



FORUM

Alternative Strategies for Keeping Animals Healthy

The general public needs to know more about the importance of preventing and controlling livestock diseases and the financial impact they would have on our lives and food supply if left unchecked. Part of our mission at the USDA Agricultural Research Service is to conduct research to protect the safety of our nation's agriculture and food supply through improved disease detection, prevention, and control.

Antibiotics are recognized as one of the most important biomedical discoveries for treating infectious diseases of animals and humans. The use of antibiotics has had a major impact on increases in food-animal production and has resulted in extraordinary progress in safeguarding the health and well-being of people. Yet, while antibiotic use is critical for treating animal diseases, growing concerns about the emergence of antibiotic-resistant bacteria are leading to restrictions on antibiotic use in animal production worldwide.

A call for reduced use of antibiotics in food-animal production has heightened existing searches for new antimicrobials, but finding alternatives to antibiotics has become a main objective of the global scientific community.

ARS scientists are exploring novel technologies that can be used instead of antibiotics to help keep animals healthy. Successes include a patented method to use complex carbohydrates as prebiotics—food or feed additives that nourish beneficial bacteria inside the intestinal tract of animals—to promote gut health. Scientists at the ARS Henry A. Wallace Beltsville [Maryland] Agricultural Research Center (BARC) have also explored a method that introduces a mushroom extract, lectin, to poultry by injection into developing embryos or through drinking water, improving the

birds' innate immunity against major parasitic diseases in the gut.

Scientific explorations include lessons from nature, such as various phytochemicals that show promise as antibiotic alternatives. Working with researchers around the world, BARC scientists have found that dietary supplements, such as green tea and cinnamaldehyde, can strengthen the poultry immune system. They've also developed a new antibiotic-free method that uses hyperimmune egg yolk antibodies to control intestinal poultry diseases.

Multi-drug-resistant "superbugs" are a persistent problem in modern health care, so new antimicrobials are needed. Natural antimicrobials with intimidating names like "phage endolysins" and "bacteriocins" are fairly easy to genetically modify in the lab, making them prime candidates for creating novel antimicrobials with multiple, simultaneous, and unique cell-killing, or "lytic," activities. Using this process, BARC scientists have generated a fusion protein combining parts of three antimicrobials that work together to kill *Staphylococcus*—the idea being that few bacteria could evade three simultaneous lytic activities. This fusion protein disrupts *S. aureus* more efficiently than the parent molecules, and the delivery of three unique antimicrobials in a single protein should also help prevent resistance from developing.

More research is featured in the article that begins on page 4. The studies mentioned are only a fraction of the achievements ARS scientists have made toward finding new methods to prevent

and control diseases that affect animals and humans.

To explore trends globally, ARS scientists together with the World Organization for Animal Health—known as "OIE"—scientists from Europe, Asia, and the Americas; regulatory agencies; livestock producers; and the feed and pharmaceutical industries have organized a symposium on alternatives to antibiotics that will occur on September 25-28, 2012, in Paris (more information is available at alternativestoantibiotics.org). The objectives of this symposium are to highlight research and novel technologies that provide promising alternatives to antibiotics, assess challenges associated with their commercialization and use, and provide actionable strategies to support their development.

World-renown experts will look at biocontrol approaches for preventing and treating pathogens in food animals, discuss alternative host-directed strategies to enhance innate defense mechanisms in the gut, and explore new approaches that can be used as alternatives for antimicrobial growth promoters in poultry, swine, ruminant, and aquaculture production. Symposium participants representing regulatory agencies and industry will also assess challenges associated with the registration of these new technologies and provide strategies to support their development.

While ARS and other scientists continue to search for and develop viable antibiotic alternatives, it should be noted that antibiotics used in food animals today are approved as safe and effective by the U.S. Food and Drug Administration (FDA) and that animals must be healthy before entering the food chain. With careful use of approved antibiotics, producers and veterinarians continue to address disease challenges in livestock and provide us with foods derived from healthy animals.

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