New Zealand Food Safety

Haumaru Kai Aotearoa

Antibiotic Sales Analysis 2017

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Further information on antimicrobial resistance is available on the MPI website: https://www.mpi.govt.nz/processing/agricultural-compounds-and-vet-medicines/antimicrobial-resistance/

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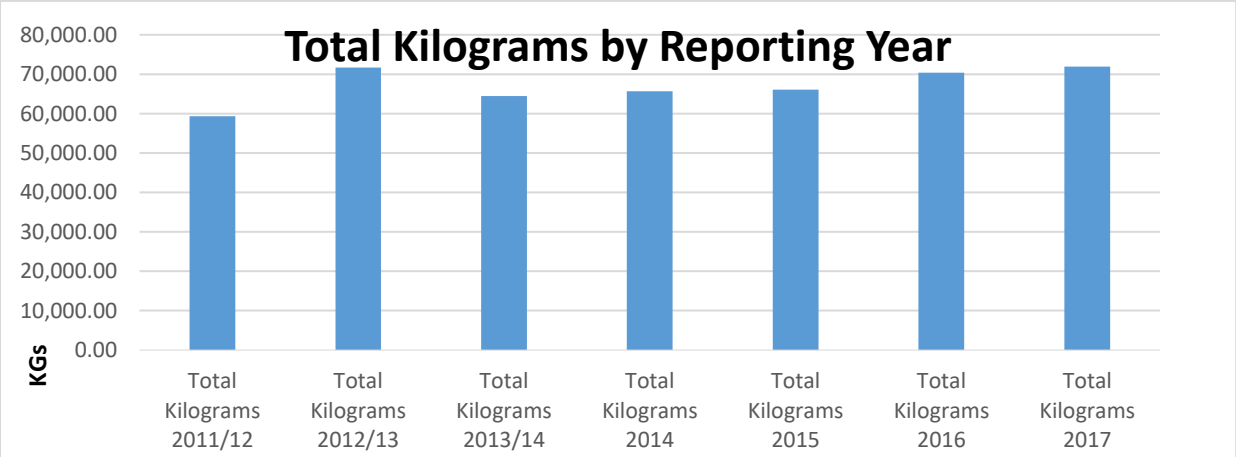
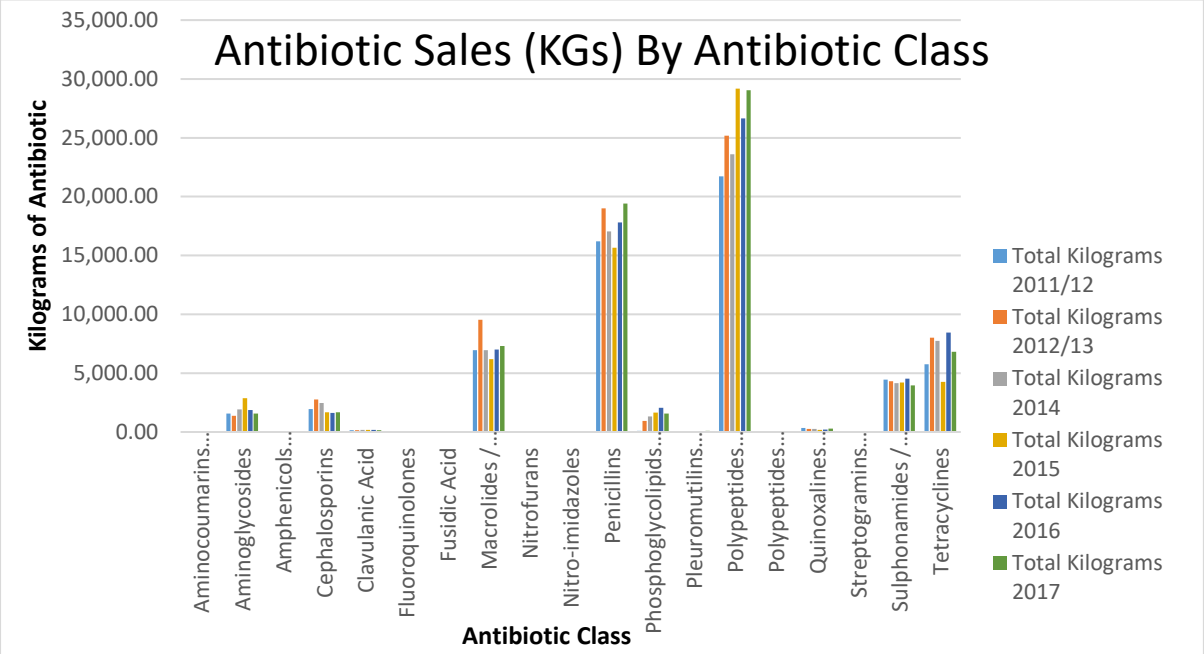
1 Summary

MPI has been collecting data on sales of antimicrobials of significance to human health used as agricultural compounds (veterinary medicines and agricultural chemicals) since 2004. These data are used to monitor trends in antimicrobial use by class, species and route of administration on a kilogram of active ingredient basis. This reporting period covers the calendar year of 1 January 2017 to 31 December 2017 and is part of the ongoing monitoring programme of antimicrobial sales by MPI. Interpretation of use is based on the sales data collected, along with feedback on antimicrobial use from the agricultural sectors and veterinarians in the field. Data from 251 trade name products containing one or more antibiotics as active ingredients were registered and therefore analysed for the 2017 reporting period. This is the same number of products that were registered and analysed for quantities of antibiotic sold during the 2016 reporting period.

Compared to the 2016 reporting period, total antimicrobial sales have increased by 3%. This report identifies an increase in quantities of antibiotic sold in four of the five classes of antibiotic identified by the World Health Organization (WHO) to be of critical importance to human health. Third generation cephalosporins increased in sales by 16% while fourth generation cephalosporins increased by 58%, although small overall volumes were sold, particularly in respect to the fourth generation cephalosporins. Macrolides increased in sales by 5% while fluoroquinolone sales remained reasonably steady compared to 2016 with an increase of 1%. Aminoglycoside sales reduced by 17%, which is attributable to the decrease in sales of antibiotics registered for use in horticulture. Penicillins, now classified as critically important to human health, increased compared to 2016 by 9%. This demonstrates an expected lag between the WHO changes in classification of antibiotics compared to use of these classes. Overall, critically important antibiotics increased by 5.5%.



The majority of antibiotics sold continue to be those registered for use by administration in feed (58%). Injectable products are the second most common type of product sold (28%). However, sales in this category have declined by 10.5% compared to the previous period. Almost half of the antibiotics sold are products registered for use in pigs/poultry (49.6%), followed by products registered for use in multiple animal species (20%).



The 3% increase in antibiotic sales is not believed to be due to the increase in the overall animal population. A calculation of the biomass when taking beef cattle, dairy cattle, poultry, pigs and sheep into account has actually decreased. The sheep and dairy cattle population decreased, while the beef cattle, pig and poultry populations increased. However, taking the average weights of each of these species into account, the overall biomass of New Zealand production animals decreased by ~0.03%. The cause of the increase in sales is not clear but could have resulted from new or increased disease prevalence, stockpiling of product or a reduction in prudent use.

2 Introduction

Antimicrobial resistance (AMR) continues to be of global concern as it threatens the ability to prevent and treat infectious disease caused by microbes. While AMR is a natural consequence of antimicrobial use, inappropriate practices hasten its evolution and spread. Resistance is present throughout the world in pathogens that are known to cause common diseases.

The most recent report outlining the antimicrobials of greatest importance to human health was published by the WHO in 2016. The purpose of this sales analysis is to identify an up to date list of 'critically important' antimicrobials, and to ensure their prudent use in both human and veterinary medicine. In future, we will use a classification system that takes into account those antimicrobials considered of importance to human, animal and plant health, as well as being relevant to the New Zealand situation.

Three categories of antimicrobials are named in the report: critically important, highly important, and important. Antimicrobials **critically important** for human health meet both Criterion 1 and Criterion 2. Those antimicrobials that meet either Criterion 1 or Criterion 2 are categorised as **highly important**, while antimicrobials that meet neither Criterion are ranked as **important**. The two criteria are:

- Criterion 1: Antimicrobial agent which is the sole agent, or one of limited available therapy, to treat human disease.
- Criterion 2: Antimicrobial agent 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 resistant genes from non-human sources.

The critically important antimicrobials are now prioritised into **'highest priority critically important'** and **'critically important'**. Antimicrobial classes in the 'highest priority critically important' group that are registered for veterinary use in New Zealand include fluoroquinolones, polymyxins, macrolides and third and fourth generation cephalosporins. Aminoglycosides, classified as 'critically important' by the WHO, are registered in New Zealand for use in both horticulture and as veterinary medicines. Polymyxins have been newly added to the group of critically important antimicrobials due to their greater importance for the treatment of Gram negative infections. Some penicillins (natural, aminopenicillins and antipseudomonal) have also now been classified as critically important. The use of penicillins is described separately in this report.

Antimicrobial sales have been reported in units appropriate to each individual product, and converted to weight in kilograms using the active ingredient concentration expressed on the product label. Overages used in manufacturing and non-active salts are not included in the final mass.

3 Background

To manage the risks associated with the development of antimicrobial resistance, registrants of restricted veterinary medicines (RVMs) and horticultural products containing antimicrobials important to human medicine must provide an annual report of sales by month to MPI as a condition of registration. A preliminary sales data report is presented to industry in order to allow each sector to comment on the significance of the findings relevant to their field. Industry comment is important to the evaluation of the sales data as it provides insight into specific disease challenges that might have occurred over the period, and highlights changes in management practices and the animal population for each species. These sales data, along with industry input, are used to monitor for significant trends that may indicate changes in antibiotic use in the field and thereby provide some insight into the potential for development of antimicrobial resistance.

Last public report

The last public report on antibiotic sales was a summary of the data collated from 1 January 2014 to 31 December 2016: (ref: https://www.mpi.govt.nz/dmsdocument/31920-antibiotic-sales-analysis-2014-2016)

Ongoing reporting of antibiotic sales

This report is focused on antimicrobial products used in horticulture and those that are classed as RVMs and used in animals.

