Antibiotic Sales 2005-2007

Registrants of prescription veterinary medicines containing antibiotics are required to provide an annual summary of sales to the New Zealand Food Safety Authority (NZFSA) as a condition of registration.

The following provides an update of antibiotic sales figures since the last major report (Antibiotic 2004-05 Sales Report), which should be read for background information. The sales year period is from April to March. The summary tables do not include data on antibiotics that are not managed as prescription veterinary medicines, e.g. ionophores, avilamycin or quinoxalines. These products are not likely to be used in human medicine and there is no evidence to suggest that they could contribute to antibiotic resistance in humans.

Data interpretation

The following issues should be considered when interpreting the information in this report:

- Sales data is not the same as data on use. An unknown amount of antibiotic sold within the nominated period will be used in the following year or years depending on the product's shelf life. Some product will be disposed of as damaged or expired.
- A change in the overall quantity used is often due to increases in animal populations. The usage on a per animal basis may actually fall despite increased sales.
- Environmental conditions and major disease outbreaks may cause a temporary increase in the use of specific antibiotics, which should not be interpreted as a long-term trend.
- Comparing quantities of different antibiotics can give a false impression of the actual numbers of doses used and the number of treated animals. Dose rates and treatment lengths vary between antibiotics. This report makes no attempt to convert sales data into the number of potential animal treatments.
- Significant quantities of antibiotics may be used legally off label in other species or for conditions that are not indicated on labels. Species such as sheep and deer, which are significant in New Zealand, are 'minor uses' elsewhere and unlikely to have registered uses on many products.
- This report only deals with antibiotics registered as veterinary medicines. Veterinarians can legally use human medicines and compound products for animals under their care subject to an approved code of practice.

Data presentation

The data is formatted in the same way as for the 2004/2005 report. Sales information is provided by registrants in kilograms or volumes of product sold on a monthly basis. The conversion to kilograms of actives is calculated assuming the product when used contains the active concentration as expressed on the label. Overages used in manufacturing and non active salts are not included in the final quantity. For example, oxytetracycline hydrochloride 113 grams per litre in the formulation will be treated as oxytetracyline 100 grams per litre when calculating the quantity of antibiotic. The conversion of sales information to the amount of active is standardised for each product to ensure consistency.

The presentation of the data assumes products are used as indicated on the label and makes no judgement on known off-label uses. The *species* categories are defined as:

- Companion – Cats and/or dogs
- Cattle – Dairy and/or beef cattle
- Pigs/Poultry – Pigs and/or chicken, turkeys and game birds
- Multi Species – All products with multiple groups approved on labels including many injectable penicillins, tetracylines and sulphonamides . This category includes all products with claims for sheep or deer as there are few examples of antibiotics registered for these species alone.
- Other – Currently includes horses, sheep, cage birds and ornamental fish.

Use categories are defined as:

- Oral – Tablets, capsules, pastes, powders and suspensions for individual dosing.
- Injectable – Intravenous, subcutaneous and intramuscular.
- Feed – In dedicated animal feed for the treatment of large number of animals.
- Water – In dedicated animal water supply for the treatment of large number of animals.
- Intramammary – ‘Milking cow’ and ‘dry cow’ products administered via the teat canal.
- Other – Topical, ophthalmic, ear preparations, intrauterine.

Sales trends

Total sales in the 2006/07 year have decreased to levels similar to the 2002/03 year, down 11.9% on 2005/06 sales. Most of the fluctuation in sales over the last three years has been driven by sales of zinc bacitracin. This antibiotic still represents 36% of all antibiotic by weight, 94% of antibiotic usage in the pig and poultry category, and 93% of in-feed and water usage. The following notes apply to Tables 1 - 5.

Macrolides/Lincosamides

Quantities sold have decreased to be the lowest in five years driven by in-feed sales of tylosin. In 2006/07, tylosin makes up 93% of the total quantity of the macrolide/lincosamide group. Approximately 29% of this is in injectable formulations, which have significant use patterns in dairy cattle for treatment of conditions such as mastitis. These sales increased 20.7% since 2004/05. Seventy-one per cent of tylosin sales, and of the whole macrolide/lincosamide group, are products intended for in-feed and in-water medication.

Penicillins

Sales of penicillins have decreased slightly over the last three years after peaking in 2004/05. This decrease has been driven by reduced sales of cattle-only products even though sales of products for multiple species have increased.

