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Fecal transplantation of patients with *Clostridium difficile* associated disease results in the complete replacement of original distal gut microbiota

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Abstract

Clostridium difficile is an opportunistic human pathogen that is known to cause enterocolitis. *C. difficile* can often bloom in the gut following an oral antibiotic administration. While *C. difficile* infection can be treated with metronidazole or vancomycin, the disease has a high recurrence rate. One alternative successful approach to combat CDAD is through fecal transplantation of distal gut microbiota from healthy donor to the *C. difficile*-infected patient.

In this study we have investigated the specific changes in the CDAD patients' gut microbial communities before and after fecal transplantation, and we compared these communities to the composition of the donor's fecal microbiota. We utilized phylogenetic Microbiota Array, high-throughput Illumina sequencing, and fluorescent *in situ* hybridization to profile microbiota composition. The original patients' microbiota had low diversity, was dominated by members of Gammaproteobacteria and Bacilli, and had low numbers of Clostridia and Bacteroidia. In comparison, donor community was dominated by Clostridia and had significantly higher diversity and evenness. At the genus level, fecal samples of CDAD patients were rich in genera *Veillonella*, *Lactobacillus*, *Streptococcus*, *Enterobacter*, and *Escherichia*, all known to be prevalent in the human small intestine. The donor fecal samples had many abundant genera that included *Coprococcus*, *Blautia*, *Faecalibacterium*, *Roseburia*, *Papillibacter*, *Bacteroides*, and *Akkermansia*. The patients' communities were completely replaced by the donor fecal microbiota within three days following fecal transplantation, and these transplanted communities remained stable in the patient for at least four months. This effect was consistent among all three transplantations. The transplanted microbiota was indistinguishable from that of the donor. In each case, the gut microbiota replacement led to full patient recovery and symptom alleviation. We conclude that *C. difficile* infection can be successfully cured by fecal microbiota transplantation.

Biography

Oleg Paliy has obtained his Ph.D. from University of Manchester, UK, and has received postdoctoral training in microbiology and systems biology at University of California - Berkeley, USA. Dr. Paliy is an Associate Professor in Boonshoft School of Medicine, Wright State University, USA, where he studies the roles of human intestinal microbiota in host health and disease. Dr. Paliy's research utilizes novel molecular techniques including phylogenetic mciroarrays and next generation sequencing which are combined with biocomputational modeling of microbial interactions and metabolic capacities. Dr. Paliy is funded by NIH and industrial partners, serves as NIH study section member and as manuscript review for numerous journals, and has published frequently on the topic of interest.