

**How to control antibiotic abuse in animal husbandry?**

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The various use patterns of antibacterial agents in terrestrial livestock (46) and aquaculture species (47) have been described recently and include prophylaxis, metaphylaxis and treatment. Since as long ago as 1947 (33) the subject of antibiotic abuse or misuse in humans (1, 28, 50, 58) as well as animals (3, 14, 16, 21, 55, 61, 63) has been repeatedly described in the literature. However, there is no universally accepted definition of ‘abuse’ and ‘misuse’ and many of the current use patterns that have been described in this way reflect label instructions approved by regulatory agencies.

What is beyond debate is that there is serious and growing concern about the impact of antibacterial resistance on human health (9, 13, 15, 29, 31, 40, 42, 44, 63, 65, 32, 73) especially when pandrug resistance has been identified in pathogenic Gram-negative bacteria (17), livestock-associated MRSA is emerging (15) and the dearth of new antibacterial agents has been described as contributing to a ‘perfect storm’ (10).

The contribution of antibacterial use (in any and all its forms) in animals to the dire situation of increasingly untreatable infections in humans remains a subject of much discussion (36, 49) and a growing number of quantitative risk assessments (37). The potential pathways travelled by resistance determinants from animals and other sources are complex (72, 76) and human exposure to such sources of resistance is difficult to study. However, if it is accepted that antibacterial agents are ‘societal drugs’ (18, 57), drugs of special importance that may be used in an individual but have impacts on the entire ecosystem, then it is time for interprofessional collaboration to ensure that all uses of antibacterial agents are ‘optimised’.

For as long as the subject of abuse has been on the agenda, so has the solution. Prudent use guidance and calls for action and action plans have a long history (22, 32, 43, 45, 59, 69, 70, 71,

73) with the most recent, the Chennai Declaration (19), representing a powerful reminder of how imminent crisis can focus the mind to prepare a practical and implementable approach to solve the seemingly insoluble problem.

Management of infectious disease is not a trivial exercise yet antibacterial agents remain available over-the-counter and used with no professional oversight (20, 23, 39, 52, 53, 64). Clearly one of the approaches to improved antibacterial use is to ensure these societal drugs are only available on prescription.

Even if available on prescription there remain many additional important elements of appropriate or optimal use. Amongst these elements are improved diagnosis (2, 7, 46), improved prescribing behaviour (8, 35, 38, 46), refined dosage regimens that incorporate the most pertinent information from economic and mathematic models (6, 25, 30), clinical studies (66, 67), and investigations of pharmacokinetic and pharmacodynamic properties (12, 26, 27, 34, 41, 46, 48, 51, 54, 56, 60, 75). Guidelines on the selection and prudent use of antibacterial agents are benefiting from a growing evidence base (24, 62, 68). Antimicrobial stewardship programs are emerging as vehicles supporting better use (4, 5).

A significant problem remains the effective implementation of the action plans that have been developed and that have benefited from decades of refinement while still not widely adopted. Awareness and education of all stakeholders is clearly a critical step. The need for more veterinarians (and paraveterinarians) to provide the essential professional support necessary to ensure livestock health and welfare is a global issue present in developing and developed countries alike (11, 74) and must be addressed if antibacterial use is to be improved.

Reference list available from the author.