

final report

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A survey of antibacterial product use in the Australian cattle industry

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Abstract

The aim of this project was to estimate the volume and indications for use of antimicrobial agents used in beef cattle production. The use of antimicrobials in livestock is under scrutiny because of its possible role in the development of resistance in bacteria and the consequent impact on human health. The project involved a review of the relevant literature and an analysis of the 223 antimicrobial products registered in Australia for use in cattle. A targeted survey of product registrants, feed manufacturers, veterinarians and producers was also undertaken.

The survey found a low rate of use of antibiotics across the industry, although 90%+ of grain-fed cattle receive an ionophore throughout their period on feed. Of the 37 antimicrobial active constituents used in products for cattle, only ceftiofur, a third generation cephalosporin, and virginiamycin, a streptogramin, are perceived as having potential to select resistance of public health importance. Ceftiofur is used occasionally in the treatment of existing respiratory infection and virginiamycin is used to prevent grain poisoning. Both are prescription (Schedule 4) drugs, meaning their use requires veterinary involvement.

Executive summary

There has been growing community concern around antimicrobial resistance and the increase in 'superbugs' in the human population. A wide-ranging review by the Joint Expert Technical Advisory Committee on Antibiotic Resistance (JETACAR) in 1999 concluded that resistant animal bacteria and resistance determinants have the potential to transfer to humans and cause disease. Most recently, a Senate inquiry reaffirmed the Committee's recommendations.

The Australian cattle industry has no reliable or systematically-collected data on the quantity or use patterns of antimicrobial agents by the industry. Without such information it cannot engage meaningfully in the debate over antimicrobial use in livestock, nor determine the most effective strategies to adopt in order to ensure the industry's interests are appropriately represented. This project was commissioned by Meat and Livestock Australia following a request by Cattle Council of Australia (and subsequent support from the Australian Lot Feeders' Association) to address this knowledge gap.

The objectives of the project were to produce a well-researched, comprehensive review of the therapeutic and non-therapeutic usage of antimicrobial agents by the industry, including extensive and intensive beef production. The review provides information on estimated annual usage (volume) of antimicrobials, by product type and administration; indications for use of each product group; comments on the importance of each antimicrobial class in human medicine and the 'vulnerability' of the industry in respect to each group, including risk from human perspective, importance in animal applications, availability of substitutes and trends in usage patterns; and recommendations on the ongoing monitoring and risk management of antimicrobial use by the industry.

The project commenced with a review of antimicrobial products and their registrants, and of relevant literature. A database of registered products was created based on information contained in the PUBCRIS database of the Australian Pesticides and Veterinary Medicines Authority (APVMA). Each of the products listed in PUBCRIS was assessed for importance to human health, using the rating of the Expert Advisory Group on Antimicrobial Resistance (EAGAR) in Australia; and the World Health Organisation (WHO) / World Organisation for Animal Health (OIE) ratings of 'Critically Important Antimicrobials' (CIA).

A targeted series of consultations was then undertaken on the use of antimicrobials in the beef industry during the 2011/12 year. The consultations sought data on sales or usage as well as indications for use and some attitudinal responses. The survey design used 'purposive sampling' which recognised the highly skewed distribution of participants at various points in the chain (that is, most of the required data resides with a small number of players). This design was considered likely to provide greater accuracy at lower cost than a random, cross-sectional survey across any single point in the supply chain.

The groups interviewed were: product registrants, feed manufacturers, veterinarians and large producers (feedlot and grass-fed). Members of each group were interviewed using a structured questionnaire and the data entered into a database created by EpiCentre. The consultation process was more difficult than originally envisaged, with five influential feedlot veterinarians refusing to participate on commercial-in-confidence grounds (despite the use of a confidentiality agreement with all interviewees). Other interviewees were generally responsive to requests for information but there was considerable work involved in preparing the data for

analysis. The data required was not always easy to obtain because it included sales to dairy cattle or other species. Also, there was a need to check that the estimated number of cattle treated was consistent with label dose rates (or an off-label regime) and that, as far as possible, consistent calculation methods were employed.

The four groups of interviewees provided different snapshots of the same product flows. The analysis of data involved cross-checking of the information gained from each of the groups against that from each other group. The data was also checked against the only published information available, a report by the APVMA of antimicrobial usage from 2005-2010 based on sales data provided by registrants. This report is useful but has some limitations, notably the absence of data disaggregation by antimicrobial class or by beef vs dairy.

The project has found that the use of antimicrobial products in extensively grazed beef cattle is negligible to very low. Typically, in southern systems, less than 1% of cattle are treated with injectable antibiotics in any year while the figure is lower, almost negligible, in northern systems. A narrow range of antimicrobials is employed. The major antibiotics, by a considerable margin, are oxytetracycline and penicillin, especially in long-acting forms. These are used for a wide range of indications including unspecified illness. Sulpha/trimethoprim combinations are the next most commonly used group, particularly for calf scours. Other antibiotics (ceftiofur, tylosin, tilmicosin) are used occasionally. There is some use of ionophores in lick blocks, mixes and pellets in the north and capsules containing monensin are used where high-legume pastures may create the risk of bloat.

In feedlots, a very high proportion (probably exceeding 90%) of cattle are fed an ionophore for the duration of their time on feed, to promote growth. Monensin is clearly the dominant agent (again, more than 90%). The use of injectable antibiotics varies substantially between feedlots. One feedlot showed a rate of antibiotic use of less than 2%, while at another, 30-40% of animals were treated. The registrant data suggests that the average treatment rate is closer to the upper end of this estimate. Most treatments are directed at bovine respiratory disease (BRD). A broader range of antimicrobials is used in feedlots than in grazing systems, the major difference being the use of the macrolides tilmicosin and tulathromycin. There is some use of in-feed antibiotics, including tylosin and oxytetracycline, although the latter is now rarely used following the introduction by Safemeat of the provisional Russian 90-day export slaughter interval (US20130288954 A1 Use of chelating agent and peptide antimicrobial compounds) from 1 January 2012.

Estimates of usage by product class are difficult to make, especially for the older, generic products with several registrants and multi-species registration. The estimates of this project of mass of active used in injectable products exceeded the APVMA estimate by a factor of about two, which is difficult to reconcile. With these caveats in mind, the following summarises the usage of the various classes of antimicrobial and their status:

- Oxytetracycline: the mass used was sufficient to treat 250,000 animals. Oxytetracycline is considered by EAGAR to be of low importance in human medicine and its use in cattle therefore presents a low risk for the beef industry.
- Procaine and benzathine penicillins: product sufficient to treat 500,000 head was sold into beef cattle. There is also some minor use of amoxicillin, as well as cloxacillin in intraocular preparations. These products are also rated as being of low importance by the EAGAR and are not considered a risk to the industry.

- Sulpha/trimethoprim: the survey did not provide an estimate of sales volumes but producer and veterinarian interviews suggested a significant component of usage was in calves, albeit at low levels (perhaps somewhere in the range 0-0.25% of all cattle). Sulpha and trimethoprim are rated of low significance to human medicine and pose minimal risk to the industry.
- Macrolides: erythromycin and tylosin have minor use as injectables although the latter is also used in-feed – sufficient to treat 70,000 animals. The two major products in this group are the single-dose tilmicosin and tulathromycin used to treat BRD, between them treating about 210,750 head, or 8.4% of feedlot cattle turned off. The macrolides are rated as a high priority among the CIA by the WHO, but low risk by the EAGAR as the former relates primarily to the consumption of chicken. Thus, they present a low risk for the industry.
- Aminoglycosides: receive little use in cattle, with possibly 6,300 head being treated with neomycin in 2011/12. Again, the aminoglycosides are rated a high priority CIA by WHO, but of low importance by the EAGAR.
- Cephalosporins: the injectable ceftiofur is the only significant product, being used to treat about 27,000 animals for BRD (although the real figure may be up to 50% higher). Ceftiofur is a third generation cephalosporin, and as such of highest priority within the WHO list of critically important antimicrobials and rated of high importance by the EAGAR. Use of ceftiofur clearly represents a vulnerable point for the beef industry.
- Ionophores and glycopospholipids: lasalocid and salinomycin appear to have negligible if any use; while product containing narasin, sufficient to treat around 91,500 head, was sold. Flavophospholipol is also thought to be a relatively minor product. Monensin is clearly dominant, accounting for around 96% of the sales quantified by the survey. The survey identified sales of monensin consistent with the treatment of about 2.7m cattle, the majority in feedlots. Probably 90%-plus of feedlot cattle received an ionophore in the feed during 2011/12 and monensin was overwhelmingly the dominant product used. While ionophores and glycopospholipids are classified as antimicrobial agents they have no human counterpart, they are not known to select resistances of public health significance and consequently they do not appear in the WHO or EAGAR ratings.
- Streptogramins: virginiamycin is provided as a feed additive to minimise grain poisoning. Total sales during 2011/12 were sufficient to treat 165,000 animals (approximately 6.6% of cattle turned off). There has been considerable regulatory interest in virginiamycin and, while it is not specifically listed by the EAGAR, the streptogramin quinupristin with dalfopristin (QD) is rated as high in importance. The importance of the streptogramins was reduced by WHO in 2011 and the current importance in Australia is also considered low (J Turnidge, pers comm 2013).

These findings are summarised in the following table:

Active	500kg animals treated (est)	EAGAR rating
Tetracyclines		
Oxytetracycline	250,000 (inj)	Low
Chlortetracycline	Negligible	Low
Penicillins		
Benzathine penicillin	500,000	Low
Procaine penicillin		Low
Amoxicillin +/-clavulanic acid	Minor	Low
Ampicillin	Nil beef	Low
Cloxacillin	Eye only	Medium
Penethamate hydroiodide	Minor if any	Low
Sulphonamides		
Sulfadiazine +/- trimethoprim	Minor in adults	Low
Sulfadimidine +/- trimethoprim		Low
Sulfadoxine +/- trimethoprim		Low
Macrolides		
Erythromycin	Minor	Low
Oleandomycin	Nil beef	Low
Tilmicosin	210,750	Low
Tulathromycin		Low
Tylosin	70,000	Low
Aminoglycosides		
Apramycin	Only in calf scour treatments	Low
Dihydrostreptomycin		Low
Streptomycin		Low
Framycetin	Eye and ear only	Low
Neomycin	6,300	Low
Cephalosporins		
Cefuroxime	Mammary, uterus, eye only	Medium
Cephalonium		Medium
Cephapirin		Medium
Ceftiofur	27,000	High

Active	500kg animals treated (est)	EAGAR rating
Ionophores / glycopospholipids		
Lasalocid sodium	Negligible	Not rated (no counterpart for human use)
Monensin	2.7m	
Narasin	91,500	
Salinomycin sodium	Negligible	
Flavophospholipol	Minor	
Streptogramins		
Virginiamycin	165,000	High
Others		
Bacitracin zinc	Topical only	Low
Florfenicol	1,100	Low

On the basis of the survey, this report identifies two risks for the industry:

1. Virginiamycin. This is a perceived, rather than real, vulnerability, as the WHO has recently reduced the risk rating on this agent. This fact and the reasons behind it are not yet well known or understood in Australia. Following a review of virginiamycin by APVMA, livestock products are in Schedule 4 (prescription animal remedies) and carry a label statement for prudent use.
2. Third-generation cephalosporins (ceftiofur). This vulnerability can be managed by evidence of appropriate use, with independent verification combined with monitoring of usage and presence of antimicrobial resistance. There are several alternatives to ceftiofur for the treatment of BRD and these alternatives currently hold much greater market share. Two of the seven ceftiofur-containing products (EXCENEL RTU ANTIBIOTIC SUSPENSION FOR INJECTION and EXCEDE STERILE SUSPENSION) carry the following label statement: "Prudent Use: Indiscriminate use of ceftiofur can contribute to the development of antibiotic resistance. Culture and sensitivity test should be performed when appropriate to determine the susceptibility of the causative organism(s). Empirical therapy may be instituted before results of susceptibility studies are known; however, once these results become available, the antibiotic treatment should be adjusted accordingly."

To manage these and possible future vulnerabilities, the beef industry needs to be able to demonstrate objectively that antimicrobial use is appropriate and judicious and that measures are put in place to ensure preventative management is emphasised. This report recommends that:

1. Antimicrobial use in the cattle industry should be consistent with the Australian Veterinary Association's (AVA's) 'Code of Practice for Prescription and Use of Products which contain Antimicrobial Agents' and based on principles of prudent and appropriate use.
2. MLA, CCA and ALFA should maintain a watching brief on the situation with respect to virginiamycin in Australia, and be prepared to argue that its use in cattle does not constitute a risk to human health, for reasons outlined in this report.

3. Registered third-generation cephalosporins such as ceftiofur should also be used according to labelled directions, the AVA Code of Practice and the results of any risk assessments and risk management plans that result from and are guided by monitoring and surveillance of antimicrobial use and resistance. All ceftiofur products should contain a 'prudent use' statement on the label.
4. Consideration should be given to targeted monitoring of extended-spectrum beta lactamase (ESBL) resistance on properties using third-generation cephalosporins.
5. MLA, ALFA and CCA should conduct a similar project to this one on a two- or three-yearly basis.
6. MLA, ALFA and CCA should approach the registrants of cattle antimicrobial products, possibly through Animal Health Alliance, to develop an MOU under which these companies provide estimates of antimicrobial sales volumes into the beef industry for the periodic review described in (5). This process would be facilitated by a third party. The MOU would prescribe agreed levels of confidentiality and reporting back to the participants.
7. MLA and ALFA should approach the four or five most influential feedlot veterinarians to canvass options for the collection of data on antimicrobial usage and indications in feedlots, also for input to (5). MLA and ALFA will need to consider incentives, including recompensing the veterinarians for this service and, above all, propose ways to protect the confidentiality of information provided.
8. In parallel with (5) and (6), MLA and ALFA should examine ways in which records of antimicrobial usage kept by accredited feedlots under the National Feedlot Accreditation Scheme may be accessed for the process described in (5). Feedlot operators were generally very cooperative in the present study and it is likely they would be supportive of such an initiative.

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Abbreviations used in this document

AGISAR	Advisory Group on Integrated Surveillance of Antimicrobial Resistance (of the WHO)
AHA	Animal Health Alliance (Australia)
ALFA	Australian Lot Feeders' Association
APVMA	Australian Pesticides and Veterinary Medicines Authority
BRD	Bovine respiratory disease
CCA	Cattle Council of Australia
CIA	Critically Important Antimicrobial (WHO rating)
EAGAR	Expert Advisory Group on Antimicrobial Resistance (of the National Health and Medical Research Council)
ESI	Export slaughter interval
JETACAR	Joint Expert Technical Advisory Committee on Antibiotic Resistance
LA	Long-acting (antimicrobial formulation)
MLA	Meat & Livestock Australia
NHMRC	National Health and Medical Research Council
OIE	World Organisation for Animal Health
OTC	Oxytetracycline
ppm	Parts per million (equivalent to mg/kg)
SA	Short-acting (antimicrobial formulation)
WHO	World Health Organisation
WHP	Withholding period

1. Background

There has been growing community concern around antimicrobial resistance and the increase in 'superbugs' in the human population (for example, Collignon 2013). In response to the issue, the Joint Expert Technical Advisory Committee on Antibiotic Resistance (JETACAR) undertook a wide ranging review of the occurrence and significance of antibiotic resistance in human and veterinary medicine in 1999. The committee concluded that resistant animal bacteria and resistance determinants have the potential to transfer to humans and cause disease. The JETACAR made a number of recommendations which included the application of risk assessment principles to the approval and re-approval process of veterinary antibacterial products and placing all antibacterial agents under the supervision of veterinarians.

Most recently the Senate 'Inquiry into the progress in the implementation of the recommendations of the 1999 Joint Expert Technical Advisory Committee on Antibiotic Resistance' reaffirmed the recommendations of the JETACAR and made further recommendations to enhance antibacterial use and the management of antimicrobial resistance (Ryan et al 2013).

There is a significant body of scientific and policy literature on this topic which has expanded enormously since the pivotal starting point defined by the report of the Swann Committee in the UK in 1969.

The Australian cattle industry has no reliable or systematically-collected data on the quantity or use patterns of antimicrobial agents by the industry. Without such information it cannot engage meaningfully in the debate over antimicrobial use in livestock, nor determine the most effective strategies to adopt in order to ensure the industry's interests are appropriately represented.

This project was commissioned by Meat and Livestock Australia (MLA) following a request by Cattle Council of Australia (CCA) (and subsequent support from the Australian Lot Feeders' Association, ALFA)) to address this knowledge gap.

2. Project objectives

The objectives of the project were to produce a well-researched, comprehensive review of the therapeutic and non-therapeutic usage of antibiotics (by type where possible) in all sectors of the Australian cattle industry, including extensive and intensive beef production and that component of dairy industry production that makes its way into the beef supply chain.

The project report is to incorporate:

1. Estimated annual usage (volume) of antibiotics in cattle entering the beef chain in Australia, by product type and administration (e.g. in-feed, parenteral; prophylactic vs. therapeutic; feedlot vs. grass-fed vs. dairy).
2. Comparison of current data with 1999 data, if these are available, using appropriate indices to account for changes in numbers of cattle each year and use patterns in different classes of cattle.
3. Indications for use of each product group.
4. Comment on the 'vulnerability' of the industry in respect to each group, including risk from human perspective; importance in animal applications; availability of substitutes; trends in usage patterns; etc.

5. Recommendations on the ongoing monitoring and risk management of antibiotic use by the industry.

3. Approach

The project was conducted as follows:

3.1. Background review

A database of the antimicrobial products registered for use in cattle in Australia was created based on information contained in the PUBCRIS database of the Australian Pesticides and Veterinary Medicines Authority (APVMA). The Australian cattle antibacterial database includes, for each product:

- Approval number;
- Name;
- Date first registered;
- Registrant / distributor;
- Active constituent;
- Scheduling;
- Claim;
- Route of administration; and
- Withholding periods.

Each of the products listed in the PUBCRIS database was assessed for its importance to human health, using the most recently published rating of the Expert Advisory Group on Antimicrobial Resistance (EAGAR) of the National Health and Medical Research Council (NHMRC, 2006); and the WHO / OIE Critically Important Antimicrobial (CIA) rating (3rd revision, 2012) (see discussion below). These scores provide an indication of the 'vulnerability' of each product to reassessment and potential for removal from animal use.

A review of available reports relevant to the project, especially surveys of antimicrobial product use in cattle and other animal species in Australia and other countries was then undertaken. Data of relevance from the dairy industry, pertaining to antimicrobial use in dairy herds with implications for the beef chain, was also sought.

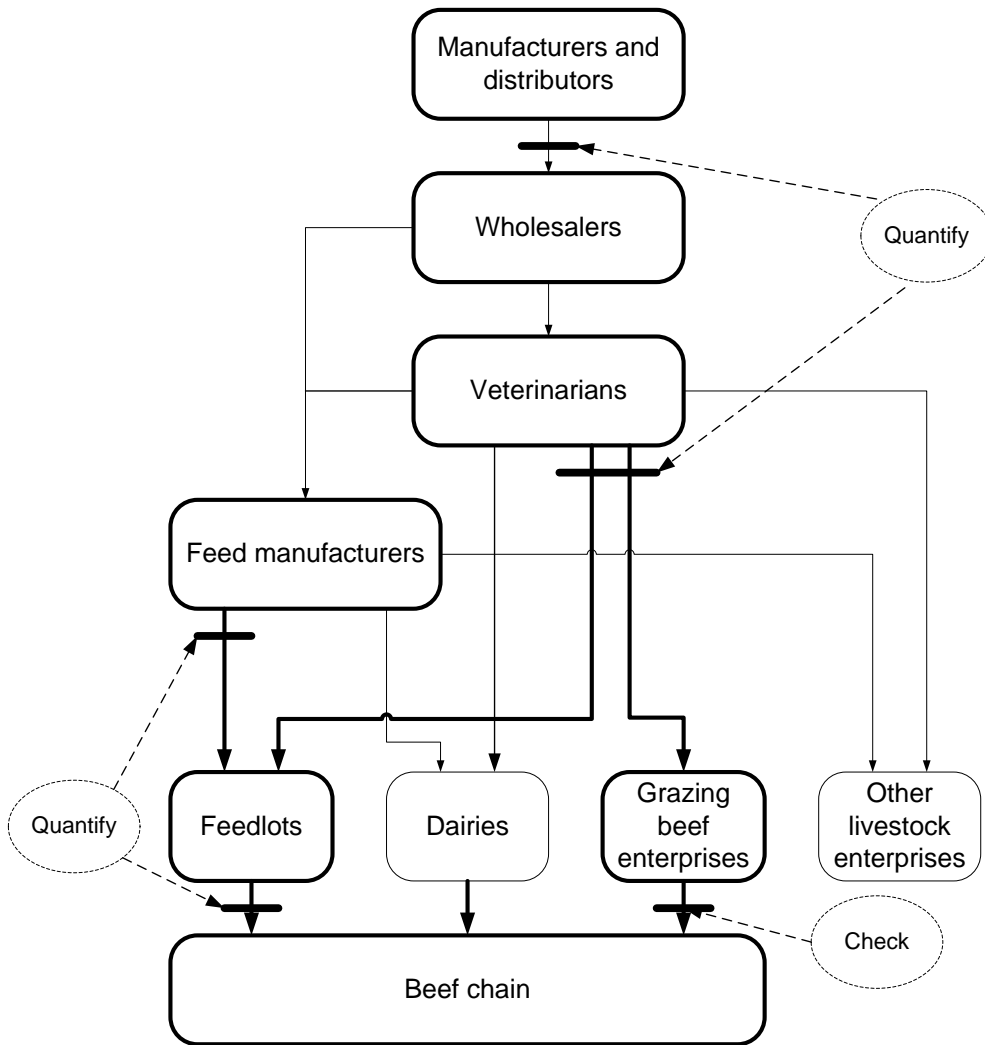
3.2. Consultation and survey

Design

A targeted series of consultations was then undertaken to attempt to quantify and characterise the use of antimicrobials in the beef industry. The approach is summarised in

Figure 1. The 'purposive sampling' sampling design adopted recognises the highly skewed distribution of participants at various points in the chain (that is, most of the required data resides with a small number of manufacturers, feed manufacturers and veterinarians). This design is likely to provide greater accuracy at lower cost than a random, cross-sectional survey across any single point in the supply pipeline.

