Early-life exercise alters gut microbes, promotes healthy brain and metabolism

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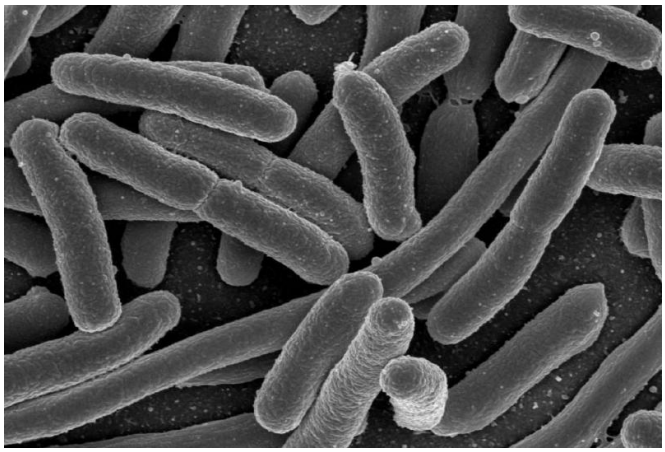

Microbes under a microscope. Credit: NIAID

The human gut harbors a teeming menagerie of over 100 trillion microorganisms, and researchers at the University of Colorado Boulder have discovered that exercising early in life can alter that microbial community for the better, promoting healthier brain and metabolic activity over the course of a lifetime.

The research, which was recently published in the journal *Immunology and Cell Biology*, indicates that there may be a window of opportunity during early human development to optimize the chances of better lifelong health.

"Exercise affects many aspects of health, both metabolic and mental, and people are only now starting to look at the plasticity of these gut microbes," said Monika Fleshner, a professor in CU-Boulder's Department of Integrative Physiology and the senior author of the new study. "That is one of the novel aspects of this research."

Microbes take up residence within human intestines shortly after birth and are vital to the development of the immune system and various neural functions. These microbes can add as many 5 million genes to a person's overall genetic profile and thus have tremendous power to influence aspects of human physiology.

While this diverse microbial community remains somewhat malleable throughout adult life and can be influenced by environmental factors such as diet and sleep patterns, the researchers found that gut microorganisms are especially 'plastic' at a young age.

The study found that juvenile rats who voluntarily exercised every day developed a more beneficial microbial structure, including the expansion of probiotic bacterial species in their gut compared to both their sedentary counterparts and adult rats, even when the adult rats exercised as well.

The researchers have not, as of yet, pinpointed an exact age range when the gut microbe community is likeliest to change, but the preliminary findings indicate that earlier is better.

A robust, healthy community of gut microbes also appears to promote healthy brain function and provide anti-depressant effects, Fleshner said. Previous research has shown that the human brain responds to microbial signals from the gut, though the exact communication methods are still under investigation.

"Future research on this microbial ecosystem will hone in on how these microbes influence brain function in a long-lasting way," said Agniezka Mika, a graduate researcher in CU-Boulder's Department of Integrative Physiology and the lead author of the new study.

Going forward, the researchers also plan to explore novel means of encouraging positive gut microbe plasticity in adults, who tend to have stable microbial communities that are more resistant to

change.

Provided by University of Colorado at Boulder