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Johns Hopkins Children's Center begins fecal transplants in children with a type of drug-resistant diarrhea

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Call it therapeutic poop, if you will, but the best hope yet for an effective treatment of childhood infections with the drug-resistant bacterium C. difficile may come straight from the gut, according to recent research.

This is why pediatric gastroenterologists at the Johns Hopkins Children's Center are launching a fecal transplantation program for patients with recurrent diarrhea caused by what they say is a wily pathogen that is increasingly impervious to drugs and a rapidly growing problem among children and adults.

Over the last 20 years, cases of antibiotic-associated diarrhea have more than doubled, with nearly three million new infections each year, with up to a fourth of patients not responding to antibiotics, research shows. Most such cases, the researchers say, stemmed from infections with C. difficile.

Enter poop transplants. Studies in adults show that more than 90 percent of patients are cured following such therapy and, experts say, they have every reason to believe the numbers would be equally impressive in children.

"Fecal transplantation—or the transfer of 'good' bacteria from the colon of one person into the colon of another—should be considered for all

children with C. diff infections who don't respond to two standard courses of antibiotics," says Maria Oliva-Hemker M.D., director of pediatric gastroenterology at Johns Hopkins Children's Center.

The rise in refractory C. difficile infections has been fueled by the growing use of antibiotics, experts say.

"Antibiotics are lifesavers, but anytime we give them to a patient to eradicate one pathogen, there's collateral damage, in that along with the bad bacteria we wipe off some good organisms that help keep the complex workings of our gut in perfect balance," Oliva-Hemker says.

Such beneficial bacteria work by keeping rogue players in check, Oliva-Hemker explains, so any shifts in gut environment—such as ones caused by antibiotics—can have dire consequences. When good bacteria are killed off by antibiotics, the bad guys multiply causing an imbalance or "dysbiosis," Oliva-Hemker says. Typically, gut infections caused by one antibiotic are treated with another one to eradicate the overgrowth of harmful pathogens, but drugs often fail to do so fully or permanently because they only treat part of the problem.

"When we administer an antibiotic to treat the C. diff infection, we destroy some of the bad bacteria, but that does not address the other half of the problem—the loss of good bacteria that might have led to the infection to begin with, so we never truly restore the balance in the gut and often the diarrhea returns with a vengeance in a matter of weeks," says Suchitra Hourigan, M.D., a pediatric gastroenterology fellow at Hopkins with a special interest in fecal transplantation.

The concept of treating poop woes with poop is hardly new. The method originated with ancient Chinese healers who gave their diarrhea-ravaged patients "yellow soup," a concoction of fecal matter and water. Thousands of years later, the delivery approach has evolved. Nowadays,

fecal transplants are often performed during a colonoscopy, and improvement can be seen in as short as two weeks, as beneficial bacteria start to repopulate the patient's gut, Hourigan says. Fecal donors, usually parents or relatives, are carefully screened for risks much like any blood donor, Hourigan says. The donor's blood is tested for infectious pathogens, such as HIV and hepatitis C. People with autoimmune diseases or other chronic conditions, such diabetes or obesity, may not qualify as donors.

"The gut microbiome plays a major role in immunity and overall health, and right now we simply do not know whether fecal matter can somehow inadvertently also transfer the propensity toward such disorders from donor to recipient," Hourigan says.

The new pediatric protocol makes Johns Hopkins Children's Center one of a handful of pediatric hospitals in the country to offer this therapy for a condition that can cause dehydration, anemia and pain, and can seriously affect a child's quality of life, leading to absence from school. In its more extreme form, recurrent diarrhea can cause life-threatening colon inflammation, which is for some 14,000 deaths each year, according to the Centers for Disease Control and Prevention. Beyond the human toll, refractory diarrhea drains the health care system of more than $3 billion each year, research has shown.

Its great therapeutic success notwithstanding, some important questions remain: How precisely do donor bacteria change the recipient's gut microbiota and which bacteria make the best poop transplants? And because poop contains trillions of bacteria and hundreds of bacterial species, scientists have not quite figured out which ones are our best friends and worst foes and which ones are mere bystanders. These are some of the questions Oliva-Hemker and Hourigan's ongoing research is attempting to answer. And with the growing understanding of gut dynamics, better therapies should emerge. In a decade or so, Oliva-

Hemker predicts, scientists would be able to design the perfect fecal concoction in a lab, obviating the need for fecal transplants.

"In less than a decade, we'll have lab-cooked poop that we can administer to restore balance in the guts of people with a wide array of conditions caused by the imbalance between good and bad germs."

Provided by Johns Hopkins University

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