (*C. difficile*) increases immediately following gastrointestinal (GI) disturbances that result in diarrhea.

Once widely considered an antibiotic- and [hospital](#)-associated pathogen, recent research into *C. difficile* has shown the infection is more frequently acquired outside of hospitals. Now, a team of researchers has shown that GI disturbances, such as those caused by [food poisoning](#) and laxative abuse, trigger susceptibility to [colonization](#) by *C. difficile*, and carriers remain *C. difficile*-positive for a year or longer.

"Our work helps show why the hospital and antibiotic association of *C. difficile* infections is an oversimplification of the risks and transmission patterns, and helps reconcile a lot of the observations that have followed the more recent revelation that transmission within hospitals is uncommon," says David VanInsberghe Ph.D. '19, a recent graduate of the MIT Department of Biology and lead author of the study. "Diarrheal events can trigger long-term *Clostridium difficile* colonization with recurrent blooms" in *Nature Microbiology*.

The researchers analyzed human gut microbiome time series studies conducted on individuals who had diarrhea illnesses and were not treated with antibiotics. Observing the colonization of *C. difficile* soon after the illnesses were acquired, they tested this association directly by feeding mice increasing quantities of laxatives while exposing them to non-pathogenic *C. difficile* spores. Their results suggest that GI disturbances create a window of susceptibility to *C. difficile* colonization during recovery.

Further, the researchers found that carriers shed *C. difficile* in highly variable amounts day-to-day; the number of *C. difficile* cells shed in a carrier's stool can increase by over 1,000 times in one day. These recurrent blooms likely influence the transmissibility of *C. difficile* outside of hospitals, and their unpredictability questions the reliability of

single time-point diagnostics for detecting carriers.

"In our study, two of the people we followed with high temporal resolution became carriers outside of the hospital," says VanInsberghe, who is now a postdoc in the Department of Pathology at Emory University. "The observations we made from their data helped us understand how people become susceptible to colonization and what the short- and long-term patterns in *C. difficile* abundance in carriers look like. Those patterns told us a lot about how *C. difficile* can spread between people outside of hospitals."

"I believe that there is a lot of rethinking of *C. diff* infections at the moment and I hope our study will help contribute to ultimately better manage the risks associated with it," says Martin Polz, senior author of the study and a visiting professor in MIT's Parsons Laboratory for Environmental Science and Engineering within the MIT Department of Civil and Environmental Engineering.

More information: David VanInsberghe et al. Diarrhoeal events can trigger long-term *Clostridium difficile* colonization with recurrent blooms, *Nature Microbiology* (2020). [DOI: 10.1038/s41564-020-0668-2](https://doi.org/10.1038/s41564-020-0668-2)

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