MPI will continue to seek registrant and industry input regarding the use of antimicrobials to provide context and inform the data analysis. The resultant report will continue to provide a reliable indication of actual antibiotic use rather than sales data alone.

It is recognised globally that collecting use information per species adds considerable value in the establishment of trends that can be used to inform resistance strategies. While a move to recording use per species rather than sales is problematic, it will give a clearer picture of which species these products are being used in and why. MPI will continue to look at methods for collecting use per species data for future reports.

Data limitations

Sales data as an indicator of antibiotic use and thereby risk of the development of antimicrobial resistance is inherently limited due to a number of variables. The amount of antibiotic sold within the evaluated time period might not be used within that same time period and therefore may not be representative of current use patterns. In addition, sales data do not take into consideration the amount of product lost during administration or transport, non-compliance if owners do not administer a full course, or stock held for future use. While sales can approximate use over the nominated period, actual use can encompass product sold one or two years prior to and following that nominated period.

Data limitations are more pronounced in antibiotics used in animals than in plants. For example, there is more variability in approved uses of antibiotics in animals, and many products are approved for use in both food-producing and companion animal species. In addition, veterinarians have the authorisation to employ discretionary use for products not limited to 'on label' use patterns (such as the case for antibiotics used in horticulture), target species, dose rates and treatment regimes. Because of the use of products 'off label', total antibiotic use cannot be accurately predicted by the sales data.

Sales data also do not give any indication of the fluctuations of animal numbers within the New Zealand herd, the health of individual animals, or emergent disease trends. Increases and decreases of sales can therefore be representative of population changes and/or changes in disease prevalence within that population just as readily as they can be of changes in antibiotic use.

There is no direct monitoring of the sales of human preparations used as veterinary medicines, or the sale and use of compounded veterinary medicines, as their use is at the discretion of the attending veterinarian in specific cases. This is especially important when considering the impact of the sales of antibiotics on the emergence of antimicrobial resistance, as compounded and non-veterinary medicines are often used when available veterinary antibiotics either fail to cure the infection or when the veterinarian determines that multi-modal therapy incorporating non-veterinary medicines is indicated.

Sales data in kilograms of active ingredient does not take into account dose rates. Certain antimicrobial classes might require more or less active ingredient that amounts to one dose of product.

The analysis is based on the weight of antibiotic active ingredient sold, but the sales are reported to MPI in amount of product sold. Product sales are mathematically converted by MPI to active ingredient weights and evaluated based on the sum in kilograms of active ingredient, often from multiple products. MPI is still working with the registrants of antibiotic veterinary medicines to eliminate errors that creep in during the process of that conversion. While there may be some discrepancies in the statistics, MPI believes that any discrepancies that may occur are unlikely to significantly alter the analysis.

Finally, MPI is aware that a proportion of antibiotics sold in New Zealand may be used in other countries including the Pacific islands. The information passed on from registrants does not specify how much product is sold for use in New Zealand and how much is supplied for overseas use.

4 Glossary

Species and administration definitions remain the same as in the previous report to ensure consistent reporting:

Species or **species group** are defined as:

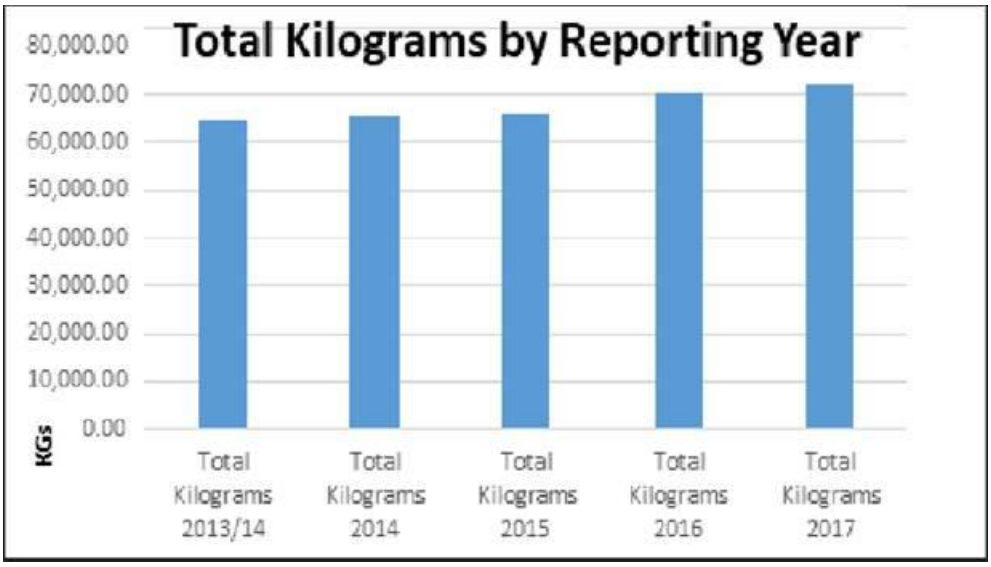
- **Cattle** – dairy and /or beef cattle
- **Companion** – cat and /or dog
- **Horses and Sheep** – horses and sheep have been identified separately from those classed as 'other'.
- **Pigs/Poultry** – pigs and /or chickens, turkeys and game birds. Where possible, particular classes and active ingredients will be discussed as they pertain to either pigs or poultry.
- **Multiple Species** – all products registered for use in multiple species including companion animals. This category includes products with claims for deer as there are few examples of antibiotics registered with use claims specific to deer.
- **Multiple Production Species** – all products registered for use in multiple production species. This category has been added to gain insight into products used in food-producing species.
- **Other** – this category includes products used in caged birds, pigeons, ornamental fish and plants.
- **Plants** – products registered for use in plants.

Administration route

- **Oral** – tablets, capsules, pastes, powders and suspensions for individual dosing.
- **Injectable** – intravenous, subcutaneous, and intramuscular preparations for individual dosing.
- **Feed** – in dedicated animal feed for the treatment of animals where other administration methods are not appropriate.
- **Water** – in dedicated animal water supply for the treatment of animals where other administration methods are not appropriate.
- **Intramammary** – lactating and dry cow products administered via the teat canal for individual dosing.
- **Topical** – superficially applied solutions, gels, ointments, creams and aerosols for individual dosing.
- **Other** – products for ophthalmic, intra-aural, intrauterine or spray–on (plant) use, or products where more than one administration route is possible.

5 Sales Trends 2017

Sales trends over the last 5 years



The total quantity of antibiotics sold during 2017 was 70,406 kg. This is an increase of 3% compared to 2016 when a total of 68,321 kg was sold. The trend over the past 5 years started with the largest quantity sold during the 2012/13 period of 70,785 kg. This dropped during the subsequent reporting year of 2013/14 to 63,099 kg and has steadily increased annually by 0.3% to 6% depending on the year.

Sales of aminoglycosides decreased by 17% from 1,870 kg in 2016 to 1,557 kg in 2017. Over the previous 5 year period, sales of this class of antibiotic increased until they peaked in 2015 at 2,611 kg, but have declined annually following that period. The volume of aminoglycoside sold in 2017 was 12.5% greater than the amount sold during 2012/13, the reporting period when the lowest quantity of aminoglycoside was sold.

Sales of fluoroquinolones remain low with 42.5 kg sold during 2017. This has remained relatively stable with an increase of 1% since 2016 when 42 kg was sold. The trend over the past 5 years is that sales in this class declined on an annual basis until 2016 when sales increased by 13.5% compared to the previous year. An overall reduction in sales by 18% has occurred compared to 2012/13.

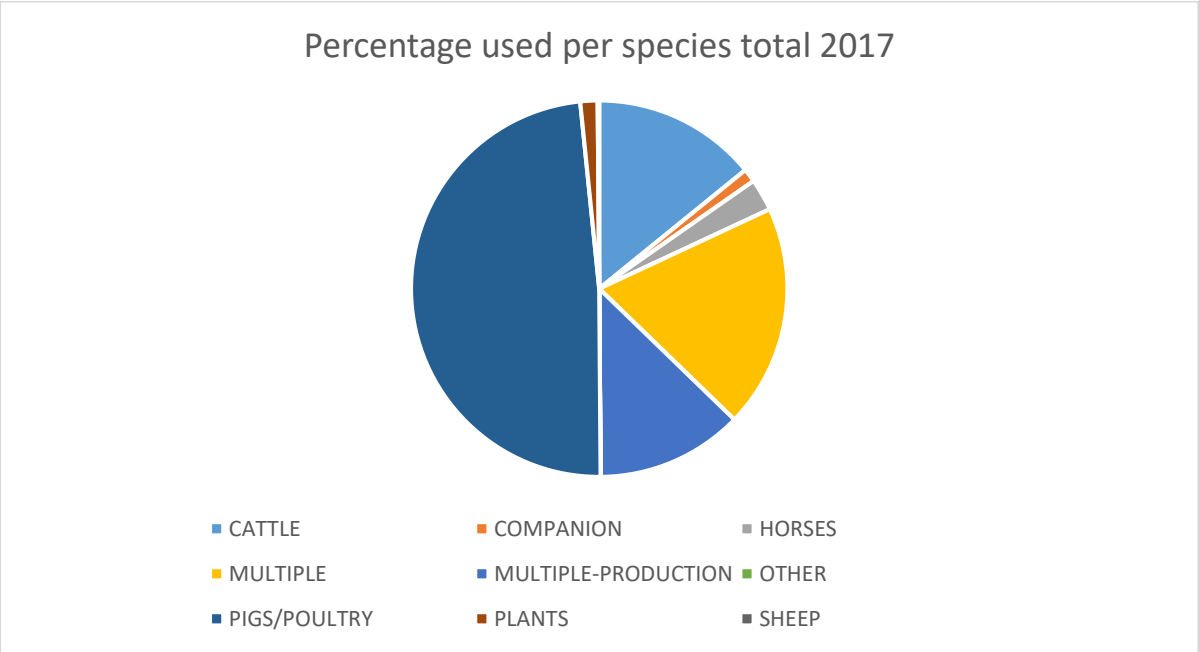
Cephalosporin sales for 2017 were 1,637 kg. Sales of this class of antibiotic have been steady for the last 3 reporting years with 1,662 kg sold in 2015 and 1,614 kg sold in 2016. There has been a downward trend of cephalosporin sales over the last 5 years, with a 40% reduction when comparing 2017 to 2012/13.

