



Massey University

Final Report

Investigation of Xylazine-related deaths in stags

Prepared for

VARNZ

Pania Flint BVSc
Massey University Deer Research Group
Institute of Veterinary, Animal and Biomedical Sciences
Massey University
P.B. 11222
Palmerston North, New Zealand
Ph. 06 3569099 ext 7757
e-mail: P.Flint@massey.ac.nz

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Executive summary

- VARNZ commissioned the Massey University Deer Research Group to undertake a study into the cause(s) of stag deaths after administration of the sedative drug Xylazine
- The study employed a case-control methodology, given the multiplicity of potential causative/contributory factors, complemented by investigation of the pathology of individual cases. Histopathology was the follow-up diagnostic method.
- Four sets of survey forms were prepared covering general farm details, velvetting episode details, specific details concerning stag deaths, and post mortem information
- Ten stag deaths were reported by farmers or veterinarians. However, anecdotal comments from farmers and veterinarians suggest that the number of deaths that were unreported is likely to be significantly higher than this.
- Under-reporting and incomplete data recording have been limiting factors to the success of this project.
- All stags reported were sedated with either 5% or 10% xylazine at a dose range of 0.3 to 1.6mg/kg liveweight. A proportion of stags were given reversal after velvet removal. In five out of ten deaths, local anaesthetic was not used, indicating that local anaesthetic administration is not a predisposing factor for death
- Deaths occurred from less than 10 minutes to more than 12 hours after xylazine.
- The number of stags dying at a velvetting occasion ranged from one to three.
- At the occasion when three stags died, the animals were reluctant to leave the paddock and were moderately stressed when held in the yards. On other occasions, animals were distressed but no deaths occurred, and in yet other instances, deaths occurred when the animals did not appear distressed.
- The major ante-mortem observations involved respiratory distress.
- Post mortem examination and histopathology supported these observations with the most significant pathological changes seen in the lungs. One stag was observed with excessive bleeding from one antler but post mortem examination did not support blood loss as a cause of death. Final diagnosis of cause of death was usually suspected anaphylactic reaction or severe stress. Four of nine cases had no diagnosis of cause of death.
- It is recommended that this study continue in modified form through the 2005-6 velvetting season to improve the robustness of results. This is likely to be achievable within current budget due to under-spending as a result of fewer numbers than predicted this season.

Participants

Peter Wilson BVSc, PhD, MACVSc

Professor

Project supervisor

Sithar Dorjee, Postgraduate student

Pania Flint BVSc, Research assistant

Cord Heuer DVM, PhD, Co-supervisor

1. Preamble

Deaths of stags from one- to three-hours to several days after velvetting under sedation with xylazine were first reported from the Hawkes Bay by Walker and Middleburg (1988) with an incidence rate of 1.7 deaths per thousand stags velvetted. The main pathological findings were pulmonary oedema and degranulation of eosinophils suggestive of hypersensitivity. Subsequent research by Mackintosh and Cross (1989) and Cross et al (1989) showed a decrease in circulating basophil numbers in animals that had been sedated with xylazine. This drop was often marked and it was suggested that it may be due to degranulation or sequestration of basophils in tissues such as the lungs. Basophils and mast cells contain vaso-active substances that alter the permeability of systemic blood vessels, (Fadal, 1985) which may contribute to pulmonary oedema as observed by Walker and Middleburg (1988). Haptoglobin, an acute inflammatory protein was also elevated in the treatment group indicating that some degree of inflammatory change or tissue damage was occurring.

Use of xylazine in sheep is a known risk. Histopathological examination of lung tissue from sheep sedated with xylazine or ST-91 showed oedema and severe morphological changes to pulmonary interstitial macrophages (Celly et al 1998). While the morphological and histological changes seen are suggestive of a hypersensitivity reaction, it appears that some degree of change occurs in all exposed animals and therefore the direct effect of the drug on tissues and inflammatory pathways is likely to play an important role with some animals reacting to such a degree as to result in death. Other adverse effects of xylazine sedation that may contribute to death include marked hypoxaemia (DeMoor and Desmet 1971; Celly et al 1997; Read et al 2001; Nolan et al 1986), hyperthermia or hypothermia (Fayed et al 1989; Sancken and Fischer 1988), regurgitation and inhalation pneumonia (Mackintosh and Cross 1989), blood loss leading to hypovolaemic shock, endotoxic shock (bacterial toxins) resulting from bowel stasis (Knight 1980) and severe stress (Spraker 1993). The effects of xylazine by direct action of the drug on alpha adrenergic receptors, present similar pathological changes in the lungs as would be seen with a hypersensitivity reaction and it is not clear what extent each process plays in the role of an adverse reaction.

Currently, post-velvetting stag deaths are of welfare concern to the industry and of welfare and financial concern to the individual farmer. Loss of genetically superior stags is an opportunity cost to the farmer and industry.

Recent anecdotal evidence suggests that while sporadic deaths still occur there are reports of multiple losses on individual properties, heightening the farmer and public awareness of the syndrome. Preliminary observations by the National Velvetting Standards Body suggest drug brand, purity, formulation and sterility issues are not involved. Thus either direct inherent

physiological/pharmacological effects of the drug on tissues and organs in deer or environmental, management or individual animal factors may contribute to the fatalities.

This study aimed to investigate a wide range of variables that may influence the probability of a stag dying after xylazine sedation. The objective was to identify predisposing factors in anticipation that the information may be used to manage or avoid the risk of fatalities in future. Information was gathered by way of questionnaires detailing circumstances surrounding mortalities and subsequent questionnaires regarding velvetting episodes when deaths did not occur.

2. Methods and materials

The phase of the study reported here was undertaken during the 2004-5 velvet removal season.

2.1. Case-control study concepts

The study was designed as a case-control observational study, combined with investigation of individual case pathology. The concept of this methodology, applied in the present context, is that details surrounding cases (deaths) are recorded, along with details of other velvetting episodes on the same property during the season when deaths did not occur (internal controls), to attempt to identify factors that may exist during the “case” episode compared with others. In addition, an attempt was made to obtain data from velvetting episodes on similar farms nearby upon which no cases are observed. These are external controls, and are an attempt to identify factors between farms.

If sufficient robust data were available, comparisons would be within-farm (velvetting episode with death vs velvetting -episode without death) and between-farms (farms where death occurred vs. farms where no deaths occurred). Since there would be many variables (factors) recorded, a multi-variable statistical approach would be employed.

In addition to the above multi-variable observational approach, the study offered the opportunity to simultaneously investigate the pathology of the syndrome to enable possible direct pharmacological or physiological effects of the drug to be detected.

2.2. Methodology

2.2.1. Identification of farms

Case farms were identified when stag deaths were notified to the researcher by the farmer or their veterinarian. Control farms were to be selected by the supervising veterinarian on a one case farm-one control farm basis and were to be similar in size, location and management practices to case farms.

Supervising veterinarians and farmers licensed to velvet stags were notified of the study via information to Deer Farmers Association Branch Chairpersons, direct notification in DINZ mailings (Deer Industry News) in a bulletin published by the National Velvetting Standards Body, by notification of veterinarians in the Deer Branch NZVA newsletter “Veterinary Cervus”, and twice during the season by direct e-mail to all members of the Deer Branch NZVA containing

data sheets as described below, as attachments. All parties were advised that information was also available on the internet through the Massey University Epidemiological Studies Centre web site.

2.2.2. Case definition

A post-velveting stag death was defined for this study as a death within 7 days of the velveting episode or administration of xylazine.

2.2.3. Data collection

Farmers and veterinarians were requested to notify researchers and do post mortems on cases within 24 hours of death. Immediately upon notification, data collection forms were sent by the fastest route available (usually email or the web site).

Four sets of data collection forms and a covering letter were prepared (Appendix A).

A General farm information (both case and control farms)

- To be completed for all farms included in the study
- Information pertaining to farm location, size, practice, stocking and facilities etc.

B Velveting episode (both case and control farms)

- To be completed for all velveting episodes that occurred during the season regardless of whether or not a death occurred at that episode.
- Included data on mustering, timing, environmental conditions and general procedure

C Stag death case details (case farm)

- One set of forms to be filled out for every stag that died at any episode
- Included specific details about the animal, drugs used, and observations during sedation

D Post-mortem description and report (case farm)

- Detailed instructions on postmortem procedure required and data to record, and samples to collect into formalin for diagnostic follow-up
- One report to be completed by the veterinarian for every stag death.
- Gross pathological findings and checklist of tissues to be sent to the laboratory.

In addition, histopathological examination of tissues supplied from post mortem examination was undertaken by Dr John Munday, a specialist veterinary pathologist at the Institute of Veterinary, Animal and Biomedical Sciences, Massey University.

On completion, all forms, including the final histopathology report, were sent to the research team at Massey University. Data was entered into an excel spreadsheet and descriptive analysis was undertaken.

Histological data and pathologist's comments were returned to the submitting veterinarian as soon as they were available.

