An alarming headline in January this year was of antibiotic resistant tuberculosis appearing in India. This would be the first country one would expect this to occur as a major share of the world's antibiotics is manufactured in India. It was almost amusing to read a 'Times of India' article on the subject of rivers in India being converted into almost floating antibiotic cabinets. 'Enough of a single powerful antibiotic was being spewed into one stream each day to treat every person in a city of 90,000'.

While India's environmental record, especially with regard to antibiotics, is dismal how well are we doing, both as a country and as a profession?

For decades now medical authorities have been taking a sideways look at the veterinary use of antibiotics and perceive this as a major contributor to the development, worldwide, of antibiotic resistance in human pathogens. Twenty years ago, when antibiotics were used in feed as growth promotants in intensively reared food animal programmes, there was some justification for their concern. Now that that practice has ceased, or at least been restricted to drugs such as bacitracin that have no great application in human health how well have veterinarians performed as stewards of antibiotic usage?

There are definite points of difference between small animal practitioners' aims and uses to those of the large animal, or food animal, veterinarian. The formers' main concern has been preserving the efficacy of the drugs in the animals they have treated, although in recent years more awareness has been made of the close contact people have with their pets so increasing the risk of sharing antibiotic resistant bacteria. On the other hand the food animal practitioner has been made well aware of the dangers of overuse of certain classes of antibiotics as the animals they treat produce goods for human consumption.

Certainly both the Companion Animal Society (CAS) and the Dairy Cattle Veterinarians (DCV) have put steps in place in recent years to keep their members informed of the issue. After a sluggish start CAS became the special interest branch (SIB) to most get behind the concept of guidelines for responsible antibiotic use mooted by NZVA in 2007 and also in 2007 DCV produced its excellent and extensive formulary on antibiotic use, highlighting not only efficacy but responsibility.

These two organisations must be commended on these approaches but what is the reality in the world of the practitioner? How responsible have NZ veterinarians been with their use of antibiotics in recent years?

Since the turn of the century the Agricultural Compounds and Veterinary Medicines Group (ACVMG) has made it mandatory for companies that sell antibiotics to the veterinary profession to record the volumes of those sales. We now have more than a decade of information to assess. Whilst this is not the full story it does give a reasonable overview of the patterns of antibiotic usage, especially as we now have a decade's worth of data with which trends can be estimated.

It is true that prophylactic dry cow therapy is a major factor in mastitis control. However the antibiotics used are predominantly penicillins and second generation cephalosporins, which are of low relevance to the issue of the issue of development of resistance in humans. The fact that the udder is a closed population is a factor in limiting resistance development and the risk of resistant organisms entering the human food chain is also made negligible by pasteurization.
Therefore the debate should mainly be about therapeutic use in food producing animals. The antibiotics of concern are fluoroquinolones and third and fourth generation cephalosporins. The former are banned from used in food producing animals in Australia and allowed, but under extremely strict registration controls in New Zealand. Therefore the volume of use is extremely low compared to that of first generation cephalosporins, tetracyclines and penicillins.

While, to quote the ACVMG report itself, “Using sales data over time as an indicator of individual animal treatments for a given antibiotic is inherently imprecise,” the differences in the amounts of fluoroquinolones and fourth generation cephalosporins used compared to that of the major antibiotics is so great that assumptions can be made as to the overall amount of prescribing.

For example, 95% of penicillin use in cattle was for intramammary use so that, from a total of 7115.9kg, other therapeutic use came to 355.8kg. In contrast fluoroquinolone use in cattle totalled 0.1kg. That equates to 28 grams of fluoroquinolone used for every kilogram of penicillin for non intramammary therapeutic use. In addition cephalosporin, tetracycline, aminoglycoside, macrolide and trimethoprim/sulpha use combined to further dilute the overall percentage use of fluoroquinolones. Cefquinome, the fourth generation cephalosporin registered for cattle has “similar low use to fluoroquinolones,” according to the report.

Graphically the issue can be clearly demonstrated. Zinc bacitracin does predominate in the figures and, yes, it is mainly used in the poultry industry as an in-feed preventative. However this antibiotic has little use in human medicine and has no relation to any antibiotics that are so it is of little consequence in the debate. As far as assessing the amount of antibiotic used zinc bacitracin skews the figures so that it is easier to make rash generalisations.

However, even with the removal of the zinc bacitracin figures, fluoroquinolone and fourth generation cephalosporin use do not register on the graph below.
intramammary therapy, most treatment is on an individual animal basis. The rise of methicillin (meticillin) resistant Staphylococcus aureus (MRSA) in human medicine was with nosocomial infections, a situation that does not exist in pastoral farming. As put by Bill Teague in 1999, a calf in a back paddock in Tokoroa, being treated with an antibiotic, will contribute very little to the development of worldwide resistance (Teague 1999).