Figure 1 Overview of antibiotic supply pipeline and targeted consultation approach



The approach involved attempting to gain estimates of antimicrobials entering the beef chain at various points in the supply pipeline:

- a. From registrants of pharmaceutical products. Sales volume data from the relatively small number of companies at this point in the pipeline could theoretically provide very good estimates of the antimicrobials entering the beef chain, with the constraints that (a) there may be time effects (not all product sold within a given year is used within that year) and (b) it is not always possible to allocate sales volumes by destination market for multi-species, multi-industry products – some products may be used in beef but also dairy cattle, +/- other livestock species, +/- domestic species.

The ten registrants responsible for the largest number of products were identified. Nine of these, being the leading companies in most of the product categories of interest, were approached to complete a questionnaire seeking data on sales volumes of antimicrobial agents as well as responses to a number of related matters. One of the companies declined to participate and three others did not return data despite several requests.

- b. From the quantities of antimicrobials used by feed manufacturers. There is a relatively small number of feed manufacturers, who maintain thorough documentation of antimicrobial use as part of the good manufacturing practices (GMP) with which they comply and products can generally be distinguished by their end market. Eight feed manufacturers were interviewed, all by telephone.
- c. From quantities of antimicrobials prescribed and supplied by veterinarians. There are far more veterinarians than antimicrobial suppliers, but with veterinarians' data there is a much higher possibility of quantifying the volume of antimicrobials used for beef cattle as distinct from other cattle and other species. This is particularly true for specialist beef feedlot veterinarians.

Ten veterinarians were interviewed, all by telephone (a further five veterinarians declined to participate – see below). The veterinarian questionnaire included a number of questions additional to the other questionnaires, in order to obtain information on the indications for different antimicrobials and the extent to which substitutes across groups for a given indication. This informed the analysis of the 'vulnerability' of the industry to the loss of antimicrobial products for which there are no alternatives.

The veterinarians covered considerable catchments in all states and territories.

- d. From the quantities of antimicrobial products used by feedlots and grass-fed beef producers. There is a relatively small number of large feedlots but many grass-fed producers, the latter using small quantities of antimicrobials and only on prescription from a veterinarian. For these reasons, the Project Team and Project Steering Committee agreed that little would be gained by attempting to interview a large number of individual grass-fed beef producers. Instead, only four (large) grass-fed producers were interviewed, and these only as a cross-check of other data. These producers ran approximately 440,000 head. Managers of seven feedlots with collectively 80,000 animals on feed were also interviewed. As with the veterinarians, care was taken to speak to producers across a wide range of locations and in northern and southern grazing systems.

Notes on the consultations

In each case, the survey period was financial year 2011/12. It was thought that this period would make it as easy as possible to obtain figures, especially for registrants.

The consultation process was more difficult than envisaged at the start of the project. In particular, the team was unable to convince any of the five major feedlot veterinarians to share their data. One such veterinarian was willing to provide qualitative input to the survey but not to reveal volumes of antimicrobial agents prescribed. The team believes that this reluctance to share information was based on anxiousness to protect intellectual property and commercial interests in a highly competitive industry.

The inability of the team to obtain this information, despite repeated requests, was unfortunate. It absorbed significant time and effort and also deprived the project of the most reliable and accurate indication of antimicrobial usage in feedlots.

Other interviewees were generally responsive to requests for information. A few individuals and companies declined to participate for reasons of confidentiality, despite all interviewees being asked to sign a confidentiality agreement protecting both the privacy of their data and of the project itself. Others cited a lack of time to participate.

The team also found that there was considerable work involved in readying the data for analysis. The data required was not always easy to obtain because it included sales to dairy cattle or other species. Also, there was a need to check that the estimated number of cattle treated was consistent with label dose rates (or an off-label regime) and that, as far as possible, consistent calculation methods were employed. In some cases the interviewees were provided only with a 'dump' of antimicrobial purchases and had to calculate the usage from that point.

The pharmaceutical registrants were approached individually but also via the Animal Health Alliance, the peak body for the animal pharmaceutical industry in Australia, 'representing the interests of registrants, manufacturers and formulators of animal health products'¹. The Alliance facilitates a collation and exchange of product sales data for its members and it was hoped this data set might be made available to this project to save the team surveying each company individually. The Alliance Board decided it could not provide the data set to the team but did encourage members to participate in the project on an individual basis and noted its willingness to participate in discussions of future surveillance of antimicrobial use.

3.3. Analysis and reporting

The various sources of data used in Stage 2 provided different snapshots of the same flows of product. Thus, the analysis of data involved cross-checking of the information gained from each of the interview groups against that from each other group.

The data obtained from Stages 1 and 2 was compiled into this report, which describes as accurately as possible:

- Estimated annual usage of antibiotics in cattle entering the beef chain in Australia, by product type and administration (e.g. in-feed, parenteral; prophylactic vs therapeutic; feedlot vs grass-fed vs dairy).
- Indications for use of each product group.
- Comment on the 'vulnerability' of the industry in respect to each group – i.e. risk from human perspective; importance in animal applications; availability of substitutes; trends in usage patterns (increasing, declining).
- Recommendations on the ongoing monitoring of antibiotic use by the industry.

A draft report was reviewed by MLA, ALFA and CCA and subsequently finalised.

¹ Animal Health Alliance website, www.animalhealthalliance.org.au/

4. Product analysis

4.1 Antimicrobials registered for use in cattle in Australia

223 antimicrobial products are registered for use in cattle in Australia. A complete listing of these products, including registrant, scheduling, label claims, withholding periods and export slaughter intervals is provided in Appendix 1.

Of these, 27 are intra-mammary preparations used almost exclusively in dairy cattle for the prevention and treatment of mastitis. A summary of the remaining 196 products is shown in Table 1.

Table 1. Antimicrobial agents registered for use in cattle in Australia²

Antimicrobial active	Class	Number of products containing active ¹
Apramycin	Aminoglycoside	1
Dihydrostreptomycin ²	Aminoglycoside	1
Framycetin ²	Aminoglycoside	2
Neomycin	Aminoglycoside	9
Streptomycin ²	Aminoglycoside	2
Ceftiofur	Beta lactam cephalosporin	7
Cefuroxime	Beta lactam cephalosporin	0 ³
Cephalonium	Beta lactam cephalosporin	1
Cephapirin	Beta lactam cephalosporin	1
Amoxicillin	Beta lactam penicillin	12
Ampicillin ²	Beta lactam penicillin	0 ³
Penicillin, benzathine ²	Beta lactam penicillin	6
Cloxacillin	Beta lactam penicillin	4
Penethamate hydroiodide	Beta lactam penicillin	3
Penicillin, procaine	Beta lactam penicillin	15
Clavulanic acid ²	Beta lactamase inhibitor	3
Trimethoprim ⁴	Diaminopyrimidine	18
Flavophospholipol	Glycophospholipid	5
Lasalocid sodium	Ionophore	5
Monensin	Ionophore	26
Narasin	Ionophore	3
Salinomycin sodium	Ionophore	11
Lincomycin ²	Lincosamide	0 ³
Erythromycin	Macrolide	2
Oleandomycin ²	Macrolide	0 ³
Tilmicosin	Macrolide	2
Tulathromycin	Macrolide	1
Tylosin	Macrolide	22
Novobiocin ²	Other	0 ³
Florfenicol	Phenicol	2
Bacitracin zinc	Polypeptide	2
Polymyxin B sulfate ²	Polypeptide	2
Virginiamycin	Streptogramin	3
Sulfadiazine ²	Sulfonamide	13
Sulfadimidine	Sulfonamide	9

² Listing obtained from the PUBCRIS database of the Australian Pesticides and Veterinary Medicines Authority (APVMA), March 2013.

Antimicrobial active	Class	Number of products containing active ¹
Sulfadoxine ²	Sulfonamide	5
Chlortetracycline	Tetracycline	6
Oxytetracycline	Tetracycline	33

¹ Excluding intra-mammary preparations. Total exceeds number of products due to presence of multiple actives in combination products

² Only available as a combination product

³ Contained in one or more intra-mammary products

⁴ Only available in combination with a sulphonamide

The large number of antimicrobial products can be more easily understood by classifying them by their route of administration, and then by purpose or class of agent. This leaves 22 quite distinct groups of products, in each of which there may be several competitor products that are largely undifferentiated. A summary of this classification system is shown in Table 2 and a more detailed description of each group is provided below.

Table 2. Grouping of antimicrobial products for cattle by route of administration and purpose/class of product

Grouping: route of administration	Subgrouping	
In-feed	Growth promotants / bloat control products	
	Grain poisoning preventives	
	General antimicrobial prophylactics and therapeutics	
In-water		
	Potentiated sulphonamides	
	Aminoglycoside / sulphonamide combinations	
	Amoxicillin / clavulanic acid combinations	
	Tetracyclines	
	Growth promotants / bloat control products	
	Sulphonamides	
	Injectable	Tetracyclines
		Potentiated sulphonamides
		Penicillins
Cephalosporins		
Macrolides		
Aminoglycosides		
Phenicols		
Penicillin plus aminoglycoside combinations		
Sulphonamides		
Topical		
Intraocular		
Intrauterine		

In-feed products

These are single-ingredient products for pre-mixing with stock feeds. They can be broadly grouped by their indications for use (Table 3):

- The ionophores and flavophospholipol are all in-feed products (except for two versions of a controlled-release capsule product containing monensin for bloat control). They are primarily indicated for improved feed efficiency and weight gain although some also carry claims as coccidiostats. Most of these products are registered for multi-species use including poultry.
- Virginiamycin is also an exclusively in-feed product, indicated specifically for the reduction in the risk of acidosis or grain poisoning in cattle and sheep.
- The other in-feed products (tylosin, oxytetracycline, chlortetracycline and neomycin) are used to prevent or treat enteric or respiratory bacterial diseases, either in calves specifically (chlortetracycline), cattle generally or multiple species.

Table 3. In-feed antimicrobial products for cattle

Group / antimicrobial active	Class	Number of products	Indications
<i>Growth promotants / bloat control products</i>			
Monensin	Ionophore	24	Improved feed efficiency / weight gain, control of bloat, increasing milk production, reducing the severity of nonclinical ketosis, as an aid in the control / prevention of coccidiosis caused by <i>Eimeria zuernii</i> and <i>Eimeria bovis</i>
Salinomycin	Ionophore	11	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle
Flavophospholipol	Glycophospholipid	5	Growth promotion and improved feed conversion efficiency in cattle and calves
Lasalocid	Ionophore	5	Improved liveweight gains/growth promotion and feed conversion efficiency in growing cattle, lot fed beef cattle, also to aid in the improvement of milk production by grass fed dairy cows and by lot fed dairy cattle, for control of coccidiosis (<i>Eimeria bovis</i> and <i>E. zuernii</i>)
Narasin	Ionophore	3	Improved feed conversion efficiency in (lotfed) cattle
<i>Grain poisoning preventives</i>			
Virginiamycin	Streptogramin	3	Reduction in the risk of acidosis (grain poisoning)
<i>General antimicrobial prophylactics and therapeutics</i>			
Tylosin	Macrolide	15	Reduction of liver abscess in cattle (one product for the treatment and prevention of bacterial enteric disorders)
Oxytetracycline	Tetracycline	10	Prophylaxis and prevention against sensitive organisms in cattle (one label specifies respiratory and enteric disease)

Group / antimicrobial active	Class	Number of products	Indications
Neomycin	Aminoglycoside	3	Treatment of bacterial enteritis (scours) caused by organisms sensitive to neomycin, including neomycin sensitive strains of <i>E. coli</i> , <i>Salmonella</i> spp, <i>Pseudomonas</i> spp, and <i>Proteus</i> spp in cattle
Chlortetracycline	Tetracycline	6	Prophylactic use in calves against sensitive organisms

In-water products

Four products are registered for administration in water:

- Two containing sulfadiazine / trimethoprim, one for infections 'especially of the respiratory, urinary and alimentary tracts'.
- One containing oxytetracycline.
- One containing apramycin.

Oral products

Orally-administered products can be further divided into five groups primarily on the basis of their chemical class (Table 4):

- Potentiated sulphonamides (sulfadiazine or sulfadimidine plus trimethoprim). These are products generally also registered for use in horses, pigs and poultry.
- Aminoglycoside plus sulphonamide combinations, some of which are registered for multiple species.
- Amoxicillin plus clavulanic acid. These products are all registered for calves and dogs.
- Oxytetracycline, also registered for multiple species.
- Monensin in a controlled-release capsule for cattle only.
- Sulfadimidine for use in cattle only.

Table 4. Orally-administered antimicrobial products for cattle

Antimicrobial active	Class	Number of products	Indications
<i>Potentiated sulphonamides</i>			
Sulfadiazine or sulfadimidine plus trimethoprim – one product includes multiple other, non-antimicrobial, anti-diarrhoeal products such as kaolin and pectin	Sulfonamide, diaminopyrimidine	6	Treatment of susceptible organisms in calves or all cattle (one product specifies infections of the respiratory tract, urogenital tract and alimentary tract)
<i>Aminoglycoside / sulphonamide combinations</i>			
Streptomycin and/or dihydrostreptomycin and/or neomycin, plus sulfadiazine plus sulfadimidine plus multiple other, non-antimicrobial products such as Vitamin B1 and B2 (various combinations)	Aminoglycoside, sulfonamide	4	Treatment of enteritis / scours in calves
<i>Amoxicillin / clavulanic acid combinations</i>			
Amoxicillin plus clavulanic acid	Beta lactam penicillin, beta-lactamase inhibitor	3	Treatment of calves
<i>Oxytetracyclines</i>			
Oxytetracycline	Tetracycline	3	Treatment of bacterial enteritis, salmonellosis, calf diphtheria (<i>Fusobacterium necrophorum</i>), pasteurellosis and bacterial pneumonia (one product) or 'sensitive organisms'
<i>Growth promotants / bloat control products</i>			
Monensin	Ionophore	2	Bloat control, production improvement, and treatment and prevention of sub-clinical ketosis in beef and dairy cattle
<i>Sulphonamides</i>			
Sulfadimidine	Sulfonamide	1	Bacterial and coccidial infection, including footrot, bacterial calf scours, pneumonia and navel infections

Injectable products (intravenous, intramuscular, subcutaneous)

This is the most diverse category of antimicrobial products. It can be further subdivided by product active as shown in Table 5.

Table 5. Injectable antimicrobial products for cattle

Group / antimicrobial active	Number of products	Indications
Tetracyclines		
Oxytetracycline	15	Treatment of sensitive bacterial infections (multiple species) – short- and long-acting preparations
Potentiated sulphonamides		
Sulfadiazine or sulfadoxine or sulfadimidine plus trimethoprim	10	Treatment of sensitive bacterial infections (multiple species)
Beta lactam penicillins		
Procaine penicillin	8	Treatment of sensitive bacterial infections (multiple species)
Procaine penicillin plus benzathine penicillin	6	Treatment of sensitive bacterial infections (multiple species)
Amoxycillin	9	Treatment of sensitive bacterial infections (multiple species)
Penethamate hydroiodide	3	Treatment of infections due to gram-positive bacteria that cause mastitis, uterine infections, respiratory infections, and footrot
Beta lactam cephalosporins		
Ceftiofur	7	Treatment of respiratory diseases caused by <i>Mannheimia haemolytica</i> , <i>Pasteurella multocida</i> and <i>Histophilus somni</i> (also registered for horses and dogs)
Macrolides		
Tylosin	5 ¹	Treatment of sensitive bacterial and mycoplasmal infections (cattle and pigs)
Erythromycin	2	Treatment of sensitive bacterial infections (multiple species)
Tilmicosin	2	Treatment of bovine respiratory disease (BRD) associated with <i>Mannheimia (Pasteurella) haemolytica</i> , <i>Pasteurella multocida</i> and other susceptible organisms in lot-fed cattle
Tulathromycin	1	Treatment of sensitive bacterial infections (cattle and pigs)
Aminoglycosides		
Neomycin	2	Treatment of sensitive bacterial infections (multiple species)
Phenicols		
Florfenicol	2	Treatment of respiratory infections caused by <i>Mannheimia haemolytica</i> , <i>Pasteurella multocida</i> and <i>Histophilus somni</i> associated with pyrexia in non-breeding, beef cattle; sensitive bacterial infections (cattle and pigs)
Penicillin plus aminoglycoside combinations		
Procaine penicillin plus neomycin	1	Treatment of sensitive bacterial infections (multiple species)
Sulphonamides		
Sulfadimidine	1	Bacterial and coccidial infection, including footrot, bacterial calf scours, pneumonia and navel infections

¹ Tylosin is also included in 2 hormonal implant products to provide local infection control

Topical products

There are four topical products registered for use in cattle (these are also registered for other species):

- Two containing bacitracin zinc, framycetin sulphate and polymyxin B sulphate for use in the eye or ear.
- One containing oxytetracycline, a spray for digital dermatitis and superficial skin infections.
- One containing neomycin for skin conditions.

Intraocular products

There are six registered products for treatment of the eye:

- Four containing cloxacillin, for the treatment of bovine keratoconjunctivitis (pink-eye) caused by *Moraxella bovis* and other sensitive organisms. Also for use in other species.
- One containing cephalonium dehydrate for use in cattle and dogs.
- One (spray) containing oxytetracycline with multi-species registration.

Intrauterine products

There are three registered intrauterine products for the treatment of metritis and retained placenta:

- Two foaming pessary products containing oxytetracycline as the active constituent, registered for multiple species.
- One suspension containing cephalirin for use in cattle only.

4.2 Product registrants

Thirty-one companies are listed as registrants of cattle antimicrobial products. A full listing of these registrants and the number of products registered by each is provided in Appendix 2. While the number of products registered does not necessarily equate to volume of sales or use, this criterion was used as a guide to identify the major suppliers of antimicrobial products for use in cattle and hence to target the survey. The top 10 companies by number of antimicrobial products (excluding intra-mammary preparations) are responsible for 156 (80%) of the 196 products registered.

It is also important to note that most of these 196 products carry multi-species registration – that is, they may be registered for use in sheep, pigs, horses, dogs and/or other species in addition to cattle.

Notwithstanding the constraints of this ranking outlined above, the ten companies with the most antimicrobial products registered for cattle are shown in Table 6.

Table 6. Top ten registrants of antimicrobial products for cattle in Australia (by number of products)

Registrant	No. antimicrobial products
Bayer Australia Ltd (Animal Health)	25
Zoetis Australia Pty Ltd	21
Elanco	21
Dox-AI Australia Pty Ltd	15
Phibro Animal Health Pty Ltd	14
Intervet Australia Pty Ltd	14
International Animal Health Products Pty Ltd	13
Norbrook Laboratories Australia Pty Ltd	12
Jurox Pty Ltd	12
Troy Laboratories Pty Ltd	9

The consultations undertaken for this project demonstrated that a ranking of companies based on numbers of products can be misleading. All but seven of the Bayer products, for example, are no longer on the market although they are still registered.

The consultations indicated that the top companies, in terms of category-leading products and market understanding, are Zoetis, Elanco, Phibro and MSD (Intervet), although not necessarily in that order.

4.3 Importance in human use or animal use

Table 7 below shows the rating by EAGAR, WHO and OIE of each of the antimicrobial agents registered for use in cattle in Australia:

1. The Expert Advisory Group on Antimicrobial Resistance (EAGAR) of the National Health and Medical Research Council (NHMRC) in Australia. In November 2006 the EAGAR published the 'Importance ratings and summary of antibiotic uses in humans in Australia'. In the EAGAR rating system, if an antibiotic is classified as 'High', it implies that if resistance develops there will be very limited or in some cases no alternatives available to treat serious bacterial infections of humans. Unfortunately EAGAR was disbanded in 2007 and the importance ratings require revision to capture any changes in importance in the last 6 years.
2. The World Health Organisation (WHO) Advisory Group on Integrated Surveillance of Antimicrobial Resistance (AGISAR) 2012 publication 'Critically important antimicrobials for human medicine' (3rd revision). The WHO list categorises antimicrobials (by class) as either 'Critically Important Antimicrobials', 'Highly Important Antimicrobials' or 'Important Antimicrobials' ('CIA', 'HIA' or 'IA' respectively in the table below).

CIA meet two, HIA meet one and IA meet neither of the following criteria:

- (i) The agent is the sole therapy, or one of limited available therapies, to treat serious human disease; and
- (ii) The agent is used to treat diseases caused by either: (1) organisms that may be transmitted to humans from non-human sources or, (2) human diseases caused by organisms that may acquire resistance genes from nonhuman sources.

AGISAR stresses in its report that “the list of Critically Important Antimicrobials should be used as a reference to help formulate and prioritize risk assessment and risk management strategies for containing antimicrobial resistance due to human and non-human antimicrobial use” and describes appropriate uses of the list to include “refining and prioritizing risk profile and hazard analysis activities for interventions by species or by region” (page 4) and using the list “for the development of prudent use and treatment guidelines in humans and animals”. The WHO list is a global guide for customisation as the local situation dictates. This in great part explains the differences between the WHO ratings and the Australian EAGAR ratings. Of special importance, according to AGISAR, is to ensure the list is updated regularly to keep it current and relevant and to adapt it to each species and region.

3. The World Organisation for Animal Health (OIE) 2013 ‘List of antimicrobials of veterinary importance’. This list categorises classes of antimicrobials as either ‘Veterinary Critically Important Antimicrobials’, ‘Veterinary Highly Important Antimicrobials’ or ‘Veterinary Important Antimicrobials’ (‘VCIA’, ‘VHIA’ or ‘VIA’ respectively in the table below).

