Plants may be transmitting superbugs to people

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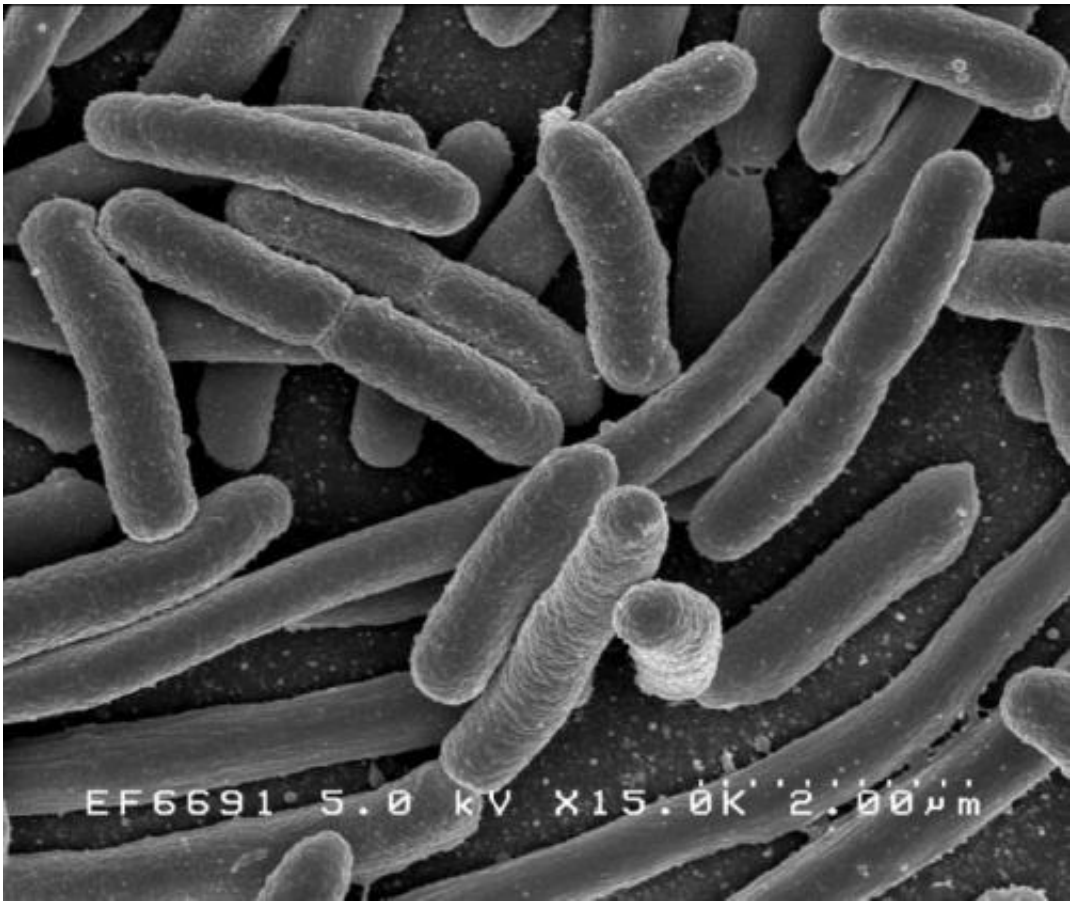

Escherichia coli. Credit: Rocky Mountain Laboratories, NIAID, NIH

Antibiotic-resistant infections are a threat to global public health, food safety and an economic burden. To prevent these infections, it is critical to understand how antibiotic-resistant bacteria and their genes are

transmitted from both meat and plant-foods. Researchers have now shown how plant-foods serve as vehicles for transmitting antibiotic resistance to the gut microbiome. The research is presented at ASM Microbe, the annual meeting of the American Society for Microbiology.

The U.S. Centers for Disease Control and Prevention estimated that of the 2 million antibiotic-resistant infections per year in the U.S., 20 percent are linked to agriculture. This estimate is based on patients who directly acquire antibiotic-resistant superbugs from eating meat. Little has been done to determine how eating plants contributes to the spread of antibiotic-resistant "superbugs."

"Our findings highlight the importance of tackling foodborne antibiotic-resistance from a complete food chain perspective that includes plant-foods in addition to meat," said Marlène Maeusli, Ph.D. candidate at Keck School of Medicine at the University of Southern California, who is the lead author on the study.

Spread of antibiotic-resistant superbugs from plants to humans is different from outbreaks of diarrheal illnesses caused immediately after eating contaminated vegetables. Superbugs can asymptomatically hide in (or "colonize") the intestines for months or even years, when they then escape the intestine and cause an infection, such as a urinary infection.

The researchers developed a novel, lettuce-mouse model system that does not cause immediate illness to mimic consumption of superbugs with plant-foods. They grew lettuce, exposed the lettuce to antibiotic-resistant E. coli, fed it to the mice and analyzed their fecal samples over time.

"We found differences in the ability of bacteria to silently colonize the gut after ingestion, depending on a variety of host and bacterial factors," said Maeusli. "We mimicked antibiotic and antacid treatments, as both

could affect the ability of superbugs to survive passage from the stomach to the intestines."

Exposure to one type of antibiotic did not increase the ability of superbugs to hide in the mouse intestines, whereas a second antibiotic resulted in stable gut colonization after ingestion. Ingestion of bacteria with food also changed colonization, as did administering an antacid before ingesting the bacteria.

"We continue to seek the plant characteristics and host factors that result in key microbial community shifts in the gut that put us at risk for colonization and those that prevent it," said Maeusli. "The environment and human health—in this context via agriculture and microbiomes—are inextricably linked."

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