

Worms and germs lead to better immune function

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Hookworms attached to the intestinal mucosa. Credit: Public Domain

A growing body of evidence in the medical community holds that greater diversity of bacteria and even worms in the digestive tract offers protection against a variety of allergic and autoimmune problems.

Germ from healthy people can be used to heal people with digestive disorders and other conditions caused by the loss of their own germs, and worms that live in the gut, called helminths, have shown success in quelling [inflammatory diseases](#).

With this in mind, researches at Duke Medicine hypothesized that enhancing [biodiversity](#) in laboratory rats, including treating the rats with worms, would suppress their immune systems. Because worms have been shown to subdue inflammatory diseases such as asthma and allergies, the thinking was, the treated [immune system](#) would not fight infections as effectively.

Actual findings were quite the opposite. Researchers found enhanced rather than suppressed [immune function](#) in animals with increased biodiversity.

Publishing online in the April 8, 2015, issue of *PLOS ONE*, the findings add to the growing understanding of the complex environment in the [digestive tract](#) and its role in maintaining health.

"We were surprised - we thought enhancing biodiversity would make the animals more immune-suppressed," said senior author William Parker, Ph.D., associate professor of surgery at Duke. "But it appears that at the same time we enhanced the biodiversity in a way that should suppress allergy and auto-immunity, we also enhanced the [immune response](#) to a variety of stimuli."

Parker and colleagues went to lengths to place the laboratory rats in a natural environment that would closely recreate natural levels of biodiversity.

"We intentionally loaded them with worms, and we housed them with wild rats that we caught around town," Parker said. "We also had to keep

these 'natural rats' in a facility far away from any other population of study animals so that they didn't contaminate the rest of our laboratory rats."

These so-called natural rats ended up with the genetics and domestication of laboratory rats, yet with digestive biodiversity more similar to wild rats. The next step was to compare immune function between the natural rats and the cleaner, traditional [laboratory rats](#).

Researchers found that enhanced biodiversity was associated with better immune responsiveness. Specifically, they found better responses to vaccination, better T-cell responses, and much higher levels of "natural" antibodies, which have been shown to be important in fighting cancer.

Parker said the study suggests that biome enrichment might serve as an "immune trainer" to improve immune function and overall health.

"In our clean environment, [rats](#) and by extension humans, are not doing well," Parker said. "We are potentially seeing a decreased ability to respond to dangerous antigens while, at the same time, we respond to things that we shouldn't, causing allergies and [autoimmune problems](#). This work demonstrates we all may really need better biodiversity, and perhaps that biodiversity needs to be artificially introduced back in the system."

Provided by Duke University Medical Center

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