

Blood bank, sperm bank ... stool bank?

7-8 minutes

Drugmakers racing to develop medicines and vaccines to combat a germ that ravages the gut and kills thousands have a new challenger: the human stool.

For patients hit hardest by the bacterium *Clostridium difficile*, getting a "stool transplant" could become a standard treatment within just a few years. Just as blood banks and sperm banks are now commonplace, stool banks may soon dot the landscape.

About 3 million Americans are infected annually with the bacterium - also known as *C. diff* - which spreads mainly through hospitals, nursing homes and doctors' offices. It is common in Australia in various strains, including [the deadly 244](#).

Most people have no symptoms, but 500,000 Americans - more than half of them 65 and older - develop abdominal cramps, fever, diarrhea and inflamed colons. As many as 30,000 die each year from the bacterium, usually after recurrences of infection.

The infections are typically the result of taking antibiotics, which wipe out friendly bacteria in the colon that normally keep *C. diff* under control. Transplants of stool from screened donors - given by enema, colonoscopy or a tube down the throat - restore these bacteria.

Although the vast majority of *C. diff* infections occur in healthcare settings, more and more cases are occurring in younger adults and children who have not recently taken antibiotics or been hospitalised. They include people who take proton pump inhibitors - a leading class of heartburn drugs.

Costly treatments from Merck & Co and other drugmakers, and a vaccine from Sanofi, are on the horizon. But growing numbers of gastroenterologists are more excited about the use of human stool transplants, which in experimental settings have consistently cured 85 percent to 90 per cent of patients who have had multiple episodes of *C. diff*.

"Until recently, fecal transplants have been on the fringes of mainstream medicine," said Dr Cliff McDonald, an epidemiologist with the US Centers for Disease Control and Prevention. "It could become the primary mode of therapy within a year or two for patients with multiple recurrences."

Wheel of misfortune

The first recorded stool transplants were given in 1958 to four patients with inflamed colons. The procedures won more attention in the mid-1980s, when Australian gastroenterologist Thomas Borody began using them to treat his *C. diff* patients.

Dr Moshe Rubin, head of gastroenterology at New York Hospital Queens, said most patients prefer the simplicity of a pill or injection, but for those with multiple bouts the fecal transplants could become a mainstay treatment.

"This has to be tested in large numbers of people before you unleash it for such a widespread disease," Rubin said.

C. diff medicines and vaccines could eventually claim total annual sales of \$2 billion, according to Morningstar analyst David Krempa, or 10 times current sales.

Fecal transplants might initially be appropriate for patients who have had a third recurrence - or about 25,000 Americans each year, according to Dr. Sahil Khanna, a Mayo Clinic gastroenterologist. That number could rise as the procedure becomes more widely accepted, and pose perhaps the biggest threat to sales of Merck's experimental drug, which is expected to target a similar patient group.

About 90 per cent of C. diff patients initially treated with vancomycin, and 60 percent of those treated with another standard oral drug called metronidazole, recover within weeks. But 20 percent suffer recurrences, as surviving bacteria spores become activated or as patients become re-infected with spores that cling to clothing and furniture and can survive for months.

With each recurrence, risk of another rises, with more weight loss, diarrhea and fatigue. After a third recurrence, the risk of suffering a fourth is 60 per cent to 70 per cent.

"It's a constant wheel of misfortune," said Eric Kimble, a senior executive for Cubist Pharmaceuticals Inc, which is developing a C. diff treatment called CB-315.

Getting over the 'ick' factor

Fecal transplants have proved a godsend to such patients. They are given to those who have not benefited from metronidazole or vancomycin - or who have suffered repeat recurrences of C. Diff after being temporarily helped by the treatments.

In more than 100 of the experimental procedures performed by Dr Christine Lee, the transplants cured the infections and prevented recurrences in 90 percent of patients, said the infectious disease physician at St Joseph's Healthcare (hospital) at McMaster University in Hamilton, Ontario.

"Their energy level and appetite bounce back within a week, sometimes within 48 hours," Lee said. "They can't believe how simple and effective the procedure is."

In a five-minute bedside procedure, Lee introduces about 50 grams (1.75 ounces) of donated fecal matter into the rectum, using an inexpensive plastic plunger. A single procedure re-establishes the balance of bacteria.

Friends and family of patients, as well as doctors and nurses, provide without pay the stool used in Lee's procedures. They are screened to ensure they do not have viruses, such as HIV or hepatitis C, or other pathogens that can be transmitted to patients. She said some donate stool on a regular basis, which can be used for a great number of patients.

Once transplants are approved by health regulators, Lee predicted, enema procedures will be less costly than two other delivery methods now used for stool transplants. They include colonoscopy, in which doctors sedate the patient and insert stool into the colon, or through a different procedure in which a plastic feeding tube is passed through the nose, down the throat and into the stomach.

In the meantime, gastroenterologists say doctors and hospitals can help prevent C. diff by being more restrained in the use of antibiotics and ensuring that hospital rooms are diligently cleaned with bleach wipes to kill C. diff spores.

Dr Mark Pochapin, director of gastroenterology at NYU Langone Medical Center, said fecal transplants had more appeal than emerging anti-toxin approaches.

"They appear effective, balance the normal intestinal flora, are inexpensive and are safe when done with appropriate testing," he said. "They will far and away revolutionise how we treat this disease."

Many patients might benefit most from transplantation of their own stool, rather than relying on donors. They would include those undergoing chemotherapy or hip or knee replacements, all of which involve use of antibiotics, said the CDC's McDonald.

People, he said, would set aside stools for processing into capsules that would be frozen and stored until needed.

Such "bacterial treatment" after antibiotics might eventually also lower the risk of developing asthma, allergy, obesity or other conditions that may be partly linked to loss of helpful bacteria, McDonald said.

"Look at it as a way to put people's bacterial population back together again after antibiotics, like restoring Humpty Dumpty," said McDonald.