

Dal epidemiologist shows probiotics prevent *C. difficile* in hospital

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Dr. Bradley Johnston of Dal's Department of Community Health & Epidemiology. Credit: Jollymore photo

Hospitalized patients at high risk for *C. difficile* infection—a species of bacterium with symptoms that range from diarrhea to life-threatening inflammation of a colon—should be recommended probiotics, says Dr. Bradley Johnston.

An associate professor in the Department of Community Health & Epidemiology at Dalhousie Medical School, Dr. Johnston led a meta-analysis comparing data from 18 clinical trials in nine countries to see if probiotics could prevent *C. difficile* infection in hospitalized [patients](#).

The infection is most common in hospitals where elderly patients have compromised immune systems and are on antibiotics.

The results, published in April in the peer-reviewed journal *Infection Control & Hospital Epidemiology* show that certain multi-species probiotics reduce the odds of *C. difficile* infection by about two-thirds—particularly among patients on two or more antibiotics.

At the same time, there were no safety concerns with any of the probiotics covered in the study among patients who are not immune-compromised.

"Our results suggest these probiotics are a safe and effective addition to *C. difficile*-prevention protocols in hospitals," says Dr. Johnston, "particularly among hospitals experiencing an outbreak of *C. difficile*."

All hospitals in Canada have robust strategies for preventing and managing *C. difficile* outbreaks, including such measures as isolating patients with suspected cases, intensive cleaning with disinfectant agents, and multi-faceted prevention and containment programs known as "antimicrobial stewardship interventions." Probiotics have rarely been included in any of these measures to date.

"The question is, 'Why don't hospitals use probiotics?' and the answer usually is, 'Well, what [probiotic](#) strain or species should we use?'" Dr. Johnston notes. "My answer is that we've done the meta-analysis and found no statistically significant difference across the probiotic species and strains in the studies we analyzed."

Not only is it better for the patient to prevent the infection in the first place, it is likely cheaper. "Some of the drugs used to treat *C. difficile* cost upwards of \$2,000 to fill a script," says Dr. Johnston, adding, "Probiotics cost from \$20 to \$40."

What is *C. difficile*?

C. difficile, short for *Clostridium difficile*, is a species of spore-forming bacterium.

"Antibiotics are one of the main risk factors for acquiring *C. difficile*," says Dr. Ian Davis, an assistant professor in the Division of Infectious Diseases at Dalhousie Medical School, noting its prevalence in hospitals with elderly patients who have compromised immune systems and are on antibiotics. "It's an opportunistic bug. If you are healthy and your intestinal flora is robust, it's unlikely *C. difficile* will get in and establish itself."

When antibiotics deplete bacterial flora, it creates space for the bacterium to flourish, although not everyone who acquires the organism will develop symptoms.

In 2017, *C. difficile* infection rates were 5.1 per 10,000 patient days across Canada and 2.39 per 10,000 patient days in Nova Scotia. Death directly attributed to *C. difficile* infection is in the one-to-two per cent range, occurring most commonly in older people and those compromised by other medical problems.

C. difficile infection is treated with antibiotics. Metronidazole costs tens of dollars, the more effective vancomycin a few hundred dollars, and the newer fidaxomicin about \$2,000 per prescription. In rarer cases, people who've had recurring infections in spite of optimal antibiotic treatment have received fecal transplants to eradicate the bacterium.

While *C. difficile* has been well-controlled in Nova Scotia, the province's health-care system still faces challenges in fighting the [infection](#) in an aging population, in educating health-care consumers and providers in the best use of antibiotics and, as this study indicates, in adopting probiotics as a prevention strategy—particularly in those at higher risk.

The role of probiotics

Probiotics are live bacteria and yeasts that can support people's health—in particular, their digestive systems.

"The probiotic products studied have numerous mechanisms of action, including anti-bacterial, anti-viral and anti-diarrheal, as well as an ability to improve the integrity of the gut lining," says Dr. Johnston, noting that, "Further research is needed to uncover the mechanism for most probiotics."

Probiotics can be taken as a yogurt, in a capsule or as a powder in food or drinks. What's important is choosing the ones that have the most reliable data on efficacy and safety, and getting an effective dose.

Running out to buy yogurt is not the solution. "The probiotic dose is very low among yogurts found in grocery stores and hasn't been studied for the prevention of *C. difficile*," Dr. Johnston says. "There are higher-dose probiotic products with evidence of efficacy for *C. difficile* found in some health food stores though."

Many physicians ask their patients to take probiotics if they're entering hospital, but official guidelines by authoritative organizations do not make any such recommendations.

"From my perspective, this information should be offered to high-risk

patients and their families," Dr. Johnston says. "Patients are likely to value the potential risk reductions in *C. difficile* that certain probiotics offer."

Experts estimate it can take 15 to 20 years to change clinical practice, even in the face of solid evidence. "This evidence has been accumulating over the past 15 years, so maybe we're almost there with respect to patients at high risk," Dr. Johnston says.

Detailed analysis provides clear answers

Dr. Johnston's team asked investigators from Sweden, Poland, the U.S., the U.K., Turkey and Chile for access to their raw data. This encompassed 18 randomized trials involving 6,851 study participants, and some of the largest probiotic trials ever conducted.

"Gaining access to the raw data allowed us to conduct a detailed analysis and determine that multi-species probiotics given to patients on two or more antibiotics may have the greatest effect," he says. "Based on our analysis, if you administer certain probiotics to 1,000 high-risk patients, you will prevent 81 cases of *C. difficile*."

More research is needed to identify those high-risk populations that may benefit most from probiotics—for example, patients known to be colonized with *C. difficile*—and to explore the potential use of probiotics in immune-compromised patients, Dr. Johnston says.

"We have compelling evidence that some probiotics work to prevent *C. difficile* in certain hospital populations and, moreover, that they're safe among those with normal immune function."

Provided by Dalhousie University

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