Antimicrobial resistance of emerging food borne pathogens: Status quo and global trends

A. Koluman¹, A. Dikici²

¹ National Food Reference Laboratory, Fatih Sultan Mehmet Bulvarı, No:70, 06170, Yenimahalle, Ankara, Republic of Türkiye
² Tunceli University, Engineering Faculty, Dept. Food Engineering, Tunceli, Republic of Türkiye

Human population is increasing and food sources are becoming more limited day by day. All food producers have been trying to improve the yield and increase the amount of products. The idea of antibiotic application during breeding period as a preventative measure had become more popular among the food animal breeders. As the data evaluated, it became clearer that antibiotic resistance of bacteria started from the farm level. Antibiotics, massively administrated at farm level as preventative measure and growth promoters, are shown to cause adverse effects on human health directly as a residue in food or indirectly with resistant pathogens. This information leads consumers to become more aware of the antimicrobial resistance of the emerging food borne pathogens.

Emerging food borne pathogens are challenging subjects of food microbiology with their antibiotic resistance and additionally their impact on public health. *Campylobacter jejuni*, *Salmonella* spp. and Verotoxigenic *Escherichia coli* (VTEC) are significant emerging food pathogens, globally. The perception in evaluating the risk of these pathogens has changed. Currently, the scientific interest is increased on antibiotic resistance of food borne pathogens. There are evidences showing that the massive use of antibiotics at farm level has triggered significant increase in antibiotic resistance of these three pathogens. Various antibiotic resistance mechanisms of *C. jejuni*, *Salmonella* spp. and VTEC have been determined. There are numerous studies showing the difference in resistance patterns of these three bacteria. It is now more visible that this trio can be resistant to different antibiotics, which is caused by different choices made for administration of antibiotics at farm level.

The decrease in supply and increase in demand lead developed countries like the member of European Union (EU) and United States (US) to produce animal products with a higher efficiency. The massive production has caused the increase of the significant food borne diseases. The strict control of food starting from farm level to fork?meal has been held by different regulations. Official measures have been applied to combat these pathogens. As an example “Avoparcin” was an antimicrobial antibiotic widely used in feeding of poultry, pigs, calves, cattle for fattening and lambs, due to its positive effects on animal growth. Denmark and Germany applied the safeguard clause in the Directive on feeding of animals by “Avoparcin” respectively on? in? May 1995 and January 1996 and banned the antibiotic, as they considered that its use in animal nutrition was capable of encouraging resistance to certain glycopeptide-based antibiotics used in human medicine. European Commission has approved a directive banning, as a precautionary protective measure, all the use of the additive "Avoparcin" in animal feed in the European Union in 1997. The ban of Avoparcin in farms was due to the significant increase in Quinolone resistance in Termotolerant *Campylobacter* spp. and other emerging food borne pathogens. This is a good example for official concern in antimicrobial resistance of food borne pathogens. EU member states designed various studies to monitor the antibiotic resistance of *Salmonella* spp. and Termotolerant *Campylobacter* spp. The results indicated increasing resistance to some antibiotics like tetracycline, streptomycin, amoxicillin. In 2005 EU declared that, an EU-wide ban on the use of antibiotics as growth promoters in animal feed would be applied on January 1, 2006. The last 4 antibiotics which have been permitted as feed additives to help fatten livestock will no longer be allowed to be marketed or used from this date. The ban is the final step in the phasing out of antibiotics used for non-medical purposes. It is a part of the Commission’s overall strategy to tackle the emergence of bacteria and other microbes resistant to antibiotics, due to their overexploitation or misuse.

This chapter will summarize some selected studies held to determine antibiotic resistance of *C. jejuni*, *Salmonella* spp. and VTEC to show status quo of antibiotic resistance globally. Additionally the global trends in antibiotic resistance of these three bacteria of concern will be evaluated with a legal point of view. The legislations designed to control antibiotic resistance and their impact will be summarized.

**Keywords** *Campylobacter*, *Salmonella* spp., Verotoxigenic *Escherichia coli*, Antibiotics, Legislation