The quantity of macrolides/lincosamides sold during 2017 was 7,316 kg. This has increased by 4.6% since 2016 when 6,994 kg was sold. Over 95% of the sales in this class are attributed to the sales of products containing tylosin administered either in feed or in water. Compared to the 2012/13 reporting period, macrolide/lincosamide sales have reduced by 24%.

Penicillin sales during 2017 amounted to 19,402 kg. This is an increase by 9% compared to 2016, at which time 17,803 kg was sold. Over the last 5 years, sales of penicillins have

fluctuated between 22% and 27% of overall antibiotics sold. The period of 2013/14 had the lowest total quantity of 14,032 kg sold, which equated to 22% of overall sales. We are aware that prescribing behaviours have changed over the last 3 to 4 years away from critically important antibiotics and this has increased the quantity of penicillins sold. Reclassification of penicillins by WHO as critically important antibiotics may result in a reduction of penicillin sales in the future.

6 Antibiotic Sales by Species



Nearly half of all antibiotics sold in New Zealand during the 2017 period (49.6%) were registered for use in pigs, poultry or pigs and poultry. This is a slight increase in percentage compared to 46% during the previous reporting period. The majority of these products contain the active ingredient zinc bacitracin.

Twenty percent of antibiotics sold were registered for use in ‘multiple’ species, which includes production and companion animals. Again, this has increased compared to 16% sold during 2016. The majority of these products were injectable penicillins, followed by in-feed tylosin products.

Fifteen percent of antibiotics sold were registered for use in cattle only. This is a 1% increase compared to the previous reporting period. Most products sold for use in cattle were injectables and contained the active penicillin.

Thirteen percent of all quantities sold were registered for use in multiple production species. All were injectable products and contained mostly macrolides (tylosin 1,187 kg) or tetracycline (2,154 kg). This is a slight decrease and likely reflects a change in use in cattle from products registered for use in multiple production species, to use of products registered for use in cattle only.

Quantities of antibiotics sold that are registered for use in horses has decreased from 3.5% of all quantities sold in 2016 to 2.8% in 2017. All products registered for use in this species re oral medications, which include sulphonamides and trimethoprim or virginiamycin.

Quantities of products sold for use in plants has reduced to 1.5% of total sales compared to 2% in 2016. Only two products are registered for use in plants and both are aminoglycosides.

The quantity of products sold that are registered for use in companion animals dropped slightly from 1.12% in 2017 compared to 1.29% in 2016. Most are oral medications with some for topical or injectable administration. Over half sold contained amoxicillin as the active ingredient.

Sales of antibiotics registered for use in sheep only remained very low at 0.14%, the same quantity as sold during 2016. There is one product registered specifically for use in sheep only and it contains penicillin as the active ingredient.

7 Production Animals: Population and Antibiotic Use

The national sheep population decreased from 27.8 million wintered in 2016 to 27.5 million wintered in 2017. The New Zealand sheep population has steadily declined over the last 5 years. Compared to 2012 when 30.8 million sheep wintered in New Zealand, the population has decreased by 11%.

The number of dairy cattle in New Zealand, including young stock and milking cows for 2017 was 6.5 million animals. This is a slight decrease in population of 1.3% compared to 2016 when 6.62 million dairy animals were present. Dairy cattle numbers have fluctuated somewhat over the previous 5 years. They steadily increased in number between 2012 and 2015 at which time the population dropped. The population then increased slightly between 2015 and 2016 before dropping again.

The national beef herd increased slightly during 2017 to reach 3.6 million cattle, compared to 3.5 million in 2016. Since 2012, there has been a steady annual decline in beef numbers, until the increase in 2017. The difference in population when comparing 2012 to 2017 amounts to a 14% reduction.

The national pig herd has been taken from the number of pigs slaughtered at licenced premises over a calendar year. In 2017, a total of 661,089 were slaughtered. This is an increase compared to the 2016 calendar year when 639,890 pigs were slaughtered. Over the last 5 year period, pig numbers have been steadily declining but in 2017 an increase in the population was noted. Compared to September 2012, the national pig herd has decreased from 719,678, a reduction of 8%.

The national poultry population again increased during 2017 to approximately 127 million chickens compared to 123.8 million in 2016, an increase of 2.6%. The number of layer chickens has increased compared with 2016 by 8% to ~3.9 million. Approximately 20 million broiler chickens are free range. Some free range broiler farms use zinc bacitracin while others do not. Since 2012, poultry numbers have increased on an annual basis. Compared to 2014, the population has increased by 23.3%.

As with previous reports, the pig, poultry, and dairy cattle industries use the greatest mass of antibiotics in New Zealand agriculture. These production systems are far more intensive compared to beef cattle and sheep farming, with animals generally in much closer proximity. This results in a greater incidence of disease and a need for more antibiotic use. Dairy cattle also have a greater biomass and therefore require more antibiotic mass per animal during treatment when compared to smaller species like sheep.

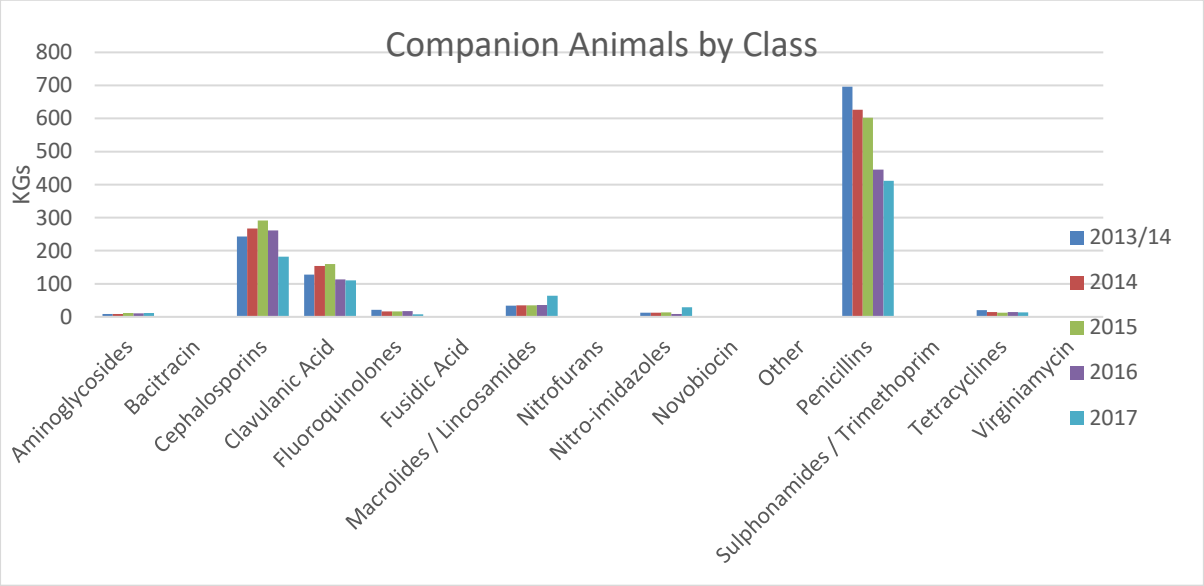
8 Companion Animals: Population and Antibiotic Use

The most recent companion animal population statistics were established in 2015 by the New Zealand Companion Animal Council[1]. The population of companion animals at that time included 683, 000 dogs, 1.1 million cats and 116,000 rabbits.

The quantity of antibiotic registered for use on companion animals sold during the 2017 period remained low at 1% of total antibiotic sales. In terms of amount sold, there has been a reduction of 8.6% to 830 kg sold during 2017.

The classes of antibiotic that increased in sales compared to 2016 included aminoglycosides, all of which were topical or aural medications (from 10.6 kg to 12.0 kg), macrolides/lincosamides, which was entirely due to an increase in sales of medications containing the macrolide spiramycin (from 35.8 kg to 63.9 kg) and nitroimidazoles (from 8.9 kg to 29.1 kg). Cephalosporins decreased in sales from 261.5 kg sold in 2016 compared to 181.8 kg sold in 2017. The sales of third generation cephalosporins has remained relatively stable while the sales of first generation cephalosporins has decreased. The other classes of antibiotic registered for use in companion animals that decreased in quantities sold during this period included penicillins (from 445 kg to 411 kg) and fluoroquinolones (from 17kg to 8 kg).

As with the previous report, the majority of antibiotic classes sold for use in companion animals continued to be penicillins, followed by cephalosporins, then clavulanic acid-based products.



9 Antibiotic Use in Horticulture

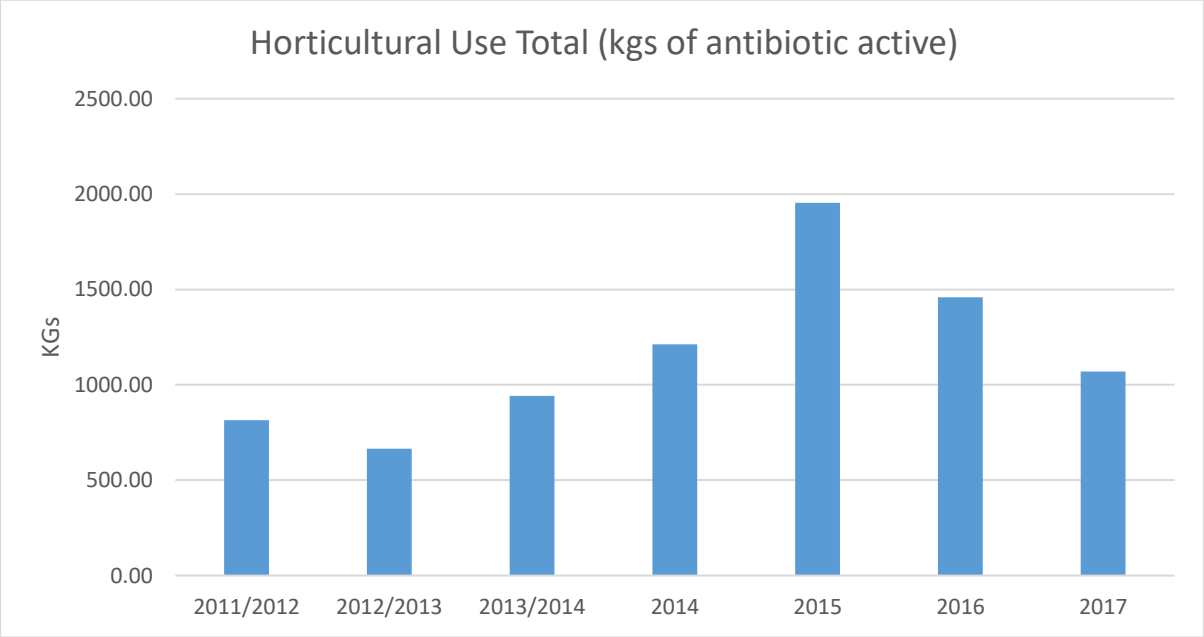
During 2017, two antibiotic trade name products remained registered for use in the horticultural sector. Both are aminoglycoside-based products; one contains the active kasugamycin while the other contains the active streptomycin. Kasugamycin is registered for use in kiwifruit to treat *Pseudomonas syringae PV. actinidiae* (Psa) infections, while streptomycin is registered for use in pip fruit, stone fruit, tomatoes, and kiwifruit to treat fireblight and other bacterial diseases. Psa, which was first detected in New Zealand kiwifruit

