Website for Dairy Nitrogen Management

Though nitrogen is an essential nutrient for crop and animal production, too much of it in rations or in fertilizer and manure applied to crops can increase losses to groundwater, surface water, and air. Commercial feeds and fertilizers are significant—and expensive—sources of nitrogen, making nitrogen management important to dairy producers and the public.

A new, interactive website, "Nitrogen Management on Dairy Farms," can help. It's the result of cooperative work by scientists with the Agricultural Research Service, Cornell University, and the University of Vermont. A USDA Fund for Rural America grant provided funding for the project.

ARS soil scientist Jack Meisinger, of the Environmental Management and Byproduct Utilization Laboratory in Beltsville, Maryland, helped develop the website.

"It is vital that information about nitrogen management be freely accessible to dairy farmers," says Meisinger. "But it is equally important that they be given the tools to achieve good nitrogen management. The website is a way of providing that."

The website contains 58 linked pages of mixed-media content covering management of crops and soils, feed storage, dairy herd nutrition, and manure use.

"It's part tutorial, with interactive diagrams as a review of information, and contains quizzes as well," says Cornell collaborator Quirine Ketterings. The website also provides detailed information on how to sample and test manure, soil, and crops. "A farmer needs to know how these factors are linked in the nitrogen cycle," Ketterings says.

Information is also available on how to interpret test results and calculate how much plant-available nitrogen is in manure. Given the high cost of fertilizer, accounting for manure nitrogen can greatly improve farm profitability. A downloadable spreadsheet, called the "Manure Nutrient Calculator," is provided as an example of a manure-crediting system used in New York State.

State and federal research on managing the fate and transport of nitrogen in animal manure is used to formulate best-management practices. Case studies illustrate how farms have made changes to reduce nutrient imbalances and losses by taking a whole-farm approach to nutrient management.

The website address is www.dairyn.cornell.edu.—By **Sharon Durham,** ARS.

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Advances in Protection Against *Listeria*

Fresh-cut fruits come with particular quality and shelf-life challenges. For example, food-contaminating microbes on a peel or rind's surface can piggyback onto a cutting knife and be dragged into the fruit's flesh.

Now an ARS-led research team has found that applying a combination of antagonistic microorganisms and bacteriophages can be effective in reducing *Listeria monocytogenes* on fresh-cut honeydew melon pieces. *L. monocytogenes* is a foodborne human pathogen that tolerates environmental stress, multiplies at low temperatures, and survives refrigeration.

Widely distributed in nature, *Listeria* can cause a serious, even fatal, infection. That's why the U.S. Food and Drug Administration has established zero tolerance for *L. monocytogenes* in ready-to-eat foods, including processed fresh-cut fruits and vegetables.

William Conway, with the ARS Produce Quality and Safety Laboratory in Beltsville, Maryland, and Wojciech Janisiewicz, with ARS's Appalachian Fruit Research Station in Kearneysville, West Virginia, led the study.

They artificially contaminated honeydew melon pieces that had been treated with three different solutions: an oxidative bacterium known as *Gluconobacter asaii,* a mixture of six bacteriophages, or a combination of both. *G. asaii* bacteria are naturally present on the surface of pome fruits, such as apples and pears. Bacteriophages—or phages—are viruses that, while nontoxic to humans, sicken certain human bacterial pathogens and eventually kill them.

The team found that the combination of phage and *G. asaii* was the most effective of the three treatments. It reduced *L. monocytogenes* populations by more than 99.999 percent.

"The phage component had an immediate inhibitory effect, while *G. asaii* controlled the pathogen for a longer period," says Janisiewicz.

"As a beneficial bacterium, *G. asaii's* mechanism of action may be that it competes for space and nutrients on fruit and vegetable surfaces where fungi or bacteria would otherwise thrive," says Conway.

Phages invade bacteria, multiply, and eventually damage bacterial walls, releasing many new phages capable of invading more bacteria. Because the phages only attack specific bacterial species and strains, they can be applied to prevent those kinds of infections.—By **Rosalie Marion Bliss,** ARS.

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