Penicillins remain the most significant class of antibiotics used for individual animal treatment across a wide range of species. The following comments can be made:

- Use in cats and dogs is primarily restricted to amoxicillin/clavulonic acid combinations.
- Sales of cattle-only products sales are mainly intramammary preparations.
- Most of the injectable amoxicillin, ampicillin and penicillin products have multispecies claims.
- Significant quantities are likely to be used for the treatment of cattle, sheep, pigs and horses.
- Total amoxicillin sales in 2006/07 increased by 18.4% on 2005/06 levels due to sales of injectable products.
- Sales of cloxacillin decreased 43.9% accounting for the 18.8% decrease in sales of all intramammary products.

Cephalosporins

Sales have fluctuated over the last five years. The cumulative increase over the last two years is due mainly to intramammary preparations for cattle with a slight increase in oral preparations for companion animals. Sales of Intramammary preparations in 2006/07 were 62.5% of all

cephalosporin sales and the majority of these were sales of cephalonium (79.7%). Oral sales were 24.4% and injectable sales were 8.72%. The majority of the latter were sales of ceftiofur, registered for use in cattle, horse and pigs. A fourth generation cephalosporin, cefquinome, is approved for use in food-producing species with very low sales reported.

Tetracyclines

Sales over the last four years have remained constant although decreasing slightly in 2005/06. The majority of tetracycline products sold are injectable and in-feed products used in multiple species. The 2005/06 dip was caused by a transient decrease in in-feed sales.

Sulphonamides

Quantities sold have decreased over the three years since the last major report. Levels are similar to 2003/04 due to a decrease in products used in multiple species. Over 46% of sulphonamides are veterinary medicines that are likely to be used only in horses and sales of these have increased by 41.7%.

Aminoglycosides

Sales decreased over the last five years to their lowest level in 2006/07 as a result of decreases in sales of streptomycin, dihydrostretomycin and neomycin. Sales also decreased across all routes of administration and known species except for a small increase in apramycin sales in pig and poultry feed. Industry indicates that use of apramycin is rare in pigs and extremely minor in poultry for specific instances of disease in broiler breeders. Streptomycin and dihydrostretomycin account for the majority of sales in this group, 64% in 2006/07 but down from 73.8% in 2005/06. This is divided between oral scour treatments (5.1%), intramammary (32.1%) and injectable (62.8%). Neomycin accounts for 19.1% of the remaining sales in 2006/07, with 51.2% in intramammary preparations.

Fluoroquinolones

Although remaining very low, fluoroquinolone sales have increased slightly over the last five years. The products available are oral and injectable individual animal treatments mainly for companion animal and multiple species use. The increase seen is primarily due to injectable marbofloxacin sales for use in multiple species and a relatively smaller increase in oral enrofloxacin for companion animals.

Nitro-imidazoles

Sales, although relatively low, have doubled in the 2006/07 year compared to the 2005/06 year due to an increase in in-feed medications sales for pigs and poultry. Of the 146.4 kilograms sold, 90.6% is sold as in-feed or water medication intended for pigs and poultry. Off-label use in other food-producing species is not permitted because of the risks to trade. The remaining 9.4% consists of metronidazole used in tablet form for treatment of cats and dogs.

Nitrofurans

Furazolidone sales have shown a steady decrease in use over the five years. This coincides with increased constraints on use due to issues unrelated to antibiotic resistance. Total sales of nitrofurans are now less than 5% of the 2002/03 levels. Furazolidone is used in relatively small quantities for the treatment of bacterial infections in pigs and poultry. Very small amounts of nitrofurazone are used for topical treatment in non food-producing animals.

Virginiamycin

No sales were reported in the last two years. Two products remain registered for therapeutic use: one for the management of laminitis in horses and one for use in poultry.

Other

The apparent increase in the other category is due to a carbadox product for use in pig feed changing to 'Prescription Animal Remedy' status and the consequent requirement to report sales data.