With our pastoral dairy system the major antibiotic indications are mastitis and footrot. Therefore, as indicated above, the major intensive antibiotic use involves penicillins and cephalosporins. These points certainly show that the rural practitioner in New Zealand has some strong advantages over colleagues in more intensively farmed countries in keeping antibiotic resistance at bay.

However our good record is not entirely accidental. The modern practitioner is well versed in the hazard of antibiotic resistance and much of the thrust from DCV’s excellent formulary in 2007 is on responsible antibiotic usage. The test of resolve may well come over the next few years with the drug ceftiofur. This is a third generation cephalosporin heavily marketed for such simple diseases such as footrot as it has a nil milk withholding period, making it very attractive to farmers. Higher milk payouts have made its use more feasible over recent years and, now that it is off patent, cheaper generics abound. In addition there is also a long acting form so that ceftiofur has the potential to be much overused, as it has overseas with the process of metaphylaxis. Metaphylaxis is defined as the timely mass medication of a group of animals to eliminate or minimize an expected outbreak of disease. In other words it is prophylactic treatment of large groups of animals with a particular antibiotic, generally when first introduced into a mob, to reduce the possibility of disease.

This is a major overseas indication for some medications that are freely used on the New Zealand market. The process itself would be totally frowned upon by most responsible administrations and certainly does not help arguments for veterinarians’ right to prescribe. Is it any wonder that as long ago as 2006 resistance to ceftiofur developed in cattle? (Donaldson et al. 2006).

Only time will tell if there is overuse of ceftiofur but so far one can only give a bouquet to the dairy practitioners of this country on the manner of how they prescribe major antibiotics.

How then have the other major antibiotic users, the companion animal practitioners, performed in this regard? There was an intriguing talk by Dr Kate Hill BVSc (Hons), DipACVIM, Registered Specialist at the Auckland Veterinary Society meeting on October 22 2009.

Her strong message was that vets were over-prescribing specialized antibiotics and this practice should be reconsidered if we want responsible antibiotic usage and protection of veterinary access to antibiotics.

The problem was dramatically emphasised by analysis of antibiotic surveys. In the Auckland city region 50% of isolates showed significant levels of enrofloxacin resistance; a figure that was out of synchrony with other centres and reflected a high reliance on that particular drug in that region. Also in that same talk it was stated that 85% of cat bite abscesses in New Zealand responded to amoxicillin alone, yet the majority of veterinarians immediately reach for second line drugs to treat them (Dobinson and Tannock 1985).

A major epidemiological survey of practitioners prescribing habits found that those who spent 100% of their time on companion animal practice and who had attended a CPD course related to companion animals in the last 12 months prior to the survey were more likely to submit a sample for culture and sensitivity testing and to prescribe longer courses of antimicrobials for the treatment of canine pyoderma than those who spent less than 100% of their time treating companion animals and had not attended a CPD course in the last 12 months. Broad spectrum drugs considered by the World Health Association to be critically important for human health, such as fluoroquinolones and amoxicillin-clavulanic acid, are among the most frequently prescribed drugs in companion animal medicine and these drugs are often prescribed without submitting a sample for culture and sensitivity testing (Pleydell et al. 2012).

Questions of current practices are being asked such as: What is the justification for use of third generation cephalosporins in cats and dogs? Such Category A drugs in human medicine are largely restricted to the treatment of meningitis caused by Gram-negative bacteria and Pseudomonas spp infections. Therefore, in veterinary practice these products should only be used if antibiotic sensitivity tests indicate that the isolate is resistant to first line drugs. (Barton 2001).

Just as the potential use of ceftiofur will be an on-going measure of intent for the large animal practitioner the appearance of a long acting third generation cephalosporin in cefovecin may indicate the responsibility of the...
small animal veterinarian. In the ACVMG report of 2009 mention was made of this particular drug, stating that usage was very low. However it was only recently introduced to the market at that stage and time will tell whether practitioners see it as a first port of call or a useful backup to their armoury.

**Conclusion**

Overall the Kiwi practitioner, at least in the rural areas, can take a bow. There has been a lot of noise throughout this decade regarding veterinary use of antibiotics and veterinary access to the important classes used in human medicine.

Quite clearly this report shows that the general attitude amongst veterinarians in the field is excellent, antibiotics are prescribed appropriately and certainly not used as panaceas. If there is a future antibiotic resistance problem in human medicine clearly the finger of blame should not be pointed at the veterinary profession.

However, while there should be a bouquet for the rural practitioner, maybe a little brickbat is earned by the companion animal veterinarian, in some areas at least, for the on-going tendency to use second line drugs as a first line of defence.

Although New Zealand general practitioners have, in general, shown very good antibiotic stewardship, this is not a reason to relax or drop our guard. If we are to retain our ‘right to prescribe’ antibiotics we must continue to strive to be seen to be acting responsibility.

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