The OIE analysis also considers two criteria (‘VCIA’ meet both, ‘VHIA’ meet one, ‘VIA’ meet neither):

- (i) A majority of the respondents [OIE member countries] identified the importance of the antimicrobial class in their response to the questionnaire; and
- (ii) Compounds within the class were identified as essential against specific infections and there was a lack of sufficient therapeutic alternatives

Table 7. Ratings by EAGAR, WHO and OIE of antimicrobial agents that are used in cattle

Active	EAGAR	WHO	OIE	Active	EAGAR	WHO	OIE
Amoxycillin	Low	CIA	VCIA	Cephalonium	Medium	HIA	VCIA
Ampicillin	Low	CIA	VCIA	Cephapirin	Medium	HIA	VCIA
Apramycin	Low	CIA	VCIA	Chlortetracycline	Low	HIA	VCIA
Ceftiofur	High	CIA	VCIA	Cloxacillin	Medium	HIA	VCIA
Clavulanic acid	Medium	CIA	VCIA	Florfenicol	Low	HIA	VCIA
Dihydrostreptomycin	Low	CIA	VCIA	Lincomycin	Medium	HIA	VHIA
Erythromycin	Low	CIA	VCIA	Oxytetracycline	Low	HIA	VCIA
Framycetin	Low	CIA	VCIA	Sulfadiazine	Low	HIA	VCIA
Neomycin	Low	CIA	VCIA	Sulfadimidine	Low	HIA	VCIA
Oleandomycin	Low	CIA	VCIA	Sulfadoxine	Low	NR	VCIA
Penethamate hydroiodide	Low	CIA	VCIA	Trimethoprim	Medium	HIA	VCIA
Penicillin, benzathine	Low	CIA	VCIA	Virginiamycin	High	HIA	VIA
Penicillin, procaine	Low	CIA	VCIA	Bacitracin zinc	Low	IA	VHIA

Active	EAGAR	WHO	OIE	Active	EAGAR	WHO	OIE
Polymyxin B sulfate	Low	CIA	VHIA	Flavophospholipol ¹	NR	NR	VIA
Streptomycin	Low	CIA	VCIA	Lasalocid sodium ¹	NR	NR	VHIA
Tilmicosin	Low	CIA	VCIA	Monensin ¹	NR	NR	VHIA
Tulathromycin	Low	CIA	VCIA	Narasin ¹	NR	NR	VHIA
Tylosin	Low	CIA	VCIA	Novobiocin ¹	NR	NR	VIA
Cefuroxime	Medium	HIA	VCIA	Salinomycin sodium ¹	NR	NR	VHIA

¹ No counterpart for human use

The WHO report identifies a group of 'highest priority critically important antimicrobials'. These are the classes of drugs that meet each of three priorities:

- Focusing Criterion 1: Sole therapy or one of few alternatives to treat serious human disease
 - Application 1.1 – High absolute number of people affected by diseases for which the antimicrobial is the sole or one of few alternatives to treat serious human disease.
 - Application 1.2 – High frequency of use of the antimicrobial for any indication in human medicine, since usage may favour selection of resistance.
- Focusing Criterion 2: Antibacterial used to treat diseases caused by organisms that may be transmitted via non-human sources or diseases caused by organisms that may acquire resistance genes from non-human sources.
 - Application 2.1 – Greater degree of confidence that there are non-human sources that result in transmission of resistant bacteria (*Campylobacter* spp.), or their resistance genes, to humans (high for *Salmonella* spp., *Escherichia coli* and *Enterococcus* spp.).

On these tests, the highest priority groups within the CIA are:

- **FLUOROQUINOLONES**, which are known to select for fluoroquinolone-resistant *Salmonella* spp. and *E.coli* in animals. At the same time, fluoroquinolones are one of few available therapies for serious *Salmonella* spp. and *E.coli* infections. Given the high incidence of human disease due to *Salmonella* spp. and *E. coli*, the absolute number of serious cases is substantial. No fluoroquinolones are registered for use in cattle in Australia.
- **THIRD- AND FOURTH-GENERATION CEPHALOSPORINS**, which are known to select for cephalosporin-resistant *Salmonella* spp. and *E. coli* in animals. At the same time, third- and fourth-generation cephalosporins are one of few available therapies for serious *Salmonella* and *E. coli* infections, particularly in children. Given the high incidence of human disease due to *Salmonella* spp. and *E. coli*, the absolute number of serious cases is substantial. Only one cephalosporin in this CIA category is registered for use in cattle in Australia – ceftiofur, which is a third generation cephalosporin.
- **MACROLIDES**, which are known to select for macrolide-resistant *Campylobacter* spp. in animals, especially *Campylobacter jejuni* in poultry. At the same time, macrolides are one of few available therapies for serious

campylobacter infections, particularly in children, in whom quinolones are not recommended for treatment. Given the high incidence of human disease due to *Campylobacter* spp., especially *C. jejuni*, the absolute number of serious cases is substantial. There are five macrolide agents on the market for cattle in Australia, at least two of which play a significant role in disease management in feedlots.

- **GLYCOPEPTIDES**, which are known to select for glycopeptide-resistant *Enterococcus* spp. in food animals (e.g., when avoparcin was used as a growth promoter, vancomycin-resistant enterococcus (VRE) developed in food animals and were transmitted to people). At the same time, glycopeptides are one of the few available therapies for serious enterococcal infections. Given the high number of cases, the previously documented occurrence of transmission of VRE to people from food animals and the very serious consequences of treatment failures in such cases, this class was re-classified as being of highest priority in the 3rd revision of the List. No glycopeptides are registered for use in cattle in Australia.

There is only a moderate correlation between the EAGAR and WHO ratings. There are many more of the cattle-registered antimicrobials in the higher importance categories of WHO than of EAGAR. This is to be expected. The WHO analysis specifically takes into account (criterion 2) whether the drug is used to treat diseases caused by bacteria that may be transmitted from non-human sources (animals, environment) to humans. These agents are considered more important because they are 'most amenable to risk-management strategies related to non-human antimicrobial use' (for example, control of veterinary use). Almost by definition, any antimicrobial used in cattle with a human counterpart will score 'yes' on this criterion and hence a 'CIA' or 'HIA' classification.

The OIE rating places almost all of the products on the list in the 'VCIA' category. This may reflect the narrower range of antimicrobials available in veterinary compared with human medicine, meaning there is a widespread 'lack of sufficient therapeutic alternatives'. In contrast to the WHO and EAGAR categorisation, the OIE list is based on a census of member countries rather than the risks to public health.

5. Background information

5.1 Published reports on antimicrobial usage in cattle

The only published reports from Australia to give any indication of the usage of antimicrobials in cattle are those compiled by the APVMA in 1999 and again in October 2012 (a draft report covering the period 2005-2010). The latter report has not yet been finalised³.

The 2012 APVMA draft report provides a useful reference point for estimating the use of antimicrobial agents in cattle. The report was prepared from a census of product registrants who were asked to provide, for each of their products:

³ As at the finalisation of this report in November 2013. The pressure to publish the report was increased following the release of the findings of the Finance and Public Administration References Committee of the Senate into 'Progress in the implementation of the recommendations of the 1999 Joint Expert Technical Advisory Committee on Antibiotic Resistance' in June.

- Product name;
- Registration number;
- Active constituent;
- Active constituent amount (e.g. g/kg);
- Pack size (e.g. 200 ml);
- Number of specific packs sizes sold;
- Kilograms of active constituent;
- Species for which product is registered; and
- Percentage used in each species.

Participation in the census was voluntary although compliance was high. The comprehensive nature of the data-gathering should make the report a definitive benchmark for antimicrobial usage. However, the report has some serious limitations for present purposes. Importantly, information on the amount of product used in each species was 'often either incomplete, or not supplied'. Much of the sales volume data is therefore aggregated at the level of 'food-producing animals' (including pigs and poultry) or, at best, 'sheep and cattle' which includes both beef and dairy combined. Thus, it can only be used as a measure of validation of the present study.

It is expected that the final report will provide a greater degree of disaggregation of the data by species and by antimicrobial agent. This is welcome although it will not solve the problem of differentiating beef from dairy usage.

Another potentially important source of data is the internal collation of sales volume data by the Anima Health Alliance (AHA), the peak body for registrants of animal health products in Australia. AHA was approached to provide data for this study (unsuccessfully – see above). A future arrangement with AHA to obtain usage data on an ongoing basis would be beneficial to the beef industry if it could be arranged.

5.2 Antimicrobial usage in other species

Appendix 3 provides a detailed listing of the antimicrobial agents approved for use by the APVMA in various livestock and companion animal species in Australia

There are 63 antimicrobial agents available variously in livestock (cattle, sheep, pigs, broilers, layers and goats) and companion animal (horses, dogs and cats). Some notable observations include the absence of fluoroquinolone use in livestock but availability for cats and dogs. Only two third-generation cephalosporins are approved with both for use in dogs and cats and one, ceftiofur, approved for use in cattle.

There is a much greater diversity of antimicrobial agents belonging to more classes approved for use in companion animals compared with livestock species. With a number of livestock species there is a very limited range of antimicrobial agents available.

5.3 Antimicrobial usage in cattle in other countries

Appendix 4 lists the antimicrobial agents registered for use in cattle in the United States and the United Kingdom, compared with those registered in Australia. The table shows that Australia has no approved fluoroquinolones or aminocyclitols. The US has no approved aminocyclitols, beta lactamase inhibitors or diaminopyrimidines. The UK has no approved ionophores, streptogramins, or glycopeptidolipids.

There are many factors that influence the availability and use of antimicrobial agents in livestock in different countries, including the type and size of livestock production systems, the economic circumstances and regulatory environment. Apart from reports from Denmark, there is little information reported on actual use quantities in any animal species.

USDA (2013) recently published the results of a comprehensive survey of management practices in US feedlots. The survey found that overall, 73.4% of feedlots with a capacity of 1,000 or more head used some antibiotics in feed for some of their animals. On 55.9% of these feedlots (41.6% of all feedlots) all cattle and calves received an antibiotic in feed as a health or production management tool. For 66.9% of feedlots, the average period of inclusion of antibiotics in feed was from 1 to 7 days.

About half of feedlots (50.4%) gave an antibiotic injection as part of the initial processing procedure for any cattle. Use of an antibiotic injection at initial processing for some cattle was more common in feedlots with a capacity of 8,000 or more head (75.1%) than in feedlots with a capacity of 1,000 to 7,999 head (39.8%) or less than 1,000 (42.0%).

Even though 50.4% of feedlots used an antibiotic as part of initial processing for some cattle, only 26.0% of cattle initially processed as a group received an injectable antibiotic.

Approximately 9 of 10 cattle were in feedlots that fed an ionophore. No information on antimicrobial agents used or quantity used is presented.

In Denmark, DANMAP (2011) collects information on sales of antimicrobial products from pharmacies intended for use in all species, including cattle. Table A4.3 of the 2011 report, entitled “Consumption of antimicrobial agents for systemic use in cattle given as Animal Daily Doses (ADDs) Denmark” shows that penicillins, tetracyclines, macrolides, sulphonamides and phenicols are the most frequently used agents. Unlike the situation in Australia, fluoroquinolones and colistin, both considered critically important by WHO, are also used in cattle.

6. Findings from this project: estimated antimicrobial usage and indications

6.1 Usage by production system

Extensive grazing

It is difficult to obtain precise estimates of antimicrobial usage in grass-fed beef systems. There are a large number of holdings across Australia and many of these are small. Most of the veterinarians that service them do so as part of a practice that includes other farm and companion animal species. There are few if any specialist grass-fed beef veterinarians, in contrast to the situation with feedlots.

In order to gain the most accurate picture of antimicrobial usage possible within these constraints, a cross-section of substantial producers, and veterinarians servicing grass-fed producers, were interviewed as part of the survey process in addition to the gathering and analysis of data from product registrants. The interviewees came from

both northern and southern systems. These interviews and the results obtained from the product registrants indicate that:

- The use of antimicrobial products by this part of the industry is negligible to very low.
- Typically, in southern systems, less than 1% of cattle are treated with parenteral antibiotics in a given year. There was evidence from the survey that this figure would be much lower – almost negligible – in northern systems where the cattle are handled infrequently.
- A narrow range of antibiotics is employed (Table 8). The major antibiotics by volume, by a considerable margin, are oxytetracycline and penicillin, especially in long-acting formulations. These are used for a wide range of indications including ‘general illness’ where an infection is suspected but the disease is not specified. Sulpha/trimethoprim combinations are the next most commonly used group, particularly for calf scours. Other antibiotics (ceftiofur, tylosin, tilmicosin) appear to be used very occasionally in individual animals for specific purposes.
- There is some use of the ionophore products in extensive grazing systems, although at a per head rate that is considerably lower than that of feedlots. Lick blocks, mixes and sometimes pellets that are supplied to animals such as lighter weaners often contain monensin. The current survey was not designed to capture volume data on this pattern of use but examples of it were found when interviewing northern graziers⁴. Capsules containing monensin are used sometimes where high-legume pastures may create the risk of bloat.
- Eye ointments containing cloxacillin are also occasionally used (for pinkeye) as are other topical preparations.

Table 8. Non-ionophore antimicrobials used in extensive beef grazing systems

Antimicrobial agent	Indication
Most common	
Oxytetracycline (LA and SA)	Respiratory disease, mastitis, lameness, calvings, joint ill, post-surgery, general illness
Penicillin (LA and SA)	Wounds, foot abscess, footrot, uterine prolapse, post-surgery, general illness (mainly LA)
Sulpha + trimethoprim	Calf scours, uterine prolapse and retained foetal membranes etc, mastitis when OTC 90-day WHP is too long
Occasional use	
Ceftiofur	Respiratory disease, joint-ill in calves
Tylosin	Non-responsive interdigital dermatitis
Cloxacillin	Pinkeye

⁴ For further information see the final report of MLA project B.NBP.0623, ‘Analysis of the potential to manipulate the rumen of northern beef cattle to improve performance’ by SBS Scibus.

Feedlots

The figures obtained from the survey for antimicrobial usage in feedlots are not as robust as was hoped because of the lack of participation by the four or five key feedlot veterinarians. However, information from registrants and from a small number of feedlots provides a reasonable indication of the volumes used and patterns of usage. The antimicrobial agents used in feedlots are summarised in Table 9.

- A very high proportion – probably exceeding 90% – of cattle in feedlots are fed an ionophore for the duration of their time on feed, to promote growth. Monensin is clearly the dominant agent (again, more than 90%).
- The use of injectable antibiotics varies substantially between feedlots, no doubt depending to a significant extent on the nature of the veterinary input. One feedlot showed a rate of antibiotic use of less than 2%, while at another, 30-40% of animals were treated. The registrant data suggests that the average treatment rate might be closer to the upper end of this estimate. A broader range of antimicrobials is used in feedlots than in grazing systems, the major difference being the use of macrolides.
- There is some use of in-feed antibiotics, including oxytetracycline, although this appears to be low to negligible following the introduction of a 90-day export slaughter interval on oxytetracycline for the Russian beef market. Tylosin is also used.

Table 9. Non-ionophore antimicrobials used in feedlots

Antimicrobial agent	Indication
Most common	
Tulathromycin	Bovine respiratory disease (BRD)
Tilmicosin	BRD
Lesser use	
Ceftiofur	BRD
Oxytetracycline (LA and SA)	BRD, wounds, footrot, abscess, lameness, general illness
Penicillin (LA and SA)	Wounds, foot abscess, footrot, abscess, lameness, general illness
Occasional use	
Amoxicillin	BRD
Sulpha + trimethoprim	
Erythromycin	BRD
Tylosin	Non-responsive interdigital dermatitis
Cloxacillin	Pinkeye

6.2 Usage by antimicrobial agent

Tetracyclines

Oxytetracycline is one of three general-purpose antibiotics used by veterinarians for beef cattle. It is most often used in the long-acting (LA) form, especially in grazing systems, because of the advantage offered by a single dose.

It is very difficult to estimate the total number of beef cattle treated with oxytetracycline. It is a generic product and there are 15 products registered for use in cattle and multiple other species. Further, many of the products can be used in either LA or SA formulations. The registrant companies are unable to estimate the total market for oxytetracycline across all species – much less beef cattle specifically (this constraint also applies to the companies' estimates of species use for their own products).

The survey conducted for this project identified sales of oxytetracycline sufficient to treat 192,000 x 500kg cattle. It is unknown though how accurate the estimate of beef cattle usage is, or what sales volumes were achieved by minor registrants who were not interviewed. Allowing for the latter, the volume used may have been sufficient to treat approximately 250,000 cattle. This would be realistic in the context of feedback from veterinarians.

There is a problem reconciling the survey figures with those of the APVMA, however. The estimates of total usage of injectable therapeutics from the survey are approximately 75% higher than those of the APVMA report (combining data in the category of injectable therapeutics for cattle and sheep plus some proportion of the undifferentiated food animal category⁵). This is despite not all registrants being interviewed in the current survey.

Oxytetracycline has also been provided in feed as a therapeutic agent to treat respiratory conditions. Usage in this form is much lower than it used to be since the imposition, from January 2012, of a 90-day export slaughter interval (ESI) for oxytetracycline or chlortetracycline for beef to Russia⁶. The survey conducted for this project suggested that around 500,000 animals were treated with oxytetracycline in feed in 2011/12. It appears that very little in-feed oxytetracycline is used now.

Chlortetracycline has been available only as an in-feed therapeutic. For the reasons described above, it is likely that very little chlortetracycline is currently used in beef cattle.

Both oxytetracycline and chlortetracycline are rated as 'Highly Important Antimicrobials' (HIA) in the 2012 WHO AGISAR report, having been downgraded from 'Critically Important Antimicrobials' in the previous report. They do not meet the criterion of being used to treat zoonotic diseases⁷. The EAGAR in Australia rates oxytetracycline and chlortetracycline as being of low importance.

The relatively low use of oxytetracycline and chlortetracycline and the low likelihood of tetracycline resistance compromising public health indicate that this group do not present a significant risk for the beef industry.

⁵ These are averages for 2005/06, 2006/07, 2007/08 and 2009/10 – 2008/09 was omitted because one major registrant did not submit data

⁶ Safemeat, 'Important advice for livestock producers – Russian market eligibility: LPA NVD Requirements, Revised', 9 March 2012

⁷ The report recommends however that countries in which human brucellosis is a concern should consider rating the tetracyclines as 'CIA'. Brucellosis of cattle, caused by *Brucella abortus*, is not present in Australia. Most human brucellosis in Australia is associated with *Brucella suis*

Penicillins

Penicillin, in the short-acting procaine and long-acting benzathine plus procaine forms, is another of the three general purpose antibiotics used in beef cattle. As for oxytetracycline, the LA form is popular because of the advantage offered by a single dose. Procaine penicillin and benzathine + procaine penicillin are only used in the injectable form.

The usage of the penicillins in beef cattle is also very difficult to estimate because of their generic nature and the multiple, multi-species products available (8 SA, 6 LA). As for oxytetracycline, the registrant companies are unable to estimate the total market for penicillin across beef cattle or even across all species.

The survey figures indicate the treatment of around 500,000 head of cattle. This appears to be a reasonable estimate when checked against the responses of veterinarians and producers interviewed. However, as noted above, the estimate of total sales volume of injectable therapeutics implied by the current survey is substantially higher than that of the APVMA report. It may reflect a misjudgement by the registrants of the final destination of their products although it is not clear why the same estimate would not have been provided to APVMA.

Other products in this group include:

- Amoxicillin (+/- clavulanic acid): there appears to be some use of this antibiotic, with one significant feedlot reporting its use in approximately 10% of animals for respiratory disease. Its use was not reported anywhere else. Amoxicillin + clavulanic acid may have some minor use in calves.
- Ampicillin: all products containing this active are intramammary preparations, and therefore used only in dairy cattle.
- Cloxacillin: all products containing cloxacillin are either for intramammary (dairy only) or intraocular use. Total usage is very minor in beef cattle.
- Penethamate hydroiodide: at least one of the three registered products containing this active has been taken off the market. The other two are expected to have very minor if any use in beef cattle.

Procaine and benzathine penicillin, and amoxicillin, are all rated as CIA in the WHO report. However, they are not among the products prioritised within the CIA list. The Australian EAGAR rates them as being of low importance. The 'critical importance' rating by the WHO is based upon the use of penicillin in the treatment of syphilis. As syphilis is not present in cattle and infection of humans by syphilis is not foodborne it is appropriate to follow the EAGAR classification as low importance in this context.

Sulphonamides

The potentiated sulphonamides (trimethoprim + sulpha combinations) make up the third of the general-purpose antimicrobial products used in beef cattle. The trim / sulpha group product that is used most widely in cattle contains 480mg active / ml.

Unfortunately, the survey did not provide an estimate of sales volumes of these products at registrant level. Data from the producers and veterinarians interviewed suggest that a significant component of usage is in calves. The level of usage across beef cattle probably lies somewhere in the range 0-0.25%.

Sulphadimidine and sulphadiazine are rated by WHO as HIA (sulphadoxine is not rated though it is likely to be also considered HIA), as is trimethoprim. All three of

these sulpha drugs are rated as being of low importance by the EAGAR although trimethoprim is rated as medium.

Macrolides

The macrolide group includes erythromycin, oleandomycin, tilmicosin, tulathromycin and tylosin. Oleandomycin is available only in one intramammary preparation.

Erythromycin appears to have some use as an injectable in beef cattle, but it is a minor antibiotic. It was used on approximately 3% of cattle in one feedlot for respiratory disease but little other use was noted.

Tylosin also appears to have only a minor role as an injectable therapeutic, being used for example for non-responsive interdigital dermatitis. It is used more widely as an in-feed treatment. The registrants interviewed for this project estimated sales of tylosin into beef in 2011/12 consistent with the treatment of 70,000 x 500kg animals. Total sales by all registrants may have been slightly higher than this.

The two major products in this group are tilmicosin and tulathromycin. Both are single-dose products with high efficacy against bovine respiratory disease which makes them very attractive to feedlots in particular (there is some minor use in grass-fed cattle, but no more than 1-2% of total sales). The survey demonstrated that tulathromycin now dominates its older rival by a considerable margin. The total volume of both these long-acting macrolides was sufficient to treat 210,750 cattle of 500kg bodyweight. Based on a turnoff of 2.5m grain-fed cattle in 2011/12 these figures represent a treatment rate of 8.4%.