Table 1: Summary of antibiotic sales in kilograms of active ingredients in family groups*

Family of active ingredient	Total kgs 2002/2003	Total kgs 2003/2004	Total kgs 2004/2005	Total kgs 2005/2006	Total kgs 2006/2007
Macrolides/lincosamides	6279	5011	5667.5	5144.57	4557.21
Penicillins	11065	13708	13818.6	13358.30	12944.92
Clavulanic acid	73	141	118.6	187.38	195.19
Cephalosporins	1176	1076	1201.6	1519.90	1443.11
Tetracyclines	1509	3458	3361.2	2903.59	3506.33
Sulphonamides/Trimethoprim	2998	4429	5339.3	4616.75	4564.08
Aminoglycosides	2325	2134	1920	1417.03	1388.83
Fluoroquinolones	23	28	26.8	33.81	33.41
Novobiocin	5	6	4.5	3.04	1.97
Nitro-imidazoles	60	105	60.7	71.59	146.43
Nitrofurans	168	111	41.9	9.64	7.84
Bacitracins	26579	27264	18057	29528.32	22756.82
Virginiamycin	4	28	16	0.00	0.00
Fusidic acid	1	2	2.4	4.18	3.98
**other	57	56	82.8	530.69	698.30
TOTAL	**52702**	**57557**	**49719**	**59328.78**	**52248.43**

*Does not include sales of ionophores

** Includes oleandomycin, florfenicol and polymixin

Route of administration versus species

Since 2004/05 there has been:

- 11.2% increase in sales of companion animal products mainly due to increased oral product sales with a smaller increase in injectable sales.
- 17.0% decrease in sales of cattle-only products due to a decrease in sales of intramammary products. There were increases in the sales of injectable product (36.2%) and the other use category more than doubled, but these numbers were proportionately much lower.
- 27.5% increase in sales for pigs and poultry due to increases in sales of bacitracin in in-feed preparations. Industry indicates that less than 5% of bacitracin would be used in the pig industry. Note 2004/05 sales levels were at a minimum. The decrease in bacitracin sales from 2002/03 was 14.4%.
- 9.9% decrease in multiple species products driven by decreases in sales of oral, feed and water products.
- 42% increase in sales for other species due to increases in oral products.

In the same time period (from June 2004 to June 2007, according to Statistics NZ figures), the total number of dairy cattle increased 2.1%. All other stock numbers fell -- beef cattle and sheep 1.2% and 2.1% respectively, pigs 5.6%, and deer and horses 20.5% and 13.9% respectively. Chicken production numbers dropped from 87,570,000 in 2002 to 84,537,000 in 2007 (Poultry Industry Association, 2008), a decrease of 3.5%. The standing population of broilers is about 12 million at any one time.

These figures show that antibiotic sales were less for cattle-only products despite slightly increased numbers of animals. Sales also decreased for products with use in multiple species, a category that includes many products used in cattle, along with other species with declining numbers. The only category where sales increased despite apparent falling numbers of animals was the ‘other’ category which includes horses. As already mentioned this is due to increased sales of oral sulphonamides. Although sales in the pig and poultry category increased over the three year period driven by the sales of bacitracin, sales of this antibiotic decreased over the five year period along with lower poultry numbers.

Table 2: 2006/2007 Sales in kilograms by active ingredient family and approved route of administration

Family	Oral	Injectable	Feed	Water	Intra-mammary	Other	Total
Aminoglycosides	96.04	629.28	87.99	115.54	449.64	10.35	1388.83
Bacitracin	0.00	0.00	22755.71	0.00	0.00	1.11	22756.82
Cephalosporins	352.72	125.84	0.00	0.00	901.92	62.63	1443.11
Clavulanic Acid	149.86	20.79	0.00	0.00	24.53	0.00	195.19
Fluoroquinolones	16.26	17.15	0.00	0.00	0.00	0.00	33.41
Fusidic Acid	0.00	0.00	0.00	0.00	0.00	3.98	3.98
Macrolides/ Lincosamides	13.59	1232.56	3213.84	52.57	44.66	0.00	4557.21
Nitrofurans	0.00	0.00	6.00	1.84	0.00	0.00	7.84
Nitro-imidazoles	13.79	0.00	126.07	6.56	0.00	0.00	146.43
Novobiocin	0.00	0.00	0.00	0.00	1.97	0.00	1.97
Other	0.00	15.60	598.75	0.00	83.68	0.28	698.30
Penicillins	521.54	8399.58	0.00	32.96	3963.95	26.88	12944.92
Sulphonamides/ Trimethoprim	4243.06	151.37	14.00	0.00	0.00	155.65	4564.08
Tetracyclines	26.70	1425.28	1714.10	32.93	131.66	175.67	3506.33
Virginiamycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	**5433.57**	**12017.45**	**28516.46**	**242.39**	**5602.01**	**436.55**	**52248.43**

Table 3: 2005/2006 Sales in kilograms **by active ingredient family and approved route of administration**