[1] New Zealand Companion Animal Council Link

in 2010, has continued to be an issue with this crop. The majority of use of these two products is likely to be in kiwifruit for the treatment of Psa.

The sales of both active ingredients decreased in 2017 compared to 2016, with kasugamycin sales decreasing by 37% and streptomycin sales decreasing by 20%. Industry has commented that stock in trade during the beginning of 2017 has given the perception of a reduction in sales of kasugamycin and does not represent the volume used by growers during that period. As a result kasugamycin sales may increase in the 2018 report. Streptomycin accounted for 65% of antibiotic sales used in the horticultural industry, while kasugamycin accounted for the remaining 35%.

Compared to the previous year, the quantity of antibiotic sold for use in plants has decreased by 26.7% from 1,458 kg in 2016 to 1,069 kg in 2017. The amount sold to the horticultural industry remains low at approximately 1.5% of all antibiotic sold in 2017. The use of antibiotics sold for use in horticulture is forecasted to increase as the land area used by the kiwifruit industry increases.



10 Sales Analysis by Route of Administration

Antibiotics registered for administration via feed accounted for 40,993 kg or 58% of all antibiotics sold during 2017. This is an increase of 7% compared to 2016. Looking at the trend since the 2011/12 report, a mean of 53% of all antibiotics sold was antibiotic registered for administration via feed.

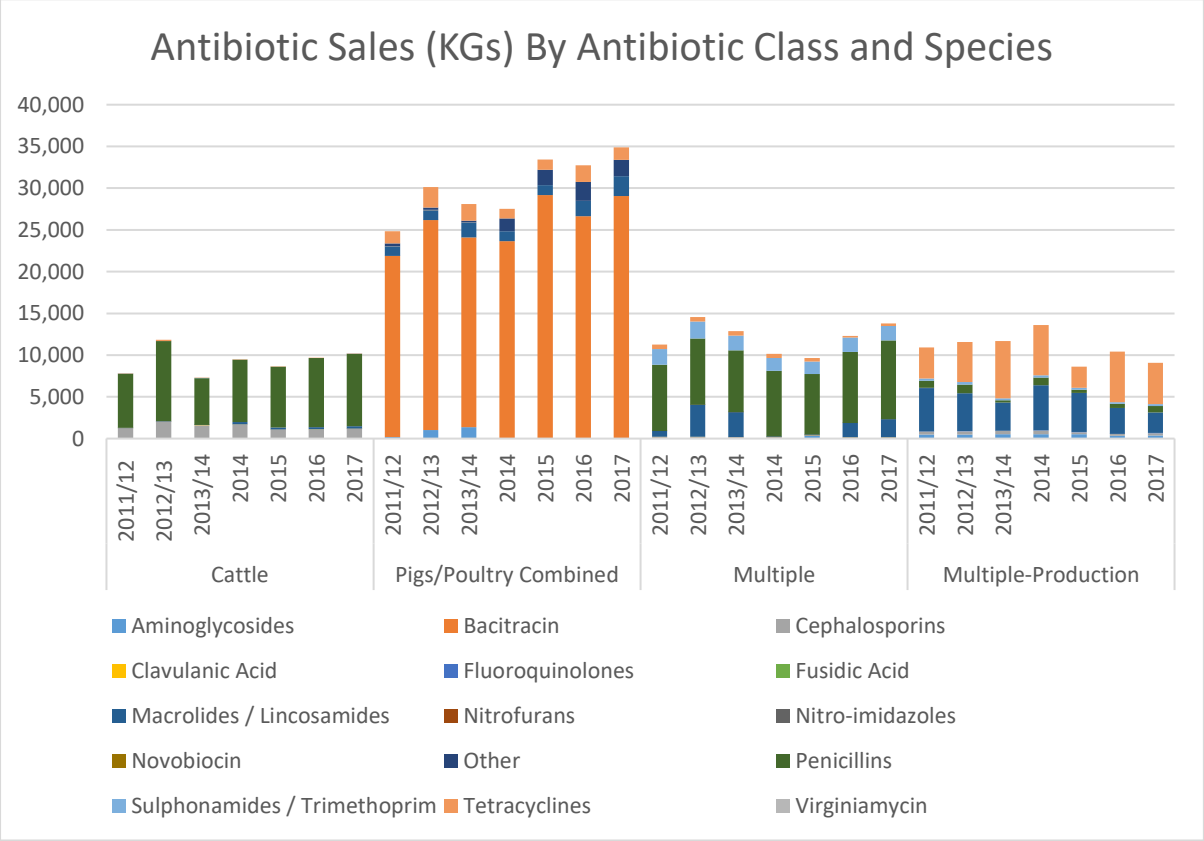
In 2017, 71% of antibiotics sold and registered for administration via feed, contained the active ingredient zinc bacitracin and is registered for use mostly in poultry, but approximately 15% of this active that was sold is registered for use in both pigs and poultry. The pig industry states that they use very little zinc bacitracin. They have estimated that less than 5% of that sold was used in pigs. Products containing aminoglycosides and macrolides/lincosamides each accounted for 8.6% of antibiotics sold and administered via feed, while tetracyclines accounted for 7.1% of these products.

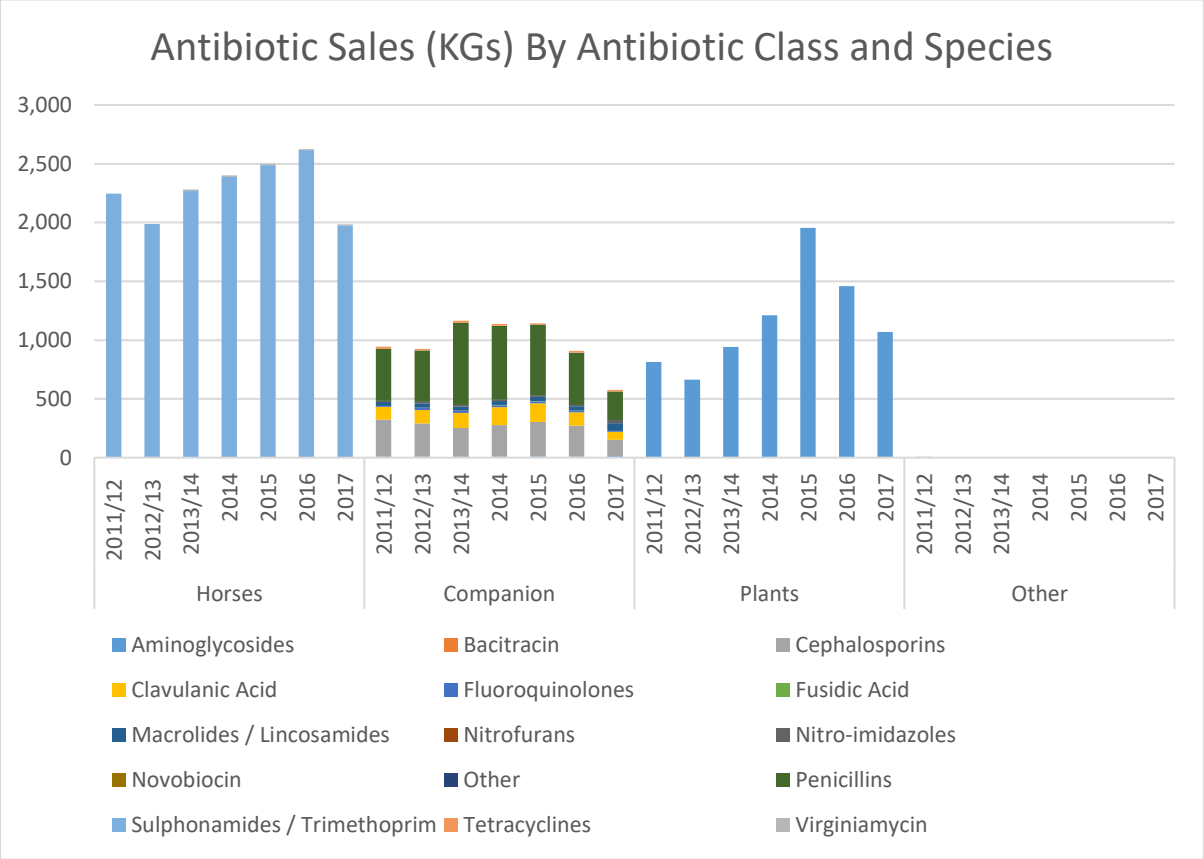
As with previous years, injectable products were the second largest mass of antibiotics sold and accounted for 23% of total sales. This is a decrease by 3% compared to 2016. Over the last 5 reporting years, injectables have accounted for between 20% and 27% with an average of 24% of overall sales. During the 2017 reporting period, 72% of injectable product sold contained penicillin, 13% contained tetracycline, 9% contained macrolide/ lincosamide and 2% contained aminoglycoside or cephalosporin.

