FECAL TRANSPLANTS

(1) Though we make feces all the time, this waste material isn't something we often enjoy talking or thinking about, but what if feces could be the cure to a dangerous and even potentially deadly disease? Fecal microbiota transplant (FMT) is a type of therapy used to treat *Clostridium difficle (C. diff)* infections which are difficult to treat and affect over half a million North Americans, killing approximately 30 000 of them each year.

(2) FMT therapy involves taking the feces from one healthy person and transplanting it into the intestines of a person infected with *C. diff*. Feces contains billions of microorganisms (microbiota) that come from your digestive tract. The majority of the microorganisms living in your intestines are beneficial bacteria that exist in harmony with your body. There are an estimated 300-1000 species of bacteria that colonize your gut to create a healthy colon (large intestine). These bacteria help manufacture vitamins, they help train the immune system of the intestines and they help keep the numbers of disease-causing microorganisms low.

(3) To understand how FMT helps treat *C. diff* infections, we should first understand a little about this organism. Some strains of the *C. diff* bacteria are pathogenic (disease-causing) and can create intestinal infections that lead to a large production of watery diarrhea, nausea, abdominal pain, fever and in some cases, a life-threatening inflammation of the colon. These symptoms occur when *C. diff* produces enterotoxin and cytotoxin that inflame the intestines.

(4) *C. diff* is passed from person to person through the fecal oral route. This means that to get *C. diff* you would need to ingest it by consuming something that was contaminated with feces, or have your hands touch something that was contaminated with feces and then put your hand in your mouth. If this happens, you are not necessarily doomed to get a *C. diff* infection. In fact, 2%-5% of the adult population have *C. diff* as a part of their usual microbiota. The beneficial bacteria in the gut greatly outnumber the *C. diff* and will keep *C. diff* numbers low.

(5) The use of antibiotics is the main cause of *C. diff* infections. Using antibiotics, especially broad spectrum antibiotics that kill a wide range of bacteria, threaten the beneficial bacteria in your intestines. This is not the intended effect, but most of this good bacteria can be wiped out by some types of antibiotics. *C. diff* , unfortunately, is quite resistant to most antibiotics so it doesn't get killed along with its bacterial neighbours. Without the inhibiting influence of the beneficial bacteria, *C. diff* can take the opportunity to multiply quickly and cause a life-threatening infection.

(6) This is where fecal microbiota transplants come in. After years of trying to treat *C. diff* patients with stronger and stronger antibiotics, an easier, more effective and cheaper answer was found using FMT therapy. When feces containing healthy microbiota are introduced to a *C. diff* patient, the new bacteria establishes itself in the recipient's colon and starts to multiply. New colonies of beneficial bacteria will take over the colon and supress the numbers of *C. diff* bacteria. The success rate using FMT therapy is 85 to 90%. Often the patient is cured after only one treatment.

(7) The donor who supplies the healthy feces has to be screened and selected to ensure that their feces does not contain any type of pathogenic organisms. When the donor is approved, 200-300 g of fresh feces is obtained from the donor (though previously frozen feces can also be used) and is mixed with water or saline solution to produce a liquid mixture. 200-500 mL of this mixture is used during one treatment.

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(8) The fecal solution can be administered in different ways. One way is using an enema which involves injecting the fecal solution into the rectum using a hand held pump. Another method involves using a colonoscope which is a delivery tube with a tiny camera attached for viewing the areas of infection. Unlike the enema, the colonoscope can reach further up into the intestines and produces better results. Another method of introducing the fecal solution is through a nasogastric or nasoduodenal tube. These enter through the nose and are pushed down the digestive tract until they reach the intestines where the fecal solution is then released.

(9) The feces of patients with healthy microbiota are sometimes collected before they undergo treatments with antibiotics. If they develop *C. diff* after the antibiotic treatment, they can be supplied with their own healthy feces from the previously collected sample. Viewing FMT as a good solution to *C. diff* infections, a group of researchers in MIT (Massachusetts Institute of Technology) created the first public stool (feces) bank in the United States in 2012. This stool bank is called OpenBiome and it contains numerous frozen, pre-screened healthy fecal samples to be used by doctors to treat *C. diff* infections.

Article Questions

1) _____ is the term for all the microorganisms living in your intestines. Pathogenic means _____. _____ g of fresh feces is collected from a donor for FMT. _____ is the name of the stool bank opened in 2012 by researchers at MIT. A _____ is a device that delivers fecal solution through a tube that contains a mounted camera. *C. diff* releases _____ and cytotoxin.

2) What does FMT stand for and what is involved in this procedure?

3) How is *C. diff* transmitted from person to person?

4) How does using broad spectrum antibiotics put a patient at risk of getting a *C. diff* infection?

5) How does FMT get rid of *C. diff* infections?

6) For FMT, can you get donor feces from anyone? Justify your answer.

7) Why might patients who need antibiotic treatment decide to collect a sample of their own feces before the treatment?