There were insufficient cases reported to run a control group or to undertake statistical analyses

3. Results and discussion

Individual detail of each case is presented in Appendix B.

3.1. Cases and reporting

Ten stags were reported as dying on six properties during the 2004/2005 velveting season. Anecdotal reports from veterinarians in practice indicate that this figure is likely to be much higher in reality. The reasons why cases were not reported for the purposes of this study are unknown and determination of this is beyond the scope of the present phase of the study. One comment received via DINZ was that the financial compensation for the postmortem was insufficient. However, the amount paid was consistent with that offered to veterinarians for CWD surveillance. In addition, the farmer was not required to pay for laboratory analyses. Other veterinarians appeared satisfied with the payment offer.

In all, seven episodes were recorded. No control farms were studied, because the veterinarians and/or farmers appeared unwilling or unable to recruit such farms. General farm information was collected for three of the properties with partial data sets from the remaining properties. Completion of all forms and stag death information occurred in one case only. Velveting episode information was recorded on four farms where there were cases, with the number ranging from one to five/farm. Stag death case details were provided for six of the ten deaths. Post mortem examinations were carried out on six animals, and histopathology was undertaken in 5 cases.

A description of completion rate for each form for each case farm is summarized in Table 1.

Data gathered in this year of the study is insufficient for statistical analysis, but descriptive data will be presented below.

Table 1: Number of forms completed and returned for each property where a stag death case was reported to the study.

| Farm | No deaths | General information Form | Episode forms (no stag deaths) | Stag death case forms | Post mortem forms | <i>Histopatholgy</i> |
|------|-----------|--------------------------|--------------------------------|-----------------------|-------------------|----------------------|
| 1 | 1 | Yes | 5 | 1 | 1 | 0 |
| 2 | 1 | Yes | 5 | 1 | 1 | 1 |
| 3 | 3 (2 +1) | No | 0 | 3 partial | 2 + partial | 3 |
| 4 | 3 | Partial | 1 | 1 | 1 | 0 |
| 5 | 1 | Yes | 4 | 0 | 0 | 0 |
| 6 | 1 | No | 0 | 0 | 1 | 1 |

3.2. Location of case properties

Farms that reported deaths were located in the North and South Islands as detailed in Table 2. One veterinary clinic in the Manawatu was particularly active in reporting deaths. Hence the over-representation of this area may reflect the reporting frequency of this clinic rather than an increased risk of death.

Table 2: Areas from which cases were reported and the number of deaths on each property

| Farm | Location | No deaths |
|------|------------|-----------|
| 1 | Manawatu | 1 |
| 2 | Manawatu | 1 |
| 3 | Nelson | 3 |
| 4 | Manawatu | 3 |
| 5 | Hawkes Bay | 1 |
| 6 | Otago | 1 |

3.3. Velveting environment

Yard and pen size and number, number of animals per pen and flooring and lighting conditions are shown in Table 3. All properties for which relevant information was complete had relatively small velveting herds (range: 6 to about 100 stags). Farms had between one and four holding yards ranging in size from 13.5 to 104m². The number of animals in each holding yard before sorting into velveting pens ranged from less than 5 to more than 10 animals per yard. Velveting pens ranged in size from 4 m² to 20 m² and between 2 and 8 animals were held in each pen. Flooring was either concrete with no covering, or bare soil. Most sheds were naturally lit, but one shed used electric lighting.

Table 3: Yard and pen size, flooring and lighting conditions and number of animals per yard or pen.

| Farm | No. holding yards | Size holding yards | Animals per yard | No. velvet pens | Size velvet pens | Animals per pen | Flooring | Lighting |
|------|-------------------|-----------------------|------------------|-----------------|-----------------------|-----------------|---------------|----------|
| 1 | 2 | 20m ² | 5 to 10 | 2 | 20m ² | 1 | Bare concrete | Natural |
| 2 | 4 | 13.5-19m ² | <5 | 3 | 13.5-19m ² | 4 | Bare soil | Natural |
| 3 | ? | ? | ? | ? | ? | 4-8 | ? | ? |
| 4 | 1 | 20m ² | <5 | 1 | 20m ² | 2 | Bare soil | Natural |
| 5 | 3 | 30-104m ² | >10 | 3 | 4 to 6m ² | | Bare concrete | Electric |
| 6 | ? | ? | ? | ? | ? | ? | ? | ? |

? = not stated

3.4. Time and Weather Conditions

The time of day and weather conditions at velveting occasions when deaths did and did not occur are shown in Table 4. Weather conditions across all episodes ranged from fine and hot, to raining. Deaths occurred on days that were hot, fine, mild and overcast. Temperature was often not recorded, but when given, ranged from 12°C to 30°C. Wind speeds ranged from no wind to strong wind. Velveting occurred in the morning or the afternoon. Deaths occurred at various times of the day. Deaths occurred from less than 10 minutes to more than 12 hours after administration of xylazine.

Table 4: Weather conditions and time of day for all velveting episodes reported.

| Farm/episode | Temp °C | Weather | Wind | Start velveting | Finish velveting | Time of death |
|---|---------|---------|-------|-----------------|------------------|---------------|
| Velveting episodes when deaths did not occur | | | | | | |
| 1/1 | 17 | Cloudy | Light | 10:00am | 11:00am | N/A |
| 1/2 | 17 | Sunny | Light | 10:30am | 12:00pm | N/A |

| | | | | | | |
|--|----|------------------|--------|--------|---------|--------------------|
| 1/4 | 18 | Sunny | Light | 1pm | 2:30pm | N/A |
| 1/5 | ? | Raining | Light | 8:15am | 9:45am | N/A |
| 1/6 | 14 | Cloudy | Light | 7:30am | 9:30am | N/A |
| 2/1 | | | | 7:15am | 9:00am | N/A |
| 2/2 | 12 | Fine | Light | 7:00am | 9:30am | N/A |
| 2/3 | ? | Fine warm | Windy | ? | ? | N/A |
| 2/5 | ? | Sunny | ? | 8:00am | 12:00pm | N/A |
| 5/1 | ? | Cloudy | Strong | 3:30pm | 4:30pm | N/A |
| 5/2 | 16 | Cloudy | Strong | 3:30pm | 4:35pm | N/A |
| 5/3 | 15 | Raining | Strong | 2:45pm | 4:25pm | N/A |
| 5/4 | 18 | Cloudy | Strong | 3:30pm | 4:45pm | N/A |
| Velvetting episodes when deaths did occur | | | | | | |
| 1/3 | ? | Mild | ? | ? | ? | 10am |
| 2/4 | 16 | Overcast showers | ? | 7:30am | 9:30am | overnight |
| 3/1 | ? | Fine | ? | ? | ? | <10mins post inj |
| 3/2 | ? | Fine | ? | ? | ? | 10-15mins post inj |
| 4/1 | ? | Fine hot | None | ? | ? | <1 hour post inj |
| 6/1 | ? | ? | ? | ? | ? | 9 hours post inj |

? = data not provided

N/A = Not applicable

3.5. Stress and Handling in yards and pens

In the majority of cases, no stress or excessive excitement was identified when the stags were in the yards or velvetting pens (see Table 5). Time to muster was less than 30 minutes in all but one recorded episode. Stags spent less than 30 minutes in the yards in most cases, but between 30 and 60 minutes on one property and between one and two hours on one episode. Animals were considered stressed in the velvetting pens on two occasions, one of which involved no deaths and the other involved three deaths. There was no separation of any animal that appeared distressed on any occasion. On the occasion when three animals were reporting dying at the same episode, the stags were reluctant to leave the paddock, although mustering took less than 15 minutes. These animals were slightly agitated in the holding yard, but were only kept there for 5 minutes. They became more agitated or excited when in the velvetting pen. However, no injuries were recorded. Another group was agitated with stags jumping over each other in both the holding yards and the velvetting pens and suffered 2 minor leg injuries. These animals were held for considerably longer (up to 2 hours), and no deaths occurred on this occasion.

Table 5: Time to muster, time spent in the holding yards and evidence of stress or mustering difficulty during episodes when stags did or did not die.

| Time to muster | Muster Difficulty | Stress in hold yard | Time in yard (mins) | Stress in velveting pen | Injuries | Post velveting deaths |
|----------------|----------------------------|----------------------------------|---------------------|----------------------------------|----------------------|-----------------------|
| <15 | No | No | <30 | No | 0 | |
| <15 | No | No | <30 | No | 0 | |
| <15 | No | No | <30 | No | 0 | 1 |
| <15 | No | No | <30 | No | 0 | |
| <15 | No | No | <30 | No | 0 | |
| <15 | No | No | <30 | No | 0 | |
| 15-30 | No | No | 30-60 | No | 0 | |
| 15-30 | No | No | 30-60 | No | 0 | |
| 15-30 | No | No | 30-60 | No | 0 | |
| 15-30 | No | No | 30-60 | No | 0 | 1 |
| 30-60 | No | Agitated, jumping on one another | 60-120 | Agitated, jumping on one another | 2 minor leg injuries | |
| | | | | | | 2 |
| | | | | | | 1 |
| <15 | Reluctant to leave paddock | Slightly agitated | 5 | Agitated /excited | 0 | 3 |
| <15 | No | No | <30 | No | 0 | |
| <15 | No | Agitated/excited | <30 | No | One broken antler | |
| <15 | No | No | <30 | No | 0 | |
| <15 | No | No | <30 | No | 0 | |
| | | | | | | 1 |

3.6. Drugs Used

All drugs were within the expiry date and reported as appearing clear and normal in colour and consistency.

