New study expands potential applications for stool transplants

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For the first time, scientists studying stool transplants have been able to track which strains of bacteria from a donor take hold in a patient's gut after a transplant. The team, led by EMBL with collaborators at Wageningen University and the Academic Medical Centre, both in the Netherlands, and the University of Helsinki, Finland found that compatibility between donor and patient likely plays a bigger role in these transplants than previously thought. The study, published today in Science, could help make stool transplants a valid treatment option for more conditions than they are currently applied to.

"Ultimately, the goal is to move from a stool transplant to something more manageable, such as a pill," says Simone Li, who carried out the work at EMBL. "Our work shows that this is likely going to be a personalised bacterial cocktail, rather than a one-size-fits-all solution."

Stool transplants - also known as faecal microbiota transplants - involve taking microbes from the poo of a healthy donor and transferring them to the patient's gut. The hope is that this will help to restore health to patients suffering from conditions where the normal balance of microbes in the gut gets skewed. The approach has been very successful for treating recurrent Clostridium difficile (C. diff) infections - which can cause life-threatening cases of diarrhoea, and are becoming a serious problem in hospitals and healthcare institutes. But for other conditions, like ulcerative colitis, stool transplants have proven much less effective. The current study, led by Peer Bork and Shinichi Sunagawa at EMBL, could help improve those odds. The trick, the scientists say, is to look beyond what species of microbes are in a person's gut, to what strains of each species.

Most people have E. coli in their gut, for instance, but different people have different strains of this species - and some of those strains can cause health issues. By distinguishing between different strains, the EMBL scientists were able to track if the microbes in a patient's gut after the treatment were their own or came from the donor.

They found that after a stool transplant, new strains of microbes from the donor were more likely to colonise a patient's gut if the patient already had that species. This implies that if doctors can match donors to patients, the chances of the treatment being a success could improve considerably. Looking at strains rather than species of bacteria could also make the therapy effective in conditions where it isn't currently working.

"With this method, we can really see if, for example, an antibiotic-resistant strain is replaced by a non-resistant one," says microbiologist Willem de Vos, who led the work at Wageningen University and the University of Helsinki, "so it could help to design stool transplants to work in other conditions beyond C. diff."

The study builds on a clinical trial that looked into the use of stool transplants as a treatment for metabolic syndrome, run by Max Nieuwdorp at the Academic Medical Centre in Amsterdam. Although based on data from only 10 people, the work already provides strong indications that donor-patient compatibility is more important than assumed: transplants from one donor led to very different outcomes in three different patients.

More information: "Durable coexistence of donor and recipient strains after fecal microbiota transplantation," DOI: 10.1126/science.aad8852

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