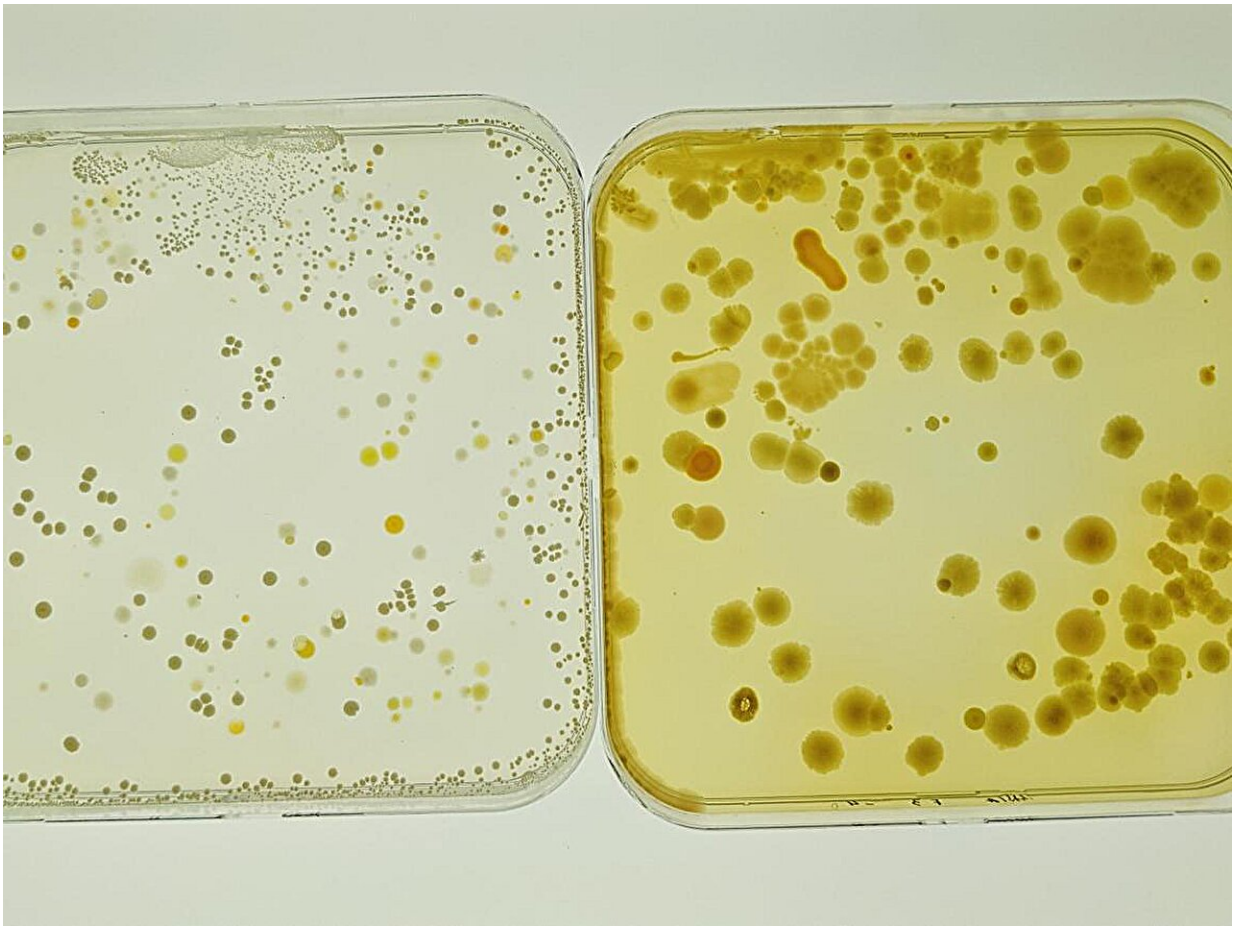
Food-borne pathogen Listeria may hide from sanitizers in biofilms

January 24 2024, by Jeff Mulhollem



Microbiota isolated from fruit packing environments growing in lab dishes. Credit: Penn State

An estimated 1,600 people in the U.S. contract a serious infection from Listeria bacteria in food each year, and of those individuals, about 260 people die, according to the Centers for Disease Control and Prevention. Penn State researchers may now better understand how the bacteria, called Listeria monocytogenes, survive and persist in fruit-packing plants by evading and surviving sanitizers.

