

Study shines light on safety of deworming programs

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A new study has identified no major differences between the microbiomes of people infected with roundworm or hookworm and uninfected peers. The investigators found no evidence that curing either of these infections with albendazole treatment has a harmful effect on the microbiome, but they identified specific changes that result from curing hookworm infections and from albendazole. The study is published in *mBio*, an open-access journal of the American Society for Microbiology.

"We don't see any evidence suggesting deworming programs should be concerned about negative effects on the gut [microbiome](#) of curing hookworm or roundworm," said lead study author Alice Easton, Ph.D., who performed the research while working in the Laboratory of Parasitic Diseases, at the National Institute of Allergy and Infectious Diseases, Bethesda, MD. She is now a postdoctoral fellow at NYU Langone Health, in New York City.

Parasitic infections caused by intestinal helminths, such as roundworms and tapeworms, are among the most prevalent infections in humans in developing countries. The researchers aimed to examine the impact of deworming on the gut microbiome, since India and many African countries have national deworming programs. The gut microbiome is an important factor in human health and can be affected by infections and medicines.

"While a number of studies have recently examined the relationship

between human stool microbiota and [infection](#) with a variety of soil transmitted helminths at study sites, there is no clear consensus of the impact of soil transmitted helminths on microbiota diversity and composition," said Dr. Easton. "We need to know whether worms have other important consequences to [human health](#)."

The investigators examined the gut microbiome of individuals with and without worm infections treated with the deworming medication albendazole and followed up three weeks and three months post-treatment. They used samples collected in Kenya as part of a larger study to examine differences in stool microbiota reflecting gut microbiome changes. Stool samples were analyzed for the presence of eight species of intestinal parasites.

The researchers found no difference at pre-treatment or in the cross-sectional study between people with and without parasitic worms. The presence of roundworms and hookworms had little effect on gut microbial composition, but treatment of parasitic worms, in particular hookworms, significantly altered the gut microbiome. Following albendazole therapy and clearance of soil-transmitted helminths, the researchers identified significant increases in the proportion of the microbiota made up by Clostridiales ($P=0.0002$), average fold change (0.57), and reductions in the proportion made up by Enterobacteriales ($P=0.0004$, average fold change -0.58). Treatment decreased Chao1 richness, species richness, even among individuals who were uninfected pre-treatment, suggesting that antimicrobial effects must be considered in any post-treatment setting.

"We see an increase in clostridia following hookworm cure, but it's worth pointing out that *Clostridium difficile* was not something we saw a change in. Nothing changed that we could clearly associate with the people being worse off," said Dr. Easton. "More happens when you treat a whole community than just clearing people of their helminth infection,

but that doesn't necessarily mean that it's bad or that it is consistent with being infected by other worms."

Dr. Easton said she was surprised to find no differences at pre-treatment in composition of the microbiome or in diversity between people with and without parasitic worms. "Some previous research has associated helminth infection with greater microbial diversity, and we did not find that," said Dr. Easton. "Part of the reason for that is even the people who were helminth free, their gut microbiomes could have been already affected by past exposure to helminth infections."

While the study showed that being cured of hookworm infection increased clostridia in the [gut microbiome](#), previous research has found that curing the roundworm *Trichuris* had the opposite effect. "One important take away from the research is a lot of times people think about these worms as all one thing, partially because we have grouped neglected tropical diseases together," said Dr. Easton. "It's useful to talk about that in terms of groups when talking about policy and raising awareness, but when thinking about hard biological impact and morbidity experience, we really have to think about them individually, and that is not always done, even in the microbiome literature."

Having a better understanding of what worms do to the human body will help those with authority to make better decisions about who to target for deworming. Without a complete understanding of the impact of mass deworming programs on the microbiome, it is impossible to accurately calculate the cost-effectiveness of such public health interventions. A number of countries, including Kenya, have funding and a plan to treat everyone for parasitic infections, often targeting school age children.

Provided by American Society for Microbiology

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