The macrolides are placed in the highest priority class of CIA by WHO (WHO 2012). The concern of the WHO leading to this categorisation was the transmission of *Campylobacter* and *Salmonella* from livestock to humans. In Australia, the EAGAR rates the macrolides as being of low importance. The EAGAR rating is the more relevant to the use of macrolides in Australian cattle because *Campylobacter* infections of humans are principally associated with consumption of chicken and not beef. The WHO report does not differentiate between animal species and, in the case of *Campylobacter*, animal species is of great importance. Even in higher risk poultry, recent surveys of the antimicrobial resistance status of isolates of *Campylobacter* spp obtained from fresh poultry at the retail level found only low levels of macrolide resistance (Barlow and Gobius 2008).

Furthermore, available data suggests that neither erythromycin nor tylosin is active against *Salmonella* and therefore would not be considered for human use.

Aminoglycosides

The aminoglycosides are a minor group of antimicrobials in beef cattle medicine. Apramycin, dihydrostreptomycin and streptomycin are found only in calf scour treatments, while framycetin is found only in two eye and ear ointments.

Neomycin is used mainly to treat bacterial scours but probably in other species more than cattle. There is one procaine penicillin/neomycin combination injectable. The registrant of this product estimated sales sufficient to treat 6,300 head x 500kg cattle.

The aminoglycosides make up one of the groups identified as a priority within the AGISAR list of CIA antimicrobials. The EAGAR rates neomycin, framycetin and streptomycin as being of low importance.

Cephalosporins

There are four actives in this group. Cefuroxime, cephalonium and cephapirin are lower-generation cephalosporins with minor use, being found mainly in intramammary preparations as well as one intraocular and one intrauterine treatment.

Ceftiofur is a significant injectable product. There are five ready-to-use solutions of ceftiofur, one powder and one long-acting product on the market. Ceftiofur has a nil milk withholding period and so has a significant use in dairy cattle. The survey estimated sales of ceftiofur for beef cattle sufficient to treat approximately 27,000 adults (approximately 1% of feedlot cattle). The real figure may be 25-50% higher as not all registrants were interviewed.

Ceftiofur is a third generation cephalosporin and a member of one of the groups identified as of highest priority within the WHO list of CIA antimicrobials. The EAGAR does not provide a rating for ceftiofur specifically, but it is a third-generation cephalosporin, and EAGAR rates this group as being of high importance for their role in treating severe pneumonia and meningitis in humans.

For this reason, use of ceftiofur may represent a vulnerable point for the beef industry. It was noted in the survey that, in at least one feedlot, the product is used off-label, with two double doses being given two days apart.

Ionophores and glycopospholipids

The actives in this group are lasalocid, monensin, narasin, salinomycin and flavophospholipol. All are provided as feed additives. Monensin is also available in an intraruminal capsule.

Data from the registrants and other interviewees indicates that lasalocid and salinomycin have negligible if any use in beef cattle. Narasin is also a relatively minor product. A quantity of narasin sufficient to treat approximately 91,500 head of cattle was sold during the period. An estimate of the volume of flavophospholipol sold during the period could not be obtained but it too is thought to be a relatively minor product in beef cattle.

Monensin is clearly the dominant ionophore, accounting for around 96% of the sales quantified by the survey, although the true figure could be a few percentage points either side of this estimate. The registrants who responded to the survey identified sales sufficient to treat around 2.7m cattle.

Some monensin is provided to grass-fed beef – for example, in weaner mixes used in northern systems. The amount of monensin used in these applications is difficult to estimate from the survey.

Again, there are inconsistencies between the current survey and that of the APVMA. Ionophores and glycopospholipids for beef cattle appear primarily in the APVMA's category of 'growth promotants / coccidiostats' sold into the sheep and cattle industry, which will include dairy usage, with minor components of beef cattle usage also within the categories of food animals generally and 'therapeutic and growth promotants / coccidiostats' sold into food animals. Even taking these into account, the APVMA figures seem to be short of the survey estimate by up to a factor of two. The reasons for this are unknown.

In summary, it appears that a very high proportion of feedlot cattle (probably 90%-plus) received an ionophore in the feed during 2011/12 and monensin was overwhelmingly the dominant product used. Some unknown proportion of extensively grazed cattle is also receiving monensin via blocks, mixes and even pellets.

While ionophores and glycopospholipids are classified as antimicrobial agents they have no human counterpart, they are not known to select resistances of public health significance and consequently they do not appear in the WHO AGISAR or EAGAR ratings.

Streptogramins

There is one product in this category: the feed additive virginiamycin. Total sales of virginiamycin during 2011/12, were sufficient to treat 165,000 animals (approximately 6.6% of grain fed cattle turned off during the period).

Virginiamycin is rated as HIA by the WHO AGISAR. It is not specifically listed by the EAGAR but another streptogramin active (quinupristin plus dalfopristin) is rated as of high importance. There has been considerable regulatory interest in virginiamycin. It was the subject of a recommendation by the JETACAR to be reviewed and a review was subsequently undertaken by APVMA. Following the JETACAR recommendations and the review by APVMA, virginiamycin was included in Schedule 4 (prescription only) and labelled with a prudent use restraint. The human medical importance of the streptogramins (in which virginiamycin is the only veterinary representative) was reduced by WHO (2012) due to the availability of other antimicrobial agents with improved efficacy and safety. Streptogramins have little or no medical use in Australia and it would be appropriate for the Australian importance ratings to be reduced when the EAGAR list is reviewed.

Others

A number of other molecules are registered as antimicrobials for use in cattle. They play minor roles. Two topical products contain the polypeptide bacitracin zinc. The phenicol florfenicol is marketed in one long-acting injectable product. Volume of product sufficient to treat 1,100 animals was sold in 2011/12. Florfenicol is rated HIA by the WHO and of low importance by the EAGAR.

7. Discussion/conclusion

The findings of this project, relating usage of antimicrobials in beef cattle and relationship to human health risk, are summarised in Table 10. The table shows the EAGAR ratings which, as described above, are the appropriate benchmark for level of concern over potential development of antimicrobial resistance.

Table 10. Summary of project findings

Active	500kg animals treated (est)	EAGAR rating
Tetracyclines		
Oxytetracycline	250,000 (inj)	Low
Chlortetracycline	Negligible	Low
Penicillins		
Benzathine penicillin	500,000	Low
Procaine penicillin		Low
Amoxycillin +/-clavulanic acid	Minor	Low
Ampicillin	Nil beef	Low
Cloxacillin	Eye only	Medium
Penethamate hydroiodide	Minor if any	Low
Sulphonamides		
Sulfadiazine +/- trimethoprim	Minor in adults	Low
Sulfadimidine +/- trimethoprim		Low
Sulfadoxine +/- trimethoprim		Low
Macrolides		
Erythromycin	Minor	Low
Oleandomycin	Nil beef	Low
Tilmicosin	210,750	Low
Tulathromycin		Low
Tylosin	70,000	Low

Active	500kg animals treated (est)	EAGAR rating
Aminoglycosides		
Apramycin	Only in calf scour treatments	Low
Dihydrostreptomycin		Low
Streptomycin		Low
Framycetin	Eye and ear only	Low
Neomycin	6,300	Low
Cephalosporins		
Cefuroxime	Mammary, uterus, eye only	Medium
Cephalonium		Medium
Cephapirin		Medium
Ceftiofur	27,000	High
Ionophores / glycopospholipids		
Lasalocid sodium	Negligible	Not rated (no counterpart for human use)
Monensin	2.7m	
Narasin	91,500	
Salinomycin sodium	Negligible	
Flavophospholipol	Minor	
Streptogramins		
Virginiamycin	165,000	High
Others		
Bacitracin zinc	Topical only	Low
Florfenicol	1,100	Low

This study provides the most accurate estimates to date of the volumes and patterns of use of antimicrobial agents in beef cattle in Australia. That said, these estimates in some cases carry wide margins of error because of the great difficulty in allocating usage between species and between beef and dairy cattle in products carrying multi-species registration. The major problems in this regard are the injectable antibiotics oxytetracycline and penicillin, and also the ionophores such as monensin, although usage of the latter can be estimated with some accuracy by adopting various approaches. The usage of other products such as the macrolides can be identified with considerable accuracy.

The soon-to-be-released report by APVMA on antimicrobial usage in all species may assist in tightening up the estimates of this study.

Notwithstanding the limitations of the present study, it has found no evidence of an imminent threat to public health from antimicrobial usage in beef cattle. The largest single antimicrobial group in use by volume, the ionophores, has no human counterpart. The most widely used injectables, oxytetracycline, penicillin and the macrolides, are not of significant concern in the literature on microbial resistance. However, there are two potential vulnerabilities for the industry:

1. Virginiamycin. This is a perceived, rather than real, vulnerability, as the WHO has recently reduced the risk rating on this agent. This fact and the reasons behind it are not yet well known or understood in Australia. Following a review

of virginiamycin by APVMA livestock products are in Schedule 4 (prescription animal remedies) and carry a label statement for prudent use.

2. Third-generation cephalosporins (ceftiofur). This vulnerability can be managed by evidence of appropriate use, with independent verification combined with monitoring of usage and presence of antimicrobial resistance. There are several alternatives to ceftiofur for the treatment of BRD and these alternatives currently hold much greater market share. Two of the seven ceftiofur-containing products (EXCENEL RTU ANTIBIOTIC SUSPENSION FOR INJECTION and EXCEDE STERILE SUSPENSION) carry the following label statement: "Prudent Use: Indiscriminate use of ceftiofur can contribute to the development of antibiotic resistance. Culture and sensitivity test should be performed when appropriate to determine the susceptibility of the causative organism(s). Empirical therapy may be instituted before results of susceptibility studies are known; however, once these results become available, the antibiotic treatment should be adjusted accordingly."

To manage these and possible future vulnerabilities, the beef industry needs to be able to demonstrate objectively that antimicrobial use is appropriate and judicious and that measures are put in place to ensure preventative management is emphasised. A system by which usage can be accurately quantified and monitored on a periodic basis accurately would have considerable benefit not only for the management of public perception, but also to allow individual prescribers to benchmark their usage patterns against other industry practice and adopt a process of continuous improvement.

This study was limited by the disconnection between participants in the antimicrobial supply chain from registrant to administrator. All participants are needed to understand the final picture, depending on the product. For example, registrant data is vital and of particular value in defined-use products such as the macrolides, while veterinary advice is critical to understanding the reasons for prescribing drugs and in particular to understand the usage volumes and patterns of older and generic multi-species products such as oxytetracycline and penicillin.

Unfortunately, considerations of commercial-in-confidence constrained the present study, particularly in respect to the small number of highly influential feedlot veterinarians. Accurate data on feedlots, where antibiotic usage per head is highest, will always be difficult to obtain in the absence of input from this group.

This report recommends that:

1. Antimicrobial use in the cattle industry should be consistent with the Australian Veterinary Association's (AVA's) 'Code of Practice for Prescription and Use of Products which contain Antimicrobial Agents' and based on principles of prudent and appropriate use.
2. MLA, CCA and ALFA should maintain a watching brief on the situation with respect to virginiamycin in Australia, and be prepared to argue that its use in cattle does not constitute a risk to human health, for reasons outlined in this report.
3. Registered third-generation cephalosporins such as ceftiofur should also be used according to labelled directions, the AVA Code of Practice and the results of any risk assessments and risk management plans that result from and are guided by monitoring and surveillance of antimicrobial use and

resistance. All ceftiofur products should contain a 'prudent use' statement on the label.

4. Consideration should be given to targeted monitoring of extended-spectrum beta lactamase (ESBL) resistance on properties using third-generation cephalosporins.
5. MLA, ALFA and CCA should conduct a similar project to this one on a two- or three-yearly basis.
6. MLA, ALFA and CCA should approach the registrants of cattle antimicrobial products, possibly through Animal Health Alliance, to develop an MOU under which these companies provide estimates of antimicrobial sales volumes into the beef industry for the periodic review described in (5). This process would be facilitated by a third party. The MOU would prescribe agreed levels of confidentiality and reporting back to the participants.
7. MLA and ALFA should approach the four or five most influential feedlot veterinarians to canvass options for the collection of data on antimicrobial usage and indications in feedlots, also for input to (5). MLA and ALFA will need to consider incentives, including recompensing the veterinarians for this service and, above all, propose ways to protect the confidentiality of information provided.
8. In parallel with (5) and (6), MLA and ALFA should examine ways in which records of antimicrobial usage kept by accredited feedlots under the National Feedlot Accreditation Scheme may be accessed for the process described in (5). Feedlot operators were generally very cooperative in the present study and it is likely they would be supportive of such an initiative.

