CHEMICAL RESIDUES AND VENISON EXPORTS

B. L. Marshall

Ministry of Agriculture and Fisheries, P O Box 2526 Wellington New Zealand

Introduction

The New Zealand deer industry is currently a relatively small but important industry to New Zealand. It is estimated that in 1991 the deer numbers will approximate 750,000 hinds and 250,000 stags. In 1990 venison, velvet antler and deer by-products provided a substantial NZ$103 million export return to New Zealand. This was the result of the slaughtering of 123,000 farmed deer in deer slaughtering premises, 37% (45,500) of which were hinds, and the processing of 23,000 feral deer in game packing houses. Venison, offal and by-products realised NZ $49.6 million with velvet antler accounting for the remainder of the export earnings. The majority of these exports (69% or 3250 tonnes) were imported by EC countries with West Germany importing 42.5% or 2000 tonnes of the total exports of 4700 tonnes. Markets such as the US (550 tonnes) Japan (240 tonnes) and even Australia (216 tonnes) form smaller but important markets to the deer industry.

As the world leader in the farming, processing and export of deer products the administrators and producers within the New Zealand deer industry are acutely aware of its position in the international venison market place and the necessity to maintain a luxury consumer product image in the discerning markets it supplies. As with other food products consumers in these markets have expressed increasing concern about the safety and wholesomeness of much of the food that is eaten. This concern has been further heightened by a number of recent residue scandals in Europe involving the use of banned growth promotants in cattle, the effects of diethylstilboestrol contaminated food of animal origin on prepubic human health and the alleged human illnesses from the ingestion of clenbuterol treated cattle.

New Zealand Residue Policy

The food safety standards set by the regulatory authorities of the markets to which New Zealand exports its venison products have over the past few years become very explicit as a result of public pressure. This has been reflected in the residue testing programmes that are formulated each year by importing countries frequently reflecting market forces and public perceptions of risk rather than that of a scientific assessment of the true health hazards that the residues may pose. As a result not only has there been a move by regulatory authorities towards introducing more specific analytical methodologies for identifying illegal and violative chemicals in deer and other

animals but there has been an increasing emphasis towards sampling larger numbers of animals for evidence of a greater range of chemical residue violations. Furthermore it has now become an annual requirement of the regulatory authorities of the EC and US that for countries wishing to maintain market access to these lucrative markets they must implement a chemical residue programme that offers equivalent guarantees and has been approved in advance (1). To ensure a greater commitment by the various animal production industries in New Zealand towards compliance with international food safety standards it is the policy of the Ministry of Agriculture and Fisheries (MAF), which is the regulatory authority that is ultimately accountable for the safety and wholesomeness of these exports, to establish industry agreed standards with the appropriate agricultural sectors in order to meet market requirements. As a result the deer industry will in the near future be establishing industry agreed standards for deer products in conjunction with MAF, which will not only protect this accountability but will ensure that food safety standards are maintained.

Chemical residue stability

One might ask why is there such an issue by governmental authorities over low levels of chemical residues in food products especially when the maximum residue tolerances that have been set for these chemicals usually contain a safety factor of between 100 and 2000? While there is no absolute proof that transferable drug resistance actually occurs in humans which have consumed of the flesh of animals containing violative residues the chance of a susceptible consumer having an anaphylactic or allergic response to such residues is a real possibility. This potential risk to the consumer is further compounded by the fact that the vast majority of chemical residues that contaminate meat and game-meat products are generally stable under cold storage temperatures of -18^{o}C or lower and are equally stable at cooking temperatures of up to 100^{o} C and in some cases for 30 min or more (2) (3). To make matters worse most of the chemicals of concern accumulate in kidney and liver tissues, tissues which are invariably cooked to the least extent prior to consumption.

It is therefore of some comfort that chemical residues in meat, game-meat and game products are generally not a problem in New Zealand. Other than two sulphonamide violations in bobby veal exported to the US in 1985 and 86 there have been no meat, game-meat or game residue violations identified in export markets over the past 20 or more years. This is not to say that on rare occasions veterinary drugs have not been found in high concentrations in meat, game-meat and game products during routine monitoring within slaughterhouses and game-packing houses in New Zealand. However, it could be confidently said that the food products produced in New Zealand are amongst the safest in the world.

