

National Antimicrobial Resistance Monitoring System (Introduction) **FDA Science Board - November 4th, 2005**

Bacterial antimicrobial resistance in both the medical and agricultural fields has become a serious problem worldwide. Antibiotic resistant strains of bacteria are an increasing threat to animal and human health, with resistance mechanisms having been described for all known antimicrobials currently available for clinical use. The emergence of antimicrobial resistance is increasing the overall mortality, morbidity and economic costs associated with treating bacterial infections caused by resistant organisms. Thus, addressing the issue of antimicrobial resistance is one of the most urgent priorities in the field of infectious disease today

In food animals, antimicrobials are used for the control, prevention and treatment of infectious bacterial diseases, as well as for feed efficiency purposes. An undesired consequence of antimicrobial use in animals is the potential development of antimicrobial-resistant zoonotic foodborne pathogens, and their subsequent transmission to humans via foods. As part of the overall CVM strategy to assess relationships between antimicrobial use in agriculture and subsequent human health consequences, the National Antimicrobial Resistance Monitoring System (NARMS) program was developed to monitor changes in susceptibility of select bacteria to antimicrobial agents of human and veterinary importance.

NARMS was established in 1996 as a collaborative effort among the Food and Drug Administration's Center for Veterinary Medicine (FDA CVM), U.S. Department of Agriculture (USDA), and the Centers for Disease Control and Prevention (CDC). The NARMS program is a surveillance system designed to detect changes in susceptibilities among foodborne pathogens recovered from animals, retail meats and humans. On an annual basis, isolates of *E. coli*, *Salmonella*, *Enterococcus*, and *Campylobacter* from human clinical specimens, samples at slaughter, and raw meat and poultry product from food animals are tested to monitor changes in resistance/susceptibility to select antimicrobial drugs. The antimicrobial drugs tested are selected based on their importance in human and animal medicine. As a public health surveillance system, the primary objectives of NARMS include:

- To provide descriptive data on the extent and temporal trends of antimicrobial drug susceptibility in enteric bacteria from humans, food animals and retail foods of animal origin;
- To respond to unusual or high levels of bacterial drug resistance in humans, animals, and retail meats in order to contain or mitigate resistance dissemination;

- To design follow-up epidemiology and research studies to better understand the emergence and transfer of antimicrobial drug resistance.

The NARMS program consists of three components or arms:

Animal Arm -- *Salmonella* isolates are collected from both on-farm studies (e.g. NAHMS) and federally-inspected slaughter and processing facilities across the U.S. and sent to the Bacterial Epidemiology and Antimicrobial Resistance Research Unit of the USDA in Athens, GA for antimicrobial susceptibility testing. The USDA Bacterial Epidemiology and Antimicrobial Resistance Research laboratory also receives *Salmonella* isolates from ill animals from veterinary diagnostic laboratories and NVSL. *Campylobacter*, *Enterococcus*, and *E. coli* isolates are recovered from chicken carcass rinsates from the Athens, GA Food Safety Inspection Service Laboratory.

Human Arm -- The human-origin isolates are sent to the CDC Foodborne and Diarrheal Diseases Laboratory in Decatur, Georgia, by state and local health departments in all 50 states. State public health laboratories systematically select every 20th non-Typhi *Salmonella* isolate, and isolates of *Shigella*, and *E. coli* O157:H7 submitted to their laboratory and send the isolates to CDC. All *Salmonella* Typhi, *Listeria monocytogenes*, and non-cholerae *Vibrio* isolates are also forwarded to CDC. Additionally, the state public health laboratory in each of the participating 10 FoodNet surveillance sites makes arrangements for submission of a representative sample of *Campylobacter* isolates to CDC.

Retail Arm -- CVM's surveillance role in NARMS involves isolating and identifying specific foodborne bacterial pathogens and commensal organisms from ground beef, ground turkey, pork chops, and chicken breasts on a monthly basis from 10 participating FoodNet sites throughout the U.S. (California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Tennessee, and Oregon). Bacteria under surveillance include *Salmonella*, *Campylobacter*, *Enterococcus* and *E. coli* and are initially identified by the FoodNet laboratories and sent to CVM's Office of Research where their identity is confirmed, and subsequent analyses are performed, including antimicrobial susceptibility testing following CLSI/NCCLS standards.

The NARMS program is designed so that comparable testing methods are used in the human, animal, and retail programs. Participating NARMS laboratories adhere to the appropriate published CLSI/NCCLS standards for antimicrobial susceptibility testing and quality control monitoring to ensure accuracy and comparability of the data.