

What are you having for dinner tonight? AMS: a stock feed miller's perspective

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Abbreviations AMR, antimicrobial resistance; AMS, antimicrobial stewardship

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Antimicrobials are important tools in both human and veterinary medicine for the treatment and prevention of disease. An over-reliance on antibiotic use has seen antimicrobial resistance (AMR) emerge as an urgent global health issue. The World Health Organization (WHO) has described AMR as a looming crisis in which common and treatable infections will become life threatening for both human and animal health. Antibiotics are a precious resource and their effectiveness must be preserved through a One Health approach. Australia's First National Antimicrobial Resistance Strategy¹ and Australian Animal Sector National AMR Plan² provide an aligned strategic direction for judicious antimicrobial use within the feed-to-food supply chain. This approach is reflected in the Australian Intensive Livestock Industries Antimicrobial Stewardship (AMS) report.³ Perhaps the greatest incentive for AMS will come from the marketplace, that being fast-food restaurant chains, supermarkets and international trade requirements. Regardless of the driving forces, AMS is a shared responsibility and the value supply chain will need to respond. The integrity of the supply chain from paddock to plate is critical to ensure the quality of the resulting food products, but also the minimisation of any potential impacts on human health.⁴

The challenges to AMS from a stock feed miller's perspective are presented, highlighting the opportunities to support and add significant value to the intensive livestock industries' AMS initiatives that ensure feed-to-food safety and integrity.

Critical review

The Australian stock feed industry

Australia has a strong reputation as a producer of good quality, safe and affordable agricultural produce, with a range of products including chicken meat and eggs, pork, beef, lamb, dairy and fish being supplied into both domestic and export markets. The Australian animal feed industry is integral to this, producing in excess of 13 million

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This paper seeks to explore the challenges to AMS from a stock feed miller's perspective. Opportunities to support and add significant value to the intensive livestock industries' antimicrobial stewardship initiatives that ensure feed-to-food safety and integrity will be highlighted.

tonnes of compound animal feed⁵ and is the largest user of Australian grain. Approximately 50% of feed is manufactured by commercial feed millers and the remaining volume is manufactured by integrated livestock producers, feedlots and on-farm production.

Aside from providing nutritional requirements, animal feed offers a practical mechanism to deliver uniform medication to the herd or flock. From a producers' perspective, feed provides an efficient solution while avoiding the potential for on-farm medication calculation errors or impact of drinking water quality on antimicrobial efficacy.⁶ This preference is evident with 76% of veterinary antimicrobials sold in Australia from 2005 to 2010 for therapeutic administration via feed, 18% via water and the remaining volume via injection, intramammary or topical administration.⁷ Similar figures have recently been reported, with over 60% of medically important antimicrobials administered to food-producing animals being delivered via feed.⁸ These figures highlight the critical role that the feed mill plays in the integrity of the feed-to-food supply chain but also in AMS.

Feed-to-food safety

The manufacture of feed containing an antimicrobial, and in particular a scheduled veterinary chemical product such as an antibiotic, is a high risk process. It is imperative that the feed mill has the operational expertise, administrative capability and processes in place to ensure (1) the safe handling of veterinary chemical products from point of receipt at the mill to delivery of the medicated feed on farm, (2) that the risk of cross-contamination is minimal through appropriate feed scheduling, adherence to and validation of mill flushing practices and (3) optimal dosing through the accurate and even distribution of the scheduled veterinary products throughout the designated animal feed.

FeedSafe® is the Australian Stock Feed industry's Quality Assurance Accreditation program and is based on the principles of Good Manufacturing Practice.⁹ In order to hold FeedSafe® accreditation, manufacturers are required to implement HACCP (Hazard Analysis and Critical Control Points) and undertake independent, annual, third-party audits to verify that the following minimum standards are met in relation to:

- premises and mill buildings
- personnel training and qualifications
- plant and equipment
- raw material security, sourcing and purchasing
- raw material quality and storage
- feed formulation and manufacturing
- product labelling
- supply chain logistics
- product inspection, sampling and testing
- customer complaint investigation.

Adherence to minimum quality standards is critical when considering that feed is the major administration route for the delivery of antimicrobials to food-producing animals.^{7,8} Of the 13 million tonnes of compound feed manufactured in Australia, approximately 50% is manufactured against FeedSafe® while the remaining volume is manufactured to other quality assurance standards, when in place. Given the high-risk nature of medicated feed manufacture, it would be prudent to adopt a minimum national feed standard to support the intensive livestock industries' AMS initiatives.