3.6.1. Xylazine

All animals were chemically restrained with xylazine. Some animals were given a top-up (repeat dose) of xylazine, although none of the stags that died were given a top-up. When asked what dose rate was used, most operators stated 1mg/kg with one operator using 1.6mg/kg. When the actual dose given was calculated for stags that died, dose ranged from 0.3 to 1.6mg/kg. In all but one case, the actual dose given was less than the general dose stated in the velveting episode form. Velvet removal occurred between 10 and 30 minutes after injection of xylazine. Xylazine brand, percent, stated general dose rate, route of administration and actual calculated dose based on volume used and estimate of stag weight are shown in Table 6.

3.6.2. Reversal

On three properties, all stags were given reversal (Table 7). On one property, some were given reversal and on two properties, it was not stated what proportion of animals received reversal. Reversal was administered IV, usually into the jugular vein and a dose rate of between 0.1 and 0.25mg/kg. Reversal was given between 20 and 30 minutes after administration of xylazine. At least five of the stags that died were given reversal. At least two stags that died were not given reversal.

3.6.3. Local Anaesthetic

Five of the ten stags that died were given local anaesthetic by subcutaneous injection. The brand (“Bomacaine”) was stated only for property 3. One stag died before administration of local anaesthetic, and therefore velvet was removed post-humus without analgesia. On a different property, three stags that died on the same occasion were in hard antler and therefore no local analgesia was deemed necessary. The other that died was sedated for tuberculosis testing and there was no need for local anaesthetic. Dose rate of local anaesthetic ranged from 15 to 30 mls per animal. No adrenaline was used in local anaesthetic in any case.

These findings suggest that local anaesthetic use and dose does not play a significant role in the post-velveting death of stags.

Table 6: Brand, dose and route of administration of xylazine given to all stags on each farm and actual dose given to stags that died.

| Farm | Xylazine brand | Xylazine % | Dose stated | Route | Actual dose and route used in stag that died |
|------|----------------|------------|-------------|---------|--|
| 1 | Phoenix | 10% | 1mg/kg | IM neck | 0.66mg/kg, neck |
| 2 | Phoenix | 10% | 1mg/kg | IM neck | 0.5mg/kg, rump |
| 3 | Phoenix | 10% | NS | NS | 0.3mg/kg, rump |
| | | 10% | NS | NS | 0.3mg/kg, rump |
| 4 | Phoenix | 5% | 1.6mg/kg | IM rump | 1.6mg/kg, rump |
| 5 | Phoenix | 10% | 1mg/kg | IM neck | |
| 6 | NS | 5% | NS | NS | |

NS = Not stated

Table 7. Brand, dose and route of administration of yohimbine reversal given to stags on each farm and the dose given to stags that died.

| Farm | Yohimbine brand | Dose (ml) | Route |
|------|-----------------|-----------|-------|
| 1 | Phoenix | 2 | IV |
| 2 | Phoenix | 1 | IV |
| 3 | None | | |
| 4 | Phoenix | 4 | IV |
| 5 | NS | NS | NS |
| 6 | NS | NS | NS |

NS = Not stated, IV = Intravenous

3.7. Sedation and ante-mortem observations

Of 66 stags for which data was recorded, three were reported as standing during velvet removal and the remaining 63 were recumbent. Of the stags that died, four of five were reported as recumbent and one was standing during sedation. Two stags died before recovery from sedation. Of the stags for which data was given, three were drowsy when released and one ran out of the shed almost fully recovered.

Five of the stags that died were seen to be having difficulty before death. Four of these were exhibiting respiratory distress and the other was bleeding from one antler eight hours after velvet removal. Two animals in acute respiratory distress less than 10 minutes after xylazine administration were gasping to breathe, but no airflow was detected, suggestive of airway blockage or severe pulmonary oedema. Another stag developed respiratory distress less than one hour after xylazine injection and was seen gurgling and panting and became recumbent. This animal was given reversal and “Depocillin” (a penicillin antibiotic) by the veterinarian. The fourth animal was observed wobbling and staggering one hour prior to death. This progressed to gasping for air, then sitting down and the animal finally became comatose and died.

The respiratory distress observed is consistent with observations from other species (Caulkett pers com.) of hypoxaemia (lack of blood oxygen) associated with respiratory depression, which is a well known pharmacological effect of xylazine in many species, including deer (Massey University research).

Investigation of oxygenation of tissues following xylazine administration in deer is warranted, since this state will cause widespread tissue damage, and is known to be fatal in many situations where xylazine has been used (Caulkett, pers com.).

3.8. Post Mortem Findings

Gross pathological findings, histopathology results and suspected cause of death are summarized in Tables 8,9 and 10, respectively. In those tables, individual stags have been numbered one to nine with the same numbers used for all tables and comments.

Six of seven stags post mortemed were reported in lateral recumbancy after death, while the seventh was still partially upright. All carcasses were fresh at the time of post mortem. One had a large amount of blood from the right antler, whereas the other six had no sign of external trauma or bleeding. One carcass was slightly bloated and the other six were not bloated at all and appeared externally normal. One stag had blood present from the anus on a rectal thermometer after taking its temperature and another had a large amount of white froth present at the mouth and nostrils. Mucous membranes were pale in all but one case, which had red membranes. Six out of seven stags had some form of grossly visible pathology in the lungs and two had haemorrhagic intestinal contents (Table 8). This is regarded as an acute haemorrhagic enteropathy and is recognized as a sign of acute stress in deer. Four of the animals were reported as having froth in the trachea or fluid in the lungs, indicating pulmonary oedema.

Histopathological findings are summarized in Table 9. They are generally correlated with the gross post mortem findings reported for those animals for which both were provided. The majority of pathological changes were again seen in the lungs and included pulmonary oedema, congestion and haemorrhage. Stag 5 had widespread congestion and haemorrhage in multiple organs, including the lungs, gastrointestinal tract and lymph nodes. Stag 3 had marked splenic

contraction, with very few red blood cells seen in the spleen and germinal centres prominent. This is sometimes seen in terminal severe stress. This stag also had a mild interstitial nephritis, possibly due to leptospirosis, but no other significant findings.

Table 8: Summary of gross pathological findings on post mortem examination performed by the attending veterinarian

| Stag | Lungs | Gastrointestinal | Other |
|------|---|--|--|
| 1 | Pink, spongy and inflated with froth in the trachea | | |
| 2 | Swollen and slightly firm with patches of dark pink over 30% | | |
| 3 | Spongy and inflated with some blood and patches of red | | |
| 4 | | Abomasal folds swollen and haemorrhagic. Inner surfaces of SI haemorrhagic, blood in intestines | |
| 5 | Lungs full of blood and fluid with patches of red on surface | Abomasum: red-brown watery contents. Lining covered in 1-2mm haemorrhages, 1cm haemorrhage on exterior surface of omasum. Bloody jejunal contents, outer surfaces of jejunum dark red, 1-2mm red spots on outer caecum | Bladder internal lining 1-2mm haemorrhages |
| 6 | Firm areas and patches of red on surface. Large amount froth in trachea | | |
| 9 | Spongy, froth and fluid filled, not inflated with large amounts of fluid in the trachea | | |

Table 9: Summary of histopathological findings.

| Stag | Lungs | Intestines | Other |
|------|--|--|---|
| 2 | Congestion, moderate to severe with mild pulmonary oedema | | |
| 3 | | | Spleen: marked contraction, cellular changes indicating severe terminal stress. Mild interstitial nephritis |
| 4 | Bronchopneumonia, mild multifocal, acute neutrophilic | | |
| 5 | Congestion and haemorrhage, pleuritis, minimal fibrosing and neutrophilic, focal chronic | Enteritis, mild neutrophilic, diffuse subacute. Congestion and haemorrhage | Lymph nodes: congestion and haemorrhage |
| 9 | Pulmonary oedema, severe acute, with intralesional neutrophils | | Myocarditis, focal chronic fibrosing, mild Adrenal congest + haemorrhage |

Table 10: Diagnosis of cause of death and method of diagnosis

| Stag | Cause of death | Diagnosed by |
|------|---|-----------------------------|
| 1 | Delayed hypersensitivity | Clinical signs and gross PM |
| 2 | No cause identified | |
| 3 | Very acute allergic reaction | Clinical signs and gross PM |
| | Stress leading to hypovolaemic shock | Histopath |
| 4 | Unknown | |
| 5 | Very acute MCF or anaphylaxis | Gross PM |
| | Uncertain, but indicative of massive vasodilation | Histopath |
| 6 | Stress | Gross PM |
| 7 | Not stated | |
| 8 | Not stated | |
| 9 | Severe pulmonary oedema | Gross PM |
| | Acute pulmonary oedema, possibly anaphylaxis or severe stress | Histopath |

4. Conclusions

This project has provided information of value in extending knowledge of post-xylazine stag deaths, but more data will be needed to permit the completion of the objectives of this study.

