Research explains how we live in harmony with friendly gut bacteria

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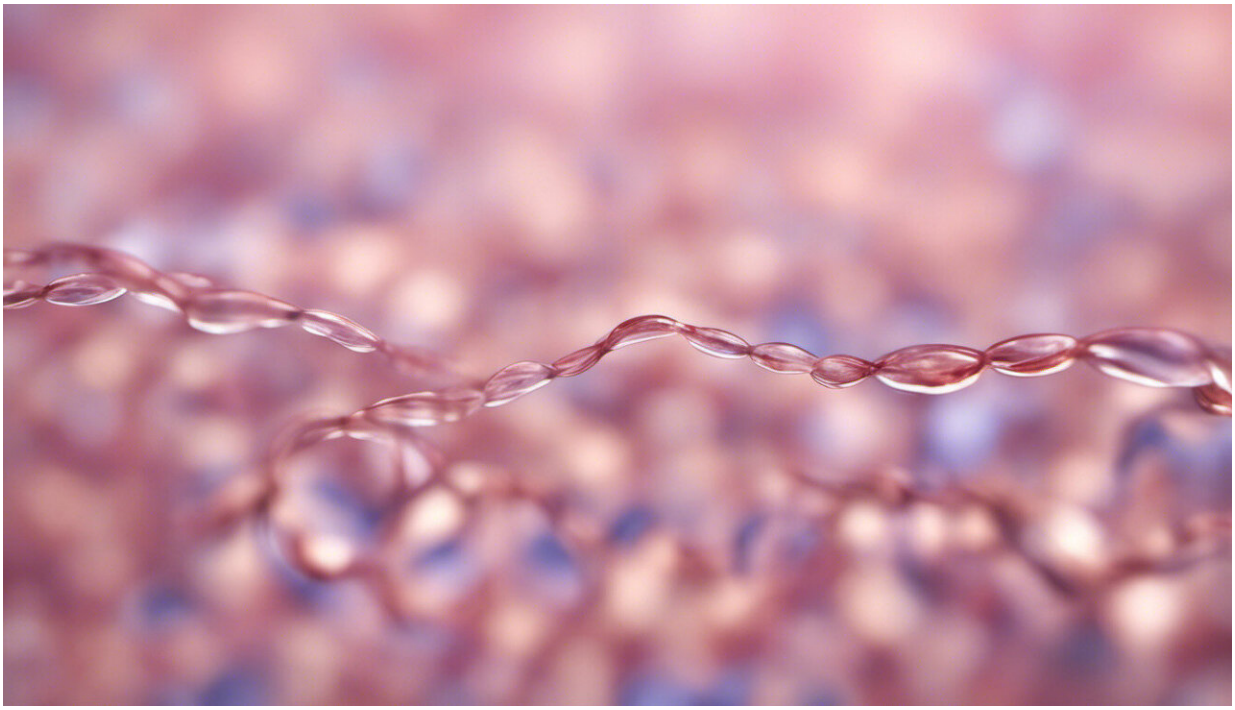

Credit: AI-generated image (disclaimer)

Stability in the composition of the hundred trillion bacterial cells in the human gastrointestinal tract is crucial to health, but scientists have been perplexed how our microbiota withstands an onslaught of toxins, dietary changes, and immune response to infections or antibiotics with little change.

Research from Yale published in the Jan. 9 issue of the journal *Science* identifies a strategy that commensal, or non-harmful, gut bacteria employ to preserve this stable relationship with their host during inflammation.

"It has been a puzzle that many immune responses target all bacteria," said Andrew Goodman, assistant professor of microbial pathogenesis and a member of the Microbial Sciences Institute at Yale's West Campus. "Yet healthy individuals maintain the same beneficial microbes for decades even when exposed to a host of environmental disturbances."

Research has shown that disruptions in the gut microbiome can lead to severe health consequences, including obesity, recurrent infections, and diseases such as irritable bowel syndrome. Instability in the microbiome has been linked to diseases as diverse as autism and cancer. Doctors may one day be able to manipulate the microbiome to treat patients, but scientists first need to understand the molecular machinery of the vast gut microbiome, which contains a hundred times more genes than the human genome.

The new study represents a first step, Goodman said. The Yale team found that in mice and humans, microbiome stability is maintained by a single gene that allows bacteria to resist high levels of inflammation-associated antimicrobial peptides. Commensal bacteria that lack this mechanism were promptly removed from the gut during inflammation in mice.

"We were surprised that a single factor could have such a large effect," Goodman said. "This study opens the door for new approaches to understand how commensal bacteria interact with their hosts."

Thomas W. Cullen of Yale is the lead author of the study.

More information: "Antimicrobial peptide resistance mediates resilience of prominent gut commensals during inflammation" *Science* 9 January 2015: Vol. 347 no. 6218 pp. 170-175 DOI: 10.1126/science.1260580

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