Appendices

7.1 Appendix 1: Products approved by APVMA for use in cattle (October 2013)

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
1	4994 3	ANTIBIOTIC & RELATED	SD333 SULFADIMIDINE SOLUTION	AGVANTAGE PTY LTD	SULFADIMIDINE SODIUM	4	For the treatment of bacterial and coccidial infection, including footrot, bacterial calf scours, pneumonia and navel infections, in cattle	SC, oral	14d	6d	
2	5409 1	ANTIBIOTIC & RELATED	AAH NEOMYCIN SULPHATE FEED ADDITIVE POWDER	ALLIED ANIMAL HEALTH PTY LTD	NEOMYCIN BASE (AS THE SULFATE)	4	For the treatment of bacterial scours caused by organisms sensitive to neomycin, including neomycin sensitive strains of E coli, Salmonella spp, Pseudomonas spp, and Proteus spp. In poultry, pigs and cattle.	Feed	30d	0	
3	5935 2	ANTIBIOTIC & RELATED	AAH OXYTETRACYCLINE HYDROCHLORIDE ORAL POWDER	ALLIED ANIMAL HEALTH PTY LTD	OXYTETRACYCLINE HYDROCHLORIDE	4	For therapeutic and prophylactic use in poultry, pigs, calves and cattle against organisms sensitive to oxytetracycline.	Feed	7d	72h	
4	3563 9	DERMATOLOGICAL PREPS.	FRAMIXIN EAR & EYE OINTMENT ANTIBIOTIC	APEX LABORATORIES PTY LTD	BACITRACIN ZINC / FRAMYCETIN SULFATE / POLYMYXIN B SULFATE	4	For bacterial infections of the eye or ear in dogs, cats, horses, cattle and sheep.	Topic al	28d	7d	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
5	3564 0	ALIMENTARY SYSTEM	GASTROZINE A TRIMETHOPRIM SULFONAMIDE MIXTURE WITH ELECTROLYTES FOR ORAL USE	APEX LABORATORIES PTY LTD	SULFADIAZINE / TRIMETHOPRIM / BISMUTH SUBCARBONATE / CALCIUM CHLORIDE / GLYCINE / HYOSCINE METHOBROMIDE / KAOLIN LIGHT / LYSINE-L / MAGNESIUM SULFATE / METHIONINE-DL / PECTIN / POTASSIUM CHLORIDE / SODIUM ACETATE / VITAMIN B1 HYDROCHLORIDE = THIAMINE HYDROCHLORIDE / VITAMIN B2 = RIBOFLAVIN	4	For the treatment of bacterial infections of the gastrointestinal tract in horses, foals, cattle, calves, and dogs due to organisms susceptible to Trimethoprim and Sulfadiazine.	Oral	14d	DNU	
6	3569 2	MUSCULOSKELETA L SYSTEM	FRAMIXIN H EAR & EYE OINTMENT ANTIBIOTIC-ANTI INFLAMMATORY	APEX LABORATORIES PTY LTD	BACITRACIN ZINC / FRAMYGETIN SULFATE / HYDROCORTISONE ACETATE / POLYMYXIN B SULFATE	4	For bacterial infections requiring anti-inflammatory treatment of the eye or ear in dogs, cats, horses, cattle and sheep.	Topic al	28d	7d	
7	3569 4	ANTIBIOTIC+GENIT OURINARY	TRIMAZINE BOLUS A SULPHONAMIDE TRIMETHOPRIM PREPARATION	APEX LABORATORIES PTY LTD	SULFADIAZINE / TRIMETHOPRIM	4	Systemic treatment of susceptible gram-pos. and gram-neg. bacterial infections due to Trimethoprim and Sulfadiazine sensitive micro-organisms in foals and calves. For prevention/treatment of postparturient bacterial infections in mares, cows, sows & ewes.	Oral, IU,V	14d	DNU	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
8	4194 3	ANTIBIOTIC & RELATED	TETRACIN 10 SOLUBLE POWDER	ARGICON PTY LTD T/A AGRICON PRODUCTS	OXYTETRACYCLINE HYDROCHLORIDE	4	A broad spectrum antibiotic for oral administration to pigs, poultry, honey bees, sheep and calves. For the treatment and control of bacterial infections caused by organisms sensitive to oxytetracycline.	Feed, Milk	5d	DNU	
9	4233 6	ANTIBIOTIC & RELATED	TRIMETSULPHA (WATER SOLUBLE)	ARGICON PTY LTD T/A AGRICON PRODUCTS	SULFADIAZINE / TRIMETHOPRIM	4	For the treatment of infections in poultry, pigs, cattle and calves due to organisms susceptible to Trimethoprim and Sulphadiazine.	Wate r	15d	DNU	
10	4233 8	ANTIBIOTIC & RELATED	TETRACIN 200	ARGICON PTY LTD T/A AGRICON PRODUCTS	OXYTETRACYCLINE HYDROCHLORIDE	4	A broad spectrum antibiotic for addition to the feed for the treatment and prevention of diseases associated with oxytetracycline sensitive micro organisms.	Feed	5d	60h	
11	4233 9	PARASITICIDES	TETRACIN 100 SOLUBLE POWDER	ARGICON PTY LTD T/A AGRICON PRODUCTS	OXYTETRACYCLINE HYDROCHLORIDE	4	A broad spectrum antibiotic for oral administration to pigs, poultry, honey bees, sheep and calves. For the treatment and control of bacterial infections caused by organisms sensitive to oxytetracycline.	Oral, water	5	DNU	
12	4741 8	DERMATOLOGICAL PREPS.	TRIPRIM ANTIBACTERIAL INJECTION	AUSRICHTER PTY LTD	SULFADIMIDINE / TRIMETHOPRIM	4	For the treatment of bacterial infections caused by bacteria sensitive to trimethoprim and sulfadimidine in horses, cattle, sheep, pigs, dogs and cats.	IM, IV	15d	72h	
13	3597 4	ANTIBIOTIC & RELATED	GALLIMYCIN 200 INJECTABLE ANTIBIOTIC FOR LARGE ANIMALS	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	ERYTHROMYCIN	4	Recommended for diseases in cattle, pigs, sheep and lambs when caused by microorganisms that are sensitive to erythromycin	IM	14d	72h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
14	3598 8	ANTIBIOTIC & RELATED	TETRAVET 100 SOLUBLE ANTIBIOTIC POWDER	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	OXYTETRACYCLINE HYDROCHLORIDE	4	CALVES: For bacterial enteritis, salmonellosis, calf diphtheria (Fusobacterium necrophorum), pasteurellosis, bacterial pneumonia, medicate the drinking water, milk, feed or give as a drench at the rate of 2.5g to 5.0g per 50 kg bodyweight per head per day until 24 hours after symptoms have disappeared	Oral	5d	(DNU)	
15	3600 8	ANTIBIOTIC & RELATED	BOMACILLIN LA PENICILLIN INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	BENZATHINE PENICILLIN / PROCAINE PENICILLIN	4	For the systemic treatment and control of infections caused by penicillin sensitive organisms in horses, cattle, sheep, dogs and cats.	IM	30d	13d	
16	3601 7	ANTIBIOTIC & RELATED	TETRAVET 200 LA LONG ACTING ANTIBIOTIC INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	OXYTETRACYCLINE DIHYDRATE	4	For the systemic treatment and control of infections caused by oxytetracycline sensitive organisms in cattle, pigs & sheep	IM	42d	7d	
17	3602 3	ANTIBIOTIC & RELATED	BOMACILLIN PENICILLIN INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	PROCAINE PENICILLIN	4	For the systemic treatment and control of infections caused by penicillin sensitive organisms in horses, cattle, sheep, dogs and cats.	IM	5d	36h/7 2h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
18	3602 6	ALIMENTARY SYSTEM	SCOURBAN ORAL ANTI-DIARRHOEAL SUSPENSION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	CALCIUM AS CALCIUM GLUCONATE / HYOSCINE AS HYOSCINE HYDROBROMIDE / MAGNESIUM AS MAGNESIUM SULFATE / NEOMYCIN SULFATE / PECTIN / POTASSIUM AS POTASSIUM CHLORIDE / SODIUM AS SODIUM CHLORIDE / STREPTOMYCIN AS STREPTOMYCIN SULFATE / SULFADIAZINE / SULFADIMIDINE	4	An aid in the prevention and treatment of bacterial diarrhoea in horses, calves, dogs and cats.	Oral	14d	DNU	
19	4061 5	ANTIBIOTIC & RELATED	DOPHARMA OXYJECT OXYTETRACYCLINE INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	OXYTETRACYCLINE HYDROCHLORIDE	4	For the treatment of infections susceptible to oxytetracycline in cattle sheep, and pigs.	IM	21d	7d	
20	4061 9	ANTIBIOTIC & RELATED	DOPHARMA PENJECT L.A. LONG ACTING PENICILLIN INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	BENZATHINE PENICILLIN / PROCAINE PENICILLIN	4	For the treatment of infections susceptible to penicillin in dogs, cats, horses, cattle, sheep where a prolonged therapeutic blood level is required.	IM	30d	15d	
21	4062 3	ANTIBIOTIC & RELATED	DOPHARMA PENJECT PENICILLIN INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	PROCAINE PENICILLIN	4	For the treatment of infections susceptible to penicillin in dogs, cats, horses, cattle, sheep and pigs.	IM	5d	36h/7 2h	
22	4101 4	ANTIBIOTIC & RELATED	DOPHARMA AMOXYJECT AMOXYCILLIN INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	AMOXYCILLIN TRIHYDRATE	4	For the treatment of infections susceptible to amoxicillin in cattle, sheep and pigs.	IM	14d	72h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
23	4658 4	ANTIBIOTIC & RELATED	TRIMETHOTAB 1200 ANTIBACTERIAL BOLUS	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	SULFADIAZINE / TRIMETHOPRIM	4	For the treatment of infections of the respiratory tract, urogenital tract and alimentary tract in calves and foals which are sensitive to sulphadiazine and trimethoprim.	Oral	14d	DNU	
24	5192 3	GENITOURINARY SYSTEM	TETRAVET FOAMING PESSARIES	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	OXYTETRACYCLINE HYDROCHLORIDE	4	As an aid in the postnatal treatment of infections, cleaning of the uterus, retained placenta and metritis of cattle, sheep, goats, pigs and horses.	IU	14d	36h	
25	5214 7	ANTIBIOTIC & RELATED	TETRAVET FLEXI- DOSE FLEXIBLE DOSE OXYTETRACYCLINE PVP INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	OXYTETRACYCLINE HYDROCHLORIDE	4	For the treatment of organisms sensitive to oxytetracycline in horses, cattle, sheep, pigs, dogs and cats.	IM	14d	72h	
26	5263 8	ANTIBIOTIC & RELATED	TETRAVET 10 INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	OXYTETRACYCLINE HYDROCHLORIDE	4	Broad spectrum antibiotic injection for use in cattle, sheep and pigs.	IM, IV	15d	60h	
27	5331 4	ANTIBIOTIC & RELATED	TETRAVET 980 SOLUBLE ANTIBIOTIC POWDER	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	OXYTETRACYCLINE HYDROCHLORIDE	4	Control and treatment of diseases caused by microorganisms sensitive to oxytetracycline in poultry, pigs, calves and cattle.	Feed	7d	72h	
28	5597 2	ANTIBIOTIC & RELATED	BOMACILLIN SA PENICILLIN INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	PROCAINE PENICILLIN	4	For the treatment of infections susceptible to penicillin in dogs, cats, horses, cattle, sheep and pigs.	IM	5d	36h/7 2h	
29	5616 4	ANTIBIOTIC & RELATED	TYLOPHARM 200 TYLOSIN INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	TYLOSIN	4	For treatment of organisms sensitive to tylosin in cattle and pigs	IM, IV	21d	72h	
30	5633 2	ANTIBIOTIC & RELATED	TETRAVET FLEXI- DOSE OXYTETRACYCLINE PVP INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	OXYTETRACYCLINE HYDROCHLORIDE	4	For treatment of organisms sensitive to oxytetracycline in horses, cattle, sheep, pigs, dogs and cats.	IM, IV	14d	72h	
31	5652 1	ANTIBIOTIC & RELATED	TYLOMIX 50 TYLOSIN TARTRATE PREMIX	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	TYLOSIN TARTRATE	5	For the reduction in incidence of liver abscess in cattle	Feed	0	0	
32	5698 1	ANTIBIOTIC & RELATED	BOMOX SA AMOXYCILLIN INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	AMOXYCILLIN TRIHYDRATE	4	For the treatment of infections susceptible to amoxicillin in cattle, sheep and pigs	IM	14d	72h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
33	5810 4	ANTIBIOTIC & RELATED	APRAPHARM SOLUBLE POWDER	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	APRAMYCIN AS APRAMYCIN SULFATE	4	For the treatment of infections caused by organisms sensitive to apramycin in pigs, calves and broilers.	Water	14d	DNU	
34	5867 1	ANTIBIOTIC & RELATED	NEOPHARM ANTIBIOTIC FEED ADDITIVE	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	NEOMYCIN BASE (AS THE SULFATE)	4	For the treatment of bacterial scours caused by organisms sensitive to neomycin, including neomycin sensitive strains of E coli, Salmonella spp, Pseudomonas spp, and Proteus spp. In poultry, pigs and cattle.	Feed	30d	0	
35	5919 3	ANTIBIOTIC & RELATED	PENETHAJECT ANTIBIOTIC INJECTION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	PENETHAMATE HYDRIODIDE	4	For the treatment of infections due to gram-positive bacteria that cause mastitis, uterine infections, respiratory infections, and footrot.	IM	5d	36h/7 2h	
36	5938 7	ANTIBIOTIC + NUTRITIONAL	SALMAX SALINOMYCIN PREMIX	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	SALINOMYCIN SODIUM	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
37	6124 9	ANTIBIOTIC & RELATED	CTC 200 GRANULAR FEED PREMIX	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	CHLORTETRACYCLI NE HYDROCHLORIDE AS CALCIUM COMPLEX	4	Feed supplement for prophylactic use when at risk from diseases and for therapeutic treatment of diseases caused by micro-organisms susceptible to chlortetracycline in calves, pigs and poultry.	Feed	5d/10d	DNU	
38	3761 7	NUTRITION & METABOLISM	AUROFAC D DISPERSIBLE ANTIBIOTIC FEED SUPPLEMENT	BEC FEED SOLUTIONS PTY LTD	CHLORTETRACYCLI NE HYDROCHLORIDE	4	For prevention of diseases in pigs and calves caused by bacteria sensitive to chlortetracycline	Feed	10	DNU	
39	4032 3	NUTRITION & METABOLISM	OTC 200 FOR FEED MEDICATION	BEC FEED SOLUTIONS PTY LTD	OXYTETRACYCLINE AS OXYTETRACYCLINE HYDROCHLORIDE	4	For use as an aid in the treatment and control of oxytetracycline-sensitive diseases in cattle, pigs and poultry.	Feed	5d	72h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
40	4714 6	ANTIBIOTIC & RELATED	BIMOXYL LA A LONG ACTING AMOXYCILLIN INJECTABLE SUSPENSION	BIMEDA (AUSTRALIA) PTY LIMITED	AMOXYCILLIN TRIHYDRATE	4	For the treatment and control of bacterial infections in cattle, sheep, pigs, dogs and cats caused by or associated with organisms sensitive to amoxicillin.	IM	30d	72h	
41	5222 8	ANTIBIOTIC & RELATED	BILOSIN 200 TYLOSIN INJECTION	BIMEDA (AUSTRALIA) PTY LIMITED	TYLOSIN	4	For treatment of organisms sensitive to tylosin in cattle and pigs.	IM, IV	21d	72h	
42	5533 1	ANTIBIOTIC & RELATED	TYLOPHARM 200 INJECTION	BIMEDA (AUSTRALIA) PTY LIMITED	TYLOSIN	4	For treatment of organisms sensitive to tylosin in cattle and pigs	IM, IV	21d	72h	
43	5546 3	ANTIBIOTIC & RELATED	BOMOX LA LONG ACTING AMOXYCILLIN INJECTION	BIMEDA (AUSTRALIA) PTY LIMITED	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE	4	For the treatment of bacterial infections sensitive to amoxicillin in cattle, sheep, pigs, dogs and cats.	IM	30d	72h	
44	5648 7	ANTIBIOTIC & RELATED	TMPS 240 INJECTION	BIMEDA (AUSTRALIA) PTY LIMITED	SULFADOXINE / TRIMETHOPRIM	4	For the treatment and control of bacterial infections susceptible to sulfadoxine/trimethoprim combination in cattle, sheep, goats, pigs, dogs and horses.	IM	14d	36h, 72h	
45	5163 7	ANTIBIOTIC & RELATED	BIVATOP 200 LONG ACTING INJECTABLE	BOEHRINGER INGELHEIM PTY LIMITED, VETMEDICA DIVISION	OXYTETRACYCLINE DIHYDRATE	4	For the treatment of conditions caused by, or associated with, oxytetracycline-sensitive organisms and infections in cattle, sheep and pigs.	SC, IM	21d	7d	
46	5175 5	ANTIBIOTIC & RELATED	MAMYZIN ESTER OF BENZYL PENICILLIN FOR INTRAMUSCULAR INJECTION	BOEHRINGER INGELHEIM PTY LIMITED, VETMEDICA DIVISION	PENETHAMATE HYDRIODIDE	4	For the treatment of infections due to gram positive bacteria 'mastitis', uterine infections, respiratory infections, 'footrot'.	IM	5d	36h/7 2h	
47	6268 2	ANTIBIOTIC & RELATED	CALEFUR STERILE POWDER FOR INJECTION	CALEDONIAN HOLDINGS DISTRIBUTION PTY LTD	CEFTIOFUR AS CEFTIOFUR SODIUM	4	For the treatment of equine and bovine respiratory infections caused by organisms sensitive to ceftiofur.	IM	24h	0	
48	6028 3	ANTIBIOTIC + NUTRITIONAL	CCD TYLOSIN 100 (TYLOSIN PHOSPHATE) PREMIX	CCD ANIMAL HEALTH PTY LTD	TYLOSIN AS THE PHOSPHATE	4	For reduction in the incidence of liver abscess in cattle	Feed	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
49	3669 3	ANTIBIOTIC & RELATED	NEOJECT 200 ANTIBIOTIC INJECTION	CEVA ANIMAL HEALTH PTY LTD	NEOMYCIN SULFATE	4	For the treatment of infections caused by organisms susceptible to neomycin sulphate.	IM	30d	36h/7 2h	
50	5209 2	ANTIBIOTIC & RELATED	ACCENT POWDER FOR INJECTION	CTCBIO INC	CEFTIOFUR AS CEFTIOFUR SODIUM	4	For the treatment of respiratory tract infections in horses and cattle, and urinary tract infections in dogs.	IM	24h	0	
51	5223 1	NUTRITION & METABOLISM	SALINDOX 60 BMP MICROGRANULATE FEED ADDITIVE	DOX-AL AUSTRALIA PTY LTD	SALINOMYCIN SODIUM	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
52	5383 0	NUTRITION & METABOLISM	SALINDOX 120 BMP MICROGRANULATE FEED ADDITIVE	DOX-AL AUSTRALIA PTY LTD	SALINOMYCIN SODIUM (PRESENT AS THE SODIUM SALT)	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
53	5965 7	NUTRITION & METABOLISM	MONENDOX 200 BMP MICRO GRANULATE FEED ADDITIVE	DOX-AL AUSTRALIA PTY LTD	MONENSIN AS MONENSIN SODIUM	4	For improved efficiency and as an aid in the control of bloat in feedlot cattle and dairy cows. As an aid in the prevention of coccidiosis caused by Eimeria zuernii and Eimeria bovis in cattle. For increased rate of weight gain and feed efficiency in ..	Feed	0	0	
54	5970 3	NUTRITION & METABOLISM	MONENDOX 100 BMP MICRO GRANULATE FEED ADDITIVE	DOX-AL AUSTRALIA PTY LTD	MONENSIN AS MONENSIN SODIUM	6	For improved feed efficiency & as an aid in the control of bloat in feedlot cattle. As an aid in the prevention of coccidiosis in cattle, goats and poultry. For increased rate of weight gain & feed efficiency & improved reproductive performance in	Feed	0	0	
55	5990 8	ANTIBIOTIC & RELATED	TYLODOX 250	DOX-AL AUSTRALIA PTY LTD	TYLOSIN AS THE PHOSPHATE	4	Reduce incidence of liver abscess in cattle.	Feed	0	0	
56	6089 1	NUTRITION & METABOLISM	TYLODOX 50 BMP MICROGRANULATE FEED ADDITIVE	DOX-AL AUSTRALIA PTY LTD	TYLOSIN AS TYLOSIN PHOSPHATE	5	For reduction in the incidence of liver abscess in cattle.	Feed	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sched ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
57	6280 1	NUTRITION & METABOLISM	MONENDOX TECHNICAL	DOX-AL AUSTRALIA PTY LTD	MONENSIN AS MONENSIN SODIUM	4	Cattle:improved feed efficiency & weight gain; aid in control of bloat; increased milk production; aid in reducing severity of non-clinical ketosis; improved reproductive performance-heifers; aid prevention of coccidiosis. Goats: Aid prevention of coccidiosis	Feed	0	0	
58	6283 8	NUTRITION & METABOLISM	MONENDOX 400	DOX-AL AUSTRALIA PTY LTD	MONENSIN SODIUM	4	Aid in prevention of coccidiosis (cattle,goats,poultry[broilers, replacement layers]). Improved feed efficiency & aid in control of bloat (feedlot cattle). Increased weight gain & feed efficiency & improved reproductive performance in heifers. (See Label).	Feed	0	0	
59	6288 5	NUTRITION & METABOLISM	MONENDOX 100	DOX-AL AUSTRALIA PTY LTD	MONENSIN AS MONENSIN SODIUM	6	Cattle - improved feed efficiency. Aid in control of bloat; aid in prevention of coccidiosis. Increased rate of weight gain & feed efficiency in heifers, etc. Goats/Poultry (Broilers and replacement layers) - aid in prevention of coccidiosis.	Feed	0	0	
60	6288 8	NUTRITION & METABOLISM	TYLODOX 50	DOX-AL AUSTRALIA PTY LTD	TYLOSIN AS TYLOSIN PHOSPHATE	5	For reduction in the incidence of liver abscess in cattle.	Feed	0	0	
61	6465 7	ANTIBIOTIC & RELATED	TYLODOX 250 G MICROGRANULATE FEED ADDITIVE	DOX-AL AUSTRALIA PTY LTD	TYLOSIN AS TYLOSIN PHOSPHATE	4	Reduce incidence of liver abscess.	Feed	0	0	
62	6465 8	NUTRITION & METABOLISM	SALINDOX 120 G MICROGRANULATE FEED ADDITIVE	DOX-AL AUSTRALIA PTY LTD	SALINOMYCIN SODIUM (PRESENT AS THE SODIUM SALT)	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
63	6465 9	NUTRITION & METABOLISM	MONENDOX 200 G MICRO GRANULATE FEED ADDITIVE	DOX-AL AUSTRALIA PTY LTD	MONENSIN AS MONENSIN SODIUM	4	Aid in prevention of coccidiosis in Cattle, Goats, Poultry (Broilers and Replacement Layers). Cattle: Improve feed efficiency; aid in control of bloat; increased weight gain; improve reproductive performance in heifers; aid reducing non clinical ketosis.	Feed	0	0	
64	6466 0	ANTIBIOTIC & RELATED	CTC 200 G MICRO GRANULATE FEED ADDITIVE	DOX-AL AUSTRALIA PTY LTD	CHLORTETRACYCLI NE HYDROCHLORIDE AS CALCIUM COMPLEX	4	Feed supplement for prophylactic use when at risk from diseases and for the treatment of diseases caused by micro-organisms susceptible to chlortetracycline in calves, pigs and poultry.	Feed	5d/10d	DNU	
65	6466 4	NUTRITION & METABOLISM	MONENDOX 400 G	DOX-AL AUSTRALIA PTY LTD	MONENSIN AS MONENSIN SODIUM	4	Aid in prevention of coccidiosis (cattle,goats,poultry [broilers,replacement layers]). Improved feed efficiency & aid in control of bloat (feedlot cattle). Increased weight gain & feed efficiency & improved reproductive performance in heifers.	Feed	0	0	
66	3678 4	NUTRITION & METABOLISM	ELANCO AF0510 MONTEBAN 100 NARASIN PREMIX	ELANCO	NARASIN	6	For improved feed conversion efficiency in lotfed cattle	Feed	0	DNU	
67	3678 7	NUTRITION & METABOLISM	ELANCO AF1304 ELANCOBAN G MONENSIN SODIUM PREMIX	ELANCO	MONENSIN SODIUM	6	Feedlot cattle: improved feed efficiency, aid control of bloat. Pasture cattle: improved weight gain. Dairy cows: increased milk production, reducing severity of non clinical ketosis, aid control of bloat. Cattle: improved weight gain and feed efficiency.	Feed	0	0	
68	3679 0	ANTIBIOTIC + NUTRITIONAL	ELANCO AF 0091 TYLAN 100 TYLOSIN PHOSPHATE PREMIX	ELANCO	TYLOSIN AS THE PHOSPHATE	4	For reduction in the incidence of liver abscess in cattle	Feed	0	0	

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69	3679 1	NUTRITION & METABOLISM	ELANCO AF0050 TYLAN 50 TYLOSIN PHOSPHATE PREMIX	ELANCO	TYLOSIN AS THE PHOSPHATE	5	For the reduction in incidence of liver abscess in cattle.	Feed	0	0	
70	3679 6	ANTIBIOTIC & RELATED	ELANCO AH0206 TYLAN 200 TYLOSIN INJECTION 200MG/ML	ELANCO	TYLOSIN	4	For the treatment of tylosin susceptible bacterial and mycoplasma infections in cattle and pigs.	IM, IV	21d	72h	
71	3680 6	ANTIBIOTIC & RELATED	ELANCO AF0250 TYLAN 250 TYLOSIN PHOSPHATE PREMIX	ELANCO	TYLOSIN AS THE PHOSPHATE	4	For the reduction in incidence of liver abscess in cattle.	Feed	0	0	
72	4565 3	ANTIBIOTIC & RELATED	ELANCO AH0230 MICOTIL 300 INJECTION (TILMICOSIN)	ELANCO	TILMICOSIN	4	For use in lot-fed cattle for the treatment of Bovine Respiratory Disease (BRD) associated with Mannheimia (Pasteurella) haemolytica, Pasteurella multocida, and other organisms susceptible to tilmicosin.	SC	28d	DNU	
73	4688 5	NUTRITION & METABOLISM	ELANCO AF0342 RUMENSIN 200 MONENSIN SODIUM	ELANCO	MONENSIN AS MONENSIN SODIUM	4	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency in heifers. For improved reproductive performance in heifers. As an aid in the control of coccidiosis caused by Eimeria zuernii and Eimeria bovis. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of nonclinical ketosis in lactating dairy cows. As an aid in the control of bloat.	Feed	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sched ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
74	4735 9	NUTRITION & METABOLISM	ELANCO AF1404 RUMENSIN 100 MONENSIN SODIUM	ELANCO	MONENSIN AS MONENSIN SODIUM	6	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency in heifers. For improved reproductive performance in heifers. As an aid in the control of coccidiosis caused by Eimeria zuernii and Eimeria bovis. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of nonclinical ketosis in lactating dairy cows. As an aid in the control of bloat.	Feed	0	0	
75	5037 8	NUTRITION & METABOLISM	ELANCO AF0635 NARAVIN NARASIN PREMIX	ELANCO	NARASIN	6	For improved feed conversion efficiency in lot-fed cattle.	Feed	0	DNU	
76	5069 6	ALIMENTARY SYSTEM	ELANCO AF0168 RUMENSIN GRANULAR MONENSIN SODIUM	ELANCO	MONENSIN AS MONENSIN SODIUM	4	Feedlot cattle - for improved feed efficiency. Dairy cows - for increased milk production under many conditions. As an aid in reducing the severity of non-clinical ketosis in lactating dairy cows. Cattle, goats, sheep, chickens - prevention of coccidiosis.	Feed	0	0	
77	5466 9	ALIMENTARY SYSTEM	ELANCO AH0315 RUMENSIN CAPSULE	ELANCO	MONENSIN AS MONENSIN SODIUM	5	Controlled release capsule for bloat control, production improvement, and treatment and prevention of sub-clinical ketosis in beef and dairy cattle.	Oral	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
78	5572 5	ANTIBIOTIC + NUTRITIONAL	ELANCO AF0170 RUMENSIN TECHNICAL MONENSIN SODIUM	ELANCO	MONENSIN AS MONENSIN SODIUM	4	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency in heifers. For improved reproductive performance in heifers. As an aid in the control of coccidiosis caused by Eimeria zuernii and Eimeria bovis. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of nonclinical ketosis in lactating dairy cows. As an aid in the control of bloat.	Feed	0	0	
79	6145 2	ALIMENTARY SYSTEM	CCD MONENSIN 100 PREMIX	ELANCO	MONENSIN AS MONENSIN SODIUM	6	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of	Feed	0	0	
80	6152 5	ANTIBIOTIC & RELATED	ELANCO AF0248 TYLAN GRANULAR TYLOSIN PHOSPHATE	ELANCO	TYLOSIN AS THE PHOSPHATE	4	For the treatment & prevention of bacterial enteric disorders in pigs, cattle, broiler & replacement chickens.	Feed	0	0	
81	6163 7	NUTRITION & METABOLISM	ELANCO AF0252 NARASIN GRANULAR	ELANCO	NARASIN	6	For improved feed conversion efficiency in cattle.	Feed	0	DNU	
82	6236 4	ALIMENTARY SYSTEM	ELANCO AH0942 RUMENSIN CAPSULE	ELANCO	MONENSIN AS MONENSIN SODIUM	5	Controlled release capsule for bloat control, production improvement, and treatment and prevention of sub-clinical ketosis in beef and dairy cattle.	Oral	0	0	

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83	6286 8	NUTRITION & METABOLISM	ELANCO AH0328 COMPONENT S WITH TYLAN GROWTH AND FINISHING IMPLANTS FOR STEERS	ELANCO	TYLOSIN TARTRATE / OESTRADIOL BENZOATE / PROGESTERONE	4	Tylosin is included as a local antibacterial for reducing the incidence of abscess formation caused by tylosin sensitive organisms at the implant site.	Impla nt	0	DNU	
84	6287 3	NUTRITION & METABOLISM	ELANCO AH0973 COMPONENT TE-S WITH TYLAN GROWTH AND FINISHING IMPLANTS FOR STEERS	ELANCO	TYLOSIN TARTRATE / OESTRADIOL / TRENBOLONE ACETATE	4	Tylosin is included as a local antibacterial for reducing the incidence of abscess formation caused by tylosin sensitive organisms at the implant site.	Impla nt	0	DNU	
85	6329 9	NUTRITION & METABOLISM	ELANCO ELANCOBAN 100 MONENSIN SODIUM	ELANCO	MONENSIN AS MONENSIN SODIUM	6	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency in heifers. For improved reproductive performance in heifers. As an aid in the control of coccidiosis caused by Eimeria zuernii and Eimeria bovis. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of nonclinical ketosis in lactating dairy cows. As an aid in the control of bloat.	Feed	0	0	