On one property, three stags died on the same occasion. Previous NVSB reports show that multiple deaths on the same property at the same episode have occurred indicating that there may be some “farm” or “episode” risk factors that increase the susceptibility of several animals in the mob dying on the same occasion.

Descriptive analysis of limited case reports indicates that the major pathological changes occur in the lungs and that the cause of death is often related to respiratory distress or severe stress. These findings are consistent with previous reports (Walker and Middleburg 1988; Mackintosh and Cross 1989; Cross et al 1989).

It is postulated that xylazine induces pulmonary changes in all sedated deer. This may be due to an allergic type hypersensitivity reaction, precipitated or exacerbated by an underlying concurrent condition or related to stress. However, some other risk factors are likely to trigger a severe reaction resulting in death. For example, it may be postulated that a syndrome like sub-acute or sub-clinical Interstitial Pneumonia as reported recently by Dunbar (2005), associated with Tryptophan concentrations in pasture, may be predisposing the animal to death. This factor could be acting synergistically with the apparently normal mild changes in lung structure and function reported by Walker and Middelberg (1998) in deer and known to occur in sheep as summarized above. Alternatively, or additionally, tissue hypoxia may exacerbate the risk of death, as occurs in other species in response to xylazine.

Further study of the epidemiology of post-xylazine stag death is required to identify these potential risk factors.

The major limiting factors in the success of this project in its current season was the under-reporting of cases and incomplete data collection, along with the reluctance of farmers and/or

veterinarians to recruit “control” farms. It is acknowledged that veterinarians and farmers are very busy and often lack time to complete detailed questionnaires. Consideration needs to be given to how this can be managed in future to maximize the level of reporting and the quality of data received for this and other projects reliant on this method to collect information. In addition, there may have been confusion amongst farmers about the definition of the purpose of the study since one promotional source used the term “adverse reaction” rather than “stag death” to describe the purpose of the study. The former term did not clearly enunciate the true nature of the study.

The fact that case and post mortem forms were returned without background farm or environmental information and without identification of control properties suggests that farmers and veterinarians saw more advantage to themselves in terms of having a diagnosis made and paid for, than contributing to the industry’s desire to investigate cause. If the study is to continue, this aspect will need to be re-evaluated.

5. Recommendation

It is recommended that this study continue, with modification, for another velvetting season. The rationale for this is:

- There has been a significant investment in development of methodology including design of data collection forms.
- The data templates have been developed, and a significant amount of data has been collected, albeit insufficient for a statistical risk factor analysis.
- It is unlikely that there will need to be significant additional financial resources to continue the project.
- There is a growing awareness in the industry of this study, whereas at its implementation, there was limited time to create awareness, and there were some mixed messages given to farmers about the precise purpose of the project.
- An additional consideration is that the expertise of the research author has been developed, and that skill will be available during the forthcoming velvet season, with this research contributing one part to a PhD project aimed at developing research skills for the New Zealand Deer Industry.

Acknowledgement

The assistance and advice of Rob Gregory and Tony Pearse, DINZ, is gratefully acknowledged. The farmers and veterinarians providing the information summarized in this report are thanked for their time, input and suggestions.

Appendix A: Data collection forms

- Letter accompanying report forms for participating veterinarians and farmers,
- Report form A: General farm information,
- B: Velvetting episode report
- C: Case episode report
- D: Post mortem report

Post- Velveting Stag Deaths

Dear Farmers/Colleagues,

We would like to extend our great appreciation for your willingness and kind cooperation to participate in this study. We hope you have already received the background information regarding this study along with its objectives and benefits.

This data gathering process needs the following forms to be completed and returned to the address below:

1. Form –A: General Information

Each farm needs to fill in this form only once and return it along with other datasheet.

2. Form – B: Velveting Episode Report

This form is to be filled in for both **Case** (farm that experienced stag death within 7 days of post-velveting) and **Control farms** (selected nearby farms where stag death has not occurred) for every velveting episode until the end of the velveting season. The case farms will have to record the velveting episode that gave rise to a case (stag death) and at least one or two previous velveting episodes of the current season.

The control farms will have to fill in only form-B and all velveting episodes from the time of selection as control farm until the end of the velveting season.

Velveting episode is a velveting occasion where any number of stags were velveted in one shift. For instance, on one single day, if you velveted stags once in the morning and another lot in the evening, it is considered as two episodes.

3. Form – C: 1. Stag death case details

2. Post-mortem Report

These forms need to be filled in for each stag that dies post-velveting.

Due to the nature and accuracy of information required we request you to complete datasheet (Form - B) at the end of every velveting episode and Form - C as soon as you experience stag death. As far as possible, we would prefer that post-mortem examination be conducted by your local veterinarian. A \$100/- payment will be given to assist the cost of post-mortem examination and sample collection. Please send the requested samples to Sithar Dorjee, at the address below, at the earliest for laboratory examination.

The datasheets (electronic and/or hard copies) will be made available to you as soon as you contact us by the fastest and most preferred means. They can also be downloaded from internet from the website: http://epicentre.massey.ac.nz/Topics_PVSDS.htm

We would appreciate receiving datasheets and other questionnaires as and when you complete them from time to time. Please feel free to ask for clarification on questionnaires or any other matters related to this study. All information obtained will be treated strictly confidential.

Contact person and questionnaire return address:

Sithar Dorjee, IVABS - EpiCentre, Private Bag 11 222, IVABS, Massey University, Palmerston North.

Telephone: (06) 350-5855; Fax: (06) 350-5716; Mobile: 027 223 4288; E-mail: S.Dorjee@massey.ac.nz

Courier address: Sithar Dorjee, Reception, Epicentre, Ring Road, Turitea Campus, Massey University, Palmerston North

Alternative contact:

Professor Peter Wilson, IVABS, Massey University, Ph 06 3569066, ext. 7619. Fax 06 3505616, Mobile 025 2462303, Home 06 3572403, e-mail: P.R.Wilson@massey.ac.nz

FORM – A: GENERAL INFORMATION

Please complete this form only once and send it along with other questionnaires!

1. Farm contact details

| | | | |
|-------------------------------|--|---------------|--|
| Name | | | |
| Farm address | | | |
| Number & Road name | | | |
| Locality | | | |
| Nearest town/city | | | |
| Phone No. | | Mobile | |
| Fax No. | | E-mail | |

2 Farm characteristics

2.1 Location of farm:

2.2 Total farm area (ha):

2.3 Deer fenced area (ha):

2.4 Type of operation: (Tick whichever applies)

| | | | |
|---------------|--|--------------------|--|
| i. Venison | | iv. Stud | |
| ii. Velvet | | v. Others -specify | |
| iii. Breeding | | | |

2.5 Number of deer wintered in 2004

| Age group | Sex | Red | Wapiti | Wapiti-Red | Fallow | Others |
|---|---------------|-----|--------|------------|--------|--------|
| i. Weaner (0 – 12 months) | Male | | | | | |
| | Female | | | | | |
| ii. Yearling (13 – 24 months) | Male | | | | | |
| | Female | | | | | |
| iii. Adult (above 24 months) | Male | | | | | |
| | Female | | | | | |
| Stags velveted in 2004-05 season | | | | | | |
| Total velveted in current season (2004-05) | Spiker | | | | | |
| | Stag | | | | | |

- 2.6 Number of holding yards in the shed used for velvetting.
- 2.7 Range of areas of these holding yards (Area in m²)
- 2.8 Number of velvetting pens in the farm (where velvet are removed)
- 2.9 Range of areas of these velvetting pens? (Area in m²)
- 2.10 Type of flooring of velvetting pens? (Please tick the appropriate one or specify)

| | | | |
|----------------------|--------------------------|---|--------------------------|
| i. Bare soil | <input type="checkbox"/> | iv. Concrete without bedding | <input type="checkbox"/> |
| ii. Saw dust on soil | <input type="checkbox"/> | v. Concrete with saw dust bedding | <input type="checkbox"/> |
| iii. Gravel floor | <input type="checkbox"/> | vi. Concrete with other types of bedding -specify | <input type="text"/> |

- 2.11 Type of lighting in the velvetting pens. (Please tick the appropriate one or specify)

| | | | | | |
|------------|--------------------------|--------------|--------------------------|--------------------|----------------------|
| i. Natural | <input type="checkbox"/> | ii. Electric | <input type="checkbox"/> | iv. Others-specify | <input type="text"/> |
|------------|--------------------------|--------------|--------------------------|--------------------|----------------------|

