

## Research Commentary

Antimicrobial usage and in particular, antibiotic usage in farmed, food producing species has become the subject of increasing interest and concern over recent years. Regulatory authorities, human medical practitioners, veterinary surgeons, farmers, the general public and others all have a legitimate interest in this area but priorities and perspectives can differ widely.

Public health and the maintenance of antibiotic efficacy in human medicine is generally accepted to be the principal priority for society. Addressing all possible causes and sites of antibiotic or antimicrobial resistance (AMR) selection should be informed by an evidence based, risk assessment of the most significant sources of AMR selection. Unfortunately there are huge gaps in our knowledge which presents problems when developing effective critical control points. For example misuse of antibiotics in human medicine has been estimated at 38% (Kardas et al 2005) and antibiotic contamination of the environment from manufacturing plants have been associated with an abundance of related resistance genes (Rutgersson et al 2014). Placing veterinary use of antibiotics in perspective with these other areas of usage is important when making policy decisions especially as there are potentially competing ethical and economic pressures such as animal welfare to consider.

From this starting point it is logical for each area of society to address those potential AMR risks which are most directly under their control. The veterinary profession has an important role to play in prescribing antibiotics responsibly and in communicating with farmers and owners to minimise the potential risk that is under our control. This is not a simple task and it is one that requires us to reappraise some commonly held assumptions. In this context the paper by Serrano-Rodríguez et al, raises some very interesting issues relating specifically to Fluoroquinolones but also more broadly to other antibiotics and antimicrobials.

In 2013 Fluoroquinolones were classified along with macrolides and 3<sup>rd</sup> & 4<sup>th</sup> generation cephalosporins as those antibiotics on the World Health Organisation 'Critically Important Antimicrobials for Human Medicine' list which required the most urgent action to reduce the risk from antimicrobial resistance selection. This is of particular importance as all three of these antibiotic groups are in common veterinary use and hence there is interest in establishing relative risk for resistance selection when using these products. Serrano-Rodríguez et al, compared several related fluoroquinolone antibiotics to compare their pharmacological properties which relate to the risk of developing resistance. This study used samples collected from dairy sheep and goats. In various countries different fluoroquinolones are licenced for the treatment of clinical mastitis in sheep and cattle. The paper provides a useful insight into the relative risk of these related active ingredients which may help more rational decisions to be made on appropriate treatment protocols and licencing provisions in the future. However, if an animal does require an antibiotic it is logical to avoid, as far as possible, the critically important groups in favour of those less frequently relied upon in human medicine in order to abide by the precautionary principal.

Furthermore, there is a far larger and wider context to be considered. The question of "which antibiotic we should prescribe?" should be preceded by at least two more fundamental questions:

1. Should we treat with antibiotics?
2. How do we prevent new clinical cases?

The answer to the first question touches on a number of important priorities that apply to the use of antibiotics in many farm animal veterinary situations when the alternative to antibiotic treatment may be; poor animal welfare, poor milk yield, reduced productivity and/or reduced efficiency.

In the case of dairy sheep and goat production attitudes and practices vary greatly across Europe and may reflect differences in veterinary and farming culture or expectations as much as licencing of available products. For example, in the UK the dry-off and culling of acute and chronic mastitis cases in sheep, rather than treatment of cases and retention in the milking flock, is standard practice for many dairy flocks. This approach is arguably more logical in any event given the low cure rates (39-82%, Attili et al, 2016) and long term negative impact yield and milk quality (SCC) of subclinical/chronic mastitis, along with the relatively low ewe replacement costs.

To answer the second question it is important for the clinician to consider not just what is the most appropriate approach or treatment for the individual ewe but to address the issue as a matter of preventive population health to reduce the clinical need to consider using antibiotics. This is fundamental and applicable to all areas of food animal production.

The prudent use of antimicrobials to treat disease in food producing species brings benefits in terms of animal welfare and productively but can only be justified when all other reasonable measures have been taken to reduce the disease prevalence. We must also refine our prescribing decisions to avoid unnecessary selection for AMR that could be detrimental to both animal and human health. The prescribing veterinary surgeon is the critical person in this context, who must exercise their informed, professional judgment to balance their responsibilities too their patient, client and the wider society.

## References

A.R Attili a, S. Preziusoa, V. Ngu Ngwaa,b, A. Cantalamessaa, M. Moriconi a, Vincenzo Cuteri, “Clinical evaluation of the use of enrofloxacin against Staphylococcus aureus clinical mastitis in sheep” Small Ruminant Research 136 (2016) 72–77

Kardas P., S. Devine, et al. (2005). “A systematic review and meta-analysis of misuse of antibiotic therapies in the community.” International Journal of Antimicrobial Agents 26(2): 106-13.

Rutgersson C, Fick J, Marathe N, Kristiansson E, Janzon A, Angelin M, Johansson A, Shouche Y, Flach C-F, Larsson DGJ. 2014. Fluoroquinolones and qnr genes in sediment, water, soil, and human fecal flora in an environment polluted by manufacturing discharges. Environ Sci Technol 48:7825–7832.

World Health Organisation ‘Critically Important Antimicrobials for Human Medicine’ 4<sup>th</sup> revision (2013) <http://www.who.int/foodsafety/publications/antimicrobials-fourth/en/>