National Residue Monitoring and Surveillance (NRMS) Programme

To provide consumer confidence in the residue status of deer products, farmed and feral deer products now form an integral part of the extensive New Zealand MAF National Residue Monitoring and Surveillance (NRMS) Programme. In this risk based statistical programme, a wide range of chemical residues that are licensed for use in livestock but not necessarily in deer, are investigated in deer selected at random in deer slaughtering premises and game packing houses. These chemical residues include anabolic substances such as the stilbenes, thyrostatics, zeranol, trenbolone and on occasions the natural steroids; a wide range of antimicrobial drugs such as the aminoglycosides, beta lactams, cephalosporins, tetracyclines, macrolides, nitrofurans, chloramphenicol, the sulphonamides and trimethoprim; in addition to a wide range of endo and ectoparasiticides, insect growth regulators, synthetic pyrethroids, anti-inflammatory drugs and the beta blockers or repartitioning agents. When a carcase is found to contain residues which are within acceptable limits the owner of the animal is "alerted' to the fact so that management practises can be introduced 'on-farm' to prevent potential violations.

Suspect listing of violative properties

If tissue residue levels are found to exceed maximum residue limits (MRL) then traceback is carried out to the property of origin and the owner's name is incorporated onto a MAF residue "suspect list'. This list is circulated to deer slaughtering premises throughout New Zealand for surveillance purposes. Deer subsequently submitted for slaughter from a "suspect property' are automatically sampled and retained pending the results of the analyses. Where the residue concentrations exceed the MRL then the retained carcases and offals are condemned for human consumption.

Residues in farmed and feral deer that have violated regulatory MRLs have in the past been few and far between and generally associated with the rapid expansion of the industry in the early to mid 1980's. The violative residues that were found in those early days were invariably associated with live deer recovery operations where it has been common practise for animals at capture to be prophylactically treated with an antibiotic, tranquilliser or selenium and vitamin B complex. Occasionally attempts would be made to disguise a carcase as being a feral deer if prior to the deer having been ear marked, the animal subsequently became ill or injured and failed to respond to treatment. Unfortunately for these farmers they were not aware that once the skin has been removed, injection site lesions become extremely obvious at carcase inspection.

Suspect injection site lesions

The policy of MAF is that any carcase which has a suspect injection site lesion, regardless of the size of the lesion, will be retained and tested for evidence of a wide range of veterinary drugs. Carcases found to contain violative drugs are routinely condemned and the owners considered for prosecution. At the moment the maximum fines are $10,000 for an individual and $40,000 for a corporate body although in the impending new legislation, because of the international concern towards food safety, the fines are to be increased to $40,000 and $100,000 respectively. Veterinary drug residue violations in feral deer reached a peak between 1985 and 87 when 10 feral animals were found to contain injection site lesions (ISLs). The residues that were found to be violative included chlortetracycline (1x), oxytetracycline (1x), tetracycline (1x), oxytetracycline/penicillin combination (1x) and penicillin (6x). The practice of shooting captured deer that became ill and/or injured and sending them through the game packing house processing system rapidly ceased after the MAF ISL policy became widely known and a successful prosecution had occurred. Since that period no further drug residue violations have been found in feral deer.

Residue violations in farmed deer have so far been extremely rare. This may be due to the fact that until now very few farmed deer have been routinely tested for chemical residues or it may be that the deer that have been tested have not generally been tested for a wide enough range of chemicals. To date only two farmed deer have been shown to contain violative residues. In 1989 a farmed red deer containing an ISL was found to contain a violative cephalosporin (cephalexin) residue and another red deer in 1990 was violative for ivermectin. Both of these animal remedies are not licensed for use in deer in New Zealand.

Off label use of drugs

At the moment a large number of ethical and non ethical drugs that are being widely used in the industry are currently not licensed for use in deer. This off label use of drugs has the potential of becoming a major problem for the industry if treated animals are not handled responsibly by veterinarians and farmers alike. The vast majority of the markets that New Zealand supplies, eg West Germany, France, Sweden, Switzerland, Japan and the US, have zero meat and game-meat residue tolerance levels for drugs that are either not registered for use in these markets or have been used off-label. As such MAF as the regulatory authority in New Zealand is expected to monitor stock according to these agreed standards and take the necessary action when violations are detected. In the two red deer situations where cephalosporin and ivermectin residues were identified in the carcases both products were being used 'off-label'. For this reason alone, veterinarians and farmers should be continually thinking in terms of withholding times whenever an animal is being treated with drugs. It is better to withhold the animal from slaughter a little longer normal than to suffer the consequences of violative residues being found in the carcase.