3 General Velvetting Practices

- 3.1 Do you carry out velvetting of stags and spikers separately?

| | | | |
|-----|--------------------------|----|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|-----|--------------------------|----|--------------------------|

- 3.2 Where do you carry out velvetting? (Please tick whichever applies)

Stags

| | | | | | | | |
|-----------------|--------------------------|----------|--------------------------|------------|--------------------------|--------------------|----------------------|
| i. Enclosed pen | <input type="checkbox"/> | ii. Race | <input type="checkbox"/> | iii. Crush | <input type="checkbox"/> | iv. Others-specify | <input type="text"/> |
|-----------------|--------------------------|----------|--------------------------|------------|--------------------------|--------------------|----------------------|

Spikers

| | | | | | | | |
|-----------------|--------------------------|----------|--------------------------|------------|--------------------------|--------------------|----------------------|
| i. Enclosed pen | <input type="checkbox"/> | ii. Race | <input type="checkbox"/> | iii. Crush | <input type="checkbox"/> | iv. Others-specify | <input type="text"/> |
|-----------------|--------------------------|----------|--------------------------|------------|--------------------------|--------------------|----------------------|

- 3.3 Do you velvet stags with 1st cut and re-growth antlers separately?

| | | | |
|-----|--------------------------|----|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|-----|--------------------------|----|--------------------------|

- 3.4 What site of administration do you use for local anaesthetic? (Please tick the appropriate one)

| | | | | | |
|-----------------------|--------------------------|--------------------------|--------------------------|------------------|--------------------------|
| i. Local infiltration | <input type="checkbox"/> | ii. Regional nerve block | <input type="checkbox"/> | iii. Combination | <input type="checkbox"/> |
|-----------------------|--------------------------|--------------------------|--------------------------|------------------|--------------------------|

- 3.5 What was the standard dose of local anaesthetic agent injected? (ml/circumference)

- 3.6 Did you use local anaesthetic containing epinephrine?

| | | | | | |
|-----|--------------------------|----|--------------------------|------------|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> | Don't know | <input type="checkbox"/> |
|-----|--------------------------|----|--------------------------|------------|--------------------------|

- 3.7 How many stags do you inject with one needle? (Please tick the appropriate one)

| | | | | |
|-----------------|----------------------|--------------------------|------------|--------------------------|
| Sedative | More than one | <input type="checkbox"/> | One | <input type="checkbox"/> |
| Local | More than one | <input type="checkbox"/> | One | <input type="checkbox"/> |

- 3.8 How many stags were injected with one syringe? (Please tick the appropriate one)

| | | |
|-----------------|----------------------|--|
| Sedative | More than one | |
| Local | More than one | |

| | |
|------------|--|
| One | |
| One | |

3.9 Do you use repeat dose syringe or single dose syringe?

| | |
|------------|--|
| Yes | |
|------------|--|

| | |
|-----------|--|
| No | |
|-----------|--|

3.9 Did you experience post velveting stag deaths in previous seasons?
(earlier to 2004-05 season)

| | |
|------------|--|
| Yes | |
|------------|--|

| | |
|-----------|--|
| No | |
|-----------|--|

If yes, please give number

| |
|--|
| |
|--|

END

FORM – B: VELVETING EPISODE^a REPORT

Please use one form for every velvetting episode until the end of the current velvetting season regardless whether or not a stag death occurred. Please include any previous velvetting episodes (at least recent one or two episodes)

Date of velvetting episode:

Mob Details

| | |
|---|--|
| i. Age range of the mob ^b | |
| ii. No. of stags in the mob | |
| iii. No. of stags velvetted | |
| iv. Temperature during the velvetting episode (in °C) | |

| | |
|--|--|
| v. Start time (mustering) | |
| vi. Finish time (return to paddock) | |
| vii. Weather condition (sunny/cloudy/ rainy) | |
| viii. Wind speed (light breeze/ strong gusty wind/ calm) | |

1. Mustering and yarding

1.1 Method used for mustering and yarding stags? (You may tick more than one)

| | | | |
|---|--|--|--|
| i. Foot <input style="width: 50px; height: 20px;" type="checkbox"/> | ii. Motor bike <input style="width: 50px; height: 20px;" type="checkbox"/> | iii. Dog <input style="width: 50px; height: 20px;" type="checkbox"/> | Others-specify <input style="width: 80px; height: 20px;" type="text"/> |
|---|--|--|--|

1.2 Number of persons involved in mustering and yarding the stags? (Please give no.)

1.3 Time taken to muster stags from paddock to holding yards? (Please tick the appropriate one)

| | |
|---|--|
| i. Less than ¼ hr. <input style="width: 50px; height: 20px;" type="checkbox"/> | iii. Between ½ -1 hr <input style="width: 50px; height: 20px;" type="checkbox"/> |
| ii. Between ¼ – ½ hr. <input style="width: 50px; height: 20px;" type="checkbox"/> | iv. Longer than 1 hr <input style="width: 50px; height: 20px;" type="checkbox"/> |

1.4 Did you face any difficulty in mustering and yarding the stags?

| | |
|--|---|
| Yes <input style="width: 50px; height: 20px;" type="checkbox"/> | No <input style="width: 50px; height: 20px;" type="checkbox"/> |
|--|---|

1.5 If yes, please describe the difficulties.

1.6 Was there mixing of stags of different mobs in the holding yards?

| | |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|----|--------------------------|
| No | <input type="checkbox"/> |
|----|--------------------------|

^a Velveting episode is a velveting occasion where number of stags were velveted in one shift. For instance, if you velveted stags once in the morning and another lot in the evening on the same day with break in between, it is considered as two episodes.

^b If two or more mobs were velveted during the same episode, please treat them as a single mob.

1.7 Range of number of stags kept in each holding yard? (Please tick the appropriate one)

| | |
|----------------|--------------------------|
| i. Less than 5 | <input type="checkbox"/> |
|----------------|--------------------------|

| | |
|------------------|--------------------------|
| ii. Between 5-10 | <input type="checkbox"/> |
|------------------|--------------------------|

| | |
|-------------------|--------------------------|
| iii. More than 10 | <input type="checkbox"/> |
|-------------------|--------------------------|

1.8 Were there any signs of stress in the holding yards? (You may tick more than one)

| | |
|------------------------------|--------------------------|
| i. None | <input type="checkbox"/> |
| ii. Panting | <input type="checkbox"/> |
| iii. Agitated/excited | <input type="checkbox"/> |
| iv. Jumping over one-another | <input type="checkbox"/> |

| | |
|--|--------------------------|
| v. Unusually aggressive to other stags | <input type="checkbox"/> |
| vi. Unusual aggression to handlers | <input type="checkbox"/> |
| vii. Others - specify | <input type="text"/> |

2. Drafting

2.1 Time taken from yarding of stags to penning (drafting) for restraint? (Please tick the appropriate one)

| | |
|---------------------|--------------------------|
| i. Less than 1/2 hr | <input type="checkbox"/> |
|---------------------|--------------------------|

| | |
|------------------------|--------------------------|
| ii. Between 1/2 - 1 hr | <input type="checkbox"/> |
|------------------------|--------------------------|

| | |
|---------------------|--------------------------|
| iii. Between 1-2 hr | <input type="checkbox"/> |
|---------------------|--------------------------|

| | |
|--------------------|--------------------------|
| iv. more than 2 hr | <input type="checkbox"/> |
|--------------------|--------------------------|

2.2 Were there any signs of stress in the velveting pen? (You may tick more than one)

| | |
|------------------------------|--------------------------|
| i. None | <input type="checkbox"/> |
| ii. Panting | <input type="checkbox"/> |
| iii. Agitated/excited | <input type="checkbox"/> |
| iv. Jumping over one-another | <input type="checkbox"/> |

| | |
|--|--------------------------|
| v. Unusually aggressive to other stags | <input type="checkbox"/> |
| vi. Unusual aggression to handlers | <input type="checkbox"/> |
| vii. Others - specify | <input type="text"/> |

2.3 Were stressed stags kept in the same group with non-stressed stags for restraint and surgical procedures?

| | |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|----|--------------------------|
| No | <input type="checkbox"/> |
|----|--------------------------|

2.3.1 If yes, were stressed stags administered sedative before they were settled?

| | |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|----|--------------------------|
| No | <input type="checkbox"/> |
|----|--------------------------|

2.4 How many stags suffered the following injury? (Please give number)

| | |
|--------------------------------------|--|
| i. Broken antler | |
| ii. Leg injuries | |
| iii. Injury leading to death or kill | |
| iv. None | |