Family	Oral	Injectable	Feed	Water	Intra-mammary	Other	Total
Aminoglycosides	101.17	613.81	71.78	117.20	503.06	10.02	1417.03
Bacitracin	0.00	0.00	29527.35	0.00	0.00	0.97	29528.32
Cephalosporins	368.42	133.06	0.00	0.00	957.43	60.99	1519.90
Clavulanic Acid	147.15	16.26	0.00	0.00	23.97	0.00	187.38
Fluoroquinolones	17.69	16.13	0.00	0.00	0.00	0.00	33.81
Fusidic Acid	0.00	0.00	0.00	0.00	0.00	4.18	4.18
Macrolides/ Lincosamides	12.49	892.11	4153.73	45.10	41.14	0.00	5144.57
Nitrofurans	0.00	0.00	8.00	1.64	0.00	0.00	9.64
Nitro-imidazoles	12.30	0.00	49.53	9.76	0.00	0.00	71.59
Novobiocin	0.00	0.00	0.00	0.00	3.04	0.00	3.04
Other	0.00	10.71	450.00	0.00	69.71	0.27	530.69
Penicillins	520.19	7921.14	0.00	7.04	4879.75	30.18	13358.30
Sulphonamides/ Trimethoprim	4309.21	164.04	28.00	0.00	0.00	115.50	4616.75
Tetracyclines	28.43	1343.04	1206.00	23.54	110.89	191.69	2903.59
Virginiamycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	**5517.03**	**11110.31**	**35494.39**	**204.27**	**6588.99**	**413.79**	**59328.78**

Table 4: 2006/2007 Sales in kilograms by active ingredient by approved species

Family	Companion	Cattle	Pigs/ Poultry	Multiple species	Other	Total
Aminoglycosides	30.01	358.05	141.30	854.20	5.26	1388.83
Bacitracin	0.74	0.00	22755.71	0.37	0.00	22756.82
Cephalosporins	352.72	964.55	0.00	125.84	0.00	1443.11
Clavulanic Acid	119.11	41.13	0.00	34.95	0.00	195.19
Fluoroquinolones	18.25	3.65	0.00	11.52	0.00	33.41
Fusidic Acid	3.98	0.00	0.00	0.00	0.00	3.98
Macrolides /Lincosamides	13.59	118.30	293.32	4132.00	0.00	4557.21
Nitrofurans	0.00	0.00	6.00	0.00	1.84	7.84
Nitro-imidazoles	11.19	0.00	132.63	0.00	2.60	146.43
Novobiocin	0.00	1.97	0.00	0.00	0.00	1.97
Other	0.22	6.10	598.75	93.24	0.00	698.30
Penicillins	404.09	4338.43	32.96	8169.44	0.00	12944.92
Sulphonamides/ Trimethoprim	16.17	188.24	14.00	2245.61	2100.05	4564.08
Tetracyclines	26.70	12.51	0.00	3463.46	3.66	3506.33
Virginiamycin	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	**996.78**	**6032.93**	**23974.68**	**19130.64**	**2113.40**	**52248.43**

Table 5: 2005/2006 Sales in kilograms by active ingredient by approved species

Family	Companion	Cattle	Pigs/ Poultry	Multiple-species	Other	Total
Aminoglycosides	29.88	429.81	148.50	803.41	5.44	1417.03
Bacitracin	0.60	0.00	29527.35	0.37	0.00	29528.32
Cephalosporins	368.42	1018.42	0.00	133.06	0.00	1519.90
Clavulanic Acid	116.15	35.65	0.00	35.58	0.00	187.38
Fluoroquinolones	17.73	5.37	0.00	10.72	0.00	33.81
Fusidic Acid	4.18	0.00	0.00	0.00	0.00	4.18
Macrolides/Lincosamides	12.49	41.14	321.06	4769.87	0.00	5144.57
Nitrofurans	0.00	0.00	8.00	0.00	1.64	9.64
Nitro-imidazoles	11.30	0.00	59.29	0.00	1.00	71.59
Novobiocin	0.00	3.04	0.00	0.00	0.00	3.04
Other	0.21	7.66	450.00	72.82	0.00	530.69
Penicillins	404.98	5220.26	7.04	7726.01	0.00	13358.30
Sulphonamides/ Trimethoprim	9.33	144.66	28.00	2344.06	2090.70	4616.75
Tetracyclines	28.43	16.20	0.00	2857.24	1.72	2903.59
Virginiamycin	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	**1003.68**	**6922.22**	**30549.24**	**18753.15**	**2100.49**	**59328.78**

Use pattern by route of administration

The data in Tables 6 and 7 tabulate use pattern by route of administration. This illustrates that the routine method of administration varies significantly between companion animals, pigs/poultry and cattle.