Intramammary products were the third highest quantity sold per route of administration and accounted for 12% of the total sold. Over the last 5 years, intramammary antibiotic quantities sold has ranged between 10% and 13% of total antibiotics sold on an annual basis, with an average of 12% each year. By far the majority of intramammaries sold were penicillin-based at 85%, followed by cephalosporin-based products at 13%. The remainder contained tetracyclines, aminoglycosides, macrolides/lincosamides or clavulanic acid, all at less than 1% of total sales.

The fourth highest group of sales by administration were oral medications. In 2017, these accounted for 9% of all sales, the same as the previous year. Over the last 5 years oral antibiotics sold have ranged between 7% and 9% of total sales. The majority of oral antibiotics sold contained sulphonamide/trimethoprim active ingredients at 61%, followed by products containing tetracyclines at 23%, then penicillin at 9%.

The remainder of antibiotics sold includes those administered via water, by topical administration or other administration routes including intra-aural, intrauterine or horticultural application. These groups comprised approximately 4% of total antibiotics sold during 2017. Almost all products sold for administration in water were tylosin-based products registered for use in pigs and poultry. This is a shift from previous years when approximately half of antibiotics sold for administration in water has been tetracycline-based.

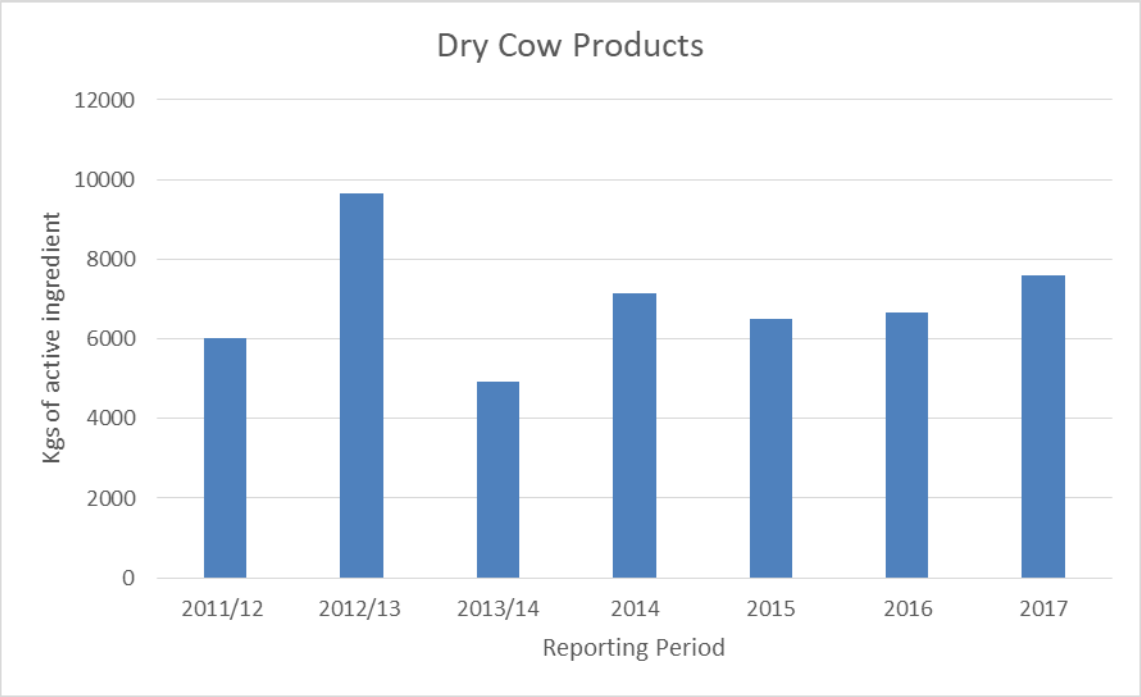



Antibiotic Sales (KGs) By Antibiotic Class and Species
3,000
2,500
2,000
1,500
1,000
500
0
2011/12
2012/13
2013/14
2014
2015
2016
2017
Horses
Companion
Plants
Other
Aminoglycosides
Bacitracin
Cephalosporins
Clavulanic Acid
Fluoroquinolones
Fusidic Acid
Macrolides / Lincosamides
Nitrofurans
Nitro-imidazoles
Novobiocin
Other
Penicillins
Sulphonamides / Trimethoprim
Tetracyclines
Virginiamycin

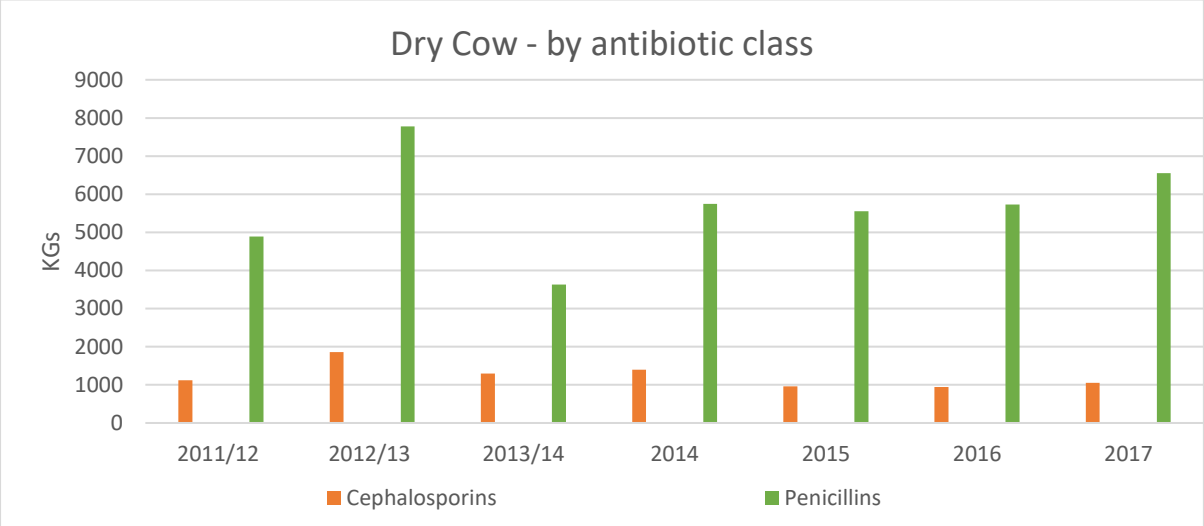
11 Dry Cow Therapies

Dry cow therapies (DCTs) are treatments administered directly into the teat canal to treat exisiting mastitis and to prevent new infections from occuring during the non-lactation (dry) period. DCTs consist of long-acting antibiotics. Sales of DCTs are known to fluctuate annually as use is dependant on multiple factures including farm finances, on-farm practices, environmental conditions, and clinical requirements.

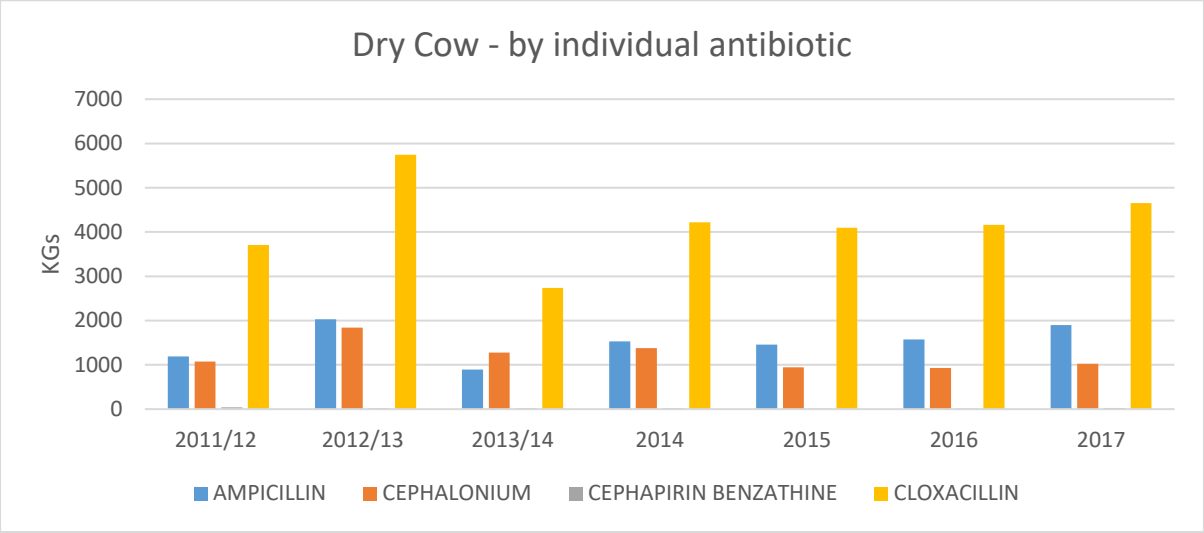
The quantity of DCTs sold during 2017 was 7,604kg or 11% of the total antibiotic quantity sold during that period. This is an increase in quantity sold of 14% compared to 2016. MPI is not able to comment on why this change occurred. While industry feedback was requested on reasoning behind the changes in sales, no information was given.



All registered DCTs continue to contain either penicillin (cloxacillin ± ampicillin) or first generation cephalosporins (cephalonium or cephapirin). As with previous years, the majority of DCTs sold contained penicillins as active ingredients.