If residues are likely to be found in deer then it will inevitably be in weaners which are being handled on a regular short term basis or in animals that are sent for slaughter earlier than they normally would be. In this instance I am thinking particularly of injured deer or tuberculosis reactors. Because of the known concerns of regulatory authorities in our export markets about residue violations in meat, the residue sampling of deer will be increased significantly from now on, as the cost effective Australian 'on-site' microbial inhibition test (MIT) kits are to be introduced into slaughterhouses as of July 1991.

Market acceptance of venison from deer treated with chemotherapeutic and productivity enhancing drugs.

Due to the high demand and correspondingly high prices for venison in Europe in September/October/November there is pressure on deer farmers to produce a 55-60 kg carcase (100 kg L Wt animal of 10-11 months of age) in the period August to October each year to allow chilled sea freight venison to reach the various lucrative pre Christmas markets. While there are a number of management practices that can be used for this purpose, I would now like to concentrate on some of the chemical compounds that are used or may be contemplated being used to help achieve increased productivity in deer and velvet antler production and the effect they may have on the marketability of these deer products.

1. Antibiotics and other antimicrobial drugs

Very few of the antimicrobial drugs currently being used therapeutically and prophylactically to treat deer in New Zealand are licensed for use in this species. Those that are licensed include products such as Terramycin LA, to quote a leading figure in the industry, "the most overused and misused drug in the deer industry", Strinacin (an oral streptomycin), Tribactral, (an oral sulphonamide preparation which also contains trimethoprim) and Scourban Plus, (an oral preparations containing three sulphonamides, neomycin and streptomycin). As it remains the prerogative of a veterinarian to use the drug that is deemed most appropriate for the treatment of a particular food animal, providing the drug is used responsibly, the client complies with the time that the animal must be withheld before submitting for slaughter and the consulting veterinarian is fully aware of the consequences of 'off label' drug misuse and abuse, the use of antimicrobial drugs should not be a problem to the industry.

2. Growth promotants

In New Zealand the hormonal growth promotants (hgps) zeranol, trenbolone and the natural steroids are freely available from veterinarians for growth promoting purposes in cattle. The controlled use of these substances in terms of individual animal identification, slaughterhouse notification etc has been

designed purely to meet the legislative requirements of the EC and consumer requirements of other niche markets. Other production animals industries of New Zealand have unanimously agreed that these substances will not be used in these species under any circumstance. This policy is designed specifically to protect New Zealand's substantial lamb and venison trade to the EC. No amount of increased productivity from 'off label' use of hgps will ever compensate for even a temporary loss of EC market access and the resultant affect it would have on the market image of New Zealand's meat game-meat and game exports.

The potential threat to EC market access was amply demonstrated in 1989 when the venison industry in the Federal Republic of Germany claimed that testosterone was being used in New Zealand farmed deer to promote the growth of velvet antler. New Zealand was advised that this practice was in direct contravention with the EC definition of 'therapeutic treatment' as outlined in Council Directive 85/649/EEC (5), which only allows substances with oestrogenic, androgenic and gestagenic actions to be used for treating fertility problems in animals. Fortunately this potentially harmful allegation was able to be negated by MAF when FRG officials were advised that not only was this practice not being carried out but testosterone is actually contraindicated in velvet antler production as it inhibits casting and stunts antler growth.

Contrary to many widely held beliefs, analytical methodologies used in hgp analyses, will readily identify hgp mis-use. The methods used are both sensitive and specific. An example of this is that the HPLC and GC/MS method used for identifying zeranol (Ralgro) mis-use will readily distinguish at one part per billion, zearalanone, one of the major metabolites of zeranol, from the myco-oestrogen zearalenone found as a contaminant of ryegrass or cereals as a result of infection by Fusarium species. Although limited trials suggest that Ralgro may on occasions decrease aggression and increase growth rates in stags the resulting increase in carcase fatness together with market attitudes should dissuade any contemplation of use of this product in deer. While there is an agreed MAF/Industry "taboo" on the use of hgps in deer, the use of ruminal growth promotants and drugs used in deer which incidentally produce a live weight gain should be viewed with care. Ultimately the desired industry image of a naturally produced product could be adversely affected by public perception.

3. Anthelmintics

A number of anthelmintic compounds are being used in the New Zealand deer industry. These range from the licensed albendazole, fenbendazole, oxfendazole and ricobendazole benzimidazoles to the non licensed ivermectins. These compounds should pose no problems as far as food safety goes providing the full meat withholding time is adhered to.

