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UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE RESEARCHERS LINK GUT BACTERIA TO HEART TRANSPLANT SUCCESS OR FAILURE

New Study Finds That Certain Gut Bacteria May Delay or Prevent Organ Rejection

Baltimore, Md., October 4, 2018 – In a new study, researchers at the University of Maryland School of Medicine (UMSOM) have found that the gut microbiome appears to play a key role in how well the body accepts a transplanted heart. The scientists found a causal relationship between the presence of certain microbes and transplant outcome.

The results have the potential to significantly change how researchers and doctors deal with the problem of rejection and transplantation. This is the first study to identify specific bacterial species that can affect whether a heart transplant is rejected, and how quickly.

The new study was published today in the *Journal of Clinical Investigation Insight*.

One of the study's two lead authors, **Emmanuel Mongodin, PhD**, an assistant professor of microbiology and immunology at UMSOM, said the research had the potential to transform transplantation. ***"From our previous work we suspected that the microbiome might have an effect on how transplanted organs are accepted,"*** says Prof. Mongodin. ***"This work clearly shows that there is a connection between these gut microbes and the body's response to the new organ. It's very exciting.***"

The link between the transplanted heart and the microbiome is the immune system. Many researchers have noted that the microbiome plays a key role in the immune system, either activating it or turning it down, depending on the bacterial species. Certain bacteria in the microbiome can trigger pro- or anti-inflammatory signals, and that these signals can in turn affect how the immune system responds to the transplanted organ.

Organ rejection remains an urgent problem in transplantation. Despite intense research, over the past 20 years researchers and doctors have not been able to improve the long-term organ rejection rate – the rejection of organs that occurs between five and eight years after transplantation.

The research began with **Jonathan S. Bromberg, MD, PhD**, a professor of surgery, microbiology and immunology at UMSOM. Dr. Bromberg, the study's other lead author, is a transplant surgeon, and has transplanted hundreds of organs over the course of his career, so he is extremely familiar with the problem of rejection. Several years ago he began wondering what other variables might help explain why long-term rejection occurred. He started looking at microbiome.

"The more I looked, the more it seemed there might be something there," said Dr. Bromberg. ***"The immune system is deeply intertwined with our gut microbiome, and I wanted to explore***

this connection in more depth." Dr. Bromberg began collaborating with Dr. Mongodin, who spent much of his career studying the microbiome.

In an animal model, the two scientists showed that by adjusting the microbiome, they could improve the outcome of the heart transplant. They identified specific species that seem to have a beneficial or harmful effect on the transplant. They suspect that this process may be similar for other organs, such as kidneys. The next step, they say will be to focus on the mechanisms behind this bacterial effect. With a better understanding of the molecular pathways, it may be possible to mimic the effect with drugs.

"This is great example of translational research," said **E. Albert Reece, MD, PhD, MBA**, Executive Vice President for Medical Affairs at UM Baltimore, and the John Z. and Akiko K. Bowers Distinguished Professor and Dean, University of Maryland School of Medicine. ***"As we learn more about these microbes, we have the potential to truly change long-term rejection rates in heart transplants and perhaps in other organs as well."***

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The Institute for Genome Sciences, founded in 2007, is an international research center within the University of Maryland School of Medicine. Comprised of an interdisciplinary, multidepartment team of investigators, the Institute uses the powerful tools of genomics and bioinformatics to understand genome function in health and disease, to study molecular and cellular networks in a variety of model systems, and to generate data and bioinformatics resources of value to the international scientific community.
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