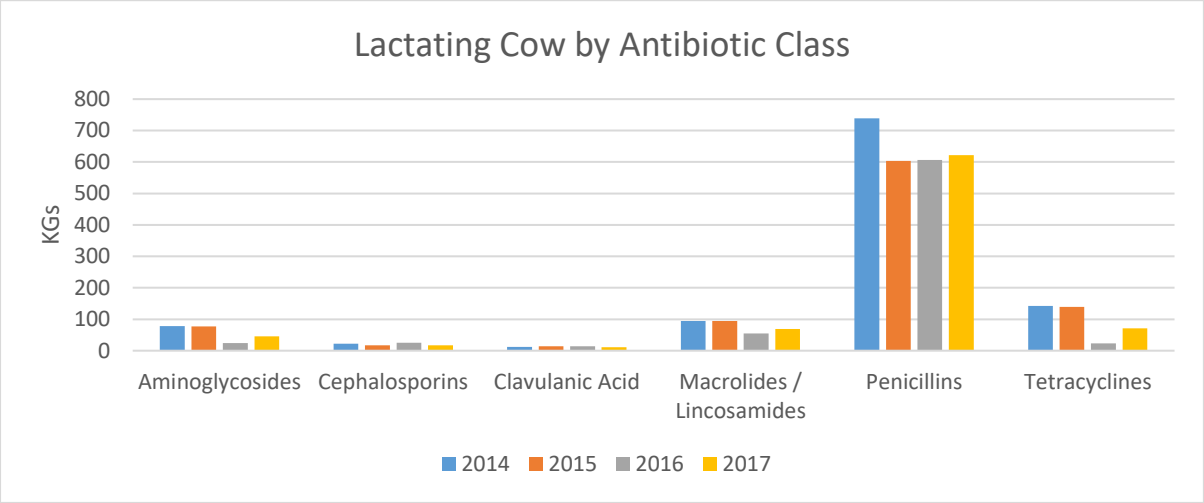
In 2017, 86% of DCTs contained penicillin, with 25% containing ampicillin and 61% containing cloxacillin by weight of active ingredient. DCTs sold containing cephalonium in 2017 made up 13% of total DCTs sales while products containing cephapirin benzathine comprised less than 0.15% of total DCTs. Four new DCTs were registered in 2017, none of which contributed to sales during this period.



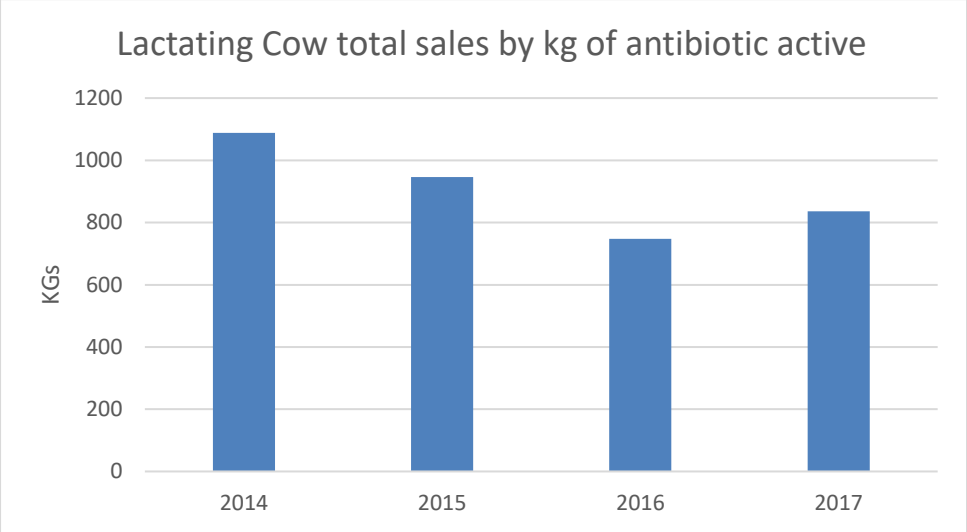
12 Lactating Cow Treatments

Lactating cow treatments (LCTs) are intramammary therapies used to treat mastitis during lactation. Throughout the 2017 reporting period, 836 kg of LCTs were sold, an increase of 12% compared to 2016. This amounts to 1% of overall antibiotic sales that occurred during 2017.

Active ingredients used in LCTs include aminoglycosides, cephalosporins, clavulanic acid, macrolides/lincosamides, penicillins and tetracyclines. The majority of LCTs sold during this period included penicillins as the active ingredient (74%). Tetracyclines accounted for 8.6% of LCTs sales, while macrolides/lincosamides accounted for 8.3%, aminoglycosides accounted for 5.5%, cephalosporins accounted for 2% and clavulanic acid made up 1.3 % of LCTs sales.



Since 2014, when monitoring of LCT sales began, quantities sold have decreased by 23%. As can be seen in the below graph, the 2016 period had the lowest sales of LCTs. MPI is not able to comment on why this change occurred. While industry feedback was requested on reasoning behind the changes in sales, no information was given.



Two LCTs were registered in 2017. Neither product affected the trend in sales of LCTs.

13 Total Quantity Sold

The total quantity of antibiotics sold during 2017 was 70,406 kg. This is an increase of 3% compared to 2016 at which time a total of 68,350 kg was sold. As with previous years, sales of some antibiotic classes increased, while others decreased.

Total Antibiotic Sales by class (in kilograms active ingredient)

Antibiotic Class	2014	2015	Difference (%) 2014-2015	2016	Difference (%) 2015-2016	2017	Difference (%) 2016-2017
Aminocoumarins (Novobiocin)	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Aminoglycosides	1, 911	2,611	↑ 37	1,870	↓28	1,557	↓17
Amphenicols (Florfenicol)	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Cephalosporins	2,457	1,662	↓ 32	1,614	↓ 3	1,677	↑4
Clavulanic Acid	170	178	↑ 5	169	↓5	161	↓5
Fluoroquinolones	40	37	↓ 8	42	↑ 13.5	42.5	↑1
Fusidic Acid	1.4	1.4	Nil	1.4	Nil	0.1	↓90
Macrolides/ Lincosamides	6,946	6,188	↓11	6,994	↑ 13	7,316	↑5
Nitrofurans	0.1	Nil	↓ 100.0	Nil	Nil	0.6	-
Nitroimidazoles	14.5	33	↑128	39	↑18	33	↓15
Penicillins	17,047	15,646	↓ 8	17,803	↑ 14	19,402	↑9
Pleuromutilin (Tiamulin)	Nil	Nil	Nil	Nil	Nil	98	-
Polypeptides (Bacitracin)	23,599	29,172	↑ 24	26,637	↓ 9	29,052	↑9
Polypeptides (Polymyxin)	0.4	0.5	↑ 25	0.5	Nil	0.4	↓11
Quinoxalines (Carbadox)	263	175	↓ 33	194	↑ 11	275	↑42
Streptogramins (Virginiamycin)	13	10	↓ 23	7.5	↓ 25	8	↑9
Sulphonamides / Trimethoprim	4,153	4,203	↑ 1	4,544	↑ 8	3,971	↓13
Tetracyclines	7,737	4,267	↓ 45	8441	↑ 98	6,821	↓19
Total	**64,351**	**64,416**	↑ 0.1	**68,321**	↑6	**70,406**	↑3

13.1 Aminoglycosides

Aminoglycosides accounted for 2.2% of the total antibiotics sold during 2017 with 1,557 kg being sold. This is a reduction in sales of 17% compared to 2016. One thousand and sixty nine kilograms or (69%) of aminoglycosides sold were registered for use in plants, which is a reduction of 27% compared to 2016. There has been a trend of decreasing sales of aminoglycosides registered for use in plants since 2015.

The second highest category of aminoglycosides were products sold for use in multiple production species, which accounted for 24% of sales. All products in this category are injectable and are registered for use in pigs, sheep and cattle.

The third highest category of aminoglycoside sales were from products sold for use in multiple species. Approximately half of the active sold in this category were from lactating animal intramammary products, while the remainder were injectable products registered for use in cats, dogs and horses.

Products registered for use in companion animals only, pigs only, and cattle only, individually made up less than 1% of aminoglycoside sales.

The overall reduction in sales compared to 2016 was due to decreased use on plants. However, the quantities sold that are registered for use in animals has increased across the board apart from those products registered for use in cattle only and pigs only. Multiple species and multiple production species have increased by 29% and 16% respectively. While the overall quantities of aminoglycosides sold in companions animals (12 kg) and pig/poultry (21 kg) were small, sales increased by 109% in pigs/poultry and 22% in companion animals compared to 2016. MPI is not able to comment on why this change occurred. While industry feedback was requested on reasoning behind the changes in sales, no information was given.

The majority of aminoglycosides sold on an active ingredient basis included streptomycin at 57%, followed by kasugamycin at 24% of sales. Products containing these two actives are predominantly registered for use in plants. However, a small amount of streptomycin was from products registered for use in multiple production species. Dihydrostreptomycin accounted for 12% of sales and consisted of products registered for use in multiple production species. Individually, the actives neomycin, gentamycin, spectinomycin and framycetin made up less than 5% of aminoglycoside sales.

13.2 Cephalosporins

Cephalosporins accounted for 2.4% of overall sales in 2017 with a total of 1,677 kg sold. This is an increase of 3% compared to 2016. Due to the quantity of first generation cephalosporins used in DCTs, the amount of cephalosporins sold is known to fluctuate from year to year.

The majority of products sold in this class (82%) contained the first generation cephalosporin cephapirin, cephalexin or cephalonium. Cephalonium, accounted for 61.5% of all cephalosporins sold in this class. All products containing cephalonium are DCTs, registered for use in cattle. Sales containing the active ingredient cephalexin accounted for 10.7% of cephalosporin sales. These products were registered for use in companion animals and multiple species.

Second generation cephalosporin sales decreased by 44% compared to 2016 and totalled 14 kg. All second generation cephalosporins registered were intramammary products for treatment of mastitis during lactation.

Third generation cephalosporins registered for use included the actives ceftiofur, cefpodoxime and cefovexin. Total sales of this group amounted to 303 kg or 18% of all cephalosporins. An increase in third generation sales of 15.6% occurred compared to 2016. Ninety percent sold were products containing ceftiofur, all of which are injectable products registered for use in multiple production species. The remainder sold contained the actives cefpodoxime or cefovexin, both of which are registered for use in companion animals. The increase in use of third generation cephalosporins compared to 2016 is all attributable to the use of products containing ceftiofur. MPI is not able to comment on why this change occurred. While industry feedback was requested on reasoning behind the changes in sales, no information was given.

Fourth generation cephalosporins accounted for 0.1% of overall cephalosporin sales. Compared to 2016, sales increased by 58%. Although this sounds large, a very small quantity of approximately 2kg was actually sold.

13.3 Fluoroquinolones

A total of 42.5kg of antibiotic classed as fluoroquinolones were sold during 2017. This amounted to 0.06% of overall antibiotic sales during this period and was a 1% increase in sales compared to 2016.

