Antibiotic resistance – the US, European and Latin American perspective

The term antibiotic resistance has several definitions and when it is described as a phenotypic trait there are different cut-off points for determining whether an organism is susceptible to an antibiotic or completely resistant. Misunderstandings also surround how resistance develops, where it comes from, and when or if it will disappear.

Dr Randy Singer, University of Minnesota College of Veterinary Medicine, attempted to answer these questions during the first day of the Antibiotic Conference – Current Issues for the Poultry & Egg Industry, held during the 2013 International Production and Processing Expo.

He noted that the lack of harmonisation across countries, regions, and times regarding the cut-off point for resistance is a challenge for many experts who want to collect data and report their findings. Since the definition is not universal, he advises caution when reading documents reporting the prevalence of antibiotic resistance. While the findings may be accurate, they may not be applicable to your situation.

Discussing the development of acquired resistance, Dr Singer remarked that it can arise from a genetic mutation, the reason for fluoroquinolone resistance in campylobacter. "But that is not the only component in resistance development, and it may not even be the most important one. Gene acquisition may be much more of a problem for us now, especially in an era of multi-drug resistance," he added.

Briefly, acquisition refers to array of genes that acquire mobility and can transfer resistance to many antibiotics from one bacterium to another, including those unrelated to each other.

Multi-drug resistance is increasing in The Netherlands, where the rate of antibiotic use is one of the lowest in the EU in humans but highest in the animal population.

Although Dutch food-producing animals appear to be an ideal environment for development of organisms resistant to many of these important drugs, this trend also makes The Netherlands a good environment for monitoring antibiotic resistance and studying its spread, said Dr Dik Mevius, professor and chair of antimicrobial resistance, University of Utrecht.

The relationship between resistance in animals and in humans is complex. Although a huge number of animal producers in The Netherlands test positive for methicillin-resistant staphylococcus aureus (MRSA), the incidence of MRSA in hospitals is very rare. Alternatively, extended-spectrum beta-lactamases (ESBLs) – enzymes that inactivate beta-lactam antibiotics, including penicillins and cephalosporins – were, until a decade ago, limited to a few countries with high antibiotic use but have become a rapidly growing problem in healthcare settings throughout Europe.

More than 1,000 variants are known, and their presence in the food chain, particularly broilers, suggests transmission from poultry to humans, with implications for the treatment options for certain infections. ESBLs have also been found in high percentages of slaughter pigs and turkey flocks, and in rising numbers of veal calves, dairy cows, and companion animals.

Mandatory reductions of antibiotic use are in effect as one strategy to counter the spread of resistance to antibiotics from ESBLs and other organisms. Even though antibiotic use is likely to drop significantly, it is unclear whether this will be enough to control resistance.

This is because antibiotic resistance is a global problem, and the efforts of one country, or of a consortium such as the EU, cannot fully address threats from outside their borders. Also, factors other than antibiotic usage affect resistance, and structural changes in animal husbandry may be needed.

The Pan American Health Organisation's program on antimicrobial resistance in pathogens found in food products and food-producing animals has been conducting surveillance and containment activities for the past 25 years. Although the effort has its challenges, the 21 participating countries have national network coordinators and seminal laboratories that perform testing, inspect and maintain equipment, and disseminate findings. The network in Colombia is particularly strong and could serve as a model for other countries, said Dr Martha Pulido, National University of Colombia.

COIPARS (Columbian Integrated Program for Antimicrobial Resistance Surveillance), led by Dr Pilar Donado, is an integrated effort focusing on animals at poultry farms and other locations, as well as retail food sellers. The organisation also collaborates with public health organisations and research universities around the world and actively involves the private sector in its efforts.

Describing antibiotic resistance throughout Latin America, Dr Pulido suggested that improvements will come about through the adoption of integrated programs and the collection, integration, analysis, and communication of information on resistance in the bacteria of humans, animals, and the environment.

This information can be used to support creation of science-based policies to control use of antibiotics in hospitals, communities, and the agricultural sector and prolong drug effectiveness. ■