3. Velveting procedures

3.1 How many persons were involved in restraining and removal of antler?
(Please give number)

3.2 Who performed velveting of stags? (You may tick more than one)

| | | | | | |
|----------|--------------------------|---------|--------------------------|------------------------------|----------------------|
| i. Owner | <input type="checkbox"/> | ii. Vet | <input type="checkbox"/> | iii. Other persons - specify | <input type="text"/> |
|----------|--------------------------|---------|--------------------------|------------------------------|----------------------|

3.3 Were stags velveted of 1st cut or re-growth group? (You may tick the appropriate one)

| | | | | | |
|------------------------|--------------------------|-------------------------|--------------------------|-------|--------------------------|
| i. 1 st cut | <input type="checkbox"/> | ii. 2 nd cut | <input type="checkbox"/> | Mixed | <input type="checkbox"/> |
|------------------------|--------------------------|-------------------------|--------------------------|-------|--------------------------|

3.4 Type of restraint used. (Please tick the appropriate one)

| | | | | | |
|-------------|--------------------------|--------------|--------------------------|------|--------------------------|
| i. Chemical | <input type="checkbox"/> | ii. Physical | <input type="checkbox"/> | Both | <input type="checkbox"/> |
|-------------|--------------------------|--------------|--------------------------|------|--------------------------|

3.5 If you used chemical restraint, what drug was used for sedation?

| Type of drug | Brand name | Concentration used |
|--------------------------------|------------|--------------------|
| i. Xylazine alone | | |
| ii. Combination | | |
| iii. Others-(without xylazine) | | |

3.6 What was the dose (ml/ 50kg body wt.) used?

| | | | |
|-------------|----------------------|---------------------------------------|----------------------|
| i. Xylazine | <input type="text"/> | ii. Xylazine component of combination | <input type="text"/> |
|-------------|----------------------|---------------------------------------|----------------------|

3.7 Where did you inject the sedative? (You may tick more than one)

| | | | | | |
|---------|--------------------------|----------|--------------------------|----------------------|----------------------|
| i. Neck | <input type="checkbox"/> | ii. Rump | <input type="checkbox"/> | iii. Other (specify) | <input type="text"/> |
|---------|--------------------------|----------|--------------------------|----------------------|----------------------|

3.8 Equipment used for administration of sedative. (You may tick more than one)

| | | | | | | | |
|----------------------|--------------------------|------------------------|--------------------------|-------------------|--------------------------|--------------------|----------------------|
| i. Automatic syringe | <input type="checkbox"/> | ii. Disposable syringe | <input type="checkbox"/> | iii. Pole syringe | <input type="checkbox"/> | iv. Others-specify | <input type="text"/> |
|----------------------|--------------------------|------------------------|--------------------------|-------------------|--------------------------|--------------------|----------------------|

3.9 Range of number of stags injected with sedative at a time? (Please tick the appropriate one)

i. Less than 5

ii. 5-10

iii. If more than 10, give range of number

3.10 Estimated time range from injection of sedative to antler removal. (Please tick the appropriate one)

i. Less than 10 min

ii. 10-20 min

iii. 20-30 min

iv. more than 30 min

3.11 What number of stags were velveted in the following position? (Please give number)

i. Recumbent

ii. Standing

3.12 Did any stag require top-up doses of xylazine?

Yes

No

If yes, please mention

i. How many stags?
ii. Top-up Xylazine concentration (%)

iii. Top-up ml/stag injected
iv. Top-up Route

3.13 How many stags were given reversal agent? (Please tick the appropriate one)

i. All

ii. Some

iii. None

3.14 If reversal agent was used:

i. Brand name
ii. Route (IM/IV)

iii. Dose (mg/kg body wt.)
iv. Time of injection after xylazine injection (minutes)

3.15 Did you give any other drugs/treatments/vaccination, etc on the day?

Yes

No

If yes;

i. Drug name

ii. Dose (mg/kg body wt.)

3.16 What tool was used for cutting antler?

3.17 Was the tool used for cutting antler disinfected before and after every stags antler removal?

Yes

No

3.18 If disinfection was used, please state brand name of disinfectant

3.19 Did you use a tourniquet (rubber ring) on stags? (Please tick the appropriate one)

i. All

ii. Some

iii. None

3.20 Did any stag spurt blood after tourniquet removal?

| | |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|----|--------------------------|
| No | <input type="checkbox"/> |
|----|--------------------------|

3.21 Did you apply any antiseptic and/or anti-bleeding powder/ cream/ lotion on the stump after antler removal?

| | |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|----|--------------------------|
| No | <input type="checkbox"/> |
|----|--------------------------|

If yes,

| | |
|--------------|----------------------|
| i. Drug name | <input type="text"/> |
|--------------|----------------------|

| | |
|-------------------------|----------------------|
| ii. Powder/cream/lotion | <input type="text"/> |
|-------------------------|----------------------|

3.22 Time range from antler removal to release of stags to paddock (Tick the appropriate one)?

| | |
|------------------------------|--------------------------|
| i. Immediately after removal | <input type="checkbox"/> |
| ii. Less than 1/2 hr | <input type="checkbox"/> |

| | |
|-------------------------|--------------------------|
| iii. Between 1/2 - 1 hr | <input type="checkbox"/> |
| iv. More than 2 hrs | <input type="checkbox"/> |

3.23 How often did you monitor stags after velveting? (Please give number)

| | |
|-------------------------------|--------------------------|
| i. Up to 2-4 hrs | <input type="checkbox"/> |
| ii. Until the end of same day | <input type="checkbox"/> |
| iii. Until next day | <input type="checkbox"/> |

| | |
|------------------------------|--------------------------|
| iv. Every day until 3-5 days | <input type="checkbox"/> |
| v. Was not required | <input type="checkbox"/> |

3.24 Did you see any bleeding in stags after releasing them to paddock?

| | |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|----|--------------------------|
| No | <input type="checkbox"/> |
|----|--------------------------|

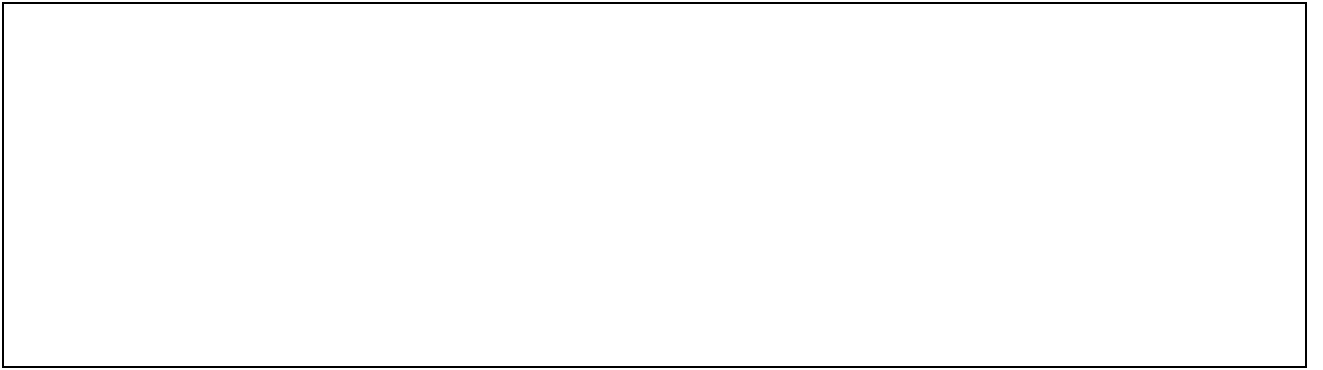
3.25 After antler removal, where did you release the stags? (Please tick the appropriate one)

| | |
|-----------------|--------------------------|
| i. Original mob | <input type="checkbox"/> |
|-----------------|--------------------------|

| | |
|----------------------------------|--------------------------|
| ii. Another mob already velveted | <input type="checkbox"/> |
|----------------------------------|--------------------------|

3.26 Please mention if anything different or unusual (interruption or problems) happened during this episode.

Any other comments:



————— **END** —————

FORM- C: 1. STAG DEATH –CASE DETAILS

Complete this form for each of the stag that died post-velveting

Name of farmer:

Date (stag death):

1. Stag details

| | | | |
|--|--|---|--|
| i. Tag no. | | vii. Time of death post-velveting (minutes / hrs) | |
| ii. Species & bloodline (NZ/English/American,etc) | | viii. Number of stags sedated with it at a time. | |
| iii. Age (in yrs) | | ix. Number of other stags dead/dying during the same velveting episode | |
| iv. 1st cut / Re-growth | | x. Number of other stags kept in the same velveting pen | |
| v. Estimate of body wt. | | xi. Who velveted the stag? (Vet/Self/ Trained personnel) | |
| vi. Body condition (very poor/ poor/good) | | xii. Total number of stags velveted by the same person at same episode | |

2. Type of restraint used: (Please tick the appropriate one)

| | | |
|---|--|--------------------------------------|
| i. Chemical <input type="checkbox"/> | ii. Physical <input type="checkbox"/> | Both <input type="checkbox"/> |
|---|--|--------------------------------------|