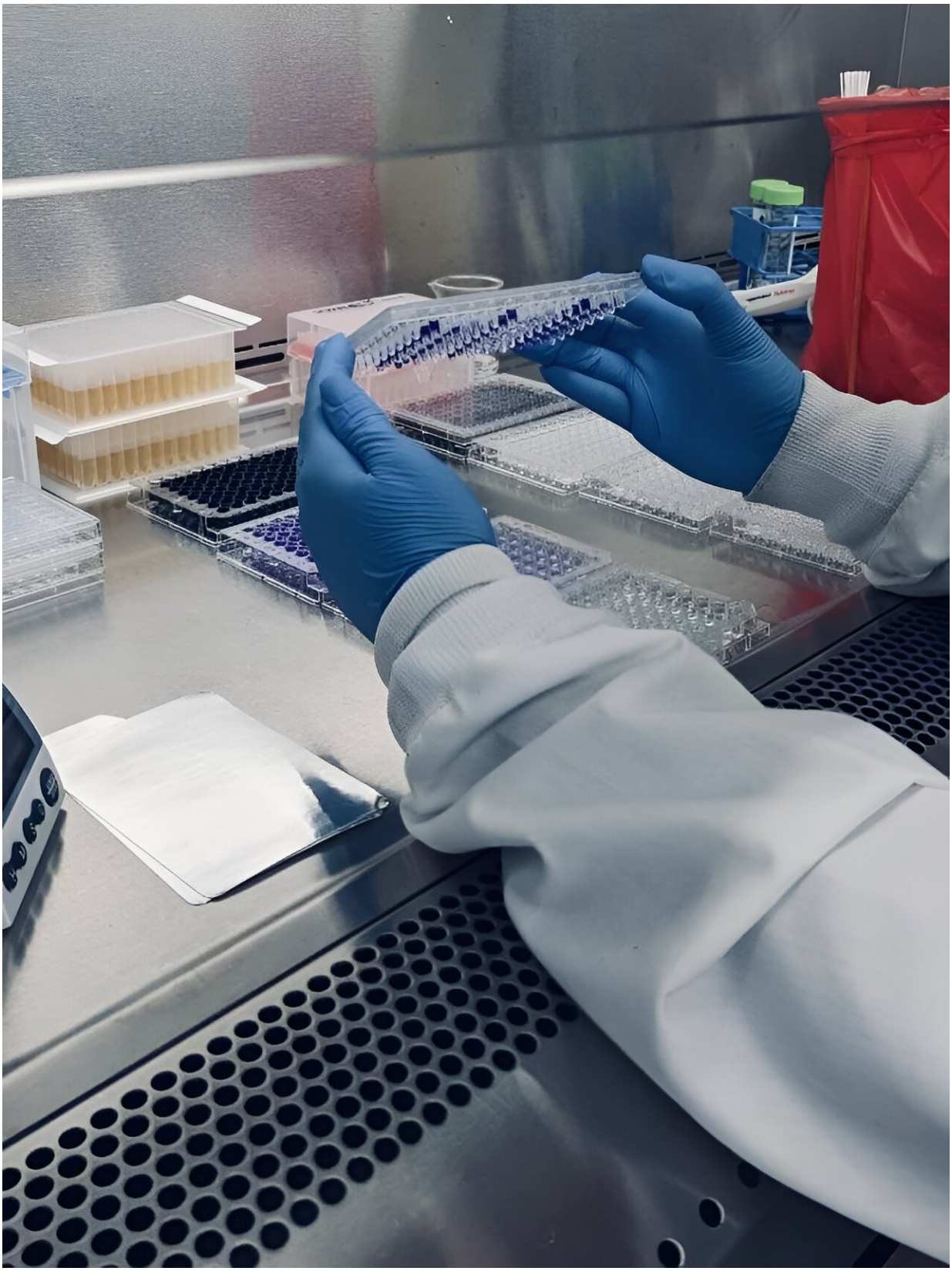
According to their study, which is now available online and will be published in the June issue of the journal *Biofilm*, biofilms—containing otherwise harmless microorganisms that attach to each other and the food surface—result in a kind of shield that surrounds and protects the Listeria. The findings may result in changes to sanitation protocols in food-processing facilities that promise to diminish contamination of food with Listeria, the researchers said.

"We found two groups of microorganisms in the tree-fruit packing environments, Pseudomonadaceae and Xanthomonadaceae, that are very good at forming biofilms and protecting Listeria monocytogenes," said corresponding author Jasna Kovac, the Lester Earl and Veronica Casida Career Development Professor of Food Safety. "Biofilms represent a physical barrier that reduces the effective diffusion and antimicrobial action of sanitizers and is hypothesized to increase L. monocytogenes' tolerance to sanitizers used in food processing facilities."

As a result of the biofilms shielding the pathogen, the sanitizers are not as effective in killing Listeria monocytogenes, explained Laura Rolon, who recently earned her doctorate from Penn State and spearheaded the study.

"Our research suggests that if packing facilities are having a recurring problem with Listeria monocytogenes, they may need to assess whether biofilm-forming microorganisms are causing it," she said.

This study's results indicate a need to assess the efficacy of commonly used sanitizers against non-pathogenic biofilm-forming microorganisms commonly found in the food processing environments to prevent biofilms from establishing, Kovac explained. The results of further assessments could help inform practical recommendations for the industry, such as application concentrations and times, to prevent biofilm formation and improve the control of Listeria monocytogenes in these environments.



The researchers tested the biofilm-forming ability of assemblages comprising the foodborne pathogens Listeria monocytogenes and environmental microbiota. Credit: Penn State

In future workshops and short courses, Penn State Extension educators will communicate the research findings to professional organizations dedicated to sanitation in food-processing facilities, noted study co-author Luke LaBorde, professor of food science and extension specialist.

"The findings of this research project will inform and enhance sanitation protocols and extension training efforts targeted at the tree-fruit industry to effectively control L. monocytogenes," said LaBorde, an expert in the tracking of Listeria monocytogenes in produce production and processing environments.

Other co-authors include M. Laura Rolan, Olena Voloshchuk and Katelyn V. Bartlett, all with the Department of Food Science in the College of Agricultural Sciences at Penn State.

More information: M. Laura Rolon et al, Multi-species biofilms of environmental microbiota isolated from fruit packing facilities promoted tolerance of Listeria monocytogenes to benzalkonium chloride, *Biofilm* (2024). DOI: 10.1016/j.bioflm.2024.100177

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