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86	6330 1	NUTRITION & METABOLISM	ELANCO ELANCOBAN 200 MONENSIN SODIUM	ELANCO	MONENSIN AS MONENSIN SODIUM	4	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency in heifers. For improved reproductive performance in heifers. As an aid in the control of coccidiosis caused by Eimeria zuernii and Eimeria bovis. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of nonclinical ketosis in lactating dairy cows. As an aid in the control of bloat.	Feed	0	0	
87	5320 4	ANTIBIOTIC & RELATED	EXACT 100 OXYTETRACYCLINE HYDROCHLORIDE 100 MG/ML INJECTION	EUROVET ANIMAL HEALTH BV	OXYTETRACYCLINE HYDROCHLORIDE	4	For the treatment of infections caused by bacteria sensitive to oxytetracycline in cattle, sheep, pigs, horses, dogs and cats.	IM	14d	72h	
88	4745 1	NUTRITION & METABOLISM	SACOX 120 MICROGRANULATE	HUVEPHARMA AD	SALINOMYCIN SODIUM	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
89	5357 4	NUTRITION & METABOLISM	GAINPRO MICROFLORA MANAGEMENT SUPPLEMENT	HUVEPHARMA AD	FLAVOPHOSPHOLIP OL	4	For the growth promotion and improved feed conversion efficiency in cattle and calves.	Feed	0	0	
90	5917 9	NUTRITION & METABOLISM	FLAVO 40 MICROFLORA MANAGEMENT SUPPLEMENT	HUVEPHARMA AD	FLAVOPHOSPHOLIP OL	4	For growth promotion and improved feed conversion efficiency in poultry (broilers and turkeys), pigs, calves and cattle.	Feed	0	0	
91	6191 3	ANTIBIOTIC & RELATED	PHARMASIN 250 GRANULAR PREMIX	HUVEPHARMA AD	TYLOSIN AS THE PHOSPHATE	4	For the reduction in liver abscess in cattle	Feed	0	0	
92	6197 7	ANTIBIOTIC & RELATED	PHARMASIN 100 GRANULAR PREMIX	HUVEPHARMA AD	TYLOSIN AS THE PHOSPHATE	4	For the reduction in liver abscess in cattle	Feed	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
93	6223 2	NUTRITION & METABOLISM	COXIDIN 400 MONENSIN FEED ADDITIVE	HUVEPHARMA AD	MONENSIN AS MONENSIN SODIUM	4	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency in heifers. For improved reproductive performance in heifers. As an aid in the control of coccidiosis caused by Eimeria zuernii and Eimeria bovis. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of nonclinical ketosis in lactating dairy cows. As an aid in the control of bloat.	Feed	0	0	
94	3712 6	ANTIBIOTIC & RELATED	KEYMIX SULPHATRIM ORAL SULPHADIAZINE AND TRIMETHOPRIM MEDICATION	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	SULFADIAZINE / TRIMETHOPRIM	4	Treatment of bacterial infections due to sulfadiazine and trimethoprim sensitive organisms of chickens, turkeys, pigs, horses, cattle and sheep especially of the respiratory, urinary and alimentary tracts.	Wate r	14d	DNU	
95	3772 1	ANTIBIOTIC & RELATED	TRIMIDINE POWDER	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	SULFADIMIDINE / TRIMETHOPRIM	4	For the treatment of infections in horses, calves, pigs and poultry due to organisms susceptible to the combination of sulphadimidine and trimethoprim.	Oral	14d	DNU	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
96	5220 8	NUTRITION & METABOLISM	MONECO 200 GRANULAR FOR CATTLE, GOATS AND POULTRY	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	MONENSIN AS MONENSIN SODIUM	4	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency in heifers. For improved reproductive performance in heifers. As an aid in the control of coccidiosis caused by Eimeria zuernii and Eimeria bovis. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of nonclinical ketosis in lactating dairy cows. As an aid in the control of bloat.	Feed	0	0	
97	5221 1	ANTIBIOTIC & RELATED	OXY-ECO ORAL POWDER	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	OXYTETRACYCLINE HYDROCHLORIDE	4	Control and treatment of diseases caused by microorganisms sensitive to oxytetracycline in poultry, pigs, calves and cattle.	Feed	7d	72h	
98	5330 4	ANTIBIOTIC + NUTRITIONAL	SALECO 120 GRANULAR	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	SALINOMYCIN SODIUM	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
99	5375 2	NUTRITION & METABOLISM	TYLECO 250 GRANULAR	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	TYLOSIN AS THE PHOSPHATE	4	For reduction in the incidence of liver abscess of cattle.	Feed	0	0	
100	5418 6	ANTIBIOTIC & RELATED	OXY-ECO BASE	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	OXYTETRACYCLINE AS THE DIHYDRATE	4	Treatment and control of respiratory and enteric bacterial infections sensitive to oxytetracycline in poultry, pigs, calves and cattle.	Feed	7d	72h	
101	5423 2	NUTRITION & METABOLISM	FLAVECO 40 FEED SUPPLEMENT	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	FLAVOPHOSPHOLIP OL	4	For improvement of productivity by stimulating the growth rate and increasing feed conversion efficacy in poultry (broilers & turkeys), pigs, calves and cattle; and increasing egg production in laying hens.	Feed	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
102	5457 3	NUTRITION & METABOLISM	TYLECO 50 GRANULAR	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	TYLOSIN AS TYLOSIN PHOSPHATE	5	For reduction in the incidence of liver abscess in cattle.	Feed	0	0	
103	5457 4	NUTRITION & METABOLISM	FLAVECO 5 FEED SUPPLEMENT	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	FLAVOPHOSPHOLIP OL	6	For nutritional use as a feed supplement in animals.	Feed	0	0	
104	5559 6	NUTRITION & METABOLISM	MONECO 100 GRANULAR FOR CATTLE, GOATS AND POULTRY	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	MONENSIN AS MONENSIN SODIUM	6	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency in heifers. For improved reproductive performance in heifers. As an aid in the control of coccidiosis caused by Eimeria zuernii and Eimeria bovis. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of nonclinical ketosis in lactating dairy cows. As an aid in the control of bloat.	Feed	0	0	
105	6085 6	NUTRITION & METABOLISM	CTC-ECO 200 GRANULAR	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	CHLORTETRACYCLI NE HYDROCHLORIDE AS CALCIUM COMPLEX	4	Feed supplement for prophylactic use when at risk from diseases and for the treatment of diseases caused by micro-organisms susceptible to chlortetracycline in calves, pigs and poultry.	Feed	5d/10d	DNU	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sched ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
106	6406 9	NUTRITION & METABOLISM	MONECO TECHNICAL FOR CATTLE, DAIRY COWS, GOATS AND POULTRY	INTERNATIONAL ANIMAL HEALTH PRODUCTS PTY LTD	MONENSIN AS MONENSIN SODIUM	4	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency in heifers. For improved reproductive performance in heifers. As an aid in the control of coccidiosis caused by Eimeria zuernii and Eimeria bovis. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of nonclinical ketosis in lactating dairy cows. As an aid in the control of bloat.	Feed	0	0	
107	3612 0	ANTIBIOTIC & RELATED	TRIBRISSEN INJECTION-480	INTERVET AUSTRALIA PTY LIMITED	SULFADIAZINE / TRIMETHOPRIM	4	For the treatment of infections caused by organisms sensitive to trimethoprim and sulfadiazine.	IM	28d	72h	
108	3620 6	ANTIBIOTIC & RELATED	VR TRIBACTRAL DUALS ANTIBACTERIAL PESSARY/BOLUS	INTERVET AUSTRALIA PTY LIMITED	SULFADIAZINE / TRIMETHOPRIM	4	For the treatment of infections in cattle, sheep, horses and pigs caused by organisms sensitive to trimethoprim and sulfadiazine.	Oral, IU,V	14d	DNU	
109	3630 8	ANTIBIOTIC & RELATED	TRIVETRIN INJECTION	INTERVET AUSTRALIA PTY LIMITED	SULFADOXINE / TRIMETHOPRIM	4	For the treatment of infections caused by organisms sensitive to trimethoprim and sulfadoxine in cattle, sheep, pigs, horses, cats and dogs.	IM	14d	36h, 3d	
110	3724 1	ANTIBIOTIC & RELATED	NEOMYCIN PENICILLIN 100/200 AQUEOUS SUSPENSION FOR INTRAMUSCULAR INJECTION	INTERVET AUSTRALIA PTY LIMITED	NEOMYCIN BASE (AS THE SULFATE) / PROCAINE PENICILLIN	4	For infections caused by penicillin-neomycin sensitive micro-organisms in horses, cattle, sheep, pigs, dogs and cats.	IM	35d	36h/7 2h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
111	3725 6	ANTIBIOTIC & RELATED	COOPERS ENGEMYCIN 100 OXYTETRACYCLINE HYDROCHLORIDE 100MG/ML INJECTION	INTERVET AUSTRALIA PTY LIMITED	OXYTETRACYCLINE HYDROCHLORIDE	4	For treatment of organisms sensitive to oxytetracycline in horses, cattle, sheep, pigs, dogs and cats.	IM	14d	72h	
112	3725 8	ANTIBIOTIC & RELATED	DEPOCILLIN PROCAINE PENICILLIN 300MG/ML INJECTION	INTERVET AUSTRALIA PTY LIMITED	PROCAINE PENICILLIN	4	As an aid in the treatment of infections caused by penicillin-sensitive organisms in horses, cattle, sheep, pigs, dogs and cats	IM, SC	5d	36h/7 2h	
113	3726 6	ANTIBIOTIC & RELATED	DUPLOCILLIN PROCAINE AND BENZATHINE PENICILLIN INJECTION	INTERVET AUSTRALIA PTY LIMITED	BENZATHINE PENICILLIN / PROCAINE PENICILLIN	4	An aid in the treatment of infections caused by penicillin-sensitive organisms in horses, cattle, sheep, pigs, dogs and cats.	IM, SC	30d	13d	
114	4709 1	ANTIBIOTIC+GENIT OURINARY	METRICURE BENZATHINE CEPHAPIRIN INTRA- UTERINE SUSPENSION	INTERVET AUSTRALIA PTY LIMITED	CEPHAPIRIN	4	Suspension for the intra-uterine treatment of metritis in herds where it is present at a high prevalence ($\geq 10\%$) and where an increase in early pregnancies (by 28 days after mating) is required.	IU	2d	0	2
115	4803 2	ANTIBIOTIC & RELATED	TRIBACTRAL ANTIBACTERIAL SUSPENSION INJECTION	INTERVET AUSTRALIA PTY LIMITED	SULFADIAZINE / TRIMETHOPRIM	4	For the treatment of infections caused by organisms sensitive to trimethoprim and sulfadiazine in cattle, sheep, pigs and horses	IM, IV	28d	72h	
116	4888 9	OPHTHALMIC PREPARATIONS	COOPERS CEPRAVIN EYE OINTMENT ANTIBIOTIC	INTERVET AUSTRALIA PTY LIMITED	CEPHALONIUM DIHYDRATE	4	For the treatment of cephalonium-sensitive bacterial ocular infections in cattle and dogs.	Eye	0	0	
117	5220 1	ANTIBIOTIC & RELATED	NUFLOR LA INJECTABLE SOLUTION	INTERVET AUSTRALIA PTY LIMITED	FLORFENICOL	4	For the treatment of bacterial infections in cattle and pigs susceptible to florfenicol.	IM, SC	42d	DNU	42
118	5373 3	ANTIBIOTIC & RELATED	TRIBACTRAL S ANTIBACTERIAL SOLUTION FOR INJECTION	INTERVET AUSTRALIA PTY LIMITED	SULFADOXINE / TRIMETHOPRIM	4	For the treatment of infections caused by organisms sensitive to trimethoprim and sulfadoxine in cattle, sheep, pigs, horses, cats and dogs.	IM	14d	36h, 72h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sched ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
119	6246 7	ANTIBIOTIC & RELATED	RESFLOR INJECTABLE SOLUTION	INTERVET AUSTRALIA PTY LIMITED	FLORFENICOL / FLUNIXIN AS FLUNIXIN MEGLUMINE	4	For the treatment of respiratory infections caused by Mannheimia haemolytica, Pasteurella multocida and Histophilus somni associated with pyrexia in non-breeding, beef cattle.	SC	49d	DNU	
120	6317 7	OPHTHALMIC PREPARATIONS	COOPERS PINKEYE OINTMENT	INTERVET AUSTRALIA PTY LIMITED	CLOXACILLIN AS THE BENZATHINE SALT	4	For the treatment of bovine keratoconjunctivitis caused by cloxacillin-susceptible bacteria including Moraxella bovis. Also for the treatment of bacterial keratoconjunctivitis caused by cloxacillin-susceptible bacteria in sheep, horses, dogs and cats.	Eye	0	0	
121	5663 9	ANTIBIOTIC & RELATED	CHLORTET 200 GRANULAR FEED ADDITIVE	J H VETERINARY PTY LTD	CHLORTETRACYCLI NE HYDROCHLORIDE AS CALCIUM COMPLEX	4	Feed supplement for prophylactic use when at risk from diseases and for therapeutic treatment of diseases caused by micro-organisms susceptible to chlortetracycline in calves, pigs and poultry.	Feed	5d/10d	DNU	42 90+ *
122	3623 7	ANTIBIOTIC & RELATED	JUROX NEOMYCIN SULFATE INJECTION	JUROX PTY LIMITED	NEOMYCIN SULFATE	4	For the treatment of infections due to neomycin sensitive organisms in cattle, horses, sheep, pigs, dogs and cats.	IM, IV	10d	36h/7 2h	
123	3626 5	ALIMENTARY SYSTEM	VR SULCIN BACTERIAL ENTERITIS TREATMENT	JUROX PTY LIMITED	STREPTOMYCIN AS STREPTOMYCIN SULFATE / SULFADIAZINE / SULFADIMIDINE / VITAMIN B1 HYDROCHLORIDE = THIAMINE HYDROCHLORIDE / VITAMIN B2 = RIBOFLAVIN	4	For the treatment of calf scours.	Oral	14d	DNU	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
124	3631 7	GENITOURINARY SYSTEM	UTOZYME FOAMING PESSARIES	JUROX PTY LIMITED	OXYTETRACYCLINE HYDROCHLORIDE	4	As an aid in the postnatal treatment of infections, cleaning of the uterus, retained placenta and metritis of cattle, sheep, goats, pigs and horses.	IU	14d	36h	
125	3632 3	ALIMENTARY SYSTEM	STREPTOSULCIN FORTE CALF SCOUR BOLUSES	JUROX PTY LIMITED	DIHYDROSTREPTO MYCIN AS THE SULFATE / HYOSCINE AS HYOSCINE METHOBROMIDE / SULFADIAZINE / SULFADIMIDINE / VITAMIN B1 HYDROCHLORIDE = THIAMINE HYDROCHLORIDE	4	For the treatment of bacterial enteritis in the calf.	Oral	14d	DNU	
126	4641 4	ALIMENTARY + ANTIBIOTIC	NEO-SULCIN SCOUR TABLETS	JUROX PTY LIMITED	NEOMYCIN SULFATE / SULFADIAZINE / SULFADIMIDINE / HYOSCINE AS HYOSCINE METHOBROMIDE / VITAMIN B1 HYDROCHLORIDE = THIAMINE HYDROCHLORIDE / VITAMIN B2 = RIBOFLAVIN	4	For the treatment of scours and enteritis of bacterial origin sensitive to neomycin or sulphonamides in calves or horses.	Oral	14d	DNU	
127	5060 8	ANTIBIOTIC & RELATED	MOXYLAN READY- TO-USE INJECTION BROAD SPECTRUM ANTIBIOTIC	JUROX PTY LIMITED	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE	4	For the treatment of bacterial infections sensitive to amoxycillin in dogs, cats, cattle and pigs	SC, IM	14d	48h	
128	5060 9	ANTIBIOTIC & RELATED	MOXYLAN LA LONG ACTING INJECTION BROAD SPECTRUM ANTIBIOTIC	JUROX PTY LIMITED	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE	4	For the treatment of infections caused by amoxycillin sensitive bacteria in cattle, sheep, pigs, dogs and cats.	IM	28d	72h	
129	5266 8	ANTIBIOTIC & RELATED	ERYMICIN 200 INJECTION	JUROX PTY LIMITED	ERYTHROMYCIN	4	For the treatment of organisms sensitive to erythromycin in cattle, sheep, lambs and pigs.	IM	14d	72h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
130	5646 4	ANTIBIOTIC & RELATED	TRIDOXINE INJECTION	JUROX PTY LIMITED	SULFADOXINE / TRIMETHOPRIM	4	For the treatment of infections caused by organisms sensitive to trimethoprim and sulfadoxine in cattle, sheep, pigs, horses, cats and dogs.	IM	14d	36h, 3d	
131	6167 1	ANTIBIOTIC & RELATED	JUROCLAV 500 BROAD SPECTRUM ANTIBIOTIC TABLETS	JUROX PTY LIMITED	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE / CLAVULANIC ACID AS POTASSIUM CLAVULANATE	4	For the treatment of bacterial infections sensitive to clavulanic acid and amoxicillin in calves and dogs.	Oral	4d	DNU	
132	6356 4	ANTIBIOTIC & RELATED	TILMIX INJECTION	JUROX PTY LIMITED	TILMICOSIN AS THE TILMICOSIN PHOSPHATE	4	For use in lot-fed cattle for the treatment of Bovine Respiratory Disease (BRD) associated with Mannheimia (Pasteurella) haemolytica, Pasteurella multocida, and other organisms susceptible to tilmicosin.	SC	35d	DNU	
133	6477 3	ANTIBIOTIC & RELATED	CEFOMAX POWDER FOR INJECTION	JUROX PTY LIMITED	CEFTIOFUR AS CEFTIOFUR SODIUM	4	For the treatment of respiratory tract infections in horses and cattle, and urinary tract infections in dogs.	IM	24h	0	
134	4517 5	NUTRITION & METABOLISM	LIENERT TYLAN 50 PREMIX	LIENERT AUSTRALIA PTY. LTD.	TYLOSIN AS THE PHOSPHATE	5	For reduction in the incidence of liver abscess of cattle.	Feed	0	0	
135	4051 2	ANTIBIOTIC & RELATED	OXYMAV 100 SOLUBLE BROADSPECTRUM ANTIBIOTIC POWDER	MAVLAB PTY. LTD.	OXYTETRACYCLINE	4	For the treatment of diseases caused by Oxytetracycline sensitive organisms of pigs, poultry and calves.	Oral	21d	7d	
136	6493 4	NUTRITION & METABOLISM	NEOVE MONENSIN 200 - FEED ADDITIVE PREMIX	NEOVE PHARMA AUSTRALIA PTY LIMITED	MONENSIN AS MONENSIN SODIUM	4	Feedlot Cattle: For improved feed efficiency. As an aid in the control of bloat. Pasture Cattle: For improved weight gain and feed efficiency. Dairy cows: For increased milk production under many conditions. As an aid in reducing the severity of	Feed	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
137	3702 0	ANTIBIOTIC & RELATED	NOROCILLIN L.A. INJECTION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	BENZATHINE PENICILLIN / PROCAINE PENICILLIN	4	Broad spectrum antibiotic injection for use in cattle, sheep, pigs, horses, dogs and cats.	IM	30d	13d	
138	3704 9	ANTIBIOTIC & RELATED	BETAMOX INJECTION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE	4	For the treatment of organisms sensitive to amoxycillin in horses, cattle, pigs, sheep, dogs and cats.	SC, IM	28d	48h	
139	4753 2	DERMATOLOGICAL PREPS.	ALAMYCIN AEROSOL TOPICAL SPRAY	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	OXYTETRACYCLINE AS OXYTETRACYCLINE HYDROCHLORIDE	4	An aid in the treatment of footrot in sheep, digital dermatitis in cattle and superficial skin infections caused by oxytetracycline sensitive organisms in pigs, sheep and cattle.	Topic al	0	0	
140	5093 8	OPHTHALMIC PREPARATIONS	OPTICLOX EYE OINTMENT	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	CLOXACILLIN AS THE BENZATHINE SALT	4	For the treatment of bovine keratoconjunctivitis caused by cloxacillin-susceptible bacteria including Moraxella bovis. Also for the treatment of bacterial keratoconjunctivitis caused by cloxacillin-susceptible bacteria in sheep, horses, dogs and cats.	Eye	0	0	0
141	5194 1	ANTIBIOTIC & RELATED	ILIUM AMOXYVET INJECTION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE	4	For the treatment of organisms sensitive to amoxycillin in horses, cattle, pigs, sheep, dogs and cats.	SC, IM	28d	48h	
142	5197 3	ANTIBIOTIC & RELATED	ALAMYCIN 10 INJECTION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	OXYTETRACYCLINE AS OXYTETRACYCLINE HYDROCHLORIDE	4	Broad spectrum antibiotic injection for use in cattle, sheep and pigs	IM, IV	15d	60h	
143	5197 7	ANTIBIOTIC & RELATED	NOROCILLIN S.A. INJECTION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	PROCAINE PENICILLIN	4	Broad spectrum antibiotic injection for use in cattle, sheep, pigs, horses, dogs and cats.	IM	5d	36h/7 2h	
144	5308 7	ANTIBIOTIC & RELATED	ALAMYCIN LA 300 OXYTETRACYCLINE INJECTABLE SOLUTION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	OXYTETRACYCLINE AS THE DIHYDRATE	4	Broad spectrum antibiotic injection for use in cattle, sheep and pigs	IM	35d	7d	35

