



FOOD SAFETY RESEARCH: A FOCUS ON

Listeria monocytogenes and Biofilms

The effective control of *Listeria monocytogenes* biofilm formation on surfaces within food processing facilities is foremost in reducing contamination of ready-to-eat (RTE) foods.

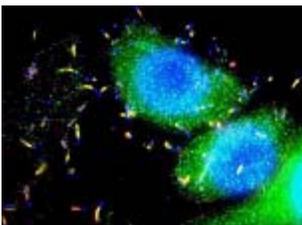
Current research concentrates on methods preventing initial biofilm formation, controlling growth, and eliminating developed biofilms.

The Agricultural Research Service (ARS) within the USDA is one of many organizations studying preventative measures to reduce bacterial attachment to surfaces and initial biofilm formation. ARS is focusing on the inhibition of bacterial contamination by both physical and chemical interventions. They are testing innovative compounds and surface materials for effectiveness against organism attachment biofilm formation.

Other research organizations and academia, including the American Meat Institute Foundation along with the Food Research Institute of UW-Madison are studying biofilm behaviors to determine factors that make different surfaces susceptible or resistant to bacterial attachment and biofilm formation.

The Food Research Institute found that stainless steel surfaces plasma modified with 12-crown-4 ether can reduce biofilm formation without affecting the ability to clean the surface.

Separate research by Colorado



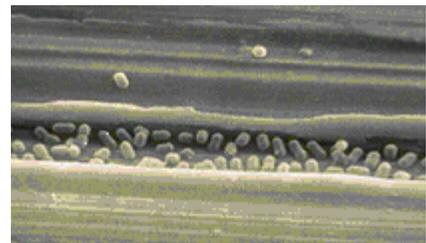
L. monocytogenes.
Image courtesy of David Drubin, University of California

State University concludes data strengthening the importance of the meat industry to follow operating temperatures and sanitation standard operating procedures.

The increased danger with *Listeria* forming a biofilm is the nature of the organism. The unusual growth requirements, survival properties, and mobility add to the complexity and difficulty of controlling and removing *L. monocytogenes* from contact surfaces and contamination within food processing facilities.

This adaptability creates a disinfection resistance-like situation. The USDA Food Safety

Inspection Service adds that combination interventions to include testing 'pre-' and 'post-' packaging and growth inhibitors are more effective than any one individually.



Lm forming a biofilm. Image courtesy of American Society of Microbiology Biofilm Project (<http://www.rit.edu/%7Ejadsbj/asmbiofilm/listeria.html>)

RESEARCH AREAS

Determine influences and relationships on biofilm development.

Study the formation and composition of biofilms on processing plant surfaces.

Evaluate the effectiveness of varying sanitation procedures and products in the controlling of *Lm*

Evaluate more sensitive detection methods for low level healthy or injured cell detection of *Lm*.

Determine the role of air, water and other plant growth on pathogen transfer to produce.

Evaluate the appropriateness of an absolute zero tolerance for *Listeria* levels.

Developing better agars and quicker rapid detection methods.

Inhibit initial adhesion of microbial contaminants with antimicrobial agents to control biofilm formation.

Develop methods to facilitate the removal of biofilms on contact surfaces for effective sanitizing.

Assess potentials of bio-preservatives applied to frankfurter casings for control of *Lm*.

Study post-cooking interventions to eliminate *Lm* in packaged and refrigerated RTE poultry products.

Develop methods preventing the formation biofilms on processing plant surfaces.

Determine the effectiveness of irradiation and packaging treatments to control *Lm*.

Evaluating production intervention strategies, education and GMPs.

FSRIO DATABASE PROJECTS

Projects in the FSRIO database related to this topic are listed below. Visit FSRIO online to access the projects.

Adhesion and Control Of Human Pathogens To And On Surfaces Of Poultry Fruits And Vegetables

USDA - Agricultural Research Service

Control Strategies for *Listeria monocytogenes* in Food Processing Environments

USDA - CSREES

Genome Sequence for *Listeria Monocytogenes*

USDA

Identification of *Listeria monocytogenes* Genetic Clusters Having Increased Pathogenic Potential (2001-02998)

USDA - CSREES/National Research Initiative

Inhibition of *L. monocytogenes* Biofilms by Plasma-Deposited Antibacterial Layers

USDA - CSREES

Post-process Pasteurization of Packaged, Ready-to-eat Meat Products for Control of *Listeria monocytogenes*

USDA - CSREES

Reduction and Control Of Pathogens Associated With Food Processing Surfaces

USDA - Agricultural Research Service

The Detection of Foodborne Pathogens in Biofilms Using Antibodies, Lectins & Fluorescent

Joint Institute of Food Safety and Applied Nutrition

RESOURCES

This factsheet was produced using the resources listed below. Visit FSRIO online to access these links.

Reduction of *Listeria monocytogenes* Biofilm Formation in Ready-to-Eat Meat Processing Environments

American Meat Institute Foundation

The War Against Invasive Bacteria that Stick to Surfaces

Agriculture and Agri-Food Canada

Listeria in ready-to-eat foods

Food Science Australia

FSIS Holds Public Meeting on *Listeria* Risk Assessment

Southwest Meat Association

Biofilm Formation Of Acid-Adapted And Nonadapted *Listeria monocytogenes* In Meat Decontamination Washings

Colorado State University, Department of Animal Sciences

This fact sheet is one of several information products developed by the Food Safety Research Information Office (FSRIO) at the USDA's National Agricultural Library (NAL). Fact sheets on specific food safety research topics are available on the FSRIO web site at:

<http://www.nal.usda.gov/fsrio/research/fsheets.htm>

FSRIO is a unique resource for the food safety research community. The program features a web site that serves as a gateway to research information and includes a database of federally-funded research projects. The database is available for researchers, policymakers, consumers and others to learn about research initiatives, and assist the government in assessing food safety research needs and priorities, thereby minimizing duplication of effort. FSRIO also provides a reference service at no charge.

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<http://www.nal.usda.gov>

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