The handling, manufacture and provision of medicated feed is a complex process (Figure 1), with the commercial feed mill being exposed to varying regulatory requirements across multiple jurisdictions. This complexity makes AMS challenging, not just for the feed miller but also for the prescribing veterinarian and intensive livestock producer. Furthermore, the regulatory requirements applicable to non-commercial feed mills for the production and supply of scheduled medicated feed are ambiguous and in some circumstances do not appear to apply. This lack of uniformity implies that a proportion of medicated animal feeds in Australia are being manufactured in the absence of the appropriate authority to handle and supply high-risk scheduled veterinary chemical products. This does not appear to fit with AMS or support either the Australian Animal Sector National AMR Plan² or that of the Australian livestock industries.³

The need for best practice to be applied when manufacturing high-risk medicated feeds is of fundamental importance when considering the integrity of the feed-to-food supply chain. Indeed, it is well recognised that even when best practices are in place and fully implemented in the feed mill there is an unavoidable presence of low levels of veterinary antimicrobials in feed and potential for carry-over.¹⁰ There is a

need to determine the quantum of this low-level presence and also the potential impacts on feed-to-food safety and in turn human and animal health. It is imperative that we understand the effects of off-label prescribing and integrity of raw material inputs, particularly when they are of animal origin. The potential for negative effects on international trade and Australia's reputation as a producer of safe, good quality produce cannot be underestimated. Interim solutions such as adoption of the EU Commission Regulation Directive on undesirable substances in animal feed and maximum residue limits for approved feed additives in non-target species could be worthwhile considerations to ensure the integrity of the Australian industry, as well as provide realistic guidelines for industry to adhere to.

AMS and the role of the Australian stock feed industry

AMS is a shared responsibility, with the animal feed industry holding a privileged position in the feed-to-food supply chain. The feed mill has the ability to support reduced reliance on antimicrobials through supply of feed with the optimal nutritional and physical characteristics for the animal to which it is being fed. Through provision of fit-for-purpose feed whilst upholding feed and delivery biosecurity, the feed mill is able to support AMS integrated farm management practices. Conversely, when antibiotics are required to protect animal health or welfare, the feed mill must have the capability to provide medicated feeds in a manner fitting with AMS while minimising any unintended consequences of antimicrobial use.

The role of the animal feed manufacturer is paramount in supporting the animal industry sectors' AMS initiatives whilst upholding regulatory requirements. Only through a collaborative approach can Australian agriculture achieve its AMS goals. The Australian cattle feedlot sector

Licence to Manufacture Medicated Feeds#	Veterinary Script*	Labelling^
<ul style="list-style-type: none"> • Sell or supply S4 Poisons/controlled substances • Licence granted on completion of successful audit • Provide S4 medicated feed in accordance with a written Vet Script/ Order • Maintain auditable records of: <ul style="list-style-type: none"> • Vet Script/ Feed Order • S4 products (date, name, supplier, quantity) on hand • Quantity blended in feed • Quantity of medicated feed supplied 	<ul style="list-style-type: none"> • In writing, legible and signed • Details of the Prescribing Vet, Animal Owner (or consignment address) & Feed Mill • Species, age, breed and sex of animals to be treated • Script is dated on the day of writing with a 3 month expiry date • S4 Poison Details: <ul style="list-style-type: none"> • Name & final concentration • Quantity of manufactured animal feed to be supplied (3 month max) • Directions for use 	<ul style="list-style-type: none"> • Federal & State Legislation • APVMA labelling requirements^ for Medicated Feed Products: <ul style="list-style-type: none"> • Name of the registered product • Active constituent • All relevant directions for use as per the vet script or registered product label • All restraint, warnings & contra-indications • WHP as per the vet script or registered product label • Export Slaughter Interval

Differences exist between States & Territories

*Drugs, Poisons and Controlled Substances Regulations 2017

^http://apvma.gov.au/node/10631#Medicated_feed_products

Figure 1. Regulatory requirements of a commercial feed mill licenced to manufacture scheduled medicated feeds in the State of Victoria, Australia. APVMA, Australian Pesticides and Veterinary Medicines Authority.

has identified within their AMS guidelines the need for an AMS team in order to successfully deliver an AMS plan in practice.¹¹ The AMS team engages multiple stakeholders from the feedlot itself, the consulting veterinarian, feedlot nutritionist and the animal feed manufacturer. Through this collaborative team approach it is possible to agree on the stewardship goals while also being cognisant of specific roles and responsibilities. From their position in the supply chain, animal feed millers can support veterinary and industry AMS initiatives through the provision of safe, clean hygienic feeds of the optimal feed form, quality and nutritional feed signature. As a result gut health, and in turn animal health and welfare, will be supported within the AMS framework.

Conclusions

Although an AMS goal is the reduced reliance on antimicrobials, it must be recognised that animal health and welfare is a priority. Feed mills must therefore have the capability to produce fit-for-purpose optimised feeds to support AMS practices on-farm whilst also being able to manufacture medicated feed in a safe and judicious manner. As discussed, with the use of antimicrobials comes the risk of unintentional consequences, despite best practices being in place. It is imperative, therefore, that a cohesive and coordinated approach to AMS is taken that is supported by both local and global regulatory harmonisation. Delivering successful AMS outcomes requires an aligned collaborative One Health approach. Only through a coordinated value-adding supply chain will antibiotic use be protected for those times of need ensuring that what YOU are having for dinner tonight and in the future remains nutritious, safe and affordable.

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