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
145	5436 2	ANTIBIOTIC & RELATED	ULTRAPEN LA PROCAINE PENICILLIN INJECTION FOR CATTLE AND PIGS	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	PROCAINE PENICILLIN	4	For use in the treatment and control of infections caused by susceptible penicillin-sensitive organisms in cattle and pigs.	IM, SC	21d	120h	21
146	5515 3	ANTIBIOTIC & RELATED	HEXASOL LA (OXYTETRACYCLIN E/FLUNIXIN) INJECTION FOR CATTLE	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	OXYTETRACYCLINE AS THE DIHYDRATE / FLUNIXIN AS FLUNIXIN MEGLUMINE	4	For the treatment of bovine respiratory diseases caused by Mannheimia haemolytica (pasteurellosis), where an antiinflammatory and antipyretic effect is required in the 24 hours post treatment. For treatment of conditions caused by, or associated with, organisms sensitive to oxytetracycline in cattle where both an antiinflammatory and antipyretic effect is required in the 24 hours post treatment.	IM	28d	30d/ DNU	28 90.
147	5550 7	ANTIBIOTIC & RELATED	NOROCLAV 500 MG TABLETS FOR DOGS AND CALVES	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE / CLAVULANIC ACID	4	For the treatment of bacterial infections sensitive to clavulanic acid and amoxicillin in dogs and calves.	Oral	4d	DNU	
148	6355 5	ANTIBIOTIC & RELATED	NOROCEF STERILE POWDER FOR INJECTION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	CEFTIOFUR AS CEFTIOFUR SODIUM	4	For the treatment of respiratory tract infections in horses and cattle, and urinary tract infections in dogs.	IM	24h	0	
149	6558 1	NUTRITION & METABOLISM	NUTRIFLAV 40 FEED SUPPLEMENT	NUTRIMENT HEALTH PTY LTD	FLAVOPHOSPHOLIP OL	4	For improvement of productivity by stimulating the growth rate and increasing feed conversion efficacy in poultry (broilers & turkeys), pigs, calves and cattle; and increasing egg production in laying hens.	Feed	0	0	
150	4017 8	ANTIBIOTIC & RELATED	TERRAMYCIN 400 FEED SUPPLEMENT	PHIBRO ANIMAL HEALTH PTY LIMITED	OXYTETRACYCLINE HYDROCHLORIDE	4	Broad spectrum antibiotic for the treatment and prevention of diseases associated with oxytetracycline sensitive organisms in poultry, pigs and cattle.	Feed	5d	72h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
151	4604 9	NUTRITION & METABOLISM	ESKALIN FEED PREMIX FOR CATTLE	PHIBRO ANIMAL HEALTH PTY LIMITED	VIRGINIAMYCIN	4	For use in complete rations for cattle to reduce acidosis due to high grain diets.	Feed	0	0	
152	4683 0	ANTIBIOTIC & RELATED	TERRAMYCIN 880 SOLUBLE POWDER CONCENTRATE	PHIBRO ANIMAL HEALTH PTY LIMITED	OXYTETRACYCLINE HYDROCHLORIDE	4	A broad spectrum antibiotic for medicating drinking water to control and prevent diseases associated with Oxytetracycline sensitive organisms in poultry, pigs and cattle.	Water	5d	72h	
153	4905 2	NUTRITION & METABOLISM	COXISTAC 120 ANTICOCCIDIAL PREMIX FEED ADDITIVE PREMIX	PHIBRO ANIMAL HEALTH PTY LIMITED	SALINOMYCIN SODIUM	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
154	4911 1	NUTRITION & METABOLISM	ESKALIN WETTABLE POWDER SPRAY-ON FEED PREMIX	PHIBRO ANIMAL HEALTH PTY LIMITED	VIRGINIAMYCIN	4	For use in cattle and sheep rations to reduce the risk of acidosis (grain poisoning) when feeding grain.	Feed	0	0	
155	4964 0	ANTIBIOTIC & RELATED	TERRAMYCIN 550 FEED SUPPLEMENT POWDER	PHIBRO ANIMAL HEALTH PTY LIMITED	OXYTETRACYCLINE HYDROCHLORIDE	4	Broad spectrum antibiotic for the treatment and prevention of diseases associated with oxytetracycline sensitive organisms in poultry, pigs and cattle.	Feed	5d	72h	
156	4969 5	NUTRITION & METABOLISM	TERRAMYCIN 200 FEED SUPPLEMENT	PHIBRO ANIMAL HEALTH PTY LIMITED	OXYTETRACYCLINE HYDROCHLORIDE	4	Broad spectrum antibiotic feed supplement for the treatment and prevention of diseases associated with oxytetracycline sensitive organisms.	Feed	0	0	
157	5023 5	ANTIBIOTIC + NUTRITIONAL	POSISTAC 60 GROWTH PROMOTANT AND ANTICOCCIDIAL FEED PREMIX	PHIBRO ANIMAL HEALTH PTY LIMITED	SALINOMYCIN SODIUM	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
158	5099 6	ANTIBIOTIC + NUTRITIONAL	POSISTAC 450 GROWTH PROMOTANT AND ANTICOCCIDIAL FEED PREMIX	PHIBRO ANIMAL HEALTH PTY LIMITED	SALINOMYCIN SODIUM	4	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
159	5135 4	NUTRITION & METABOLISM	ESKALIN 500 FEED PREMIX	PHIBRO ANIMAL HEALTH PTY LIMITED	VIRGINIAMYCIN	4	For use in complete rations for cattle to reduce acidosis due to high grain diets.	Feed	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
160	5552 6	NUTRITION & METABOLISM	PHIBROMONENSIN 200 MONENSIN FEED ADDITIVE PREMIX	PHIBRO ANIMAL HEALTH PTY LIMITED	MONENSIN AS MONENSIN SODIUM	4	To improve feed efficiency in feedlot cattle (except lactating dairy cows). Increase milk production in dairy cows under some conditions. Aid in reducing the severity of non-clinical ketosis in lactating dairy cows. Aid in the prevention of coccidiosis...	Feed	0	0	
161	5552 7	NUTRITION & METABOLISM	PHIBROMONENSIN 400 MONENSIN FEED ADDITIVE PREMIX	PHIBRO ANIMAL HEALTH PTY LIMITED	MONENSIN AS MONENSIN SODIUM	4	Cattle: feed efficiency, bloat control (feedlot); dairy cows: bloat control, milk production, non-clinical ketosis (reduction); heifers: weight gain, feed efficiency, reproductive performance; cattle, chickens and goats: prevention of coccidiosis.	Feed	0	0	
162	5552 8	NUTRITION & METABOLISM	PHIBROMONENSIN 100 MONENSIN FEED ADDITIVE PREMIX	PHIBRO ANIMAL HEALTH PTY LIMITED	MONENSIN AS MONENSIN SODIUM	6	Cattle: feed efficiency, bloat control (feedlot); dairy cows: bloat control, milk production, non-clinical ketosis (reduction); heifers: weight gain, feed efficiency, reproductive performance; cattle, chickens and goats: prevention of coccidiosis.	Feed	0	0	
163	6323 0	ANTIBIOTIC & RELATED	COXISTAC 120 GRANULAR ANTICOCCIDIAL PREMIX FEED ADDITIVE PREMIX	PHIBRO ANIMAL HEALTH PTY LIMITED	SALINOMYCIN SODIUM	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
164	6180 4	MISCELLANEOUS VETERINARY	COOPERS BOOST PLUS RUMENSIN	RIDLEY AGRIPRODUCTS PTY LTD.	MONENSIN AS MONENSIN SODIUM	6	Protein and energy supplement for growing and producing cattle.	Feed	0	0	
165	6125 2	ANTIBIOTIC & RELATED	YODIMASPEN ESTER OF BENZYL PENICILLIN FOR INTRAMUSCULAR INJECTION	SYKES VET (INTERNATIONAL) PTY. LTD.	PENETHAMATE HYDRIODIDE	4	For the treatment of mastitis, foot rot, uterine and respiratory infections in cattle caused by gram positive bacteria susceptible to penethamate hydriodide.	IM	5d	36h/7 2h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
166	3772 1	ANTIBIOTIC & RELATED	SULPRIM ORAL POWDER	TROY LABORATORIES PTY LTD	SULFADIMIDINE / TRIMETHOPRIM	4	For the treatment of infections in horses, calves, pigs and poultry due to organisms susceptible to the combination of sulphadimidine and trimethoprim.	Oral	14d	DNU	
167	3863 7	DERMATOLOGICAL PREPS.	ILIU M NEOCORT ANTIBIOTIC, ANTI- INFLAMMATORY, ANAESTHETIC SKIN EMOLLIENT CREAM	TROY LABORATORIES PTY LTD	NEOMYCIN AS THE SULFATE / HYDROCORTISONE AS THE ACETATE / LIGNOCAINE AS LIGNOCAINE HYDROCHLORIDE	4	Topical treatment of skin conditions caused by neomycin-sensitive organisms and where anti-inflammatory and anaesthetic effect is desired	Topic al	28d	3d	
168	4005 7	ANTIBIOTIC & RELATED	ILIU M OXYTET-200 L.A. LONG-ACTING BROAD-SPECTRUM ANTIBIOTIC INJECTION	TROY LABORATORIES PTY LTD	OXYTETRACYCLINE	4	A long-acting broad spectrum antibiotic indicated for the treatment and control of conditions caused by oxytetracycline-sensitive organisms in cattle, sheep and pigs.	IM	42d	7d	
169	4137 6	ANTIBIOTIC & RELATED	ILIU M TRISOVET ANTI-BACTERIAL INJECTION	TROY LABORATORIES PTY LTD	SULFADOXINE / TRIMETHOPRIM	4	For the treatment of infections caused by organisms sensitive to trimethoprim and sulfadoxine in cattle, sheep, pigs, horses, cats and dogs.	IM	14d	36h, 72h	
170	5052 2	ANTIBIOTIC & RELATED	BENACILLIN LONG ACTING PENICILLIN INJECTION	TROY LABORATORIES PTY LTD	BENZATHINE PENICILLIN / PROCAINE HYDROCHLORIDE / PROCAINE PENICILLIN	4	For parenteral treatment of infections caused by bacteria sensitive to penicillin in dogs, cats, pigs, calves, foals, horses and cattle.	IM	30d	13d	
171	5114 3	ANTIBIOTIC & RELATED	TRISOPRIM-480 ANTI-BACTERIAL INJECTION	TROY LABORATORIES PTY LTD	SULFADIAZINE / TRIMETHOPRIM	4	For the systemic treatment of bacterial infections caused by organisms sensitive to trimethoprim and sulphadiazine for cattle, horses, sheep and pigs.	IM	28d	3d	
172	5604 6	ANTIBIOTIC & RELATED	ILIU M AMOXYCILLIN BROAD-SPECTRUM ANTIBIOTIC INJECTION	TROY LABORATORIES PTY LTD	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE	4	For the treatment of bacterial infections sensitive to amoxicillin in dogs, cats, cattle and pigs.	SC, IM	14d	48h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
173	5955 8	OPHTHALMIC PREPARATIONS	ILIUM OPTICILLIN EYE OINTMENT	TROY LABORATORIES PTY LTD	CLOXACILLIN AS THE BENZATHINE SALT	4	For the treatment of bovine keratoconjunctivitis caused by cloxacillin-susceptible bacteria including Moraxella bovis. Also for the treatment of bacterial keratoconjunctivitis caused by cloxacillin-susceptible bacteria in sheep, horses, dogs and cats.	Eye	0	0	
174	6052 1	ANTIBIOTIC & RELATED	ILIUM PROPERCILLIN ANTIBIOTIC INJECTION	TROY LABORATORIES PTY LTD	PROCAINE PENICILLIN	4	An aid in the treatment of infections caused by penicillin-sensitive organisms in horses, cattle, sheep, pigs, dogs and cats.	IM, SC	5d	36h/7 2h	
175	3883 1	ANTIBIOTIC & RELATED	AMPHOPRIM S ANTIBACTERIAL INJECTABLE SOLUTION	VIRBAC (AUSTRALIA) PTY LTD	SULFADIMIDINE AS SODIUM ETHANE SULPHONATE SALT / TRIMETHOPRIM	4	For the treatment of infections caused by organisms sensitive to trimethoprim and sulfadimidine including Septicaemia, Intestinal, Respiratory, Urogenital Infections, Mastitis, Arthritis in cattle, horses, sheep, pigs, dogs and cats	IM, SC, IV	15d	72h	
176	5394 2	NUTRITION & METABOLISM	VIRBAC PROMENSIN 900 MONENSIN SODIUM	VIRBAC (AUSTRALIA) PTY LTD	MONENSIN AS MONENSIN SODIUM	4	For improved feed efficiency in feedlot cattle. For increased milk production under some conditions, and as an aid in reducing the severity of non-clinical ketosis in lactating dairy cows. As an aid in the prevention of coccidiosis in cattle and goats.	Feed	0	0	
177	3589 3	OPHTHALMIC PREPARATIONS	ORBENIN EYE OINTMENT	ZOETIS AUSTRALIA PTY LTD	CLOXACILLIN AS THE BENZATHINE SALT	4	For the treatment of cloxacillin susceptible bacterial keratoconjunctivitis in cattle, sheep, horses, dogs and cats.	Eye	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
178	3664 5	ANTIBIOTIC & RELATED	AUROFAC 200 ANTIBIOTIC FEED SUPPLEMENT GRANULATED	ZOETIS AUSTRALIA PTY LTD	CHLORTETRACYCLI NE HYDROCHLORIDE	4	For inclusion in the feed of pigs, poultry & calves for prophylactic use when the veterinarian considers them to be at risk from disease, or for the treatment of diseases of pigs, poultry and calves caused by micro-organisms sensitive to chlortetracycline	Feed	5d, 10d	DNU	
179	3782 3	ANTIBIOTIC & RELATED	TERRAMYCIN /LA INJECTABLE SOLUTION	ZOETIS AUSTRALIA PTY LTD	OXYTETRACYCLINE	4	Long acting broad spectrum antibiotic in a 2-pyrrolidone base for cattle, sheep and pigs.	IM	42d	7d	
180	3783 5	OPHTHALMIC PREPARATIONS	TERRAMYCIN PINKEYE AEROSOL	ZOETIS AUSTRALIA PTY LTD	OXYTETRACYCLINE HYDROCHLORIDE	5	A broad spectrum antibiotic for treatment of eye infections of animals and in particular pinkeye conditions in sheep and cattle.	Eye	0	0	
181	3811 9	NUTRITION & METABOLISM	BOVATEC LASALOCID SODIUM FEED ADDITIVE PREMIX 150G/KG	ZOETIS AUSTRALIA PTY LTD	LASALOCID SODIUM	6	For improved liveweight gains/feed conversion efficiency in growing/ lot fed beef cattle, to aid in improvement of milk production by dairy cows fed high protein grass pastures & by lot fed dairy cattle; and for reduction of faecal shedding of Eimeria spp	Feed	0	0	
182	4574 8	ANTIBIOTIC & RELATED	EXCENEL POWDER FOR INJECTION INJECTABLE ANTIBIOTIC	ZOETIS AUSTRALIA PTY LTD	CEFTIOFUR AS CEFTIOFUR SODIUM	4	For the treatment of respiratory tract infections in horses and cattle, and urinary tract infections in dogs.	IM	24h	0	
183	4843 1	ANTIBIOTIC & RELATED	DUPHAPEN PENICILLIN INJECTION	ZOETIS AUSTRALIA PTY LTD	PROCAINE PENICILLIN	4	For the treatment and control of infections caused by susceptible penicillin sensitive organisms in horses, cattle, sheep, dogs and cats.	IM	5d	36h/7 2h	
184	4850 9	ANTIBIOTIC & RELATED	TERRAMYCIN 100 INJECTABLE SOLUTION	ZOETIS AUSTRALIA PTY LTD	OXYTETRACYCLINE HYDROCHLORIDE	4	Broad spectrum antibiotic for horses, cattle, sheep and pigs.	IM,S C, IP, IV	14d	72h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
185	4892 7	ANTIBIOTIC & RELATED	DUPHAPEN LA PENICILLIN INJECTION	ZOETIS AUSTRALIA PTY LTD	BENZATHINE PENICILLIN / PROCAINE PENICILLIN	4	For the treatment and control of infections caused by susceptible penicillin sensitive organisms in horses, cattle, sheep, dogs and cats.	IM	30d	13d	
186	4893 5	ANTIBIOTIC & RELATED	DUPHACYCLINE 100 OXYTETRACYCLINE HYDROCHLORIDE INJECTION	ZOETIS AUSTRALIA PTY LTD	OXYTETRACYCLINE HYDROCHLORIDE	4	For the treatment and control of infections of the alimentary, respiratory and urogenital tracts and septicaemic conditions (including secondary infections) caused by susceptible organisms in horses, cattle, sheep and pigs.	IM	21d	7d	
187	5050 7	ANTIBIOTIC & RELATED	EXCENEL RTU ANTIBIOTIC SUSPENSION FOR INJECTION	ZOETIS AUSTRALIA PTY LTD	CEFTIOFUR AS CEFTIOFUR HYDROCHLORIDE	4	For the treatment of respiratory infections in cattle.	IM, SC	3d	0	
188	5117 3	ANTIBIOTIC + NUTRITIONAL	BIO-COX 120G ANTICOCCIDIAL PREMIX	ZOETIS AUSTRALIA PTY LTD	SALINOMYCIN SODIUM	6	Enhancing productivity by increasing the rate of weight gain and improving feed efficiency of feedlot beef cattle.	Feed	0	DNU	
189	5262 1	NUTRITION & METABOLISM	NEOMYCIN SULPHATE UPJOHN FEED ADDITIVE POWDER	ZOETIS AUSTRALIA PTY LTD	NEOMYCIN AS THE SULFATE	4	For the treatment of bacterial enteritis (scours) caused by organisms sensitive to neomycin, including neomycin sensitive strains of E coli, Salmonella spp, Pseudomonas spp, and Proteus spp in poultry, pigs and cattle.	Feed	30d	0	
190	5269 3	NUTRITION & METABOLISM	BOVATEC LASALOCID SODIUM FEED ADDITIVE LIQUID 200G/L.	ZOETIS AUSTRALIA PTY LTD	LASALOCID SODIUM	6	For improved live weight gain & feed conversion efficiency/growth promotion in growing cattle, lot fed beef cattle & sheep; aid in improvement of milk production by pasture fed dairy cows by lot fed dairy cattle; for the reduction of faecal shedding.	Feed	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
191	5344 5	ANTIBIOTIC & RELATED	CLAVULOX PALATABLE TABLETS BROAD SPECTRUM ANTIBIOTIC 500MG	ZOETIS AUSTRALIA PTY LTD	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE / CLAVULANIC ACID AS POTASSIUM CLAVULANATE	4	For the treatment of bacterial infections sensitive to clavulanic acid and amoxicillin in calves and dogs.	Oral	4d	DNU	
192	5414 4	NUTRITION & METABOLISM	AVATEC /BOVATEC TECHNICAL	ZOETIS AUSTRALIA PTY LTD	LASALOCID SODIUM	6	For improved liveweight gains/growth promotion & feed conversion efficiency in growing cattle, lot fed beef cattle & sheep. To aid in the improvement of milk production by grass fed dairy cows and by lot fed dairy cattle. For control of coccidiosis (etc)	Feed	0	0	
193	5627 2	NUTRITION & METABOLISM	BOVATEC CC LASALOCID SODIUM FEED ADDITIVE PREMIX 150G/KG	ZOETIS AUSTRALIA PTY LTD	LASALOCID SODIUM	6	For improved liveweight gains/feed conversion efficiency in growing/ lot fed beef cattle, to aid in improvement of milk production by dairy cows fed high protein grass pastures & by lot fed dairy cattle; and for reduction of faecal shedding of <i>Eimeria</i> spp	Feed	0	0	
194	6001 8	ANTIBIOTIC & RELATED	DRAXXIN INJECTABLE SOLUTION	ZOETIS AUSTRALIA PTY LTD	TULATHROMYCIN	4	For the treatment of tulathromycin sensitive bacterial respiratory diseases in cattle and pigs.	SC	35d	DNU	35
195	6076 1	NUTRITION & METABOLISM	BOVATEC 20CC LASALOCID SODIUM PREMIX	ZOETIS AUSTRALIA PTY LTD	LASALOCID SODIUM	6	For improved liveweight gains/feed conversion efficiency in growing/ lot fed beef cattle, to aid in improvement of milk production by dairy cows fed high protein grass pastures & by lot fed dairy cattle; and for reduction of faecal shedding of <i>Eimeria</i> spp	Feed	0	0	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Schedule	Cattle Claim(s)	Route	WHP MEAT (cattle)	WHP MILK	ESI * d
196	65092	ANTIBIOTIC & RELATED	EXCEDE STERILE SUSPENSION	ZOETIS AUSTRALIA PTY LTD	CEFTIOFUR AS CEFTIOFUR CRYSTALLINE FREE ACID	4	For the treatment of bovine respiratory diseases caused by Mannheimia haemolytica, Pasteurella multocida and Histophilus somni.	SC (ear)	14d	0	14
197	68346	ANTIBIOTIC & RELATED	MASTYLO TYLOSIN INJECTION	ZOETIS AUSTRALIA PTY LTD	TYLOSIN	4	For treatment of organisms sensitive to tylosin in cattle [pneumonia, metritis, footrot, leptospirosis, acute mastitis, contagious calf pneumonia, calf pneumonia/enteritis, secondary bacterial infections] and pigs	IM, IV	21d	72h	
INTRAMAMMARY PRODUCTS											
198	55864	ANTIBIOTIC & RELATED	DRYCLOX DCX DRY COW INTRAMAMMARY SUSPENSION	BAYER AUSTRALIA LTD (ANIMAL HEALTH)	AMPICILLIN AS THE TRIHYDRATE / CLOXACILLIN AS THE BENZATHINE SALT	4	For the control of mastitis in dairy cows caused by organisms sensitive to ampicillin & cloxacillin during the dry period.	DC	30d	49d/96h	
199	56073	ANTIBIOTIC & RELATED	SPECTRAZOL DRY COW INTRAMAMMARY ANTIBIOTIC	INTERVET AUSTRALIA PTY LIMITED	CEPHALONIUM DIHYDRATE	4	For sustained, broad spectrum control of and protection against mastitis- causing bacteria (including penicillin- resistant strains) in non-lactating dairy cattle.	DC	21d	49d/96h	
200	47940	ANTIBIOTIC & RELATED	COOPERS CEPRAVIN DRY COW INTRAMAMMARY ANTIBIOTIC	INTERVET AUSTRALIA PTY LIMITED	CEPHALONIUM DIHYDRATE	4	For sustained, broad spectrum control of and protection against mastitis-causing bacteria (including penicillin resistant strains) in non-lactating dairy cattle. Aids in the reduction of clinical mastitis and subclinical mastitis in the subsequent lactation.	DC	21d	49d/96h	
201	54660	ANTIBIOTIC & RELATED	COOPERS DRY COW INTRAMAMMARY ANTIBIOTIC	INTERVET AUSTRALIA PTY LIMITED	CLOXACILLIN AS THE BENZATHINE SALT	4	For the control in dairy cows of mastitis caused by streptococcus spp., staphylococcus spp., (including penicillin resistant strains), corynebacterium spp., and other organisms susceptible to cloxacillin.	DC	30d	35d/96h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
202	4794 1	ANTIBIOTIC & RELATED	COOPERS CEPRAVIN L.C. LACTATING COW INTRAMAMMARY ANTIBIOTIC	INTERVET AUSTRALIA PTY LIMITED	CEFUROXIME SODIUM	4	For broad spectrum control of mastitis-causing bacteria (including penicillin resistant strains) in lactating dairy cattle	LC	7d	72h	
203	5607 0	ANTIBIOTIC & RELATED	SPECTRAZOL L.C. LACTATING COW INTRAMAMMARY ANTIBIOTIC	INTERVET AUSTRALIA PTY LIMITED	CEFUROXIME AS CEFUROXIME SODIUM	4	For broad spectrum control of mastitis-causing bacteria (including penicillin resistant strains) in lactating dairy cattle.	LC	7d	72h	
204	6747 9	ANTIBIOTIC & RELATED	MAXALAC DC DRY COW INTRAMAMMARY ANTIBIOTIC	JUROX PTY LIMITED	CEPHALONIUM DIHYDRATE	4	For sustained, broad spectrum control of and protection against mastitis-causing bacteria (including penicillin resistant strains) in non-lactating dairy cattle.	DC	21d	49d/9 6h	21
205	5023 9	ANTIBIOTIC & RELATED	JURACLOX L.A. 600 DRY COW LONG ACTING INTRAMAMMARY SUSPENSION	JUROX PTY LIMITED	CLOXACILLIN AS THE BENZATHINE SALT	4	For the control in dairy cows of mastitis caused by streptococcus spp., staphylococcus spp., (including penicillin resistant strains), corynebacterium spp., and other organisms susceptible to cloxacillin.	DC	30d	35d/9 6h	
206	3584 2	ANTIBIOTIC & RELATED	AMPICLOX DRY COW INTRAMAMMARY ANTIBIOTIC INFUSION	JUROX PTY LIMITED	AMPICILLIN TRIHYDRATE / CLOXACILLIN AS THE BENZATHINE SALT	4	For the treatment of mastitis caused by organisms sensitive to ampicillin and cloxacillin, during the dry period.	DC	30d	30d/9 6h	
207	5952 8	ANTIBIOTIC & RELATED	MAXALAC L.C. INTRAMAMMARY ANTIBIOTIC	JUROX PTY LIMITED	CEFUROXIME SODIUM	4	For broad spectrum control of mastitis-causing bacteria (including penicillin resistant strains) in lactating dairy cattle	LC	7d	72h	
208	5244 3	ANTIBIOTIC & RELATED	JURACLOX L.C. LACTATING COW INTRAMAMMARY ANTIBIOTIC INFUSION	JUROX PTY LIMITED	AMPICILLIN AS THE SODIUM SALT / CLOXACILLIN AS THE SODIUM SALT	4	For the treatment of mastitis in lactating cows, caused by organisms sensitive to ampicillin and cloxacillin.	LC	30d	72h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sched ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
209	3584 9	ANTIBIOTIC & RELATED	AMPICLOX L.C. LACTATING COW INTRAMAMMARY ANTIBIOTIC INFUSION	JUROX PTY LIMITED	AMPICILLIN AS THE SODIUM SALT / CLOXACILLIN AS THE SODIUM SALT	4	For the treatment of mastitis in lactating cows, caused by organisms sensitive to ampicillin and cloxacillin.	LC	30d	72h	
210	5184 8	ANTIBIOTIC & RELATED	ELACLOX DCX DRY COW INTRAMAMMARY SUSPENSION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	CLOXACILLIN AS THE BENZATHINE SALT	4	For the control in dairy cows of mastitis caused by streptococcus spp., staphylococcus spp., (including penicillin resistant strains), Arcanobacterium spp., and other organisms susceptible to cloxacillin.	DC	30d	35d/9 6h	
211	5697 6	ANTIBIOTIC & RELATED	NOROCLOX 600 DRY COW INTRAMAMMARY SUSPENSION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	CLOXACILLIN AS THE BENZATHINE SALT	4	For the control in dairy cows of mastitis caused by streptococcus spp., staphylococcus spp., (including penicillin resistant strains), Arcanobacterium spp., and other organisms susceptible to cloxacillin.	DC	30d	35d/9 6h	
212	5107 8	ANTIBIOTIC & RELATED	BOVACLOX DC LA DRY COW INTRAMAMMARY SUSPENSION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	AMPICILLIN TRIHYDRATE / CLOXACILLIN AS THE BENZATHINE SALT	4	For the control of mastitis in dairy cows caused by organisms sensitive to ampicillin & cloxacillin during the dry period.	DC	30d	49d/9 6h	
213	5697 8	ANTIBIOTIC & RELATED	NOROCLOX 500 DRY COW INTRAMAMMARY SUSPENSION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	CLOXACILLIN AS THE BENZATHINE SALT	4	For the treatment of subclinical mastitis caused by organisms sensitive to cloxacillin in dairy cows at drying off.	DC	30d	30d/9 6h	
214	5616 2	ANTIBIOTIC & RELATED	CLAVET LC BROAD SPECTRUM INTRAMAMMARY ANTIBIOTIC FOR LACTATING COWS	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE / CLAVULANIC ACID AS POTASSIUM CLAVULANATE	4	Broad Spectrum Intramammary Antibiotic	LC	7d	84h	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Sch ed ule	Cattle Claim(s)	Rout e	WHP MEAT (cattle)	WHP MILK	ESI * d
215	5849 1	ANTIBIOTIC & RELATED	NOROCLOX LC LACTATING COW INTRAMAMMARY ANTIBIOTIC INFUSION WITH PROLONGED ACTION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	CLOXACILLIN AS THE BENZATHINE SALT	4	For the treatment of bovine mastitis in lactating cows caused by organisms sensitive to cloxacillin.	LC	30d	96h	
216	5611 3	ANTIBIOTIC & RELATED	LACTACLOX LC LACTATING COW INTRAMAMMARY ANTIBIOTIC INFUSION	NORBROOK LABORATORIES AUSTRALIA PTY LIMITED	AMPICILLIN AS THE SODIUM SALT / CLOXACILLIN AS SODIUM MONOHYDRATE SALT	4	For the treatment of mastitis in lactating cows, caused by organisms sensitive to cloxacillin and ampicillin.	LC	30d	72h	
217	6580 5	ANTIBIOTIC & RELATED	QUADRANT DRY COW INTRAMAMMARY ANTIBIOTIC	VIRBAC (AUSTRALIA) PTY LTD	CEPHALONIUM DIHYDRATE	4	For sustained, broad spectrum control of & protection against mastitis-causing bacteria (incl. penicillin-resistant strains) in non-lactating dairy cattle.	DC	21d	49d/ 96h	1
218	4563 5	ANTIBIOTIC & RELATED	ORBENIN ENDURO DRY COW INTRAMAMMARY SUSPENSION	ZOETIS AUSTRALIA PTY LTD	CLOXACILLIN AS THE BENZATHINE SALT	4	For the control in dairy cows of mastitis caused by streptococcus spp., staphylococcus spp., (including penicillin resistant strains), corynebacterium spp., and other organisms susceptible to cloxacillin.	DC	30d	35d/9 6h	
219	3584 8	ANTIBIOTIC & RELATED	ORBENIN DRY COW INTRAMAMMARY ANTIBIOTIC INFUSION	ZOETIS AUSTRALIA PTY LTD	CLOXACILLIN AS THE BENZATHINE SALT	4	For the treatment of bovine mastitis caused by organisms sensitive to cloxacillin during the dry period.	DC	30d	30d/9 6h	
220	4985 1	ANTIBIOTIC & RELATED	MASTALONE INTRAMAMMARY SUSPENSION FOR LACTATING COWS	ZOETIS AUSTRALIA PTY LTD	NEOMYCIN AS THE SULFATE / OLEANDOMYCIN AS THE PHOSPHATE / OXYTETRACYCLINE AS OXYTETRACYCLINE HYDROCHLORIDE	4	A broad spectrum antibiotic for the control of mastitis in lactating cattle	LC	30d	7d	

