

## *A System to Describe Antimicrobial Resistance Among Human and Animal Populations*

David A. Dargatz<sup>1</sup>, Paula J. Fedorka-Cray<sup>2</sup>, Kenneth E. Petersen<sup>3</sup>, Linda Tollefson<sup>4</sup>,  
Nora E. Wineland<sup>5</sup>, Kathy Hollinger<sup>6</sup>, and Marcia Headrick<sup>7</sup>

Global concerns about antimicrobial resistance have grown in recent years and include the agricultural and human-health care arenas. The World Health Organization has seated several consultancy groups to examine the implications of antimicrobial use and resistance development. The National Academy of Sciences also has taken up the issue of antimicrobial use and resistance. Numerous other groups have held public and private meetings to discuss various aspects of antimicrobial resistance. Though there is little consensus regarding the roles of various antimicrobial-use practices in the development of resistance that can impact public health, there is widespread recognition that the issue merits further study and that there is a sense of urgency in our need for more data and information.

To track emerging resistance, the National Antimicrobial Resistance Monitoring System - Enteric Bacteria (NARMS-EB) was established in 1996. The overall system is comprised of two separate components for antimicrobial-susceptibility testing of veterinary and human isolates. Testing of the human isolates component of the system is done at the Center for Disease Control in Atlanta. Testing of the veterinary isolates is conducted by the U.S. Department of Agriculture at the Agricultural Research Service Richard Russell Research Center in Athens, Georgia. *Salmonella* was chosen as the sentinel organism to describe levels of resistance and monitor trends in both systems. Currently, *Campylobacter* and *Escherichia coli* O157 (when available) also are tested in both systems. Testing for the veterinary NARMS-EB *Salmonella* isolates is conducted using a semi-automated system (Sensititre<sup>TM</sup>, Trek Diagnostics). Plates are custom made with 17 antimicrobials in an MIC format. This system is also used for the *E. coli* O157 isolates. *Campylobacter* susceptibility testing to seven antimicrobial drugs is done using the E-test (AB BIODISK). Testing for the human NARMS-EB isolates is conducted using the same testing methodologies and antimicrobials as those used for the veterinary isolates. Veterinary isolates represent a broad range of species and come from diagnostic laboratories, healthy animals on farms, and raw product collected in slaughter or processing plants. The samples from farms are collected as part of the National Animal Health Monitoring System (NAHMS) and represent dairy, beef cow-calf, beef-feedlot, and swine operations.

The goals and objectives of the monitoring program are to (1) provide descriptive data on the extent and temporal trends of antimicrobial susceptibility in *Salmonella* and other enteric organisms from the human and animal populations; (2) facilitate the identification of resistance in humans and animals as it arises; (3) provide timely information to veterinarians, physicians, and others; (4) prolong the life span of approved drugs by promoting prudent and judicious use of antimicrobials; and (5) identify areas for more detailed investigation. Information resulting from the monitoring program and follow-up outbreak investigations will be distributed to veterinarians, physicians, and food animal producer groups in a timely manner. Use of the information will be targeted to redirecting drug use so as to diminish the development and spread of resistance over the short term with directives involving long-term use developed in collaboration with the appropriate professional practitioner groups. Outbreak investigations and field studies will be initiated as a result of major shifts or changes in resistance patterns in either animal or human isolates.

---

<sup>1</sup>U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Centers for Epidemiology and Animal Health, 555 South Howes Street, Fort Collins, CO 80521 ([david.a.dargatz@usda.gov](mailto:david.a.dargatz@usda.gov))

<sup>2</sup>U.S. Department of Agriculture, Agricultural Research Service, P.O. Box 70, Ames, IA 50010-0000 ([pcray@nadc.ars.usda.gov](mailto:pcray@nadc.ars.usda.gov))

<sup>3</sup>U.S. Department of Agriculture, Food Safety and Inspection Service.

<sup>4</sup>U.S. Food and Drug Administration, Center for Veterinary Medicine, 7500 Standish Place, Rockville, MD 20855 ([ltollefs@cvm.fda.gov](mailto:ltollefs@cvm.fda.gov))

<sup>5</sup>U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Centers for Epidemiology and Animal Health, 555 South Howes Street, Fort Collins, CO 80521

<sup>6</sup>U.S. Food and Drug Administration, Center for Veterinary Medicine, 7500 Standish Place, Rockville, MD 20855 ([kholling@cvm.fda.gov](mailto:kholling@cvm.fda.gov))

<sup>7</sup>U.S. Food and Drug Administration, Center for Veterinary Medicine, 7500 Standish Place, Rockville, MD 20855 ([mheadric@cvm.fda.gov](mailto:mheadric@cvm.fda.gov))