DANMAP:
MONITORING OF ANTIMICROBIAL RESISTANCE IN BACTERIA FROM ANIMALS FOODS AND HUMANS IN DENMARK

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DANMAP – PROVIDING DATA ON ANTIMICROBIAL RESISTANCE

In 1995, The Danish Integrated Antimicrobial Resistance Monitoring and Research Programme (DANMAP) was established by the Danish Ministry of Food Agriculture and Fisheries and the Danish Ministry of Health. Since 1996, DANMAP reported annually on the occurrence of antimicrobial resistance is pathogenic and indicator bacteria from animals, food and humans in Denmark. Furthermore, DANMAP reports data on antimicrobial usage in animals and humans.

The objectives of the programme are to provide data on trends in the occurrence of antimicrobial resistance, to monitor consumption of antimicrobial agents, and to investigate associations between use of antimicrobials and occurrence of resistance in animals and humans.

ISOLATES FROM ANIMALS

Bacterial isolates included in the monitoring programme are collected from animals at slaughter (E. coli, enterococci and Campylobacter), as well as from diagnostic submissions (Staphylococcus hyicus from pigs and Staphylococcus aureus (mastitis) from cattle and E. coli from diarrhoea in cattle and pigs and septicaemia in poultry). Salmonella isolates from subclinical infections as well as from cases of clinical salmonellosis are included.

The samples from animals at slaughter are collected by meat inspection staff or company personnel and sent to the Danish Veterinary Institute (DVI) for examination. The number of samples for each plant has been determined in proportion to the number of animals slaughtered per year. Each sample represents one herd or flock. They are collected once a month (weekly for broilers). The broiler, cattle and pig slaughter plants included in the surveillance programme account for 98%, 80% and 95%, respectively, of the total production of these animal species in Denmark. Accordingly, the bacterial isolates may be regarded as representing a stratified random sample of the respective populations, so that the occurrence of resistance provides an estimate of the true occurrence in the populations.

Among all Salmonella isolates serotyped at DVI only one isolate of each serotype per farm is selected for the DANMAP report. The DVI is the national reference laboratory for Salmonella in animals, feeding stuffs and food, and receives isolates for typing.

Bacterial isolates from diagnostic submissions are selected by systematic random sampling among isolates from submissions to the DVI, the Cattle Health Laboratory in Ladelund and the laboratory of the Federation of Danish Pig Producers and Slaughterhouses in Kjellerup. Accordingly, the programme achieves nationwide coverage for these pathogens.

ISOLATES FROM FOOD

All food samples are collected at wholesale and retail outlets by the Regional Veterinary and Food Control Authorities during routine inspection, or on request for the DANMAP surveillance programme. The collection of food samples for analyses of indicator bacteria (enterococci and E. coli) is planned and coordinated by the Danish Veterinary and Food Administration. Samples are collected from Danish and imported foods.
ISOLATES FROM HUMANS

Salmonella spp. and Campylobacter spp. from humans are selected by random sampling of isolates grown from faeces samples submitted to the Statens Serum Institut for diagnostic purpose. For Salmonella Typhimurium all isolates are subjected to susceptibility testing.

To monitor the level of resistance among healthy individuals a running surveillance comprising approximately 200 stool samples per year were initiated in 2002. Subjects selected for participation in the surveillance were found through the Danish Civil Register system (CPR), which is a continuously updated register of all residents in Denmark. Indicator bacteria (enterococci and E. coli) from the samples are subjected to susceptibility testing. All Staphylococcus aureus blood isolates and all Streptococcus pneumoniae blood and spinal fluid isolates, nationwide, are sent to the Statens Serum Institut and are available to DANMAP. Furthermore Escherichia coli and coagulase-negative staphylococci obtained from either blood or urine samples submitted for microbiological diagnostic are available.

SUSCEPTIBILITY TESTING

Susceptibility testing of bacterial isolates from animals and food is carried out using broth micro dilution (Trek Diagnostic Systems Ltd.). Testing of bacterial isolates from humans is carried out using either broth micro dilution or tablet/disk diffusion. All Campylobacter isolates are tested using plate dilution. The antimicrobial panels used include antimicrobial substances representing the main groups of therapeutic agents as well as antimicrobial growth promoters.

VETSTAT – PROVIDING DATA ON ANTIMICROBIAL CONSUMPTION

Since 1996, statistics on the total sales of antimicrobials for veterinary use in Denmark have been performed, based on reports from the pharmaceutical companies to the Danish Medicines Agency. These data did not included information on usage in individual target animal species. From 2001, the Danish register of veterinary medicines, VetStat, has replaced the returns on annual sales from the pharmaceutical industry. The VetStat data are collected close to the point of use, ie. the pharmacies, the veterinary practises, and the feed mills.

VetStat comprise detailed information on all prescription medicine on herd level, including information on farm identity, animal species, age group, disease class, drug identity, amounts of drug and prescribing veterinarian. In Denmark, all therapeutic antimicrobial drugs are prescription only. Approximately 80% of the total amounts of antimicrobials are sold directly to the animal owners from the pharmacies on prescription. Due to stringent legislation, antimicrobial drugs for use in veterinary practise can only be obtained at the pharmacies. The veterinary practitioners report all usage of prescription medicines in animals to VetStat. The feed mills report sales of medicated feed sold to farms and aquaculture.

The detailed information in VetStat enables standardisation of drug usage, taking into account the potency of the drugs and the animals in which they are used. Standardised animal daily dosages (ADD) have been defined for each species and every therapeutic formulation. The general principles for standardisation of dosage for animals is parallel to the defined daily dosage in humans, however, ADD are calculated for each age group in VetStat. The introduction of ADDs facilitates comparison of antimicrobial usage between different animal species and compounds.

The VetStat programme monitors veterinary use of drugs, hereby providing data on which control measures and legislations regarding veterinary drug administration can be based. Furthermore, in combination with the DANMAP programme, the VetStat programme provides valuable data for pharmaco-epidemiological research.