Antibiotics registered for use in companion animals amounted to 15 kg or 35% of fluoroquinolones sold. There was an 11% reduction in sales of antibiotics in this category compared to 2016. Actives registered for use in companion animals include enrofloxacin, marbofloxacin and pradofloxacin. The majority sold continue to be oral medications (14kg), with small quantities of product administered by injection or for aural administration.

Antibiotics specifically registered for use in cattle include the active marbofloxacin and accounted for 12% fluoroquinolone sales. Sales of fluoroquinolones in this category have increased by 28% compared to 2016. The products registered in this category have treatment claims for respiratory infections and acute mastitis.

Fluoroquinolones registered for use in multiple production species (pigs and cattle) accounted for 52% of sales in this class. The actives include enrofloxacin and marbofloxacin. Sales in this category increased by 8% compared to 2016. MPI is not able to comment on why this change occurred. While industry feedback was requested on reasoning behind the changes in sales, no information was given.

13.4 Macrolides and Lincosamides

Overall sales of antibiotics in this class increased by 5% compared to 2016 with 7,316 kg sold.

The actives sold in this class remained the same as previously reported and included clindamycin, erythromycin, lincomycin, oleandomycin, spiramycin, tulathromycin, tilmicosin and tylosin. The lincosamide group, which includes lincomycin and clindamycin, is monitored with macrolides due to the similar mode of action and spectrum of activity, which means that cross resistance can develop against active ingredients in both classes if it develops against a compound in either class.

Lincosamide sales are historically low and remained low during this reporting period with 53 kg sold. This is an 11% reduction compared to 2016 when 59 kg of lincosamides were sold. MPI is not able to comment on why this change occurred. While industry feedback was requested on reasoning behind the changes in sales, no information was given. More than half (63%) of lincosamides sold were registered as intramammary treatments for mastitis during lactation. Twenty percent sold was product registered for use in pigs and poultry, while the remainder was registered for use in companion animals.

Sales of macrolides/lincosamides registered for use in cattle declined by 13.5% to 246 kg compared to 2016. Products sold during 2017 that were registered for use in cattle included injectables and intramammary products containing the actives lincomycin, tilmicosin or tylosin.

Macrolides/lincosamides registered for use in poultry and/or pigs increased by 28% compared to 2016 and totalled 2,371 kg. MPI is not able to comment on why this change occurred. While industry feedback was requested on reasoning behind the changes in sales, no information was given. Products sold during this period were registered for administration in feed and in water, and included the actives lincomycin, tilmicosin or tylosin.

Sales of macrolides/lincosamides registered for use in companion animals increased by 78% compared to 2016 with a total of 64 kg sold. All of the sales included oral medications with the active ingredient being either spiramycin or lincomycin.

When looking at macrolides only, sales increased by 5% compared to 2016 with a total quantity of 7,262 kg sold. By far the majority (96%) of macrolides sold included the active ingredient tylosin. The majority (49%) of tylosin-based products sold were registered for administration in pigs, poultry or cattle feed, followed by products administered via water for pigs and poultry. The remainder of tylosin-based products are sold as injectables, for use in cattle only, or for use in multiple production species.

The main increase in sales of this class is attributed to an increase in the sales of the actives oleandomycin (↑213%), spiramycin (↑113%), tilmicosin (↑38%) and tylosin (↑3%). While the percentage increase of oleandomycin and spiramycin are large, the overall quantities sold were actually small at 36kg and 55kg respectively. Tilmicosin products are used to treat footrot in sheep, which is seasonal and weather dependant. Increased prevalence in footrot may account for some of the increase in sales of this active.

13.5 Nitrofurans

There is only one product registered for use containing this class of antibiotics and it is registered for use in tropical fish. Sales in this class amounted less than 1kg.

13.6 Nitroimidazoles

The total amount of nitroimidazoles sold during 2017 amounted to 33 kg. Compared to 2016, there was a drop in sales of 15%. The active ingredients sold in this class include metronidazole, dimetridazole and ronidazole.

Metronidazole is registered for use in companion animals and accounted for 89% of sales in this class during 2017. Compared to 2016, sales increased by 231%. It is not clear whether this is due to availability issues during 2016, or whether change occurred during 2017 that required increased use of this active in companion animals.

Products containing dimetridazole account for 7% of nitroimidazoles sold during 2017. Sales of this active reduced significantly compared to 2016 by around 1000%. Products containing this active are registered for use in pigs, turkeys, chickens and game birds.

A small quantity of product that contains the active ingredient ronidazole was sold for use in pigeons. Compared to the overall mass of antibiotics, the amount of nitroimidazoles sold is very small.

13.7 Novobiocin

While products that contain novobiocin are registered in New Zealand, zero sales have occurred over the last 3 reporting periods.

13.8 Other

This category contains antibiotics that cannot be attributed to other classes of antibiotic and includes carbadox, tiamulin, florfenicol and fusidic acid.

During 2017 a total of 373 kg were sold compared to 2016 when 194 kg were sold. This in an increase in sales of 185%. This is due to an increase in sales of both tiamulin and carbadox. Sales in this category accounted for less than 1% of overall sales during 2017.

Although registered, there were no sales of antibiotics containing the active ingredient florfenicol in 2017. Zero sales also occurred during 2016.

Sales of carbadox increased by 42 % compared to 2016 with 275 kg sold. This active ingredient is registered solely for use in weaner pigs to prevent swine dysentery and as an antiparasitic.

Tiamulin sales amounted to 98 kg in 2017 compared to zero sales in 2016. Products containing this ingredient are registered for use in poultry to treat chronic respiratory disease and in pigs to treat mycoplasma pneumonia.

Fusidic acid sales decreased from 1.4 kg to 0.6 kg. Products containing this ingredient are registered for use in companion animals as topical medications.

13.9 Polymyxins

Polymyxins were added to the WHO list of critically important antibiotics in 2016 to reflect the greater importance of this group for the treatment of Gram negative bacilli. Colistin use is increasing globally to treat serious infections in humans. No products containing colistin are registered for use in New Zealand.

Products containing polymyxins continue to be registered for use in cats, dogs and horses only, as topical, otic or aural medications. A total of 0.4 kg of this ingredient was sold during 2017. Due to the relative difference in importance to AMR, the polypeptide zinc bacitracin is considered separately in this report.

13.10 Penicillins

These drugs have been moved to the critically important WHO category of antibiotics because of the high frequency of use in humans and because they used to treat infections where transmission of resistance is known to occur, though the WHO recognises that penethamate is a veterinary-only active ingredient. Anti-staphylococcal penicillins remain categorised as ‘highly important’. The only active ingredient included in this group that is registered for use in New Zealand is cloxacillin.

Total penicillin sales during 2017 amounted to 19,402 kg or 28% of overall sales. Compared to 2016, this is an increase of 9%.

Critically important penicillin sales amounted to 14,419 kg during 2017 compared to 13,245 kg in 2016, an increase of 9%. The majority of these products remained as injectables that were registered for use in multiple species and containing the active ingredient penicillin G (64%). This was followed by sales of products registered for use in cattle as injectables or intramammary products (26%) containing ampicillin or penicillin G. Critically important

penicillins used in companion animals accounted for 3% of overall sales in this category. All were oral medications containing amoxicillin. There were no penicillins in this category sold that are registered for use in pigs or poultry.

Cloxacillin is the only penicillin active registered for use in New Zealand not listed as critically important by WHO. Cloxacillin sales during 2017 amounted to 4,947 kg which accounts for 25% of all penicillins sold, or 7% of overall sales during this period. Almost all products containing cloxacillin (97%) are registered for use as intramammary treatments.

13.11 Sulphonamides/Trimethoprim

Sulphonamides are classified by the WHO as 'highly important' as they are one of a limited number of therapies available for the treatment of bacterial meningitis and Salmonella, as well as for other infections.

During 2017, sulphonamides/trimethoprim accounted for 3,971 kg or 6% of overall sales. This is a 12.6% decrease compared to the previous reporting period. MPI is not able to comment on why this change occurred. While industry feedback was requested on reasoning behind the changes in sales, no information was given. The majority of product sold is registered for use in horses (50%), followed by products registered for use in multiple species (47%). Small amounts sold were registered for use in cattle or in multiple production species. There were zero sales of products registered for use in poultry and in companion animals.

13.12 Tetracyclines

Tetracyclines are classed as 'highly important' by the WHO in regions where Brucella infections do not occur in food-producing animals including, New Zealand.

In 2017, 6,821 kg of tetracyclines were sold which accounted for 10% of overall antibiotics sold. This is a reduction in sales of 19% compared to 2016. The drop in sales has been across the board when considering species with the exception of products registered for use in cattle only which increased by 43%. The largest change in sales occurred in products registered for multiple species which decreased by 43%, then pigs/poultry which dropped by 23%, then in products registered for use in multiple species which decreased by 20%.

The active ingredients used in this class include oxytetracycline, doxycycline and chlortetracycline. Oxytetracycline accounted for 77% sold in this class and was mainly sold in injectable form for use in multiple production species. Doxycycline accounted for only 0.2% of tetracyclines sold and was registered for use in companion animals as well as aviary birds and pigeons. Chlortetracycline accounted for 22% of tetracyclines sold and was mostly registered for use in feed for pigs and poultry.

The majority of tetracyclines sold was registered for use in multiple production species (77%), followed by products registered for use in pigs/poultry (22%), then those registered for use in multiple species (4%). Less than 1% of tetracycline sold were registered for use in cattle only, companion animals and aviary birds/pigeons.

When looking at route of administration, the majority of tetracyclines sold were registered for use in feed (43%), followed by injectables (32%), then oral administration (21%). Of interest, 3% of antibiotics sold in this class were for topical use as sprays. One percent or less were

registered for use as intramammary and intrauterine treatments as well as ocular and in water treatments.

13.13 Virginiamycin

Virginiamycin belongs to streptogramin class of antibiotics. Streptogramins are currently considered by the WHO as 'highly important' due to their use in treating infections that can be transmitted form non-human sources including MRSA and *Enterococcus* spp.