3. Time taken between administration of sedative and antler removal.

..... (minutes)

4. Details of drugs used:

| | Sedation | Reversal | Local |
|---|-----------------|-----------------|--------------|
| i. Brand name: (a)Xylazine alone | (a) | | |
| (b) Other drug combination | (b) | | |
| ii. Xylazine concentration (%) | | | |
| iii. Pack size (ml) | | | |
| iv. Batch No. | | | |
| v. Expiry date | | | |
| vi. Total dose injected (ml) | | | |
| vii. Route | | | |
| viii. Site (Neck/Rump) | | | |

| | | | |
|---|--|--|--|
| Viii. Xylazine Top-up given (ml) | | | |
| ix. Appearance of drug (Clear & clean/cloudy/contained crystals) | | | |

5. If reversal drug was given, time of injection after sedative administration.

..... (minutes)

6. Did you give other treatments (de-worming/vaccination, etc) to the stag on the same day?

| | | | |
|------------|--------------------------|-----------|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|------------|--------------------------|-----------|--------------------------|

6.1 If yes,

Name of the drug: Dose rate (mg/kg):

Total dose given (ml/stag):

7. Where was the stag velveted?

| | | | | | |
|-------------------------|--------------------------|------------------|--------------------------|------------------|--------------------------|
| i. Velveting pen | <input type="checkbox"/> | ii. Crush | <input type="checkbox"/> | iii. Race | <input type="checkbox"/> |
|-------------------------|--------------------------|------------------|--------------------------|------------------|--------------------------|

8. Any signs of stress at the time of sedative injection? (You may tick more than one)

| | | | |
|-------------------------------------|--------------------------|---|--------------------------|
| i. None | <input type="checkbox"/> | v. Unusually aggressive to other stags | <input type="checkbox"/> |
| ii. Panting | <input type="checkbox"/> | vi. Unusual aggression to handlers | <input type="checkbox"/> |
| iii. Agitated/excited | <input type="checkbox"/> | vii. Others -specify | <input type="checkbox"/> |
| iv. Jumping over one-another | <input type="checkbox"/> | | |

9. Stag position: (Please tick the appropriate one)

| | Standing | Recumbent | |
|----------------------------|--------------------------|------------------------------------|---|
| | | Sternal (lying on belly) | Lateral (lying on side –head & neck on floor) |
| i. During velveting | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ii. After velveting | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| iii. After revival | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

10. If the stag entered lateral recumbency, was it propped up into its sternum?

| | | | |
|------------|--------------------------|-----------|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|------------|--------------------------|-----------|--------------------------|

11. Did you apply antiseptic or anti-bleeding powder/cream/lotion to the stump of velvet antler after velveting?

| | | | |
|------------|--------------------------|-----------|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|------------|--------------------------|-----------|--------------------------|

11.1 If yes,

Brand Name: Type (Powder/cream/lotion).....

12. Any evidence of stomach bloat during and post-velvetting?

| | | | |
|-----|--------------------------|----|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|-----|--------------------------|----|--------------------------|

13. Any evidence of stomach content in the mouth during and immediately after velvetting?

| | | | |
|-----|--------------------------|----|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|-----|--------------------------|----|--------------------------|

14 Any signs of abnormality seen after velvetting?

| | | | |
|-----|--------------------------|----|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|-----|--------------------------|----|--------------------------|

14.1 If yes, describe:

15. How long did the stag remain in the holding yard before releasing to pasture after velvetting?

..... (minutes)

16. Condition of the stag upon release from holding yard to paddock? (Please tick the appropriate one)

| | |
|--|--------------------------|
| i. Fully recovered-walking and grazing normally | <input type="checkbox"/> |
| ii. In drowsy state –unsteady gait, head held low, etc | <input type="checkbox"/> |
| iii. Others – specify | <input type="checkbox"/> |

17. If the stag died within few hours of velvetting and if you attended to it, what were the main clinical signs observed?

Rectal temperature shortly before death:°C

1.
2.
3.
4.

18. Any medical intervention before death?

| | | | |
|-----|--------------------------|----|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|-----|--------------------------|----|--------------------------|

18.1 If yes, please mention treatments given and actions taken:

19. Did any other stags suffer side effects of sedation and recover either spontaneously or through medical intervention during the same velveting episode? (If not applicable please answer as -NA)

Number:

20. Any history of recent illness of the stag before velveting? (If not applicable answer -NA)

State reason(s) for illness (diagnosis)

21. Any history of recent treatment with routine drugs (like deworming, vaccination, etc)?

| | |
|------------|--|
| Yes | |
|------------|--|

| | |
|-----------|--|
| No | |
|-----------|--|

21.1 If yes,

Name of drug(s) How many days before?

22. Did you notice any signs of injury on the stag at the time of velveting?

| | |
|------------|--|
| Yes | |
|------------|--|

| | |
|-----------|--|
| No | |
|-----------|--|

22.1 If yes, please mention type of injury:.....

23. Were there any difficulties or peculiarities encountered with this stag in previous years or handling at other times?

| | |
|------------|--|
| Yes | |
|------------|--|

| | |
|-----------|--|
| No | |
|-----------|--|

23.1 If yes, please describe:

23. What was the temperature and weather condition between velveting and the time stag was found dead?

[Empty rectangular box for text input]

24. Any opinion on the likely cause(s) of death?

[Empty rectangular box for text input]

25. Any other comments?

[Empty rectangular box for text input]

_____ **END** _____

FORM – C: 2. POST-MORTEM REPORT

Date of examination:..... **Time of examination:**

Examined by (State Vet/farmer)

1. Farmer's name and Address:
.....

2. Stag details:

Tag no. **Age:** **Species:**

3. Clinical history and signs observed before death and including treatment (if applicable)

4. Describe place where the stag was found dead (whether flat, hilly, shady, gutter, etc).

5. Was there damage to vegetation in and around the place where stag was found dead?

| | |
|------------|--------------------------|
| Yes | <input type="checkbox"/> |
|------------|--------------------------|

| | |
|-----------|--------------------------|
| No | <input type="checkbox"/> |
|-----------|--------------------------|

6. How far was paddock from the yard where stag was found dead?

..... (meters)

7. Describe the position of the stag.

.....
.....

8. What was the condition of carcass at the time of examination? (Please tick the appropriate one)

| | |
|--------------|--------------------------|
| Fresh | <input type="checkbox"/> |
|--------------|--------------------------|

| | |
|-----------------------------|--------------------------|
| Partially decomposed | <input type="checkbox"/> |
|-----------------------------|--------------------------|

| | |
|-------------------------|--------------------------|
| Fully decomposed | <input type="checkbox"/> |
|-------------------------|--------------------------|

9. Any signs of injury or trauma? (Please tick whichever applies)

| | |
|------------|--------------------------|
| Yes | <input type="checkbox"/> |
|------------|--------------------------|

| | |
|-----------|--------------------------|
| No | <input type="checkbox"/> |
|-----------|--------------------------|

9.1 If yes, describe:

10. Was there blood in and around pedicles and head region?

| | |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|----|--------------------------|
| No | <input type="checkbox"/> |
|----|--------------------------|

11. Describe the state of carcass (eg. extremely bloated or not, etc).

.....
.....

12. Any discharge observed? (You may tick more than one)

| | |
|-------|--------------------------|
| Mouth | <input type="checkbox"/> |
|-------|--------------------------|

| | |
|------|--------------------------|
| Eyes | <input type="checkbox"/> |
|------|--------------------------|

| | |
|----------|--------------------------|
| Nostrils | <input type="checkbox"/> |
|----------|--------------------------|

| | |
|------|--------------------------|
| Anus | <input type="checkbox"/> |
|------|--------------------------|

| | |
|------|--------------------------|
| None | <input type="checkbox"/> |
|------|--------------------------|

13. Appearance of discharge (state whether bloody, frothy, etc)

Mouth:

Eyes:

Nostrils

Anus

14. What was the colour of visible mucous membrane of eye (conjunctiva) and mouth (gum)? (Tick the appropriate one)

| | |
|------|--------------------------|
| Pink | <input type="checkbox"/> |
|------|--------------------------|

| | |
|-----|--------------------------|
| Red | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|------|--------------------------|
| Pale | <input type="checkbox"/> |
|------|--------------------------|

| | |
|--------------|--------------------------|
| Papery white | <input type="checkbox"/> |
|--------------|--------------------------|

15. Examination of body cavities

15.1 Thoracic cavity

15.1.1 Was there increased fluid in the thoracic cavity?

| | |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|----|--------------------------|
| No | <input type="checkbox"/> |
|----|--------------------------|

If yes, please tick the appropriate appearance of fluid as given below:

| | |
|--------|--------------------------|
| Bloody | <input type="checkbox"/> |
|--------|--------------------------|

| | |
|------------------------|--------------------------|
| Cheesy white & thready | <input type="checkbox"/> |
|------------------------|--------------------------|

| | |
|-----|--------------------------|
| Pus | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|-------------------|----------------------|
| Any other-specify | <input type="text"/> |
|-------------------|----------------------|

