Certain Traits Could Come From Our Mother's Bacteria, Rather Than Our Genes

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Health and Medicine

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We're all products of both our genetics and the environment in which we live; that's well-established science. But what's also becoming increasingly apparent is the role that the bacteria living in our bodies can play in influencing some of our characteristics, such as weight and behavior. Now, in a surprising twist, it turns out that some traits we assumed would be inherited from our parents' genes could actually have their origins in the DNA of the bacteria that our mothers passed on shortly after birth.

This intriguing possibility was identified in a new study which found that female mice can pass to their offspring a susceptibility to certain gut disorders through the transmission of a particular group of gut-residing bacteria. This is the first piece of research to demonstrate that bacterial DNA can pass from parent to offspring in such a way that affects specific traits, such as immunity. The study, conducted by scientists at Washington University School of Medicine in St. Louis, has been published in *Nature*.

The human body is riddled with life; our cells are outnumbered by microbes at least 10 to 1. But these bugs don't just sit there idle, nor does the vast majority represent a threat to our health. Most bacteria in our bodies are known as commensals, meaning they don't do us any harm and can actually be beneficial, for example by helping us produce hormones and vitamins.

Human microbial colonization begins at birth, maybe even in the womb, and our microbial populations continue to change throughout our lives. Our mothers pass on much of these organisms, for example through contact or when we pass through the birth canal. Although we know these microbes can influence certain traits, it was assumed that these particular bacteria were acquired during our lives. Now, scientists have identified a specific trait, caused by bacteria, which can be passed from mother to offspring.

Inflammatory bowel diseases, such as Crohn's disease, are linked to low gut levels of a defense antibody known as IgA, which helps our body fight off pathogens. It was believed that this deficiency was predominantly hereditary, meaning it's inherited from our parents' genes. But scientists working on these conditions began to wonder whether there might be more to the story when they observed that many of their genetically modified mice had low levels of IgA, a trait that was not bred into the animals.

Interestingly, when these animals were housed alongside mice with high IgA levels, within just a few weeks all of the mice had similarly low antibody levels. Furthermore, when the mice were bred, offspring that came from mothers with low IgA also ended up with low antibody levels in their gut.

After a series of experiments, the scientists finally revealed what was going on: The mice were spreading a bacteria called *Sutterella* to each other through their feces, and the mothers were also passing it on to their offspring. Since *Sutterella* inhibits the secretion of IgA, the mice were passing on the trait of low IgA through this organism.

Alongside having implications for experimental setups in animal laboratories, the discovery could mean that scientists now need to consider a new factor—microbial DNA passed from mother to child—when they attempt to understand how both human and microbial genes shape illness and health.

[Via Washington University, Nature and Live Science]