The ‘other’ species category almost entirely consists of sulphonamides and trimethoprim intended for oral use in horses. Small amounts are also used in cage birds and one oral product for lambs.

The large amount of antibiotic potentially used in a range of species makes interpretation of this information difficult. If the data is analysed for each product recorded as ‘multiple-species’, the following assumptions can be made:

- The *ora*l product consists largely of anti-diarrhoeal preparations, most of which are likely to be used in large animals, particularly cattle. A small amount consists of 500mg amoxicillin/ clavulonic acid tablets, which could be used in dogs or calves.

- The *injectable* product mainly consists of the older, established antibiotic groups of tetracylines, penicillins and sulphonamides. A significant amount is likely to be used in cattle and sheep and, to a lesser extent, pigs, deer and horses. The actual quantity used in companion animals will be small simply due to the comparative animal sizes and the type of antibiotics involved.

- The *in-feed* medication consists of oxytetracyline and tylosin. These products are likely to be used in the pig and poultry industries but will also have uses in dairy and feed lot cattle where in-feed medication is practical.

- The *in-water* medication consists mostly of neomycin with a smaller amount of oxytetracyline. In-water medication is most practical in the pig and poultry industries. Oxytetracyline could be used in milk to medicate calves.

- The *intramammary* use is due to an intramammary product that also has indications for treating topical conditions in cats and dogs. Most of this product will be used in cattle. Intramammary products are normally registered only for treatment of mastitis in cattle; however, small amounts could be used to treat sheep and goats.

- The *other* category consists mainly of topical products, which are frequently approved with multiple species claims. It also contains a small amount of intra-uterine product.

Table 6: 2006/07 Sales in kilograms by route of administration and species

Route	Companion	Cattle	Pigs/Poultry	Multiple-species	Other	Total
Oral	980.67	32.76	0.69	2311.53	2107.91	5433.57
Injectable	2.16	468.19	2.91	11544.19	0.00	12017.45
Feed	0.00	0.00	23826.36	4690.10	0.00	28516.46
Water	0.00	0.27	144.71	91.92	5.49	242.39
Intramammary	0.00	5313.43	0.00	288.58	0.00	5602.01
Other	13.96	218.28	0.00	204.31	0.00	436.55
TOTAL	**996.78**	**6032.93**	**23974.68**	**19130.64**	**2113.40**	**52248.43**

Table 7: 2005/06 Sales in kilograms by route of administration and species

Route	Companion	Cattle	Pigs/Poultry	Multiple-species	Other	Total
Oral	988.07	36.00	0.28	2395.55	2097.14	5517.03
Injectable	1.94	355.67	1.49	10751.21	0.00	11110.31
Feed	0.00	0.00	30409.14	5085.25	0.00	35494.39
Water	0.00	0.82	138.34	61.76	3.36	204.27
Intramammary	0.00	6358.18	0.00	230.80	0.00	6588.99
Other	13.67	171.54	0.00	228.58	0.00	413.79
TOTAL	**1003.68**	**6922.22**	**30549.24**	**18753.15**	**2100.49**	**59328.78**

Antibiotic use in horticulture

One product containing streptomycin is registered for the following uses:

- Pipfruit - Fireblight
- Stonefruit - Blast and bacterial spot
- Seedling tomatoes - Bacterial diseases.

Sales of streptomycin in horticulture have increased again in 2006/07 after a two year low, possibly caused by varying disease incidence and climatic factors.

Table 8: Reported streptomycin sales for use in horticulture

1999	2001-2002	2002 -2003	2003 - 2004	2004 - 2005	2005-2006	2006-2007
1200 kg	391 kg	359 kg	495.9 kg	281.35 kg	281.42kg	393.92kg

Summary

The sales information provides a snapshot of registered veterinary antibiotics of interest. The data presented over a five year period shows no trends that would indicate antibiotics are not being used as intended. Increased sales or use cannot be interpreted as increased prescribing frequency without considering changes to the animal populations. Large variations in sales are most likely to occur with products that are used in small quantities to manage disease outbreaks. Any changes that might represent a significant alteration have been highlighted in the report.