Antibiotics allow gut pathogens to 'breathe'

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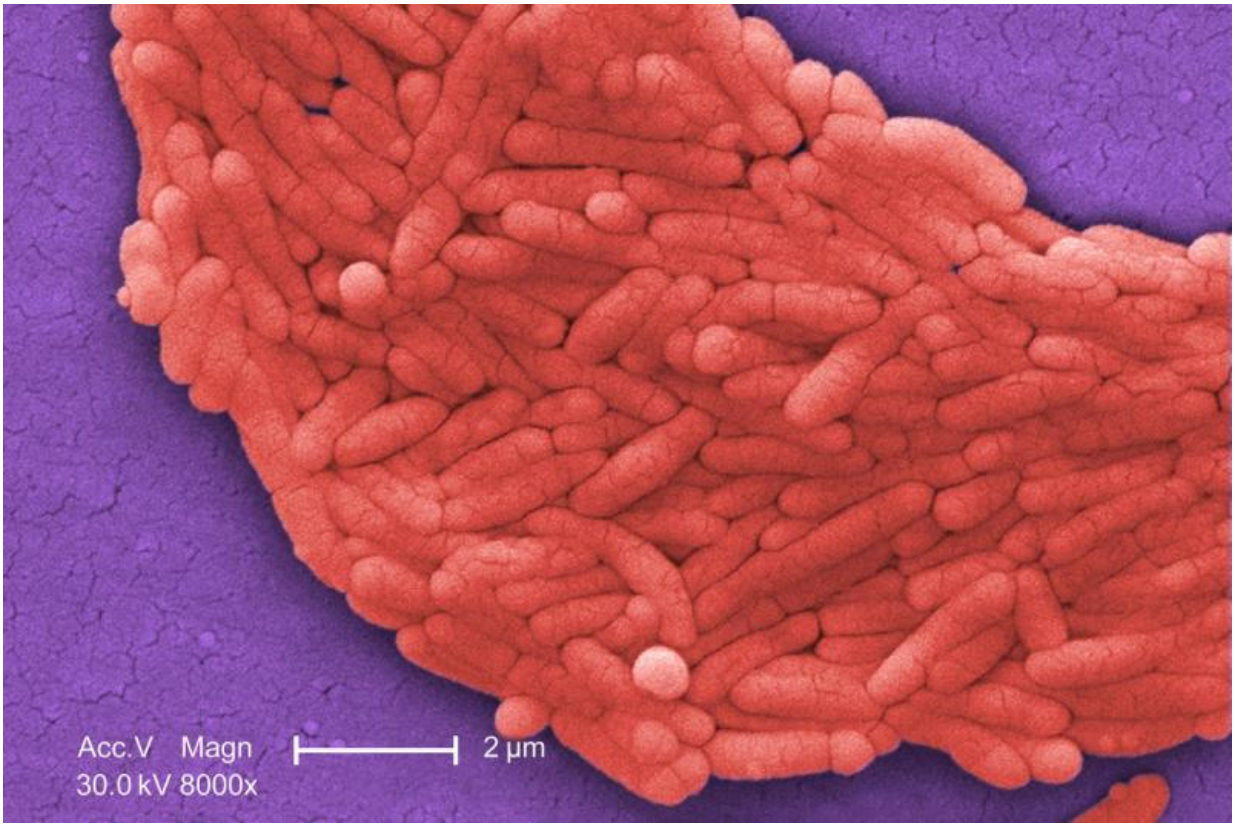

Salmonella forms a biofilm. Credit: CDC

Antibiotics are essential for fighting bacterial infection, but, paradoxically, they can also make the body more prone to infection and diarrhea.

Exactly how the resident "good" microbes in the gut protect against

pathogens, such as *Salmonella*, and how antibiotic treatments foster growth of disease-causing microbes have been poorly understood.

But research in a mouse model led by Andreas Bäumler, professor of medical immunology and microbiology at UC Davis Health System, has identified the chain of events that occur within the gut lumen after antibiotic treatment that allow "bad" bugs to flourish.

The finding has profound implications, expanding the current view of how microbes interact with each other at the gut surface and informing the development of new strategies to prevent the side effects of antibiotic treatment, wrote the authors of an accompanying commentary that appeared online with the study April 13 in the journal *Cell Host Microbe*.

According to Bäumler, the process begins with antibiotics depleting "good" bacteria in the gut, including those that breakdown fiber from vegetables to create butyrate, an essential organic acid that cells lining the large intestine need as an energy source to absorb water. The reduced ability to metabolize fiber prevents these cells from consuming oxygen, increasing oxygen levels in the gut lumen that favor the growth of *Salmonella*.

"Unlike *Clostridia* and other beneficial microbes in the gut, which grow anaerobically, or in the complete absence of oxygen, *Salmonella* flourished in the newly created oxygen-rich micro environment after antibiotic treatment," Bäumler said. "In essence, antibiotics enabled pathogens in the gut to breathe."

Other research has linked low levels of butyrate-producing microbes with inflammatory bowel disease, but additional research is needed to determine if these findings are limited to butyrate and growth of *Salmonella* or if similar mechanisms underlie interactions that influence

human health.

More information: Fabian Rivera-Chávez et al, Depletion of Butyrate-Producing Clostridia from the Gut Microbiota Drives an Aerobic Luminal Expansion of Salmonella, *Cell Host & Microbe* (2016). DOI: 10.1016/j.chom.2016.03.004

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