4. Anaesthetics, local and general

In New Zealand antler velvet is required to be removed under anaesthesia. A number of general and local anaesthetics are used in this procedure. The drug most commonly used in New Zealand is xylazine hydrochloride, a hypnosedative with analgesic and muscle relaxing properties. Not unexpectedly, Rompun (which is licensed for use in deer) has been shown to reach concentrations in antler velvet as high as 70-220 ng/gm antler tissue (5). While this drug is not of pharmacological significance to the consumer it is violative in terms of regulatory requirements. The concern shown in the early 1980's by the Korean regulatory authorities about these residues has since abated as animal welfare considerations associated with velvet antler removal have taken precedence over velvet antler residue levels. For this reason and the pharmological food safety aspect of the procedure, MAF does not monitor velvet antler tissue for residues of these drugs in the NRMS Programme. The use of anaesthetic antagonists such as Recervyl and Reversal should not pose residue problems in the carcase of any animal sent for slaughter post velvetting. While the withholding time for these substances is 5 hours, yet clinical signs may be observable beyond this period, the general policy of deer slaughtering premises (DSPs) is that animals may only be slaughtered at the earliest on the day following velvetting to avoid the processing of stressed animals. Similarly, some DSPs will only accept velvetted deer for slaughter after a 7 to 10 day withholding time has elapsed to ensure that the prevalence of bruising in the carcase will be minimal.

5. New Technologies

Artificial induction of casting of antlers.

The 'off label' use of the synthetic progesterone, medroxyprogesterone (MPA) in conjunction with oestradiol, to produce additional sets of antlers and for advancing the breeding season doesn't comply with the requirements of EEC Directive 85/649/EEC regarding steroid use in animals. While this procedure is not routinely used in deer in New Zealand, even though it does have an effect, the Ministry of Agriculture and Fisheries strongly advises the deer industry to desist from this practice because of non compliance with the Directive and the reality or perception of residues being in the carcase.

Probiotics

MAF considers that the probiotics ALL-LAC, a drench containing high concentrations of the live micro encapsulated lactic acid producing bacteria Lactobacillus acidophilus and Streptococcus faecium, and YEA SACC, the live yeast cell culture of Saccharomyces cerevisiae are of no regulatory importance. ALL-LAC which is used to correct scouring problems, particularly in weaners and in the "fading Wapati" syndrome in adults and YEA SACC,

which assists in feed utilisation, do not contain any components that would be of risk to food safety. They simply encourage recolonisation of the naturally symbiotic organisms in the gut.

Melatonin

The use of melatonin in deer to advance the breeding season in hinds and stags is not likely to create any immediate concern in the minds of consumers in Europe as it is a natural cyclical hormone which is only given in physiological quanties to animals which are reproducing and not being sent directly for slaughter. The reality that melatonin will therefore not create residue problems in the carcase meat, as animals are slaughtered during the day when the natural levels are low, may however be offset by consumer perception of its 'hormone like' use. The widespread use of this substance therefore needs to be carefully considered by the industry in terms of the overall marketing strategy and image the industry wishes to portray.

Immunogens

- **anti-melatonin:** used to immunise deer against melatonin in order to overcome seasonal inappetance.

- **anti-Gn RH:** used to suppress the rut and to immunise weaners against velvet antler production at 12 months of age. While this procedure is unlikely to interfere with growth of the animal, the testosterone levels which cause the delayed/impaired velvet antler production, are likely to be very high in the carcase.

Because the effects of the immunogens can be detected endocrinologically and the fact that manipulations such as these will more than likely adversely affect market perceptions of venison products in the EC, the Ministry of Agriculture and Fisheries strongly advises caution by the industry when contemplating any use of these procedures.

Conclusion

Consumer demands in terms of food safety and quality in the lucrative markets that the New Zealand deer industry supplies, are becoming increasingly specific. While there is no such thing in this world as absolute food safety it is necessary to weigh up the potential risks that the product is likely to be exposed to and implement proactive producer and governmental programmes to minimise problems occurring. The veterinary profession and farming community have a significant contribution to play in the avoidance of violative chemical residues in meat and game-meat products. With the increased sensitivity of tests and the increased number of analytical methods

that can now be carried out, the number of deer that will be monitored in the future will be significantly greater than in the past.Where a withholding time has not been set for an animal remedy because the compound is not licensed for use in deer, the withholding time for cattle plus an additional safety period should be used to avoid carcase residues problems. Education of the producer and responsible handling and use of animal chemicals will go a long way to ensuring that market acceptability for New Zealand animal products remain.

References

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