While there are products registered in New Zealand containing virginiamycin for use in horses and poultry, only products registered for use in horses were sold. The amount sold was very low at 8 kg and the products sold were registered for treatment of laminitis. The quantity sold increased by 9% compared to 2016, however there has been a downward trend in sales when considering the last 5 years.

13.14 Zinc Bacitracin

Bacitracins are currently classified by the WHO as 'important' to human health. Zinc bacitracin is registered for use in pigs and poultry to prevent necrotic enteritis, a disease caused by *Clostridium perfringens*. Necrotic enteritis can result in significant loss if not prevented. A small number of products containing the polypeptide, polymyxin, are registered for use in companion animals and multiple species. As reported above, these products accounted for less than 1 kg of total sales in 2017.

Zinc bacitracin represents 41% of the total amount of antibiotic sold during this reporting period. Throughout 2017, 29,072 kg of Zinc bacitracin was sold. This is an increase of 9% compared to 2016. MPI is not able to comment on why this change occurred. While industry feedback was requested on reasoning behind the changes in sales, no information was given. Over the past 5 year period, sales have steadily increased which somewhat mirrors the increase in the poultry population grown for meat and eggs in New Zealand.

14 Conclusion

The 3% increase in overall sales cannot be attributed to a change in the animal population because a calculation comparing biomass between the previous and current reporting period, demonstrated a decrease during 2017. The reasons for the increase in sales are not clear. The classes of antibiotic sold that contributed to the increase in sales included zinc bacitracin, penicillins and macrolides, and to a lesser extent, carbadox and cephalosporins.

Of concern is the increase in sales of four of the five classes of antibiotic considered critical for human health. Third generation cephalosporin sales increased by 16%, and the increase was attributed mostly to sales of products containing ceftiofur, all of which were registered for use in multiple production species. Although the overall quantity of fourth generation cephalosporin sales were very small at 2kg, sales increased by 58%. The sales of fluoroquinolones increased by 1%, most of which were from products registered for use in multiple production species. Macrolide sales also increased by 5%. The only class of antibiotic considered critically important to human health that decreased in sales during this reporting period were the aminoglycosides. The reduction in aminoglycoside sales is entirely attributable to decreased use in the horticultural industry.

An increase in 1500 kg of penicillin-based products is reported. Some of this increase will be attributable to a change in prescribing behaviour away from those classes considered critical, however the increase is not in line with a changing animal population that penicillin based products are registered for use in. Carbadox use has also increased which is likely the result of an increase in the pig population and a move away from use of critically important antibiotic classes in the pig industry.

15 Acknowledgement

The antibiotic sales data analysis was completed with input from industry representatives and practising veterinarians on the use of antibiotics in New Zealand's production and companion animals, as well as in plants.

MPI would like to thank the following groups for contributing to the content of this report:

Agcarm

Animal Remedy and Plant Protection Association (ARPPA)

Beef and Lamb NZ

Dairy NZ

Horticulture NZ

National Mastitis Advisory Committee (NMAC)

New Zealand Feed Manufacturers

New Zealand Veterinary Association (NZVA)

NZ Pork

Poultry Industry of New Zealand (PIANZ)

Registrants of antibiotic trade name products in New Zealand

16 Antimicrobial Products Registered in New Zealand under the ACVM Act 2011-2017

DATE REGISTERED		REG'N NUMBER	PRODUCT NAME	REGISTRANT	ACTIVE INGREDIENT(S)	CLASS
2017	24/01/2017	A011316	Marbocyl P	Ethical Agents Veterinary Marketing Limited	Marbofloxacin	Fluoroquinolones
	28/02/2017	A010955	Metrivet	Agrihealth NZ Limited	Cephapirin benzathine	Cephalosporins
	8/03/2017	A011329	Mastiplan	Schering-Plough Animal Health	Cephapirin sodium	Cephalosporins
	22/05/2017	A011405	Apex Doxy 100 Paste	Apex Laboratories NZ Ltd	Doxycycline	Tetracyclines
	28/06/2017	A011433	Duramast DC 500	Norbrook NZ Ltd	Cloxacillin / ampicillin	Penicillins
	28/06/2017	A011434	Duramast DC 600	Norbrook NZ Ltd	Cloxacillin / ampicillin	Penicillins
	28/06/2017	A011435	Solodox DC 600	Norbrook NZ Ltd	Cloxacillin	Penicillins
	4/07/2017	A011175	Cefaclear	Zoetis	Cephalonium	Cephalosporins
	29/08/2017	A011484	Lincovet	Agrihealth NZ Limited	Lincomycin / Neomycin	Macrolides/ Lincosamides & Aminoglycosides
	6/11/2017	A011416	Osurnia Ear Gel for Dogs	Elanco Animal Health	Florfenicol	Amphenicols
2016	17/02/2016	A011142	Forcyl	Ethical Agents Veterinary Marketing Limited	Marbofloxacin	Fluoroquinolones
	14/03/2016	A011140	Oridermyl	Ethical Agents Veterinary Marketing Limited	Neomycin	Aminoglycosides
	4/11/2016	A011314	Excenel Flow	Zoetis	Ceftiofur	Cephalosporins
	27/04/2016	A011216	Cephalexin 600 Tablets with Beef Flavouring	Apex Laboratories Pty Limited	Cephalexin	Cephalosporins
2015	11/02/2015	A011126	Dryclox Xtra	Bayer NZ Ltd	Cloxacillin + Ampicillin	Penicillins
	11/02/2015	A011125	Dryclox DC	Bayer NZ Ltd	Cloxacillin + Ampicillin	Penicillins
	28/07/2015	A011156	Veraflox 25mg/mL Oral Suspension for Cats	Bayer NZ Ltd	Pradofloxacin	Fluoroquinolones
	18/08/2015	A011069	Furan - 2	Brooklands Aquarium Ltd	Nitrofurazone	Nitrofurans

	24/08/2015	A011195	TilmoVet 300 Injection	Agrihealth NZ Limited	Tilmicosin	Macrolides/Lincosamides
	21/09/2015	A010991	Clinicin	Chanelle Pharmaceuticals Manufacturing Ltd	Clindamycin	Macrolides/Lincosamides
	29/09/2015	A011182	Neotopic H Lotion	Ceva Animal Health (NZ) Ltd	Neomycin	Aminoglycosides
	3/11/2015	A011173	CloxaSeal 600	Norbrook NZ Ltd	Cloxacillin	Penicillins
	13/11/2015	A011130	Apex PMP Ear Suspension for Dogs and Cats	Apex Laboratories NZ Ltd	Polymyxin	Polypeptides
	19/11/2015	A011232	Enro 100 Injectable Solution	Randlab Australia Pty Ltd	Enrofloxacin	Fluoroquinolones
	10/12/2015	A011249	Clindacure	Chanelle Pharmaceuticals Manufacturing Ltd	Clindamycin	Macrolides/Lincosamides
2014	10/01/2014	A010984	Neove 200 Tylosin Injection	Neove Pharma Australia Pty Ltd	Tylosin	Macrolides/Lincosamides
	30/01/2014	A010848	Kelacef	Kela N.V.	Ceftiofur	Cephalosporins
	24/02/2014	A010920	Penethajec t RTU	Bayer NZ Ltd	Penethemate	Penicillins
	18/3/20104	A011026	Norocef RTU	Norbrook NZ Ltd	Ceftiofur	Cephalosporins
	8/04/2014	A011025	DC Duo	Bayer NZ Ltd	Cloxcillin + Ampicillin	Penicillins
	29/04/2014	A010792	Ultraclox 24	Bayer NZ Ltd	Cloxacillin	Penicillins
2013-2014	18/03/2014	A011026	Norocef RTU	Norbrook NZ Ltd	Ceftiofur	Cephalosporins
	30/01/2014	A010848	Kelacef	Phoenix Pharm	Ceftiofur	Cephalosporins
	10/01/2014	A010984	Neove 200 Tylosin Injection	Neove Pharma Australia Pty Ltd	Tylosin	Macrolides/Lincosamides
	23/10/2013	P008603	Kasumin	Etec	Kasugamycin	Aminoglycosides
	17/10/2013	A010814	Draxxin Injectable Antibiotic Solution	Zoetis NZ Ltd	Tulathromycin	Sulphonamides/ Trimethoprim
	20/08/2013	A010927	Veraflox Tablets for Dogs and Cats	Bayer NZ Ltd	Pradofloxacin	Fluoroquinolones
	20/09/2013	A010735	Metricyclin e	Kela NV	Chlortetracycli ne	Tetracyclines
2012-2013	21/03/2013	A010884	PenClox 1200 High Potency Milking Cow	Virbac New Zealand Ltd	Penicillin + Cloxacillin	Penicillins

	17/12/2012	A010555	Genta 100	Phoenix Pharm	Gentamicin	Aminoglycosides
	4/12/2012	A010742	BaciMax 150 Granular	Agrihealth NZ Limited	Zinc Bacitracin	Bacitracin
	18/11/2012	A010714	Tylosin 300 Injection	Bayer NZ Ltd	Tylosin	Macrolides/Lincosamides
	15/08/2012	A010672	TMPS Powder	Caledonian Holdings Ltd	Trimethroprim + Sulphamethazine	Sulphonamides/ Trimethoprim
	20/07/2012	A010807	TyloVet Injection	Agrihealth NZ Limited	Tylosin	Macrolides/Lincosamides
	10/07/2012	A010772	Tylofen	Bayer NZ Ltd	Tylosin	Macrolides/Lincosamides
2011-2012	17/11/2011	A010667	Furan-2	Brooklands Aquarium Ltd	Nitrofurazone + Furazolidone	Nitrofurans
	4/11/2011	A010727	Romagel VS	Merial NZ Ltd	Cephalonium	Cephalosporins
	3/10/2011	A010691	Eficur	Hipra NZ Ltd	Ceftiofur	Cephalosporins
	8/08/2011	A010697	Cefaject	Bayer NZ Ltd	Ceftiofur	Cephalosporins
	8/08/2011	A010685	Pharmasin 10% Granular Premix	Agrihealth NZ Limited	Tylosin	Macrolides/Lincosamides
	11/04/2011	A010637	Tylomix 250	Bayer NZ Ltd	Tylosin	Macrolides/Lincosamides