#	APV MA No	Product Type	Product Name	Registrant	Active(s)	Schedule	Cattle Claim(s)	Route	WHP MEAT (cattle)	WHP MILK	ESI * d
221	47115	ANTIBIOTIC & RELATED	CLAVULOX LC BROAD SPECTRUM INTRAMAMMARY ANTIBIOTIC FOR LACTATING COWS	ZOETIS AUSTRALIA PTY LTD	AMOXYCILLIN AS AMOXYCILLIN TRIHYDRATE / CLAVULANIC ACID AS POTASSIUM CLAVULANATE	4	Broad Spectrum Intramammary Antibiotic	LC	7d	48h	
222	38696	ANTIBIOTIC & RELATED	SPECIAL FORMULA 17900 FORTE-V LACTATING INTRAMAMMARY ANTIBIOTIC SUSPENSION	ZOETIS AUSTRALIA PTY LTD	DIHYDROSTREPTOMYCIN / NEOMYCIN SULFATE / NOVOBIOCIN AS NOVOBIOCIN SODIUM	4	For the treatment of bovine mastitis, in lactating cattle only, by intramammary infusion.	LC	30d	72h	
223	38698	ANTIBIOTIC & RELATED	LINCOCIN FORTE LACTATING INTRAMAMMARY ANTIBIOTIC SOLUTION	ZOETIS AUSTRALIA PTY LTD	LINCOMYCIN AS LINCOMYCIN HYDROCHLORIDE / NEOMYCIN AS THE SULFATE	4	For the treatment of bovine mastitis, in lactating cattle only, by intramammary infusion.	LC	30d	96h	
224	46337	ANTIBIOTIC & RELATED	ORBENIN L.C. LACTATING COW INTRAMAMMARY ANTIBIOTIC INFUSION WITH PROLONGED ACTION	ZOETIS AUSTRALIA PTY LTD	CLOXACILLIN AS THE BENZATHINE SALT	4	Intramammary Antibiotic Infusion with prolonged action	LC	30d	96h	

*Export Slaughter Intervals (ESIs) of veterinary chemicals for use in cattle (10 October 2013)

** Safemeat Provisional Russian ESI of 90 days is required before a claim of 'Russian eligible' can be written on the LPA NVD

7.2

7.3 Appendix 2: Registrants of antimicrobial products for cattle in Australia

Registrant	No of products registered for cattle
Agvantage Pty Ltd	1
Ausrichter Pty Ltd	1
Caledonian Holdings Distribution Pty Ltd	1
Ccd Animal Health Pty Ltd	1
Ceva Animal Health Pty Ltd	1
Ctcbio Inc	1
Eurovet Animal Health Bv	1
J H Veterinary Pty Ltd	1
Lienert Australia Pty. Ltd.	1
Mavlab Pty. Ltd.	1
Nutriment Health Pty Ltd	1
Ridley Agriproducts Pty Ltd.	1
Sykes Vet (International) Pty. Ltd.	1
Virbac (Australia) Pty Ltd	2
Allied Animal Health Pty Ltd	2
Bec Feed Solutions Pty Ltd	2
Boehringer Ingelheim Pty Limited, Vetmedica Division	2
Apex Laboratories Pty Ltd	4
Argicon Pty Ltd T/A Agricon Products	4
Bimeda (Australia) Pty Limited	5
Huvepharma Ad	6
Troy Laboratories Pty Ltd	9
Jurox Pty Limited	12
Norbrook Laboratories Australia Pty Limited	12
International Animal Health Products Pty Ltd	13
Intervet Australia Pty Limited	14
Phibro Animal Health Pty Limited	14
Dox-AI Australia Pty Ltd	15
Elanco	21
Zoetis Australia Pty Ltd	21
Bayer Australia Ltd (Animal Health)	25

7.4 Appendix 3: Antimicrobials registered for use in different species in Australia

ANTIBACTERIAL AGENTS APPROVED FOR USE BY APVMA IN VARIOUS LIVESTOCK AND COMPANION ANIMAL SPECIES											
ANTIBACTERIAL AGENT 63	I*	CLASS 25	BOV 37	OV 15	POR 25	BRO 27	LAY 13	CAP 3	EQU 21	CAN 38	FEL 36
Spectinomycin	3	Aminocyclitol			POR	BRO	LAY			CAN	FEL
Apramycin	1	Aminoglycoside	BOV		POR	BRO					
Dihydrostreptomycin	1	Aminoglycoside	BOV							CAN	FEL
Framycetin	1	Aminoglycoside	BOV	OV					EQU	CAN	FEL
Gentamicin	1	Aminoglycoside							EQU	CAN	FEL
Neomycin	1	Aminoglycoside	BOV	OV	POR	BRO	LAY		EQU	CAN	FEL
Streptomycin	1	Aminoglycoside	BOV						EQU	CAN	FEL
Enrofloxacin	1	Fluoroquinolone								CAN	FEL
Ibafloxacin	1	Fluoroquinolone								CAN	FEL
Marbofloxacin	1	Fluoroquinolone								CAN	FEL
Orbifloxacin	1	Fluoroquinolone								CAN	FEL
Lasalocid	0	Ionophore	BOV			BRO					
Maduramicin	0	Ionophore				BRO					
Monensin	0	Ionophore	BOV	OV		BRO		CAP			
Narasin	0	Ionophore	BOV			BRO					
Salinomycin	0	Ionophore	BOV		POR	BRO					
Semduramicin	0	Ionophore				BRO					
Clindamycin	2	Lincosamide								CAN	FEL
Lincomycin	2	Lincosamide	BOV		POR	BRO	LAY			CAN	FEL
Erythromycin	1	Macrolide	BOV	OV	POR	BRO					
Kitasamycin	1	Macrolide			POR						
Oleandomycin	1	Macrolide	BOV								
Spiramycin	1	Macrolide								CAN	FEL
Tilmicosin	1	Macrolide	BOV		POR						
Tulathromycin	1	Macrolide	BOV		POR						
Tylosin	1	Macrolide	BOV		POR	BRO	LAY				
Nitrofurazone	3	Nitrofurane							EQU	CAN	FEL
Metronidazole	3	Nitroimidazole							EQU	CAN	FEL
Roxarsone	0	Other arsenical			POR	BRO					
Novobiocin	0	Other coumarin	BOV							CAN	FEL
Fusidic acid	2	Other fusidane								CAN	FEL
Flavophospholipol	0	Other glycolipid	BOV		POR	BRO	LAY				
Avilamycin	0	Other orthosomycin				BRO					
Bacitracin	3	Other peptide	BOV	OV		BRO	LAY		EQU	CAN	FEL
Gramicidin	0	Other peptide								CAN	FEL
Polymyxin B	1	Other peptide	BOV	OV					EQU	CAN	FEL
Olaquinox	0	Other quinoxaline			POR						
Chloramphenicol	2	Phenicol								CAN	FEL
Florfenicol	2	Phenicol	BOV		POR						
Tiamulin	2	Pleuromutilin			POR	BRO					
Virginiamycin	2	Streptogramin	BOV	OV		BRO			EQU		
Sulfacetamide	2	Sulfonamide							EQU	CAN	FEL
Sulfadimidine	2	Sulfonamide	BOV		POR	BRO	LAY		EQU		
Sulfaquinoxaline (+/- diaveridine)	2	Sulfonamide				BRO	LAY				
Sulfadiazine / trimethoprim	2	Sulfonamide / Diaminopyrimidine	BOV	OV	POR	BRO	LAY		EQU	CAN	FEL
Sulfadimidine /	2	Sulfonamide /	BOV	OV	POR	BRO	LAY		EQU	CAN	FEL

ANTIBACTERIAL AGENTS APPROVED FOR USE BY APVMA IN VARIOUS LIVESTOCK AND COMPANION ANIMAL SPECIES											
ANTIBACTERIAL AGENT 63	I*	CLASS 25	BOV 37	OV 15	POR 25	BRO 27	LAY 13	CAP 3	EQU 21	CAN 38	FEL 36
trimethoprim		Diaminopyrimidine									
Sulfadoxine / trimethoprim	2	Sulfonamide / Diaminopyrimidine	BOV	OV	POR			CAP	EQU	CAN	FEL
Chlortetracycline	2	Tetracycline			POR	BRO	LAY			CAN	FEL
Doxycycline	2	Tetracycline								CAN	FEL
Oxytetracycline	2	Tetracycline	BOV	OV	POR	BRO		CAP	EQU	CAN	FEL
Tetracycline	2	Tetracycline								CAN	FEL
Cephalexin	2	β lactam [1GC]								CAN	FEL
Cephalonium	2	β lactam [1GC]	BOV							CAN	
Cephapirin	2	β lactam [1GC]	BOV								
Cefuroxime	2	β lactam [2GC]	BOV								
Cefovecin	1	β lactam [3GC]								CAN	FEL
Ceftiofur	1	β lactam [3GC]	BOV						EQU	CAN	
Amoxicillin	1	β lactam penicillin	BOV	OV	POR	BRO	LAY		EQU	CAN	FEL
Ampicillin	1	β lactam penicillin	BOV								
Cloxacillin	2	β lactam penicillin	BOV	OV					EQU	CAN	FEL
Penethamate	1	β lactam penicillin	BOV	OV	POR				EQU		
Penicillin	1	β lactam penicillin	BOV	OV	POR				EQU	CAN	FEL
Clavulanic acid	0	β lactamase inhibitor	BOV							CAN	FEL

* Importance (WHO 2012): 1 = critically important; 2 = highly important; 3 = important; 0 = not rated

BOV bovine; OV ovine; POR porcine; BRO broiler; LAY laying hen; CAP caprine; EQU equine; CAN canine; FEL feline

7.5 Appendix 4: Antimicrobials registered for use in the US and UK

CATTLE ANTIMICROBIAL AGENTS APPROVED IN AUS USA UK					
Class (19)	Active (61)	Importance*	AUS#	USA#	UK#
		classes→	15	14	14
		actives→	37	37	42
		products→	219	429	219
Aminocyclitol	Spectinomycin	3			1
Aminoglycoside	Apramycin	1	1		1
	Dihydrostreptomycin	1	2	4	7
	Framycetin	1	2		4
	Gentamicin	1		1	
	Kanamycin	1			1
	Neomycin	1	11	26	5
	Streptomycin	1	2	2	3
Beta lactam, cephalosporin	Cefalexin ^{1GC}	2			2
	Cefalonium ^{1GC}	2	5		2
	Cefapirin ^{1GC}	(2)	1	4	2
	Cefuroxime ^{2GC}	2	3		
	Cefoperazone ^{3GC}	1			2
	Ceftiofur ^{3GC}	1	7	10	14
	Cefquinome ^{4GC}	1			7
Beta lactam, Penicillin	Amoxicillin	1	13	4	22
	Ampicillin	1	6	5	10
	Cloxacillin	2	19	4	15
	Hetacillin	1		2	
	Nafcillin	2			1
	Penethamate Hydriodide	1	3		5
	Penicillin (benzyl)	1	21	33	15
Beta lactamase inhibitor	Clavulanic Acid	0	5		11
Coumarin	Novobiocin	0	1	5	1
Diaminopyrimidine	Trimethoprim	2	16		13
Fluoroquinolone	Danofloxacin	1		1	2
	Difloxacin	1			1
	Enrofloxacin	1		2	24
	Marbofloxacin	1			25
Glycophospholipid	Flavophospholipol	0	5	1	
Ionophore	Laidlomycin	0		1	
	Lasalocid	0	5	20	
	Monensin	0	26	35	
	Narasin	0	3		
	Salinomycin	0	11		
Lincosamide	Lincomycin	2	1		1
	Pirlimycin	2		1	1
Macrolide	Erythromycin	1	2	8	
	Gamithromycin	1		1	1
	Oleandomycin	1	1		

CATTLE ANTIMICROBIAL AGENTS APPROVED IN AUS USA UK						
	Class (19)	Active (61)	Importance*	AUS#	USA#	UK#
1						
45		Spiramycin	1			1
46		Tildipirosin	1		1	1
47		Tilmicosin	1	2	3	8
48		Tulathromycin	1	1	1	1
49		Tylosin	1	21	44	3
50	Phenicol	Florfenicol	2	2	3	12
51	Polypeptide	Bacitracin (zinc, BMD)	3	2	10	
52		Colistin	1			1
53		Polymyxin B	1	2		
54	Streptogramin	Virginiamycin	2	3	2	
55	Sulfonamide	Sulfabromomethazine	(2)		1	
56		Sulfachlorpyridazine	(2)		7	
57		Sulfadiazine	2	11		13
58		Sulfadimethoxine	2		25	
59		Sulfadimidine (sulfamethazine)	2	9	16	1
60		Sulfadoxine	(2)	5		1
61		Sulfaethoxypyridazine	(2)		5	
62		Sulfaquinoxaline	(2)		5	
63	Tetracycline	Chlortetracycline	2	4	57	4
64		Oxytetracycline	2	33	78	26
65		Tetracycline	2		16	1
66	* Importance (WHO 2012): 1 = critically important; 2 = highly important; 3 = important; 0 = not rated # Number of approved products containing the active					

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