15.2 Abdominal cavity

15.2.1 Was there increased fluid in the abdominal cavity?

| | |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|----|--------------------------|
| No | <input type="checkbox"/> |
|----|--------------------------|

If yes, please tick the appropriate appearance of fluid as given below:

| | |
|--------|--------------------------|
| Bloody | <input type="checkbox"/> |
|--------|--------------------------|

| | |
|------------------------|--------------------------|
| Cheesy white & thready | <input type="checkbox"/> |
|------------------------|--------------------------|

| | |
|-----|--------------------------|
| Pus | <input type="checkbox"/> |
|-----|--------------------------|

| | |
|-------------------|----------------------|
| Any other-specify | <input type="text"/> |
|-------------------|----------------------|

16. Lungs

16.1 What was the colour of lungs? (Please tick the appropriate one)

| | | | | | | | |
|----------------------|--------------------------|-----------------------|--------------------------|-------------------------------|--------------------------|--------------------------|--------------------------|
| Pink all over | <input type="checkbox"/> | Patches of red | <input type="checkbox"/> | Dense dark brown areas | <input type="checkbox"/> | Any other-specify | <input type="checkbox"/> |
|----------------------|--------------------------|-----------------------|--------------------------|-------------------------------|--------------------------|--------------------------|--------------------------|

16.2 What was the consistency of lung? (Tick the appropriate one)

| | | | | | | | |
|--------------------------|--------------------------|---------------------------------|--------------------------|-----------------------------------|--------------------------|--------------------------|--------------------------|
| Spongy - inflated | <input type="checkbox"/> | Swollen, firm & hard | <input type="checkbox"/> | Collapsed, firm & hard | <input type="checkbox"/> | Any other-specify | <input type="checkbox"/> |
|--------------------------|--------------------------|---------------------------------|--------------------------|-----------------------------------|--------------------------|--------------------------|--------------------------|

| | | | | |
|---|------------|--------------------------|-----------|--------------------------|
| 16.3 Was lung adherent (sticking) to the ribs? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 16.4 Were there abscesses -creamy patches with foul smelling content? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 16.5 Was there food material in the lungs or trachea upon incision? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 16.6 Were there lung worms in lungs or trachea (wind pipe)? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 16.7 Was there froth in trachea? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |

17. Heart

| | | | | |
|--|----------------------|--------------------------|-----------------|--------------------------|
| 17.1 Was there excess fluid in heart sac? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 17.2 If yes, mention the colour and consistency of fluid | <input type="text"/> | | | |
| 17.3 What was the size of heart normal? | Normal | <input type="checkbox"/> | Enlarged | <input type="checkbox"/> |
| 17.4 Were there red spots on the surface of the heart? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 17.5 Did both lower chambers of heart contain blood? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 17.6 Any other abnormality observed? | <input type="text"/> | | | |

18. Liver

18.1 What was the colour and aspects of liver? (Please tick which ever applies)

| | | | | | | | | | |
|-------------------|--------------------------|-------------------|--------------------------|------------------------------|--------------------------|----------------|--------------------------|--------------------------|--------------------------|
| Normal red | <input type="checkbox"/> | Dark brown | <input type="checkbox"/> | Scattered white spots | <input type="checkbox"/> | Abscess | <input type="checkbox"/> | Any other specify | <input type="checkbox"/> |
|-------------------|--------------------------|-------------------|--------------------------|------------------------------|--------------------------|----------------|--------------------------|--------------------------|--------------------------|

18.2 What was the consistency of liver?

| | | | |
|--------------------|--------------------------|--|--------------------------|
| Normal-firm | <input type="checkbox"/> | Friable-easily crushed with fingers | <input type="checkbox"/> |
|--------------------|--------------------------|--|--------------------------|

18.3 Were there parasites?

| | | | |
|------------|--------------------------|-----------|--------------------------|
| Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
|------------|--------------------------|-----------|--------------------------|

18.4 Any others –specify:

19. Kidney

19.1 Were there red spots on the kidney surfaces?

| | |
|-----|--|
| Yes | |
|-----|--|

| | |
|----|--|
| No | |
|----|--|

19.2 Were there pale wedge shaped areas (infarcts)?

| | |
|-----|--|
| Yes | |
|-----|--|

| | |
|----|--|
| No | |
|----|--|

19.3 What was the colour of the urine?

| | |
|--------|--|
| Normal | |
|--------|--|

| | |
|------------|--|
| Not normal | |
|------------|--|

19.4 Please state any other abnormal findings:
.....

20. Adrenal glands

20.1 What was the size of adrenal glands?

| | |
|--------|--|
| Normal | |
|--------|--|

| | |
|----------|--|
| Enlarged | |
|----------|--|

20.2 Any other findings:

21. Stomach: (Reticulum, Rumen, Omasum and Abomasums)

21. 1 Please state whether there were any abnormal contents, like parasites, foreign bodies, etc or simply state as NA (No Abnormality):

.....
.....

21.2 Please describe the colour of the stomach. Please state as: (i) normal, (ii) dark or black colour, (iii) specify other abnormality:

.....
.....

21.3 Please state whether inner linings of stomach are easily peeling off or not?

.....
.....

21.4 Whether the inner stomach lining were reddish or not? (Yes/No):

21.5 Any other - specify :

.....

22. Intestines:

22.1 What was the colour of outer surfaces? (Please state whether it was pink, red, or presence of red spots, etc and length of involvement)

.....
.....

22.2 What was the appearance of inner surfaces? (Please state whether it was pink, red, or presence of red spots, etc and length of involvement)

.....
.....

22.3 Please state whether there was blood, parasites, etc within the intestine:

.....
...

23. Head

23.1 Please state whether there were any signs of skull injury or other abnormalities in head and brain:

.....
.....

24. Musculo-skeletal system:

24.1 What was the colour of muscles? (Please state whether normal or pale):

24.2 Was there any sign of fractures of bones (state Yes/No):

If yes, please state which bone was involved:.....

24. Please state any other observations:

CONCLUSION (DIAGNOSIS):

.....

Post-mortem samples to be submitted:

1. Please take samples from:

- Lung
- Heart
- Liver
- Kidney
- Adrenal gland
- Brain
- Abomasums
- Other organs having lesions.

Take multiple sections of lung and liver (looking for focal lesions) and a piece of each lung lobe and 2 samples of liver, one from the left and one from the right lobe. Piece of adrenals, piece of both kidneys, multiple samples of brain (brainstem, cerebellum, midbrain, cerebrum) - or submit the whole brain. A piece of abomasums is also preferred. Kidney should be cut in half lengthways and then across.

"The adrenal gland is a small pea shaped organ located at the cranial pole of the kidney. Its medial surface is crossed by the phrenico-abdominal vein which is closely associated with the renal vein."

2. A sample size should not be larger than 2 cm in size and 5mm in thickness. *It is very important that you include portion of normal tissue when you take sample from lesions!*

3. Do not wash sample!

4. Put them immediately in 10% formalin solution. Formalin solutions should be 10 times the volume of tissue samples.

Appendix B: Individual Case reports

Note: cases are numbered the same as in the text of the report.

Farm 1, Case 1

29th October 2004

A 7-year-old wapiti stag weighing 380kg, in good body condition in primary velvet growth died. This was one of 2 animals velveteed on this occasion and the only death. The stags were velveteed at 10am by the veterinarian with the farmer in attendance.

Sedation was with 2.5mls of Phoenix Xylazine 10% by intramuscular injection into the neck. (Dose rate: 0.66mg/kg) and no top-up sedation was required. The stag remained in sternal recumbency during sedation and antler removal. A total of 30mls of lignocaine hydrochloride was used for local anaesthesia of the antlers in a regional nerve block. Antlers were removed 20 minutes after sedation and 2mls of Phoenix Reversal was given 25minutes after sedation into the jugular vein. 30g of copper plan was also given. The stag left the pen 3 minutes after recovery and was drowsy as it walked out.

One hour before death the stag was seen staggering and looking wobbly but would run away when approached. As time progressed it was seen to be gasping for air, demonstrating respiratory distress, sitting down and then was observed to be comatose.

The stag was found dead in lateral recumbency in a shady area of the paddock near a shelter belt of trees. The carcass was examined fresh. On external examination the carcass appeared normal with no bloating and a very small amount of blood from the pedicle stumps. On opening the thoracic cavity, there was an abnormal amount of sero-sanguinous fluid observed. The lungs were pink and inflated and foam was found in the trachea. No other abnormalities were reported and samples were not submitted for histopathology. The attending veterinarian suspected delayed hypersensitivity as the cause of death.

Farm 2, Case 2

17.12.04

One 2-year-old red stag of 10 velveteed died on this occasion. Velveting took place between 7:30 and 9:30am and was performed by the veterinarian with the farmer in attendance. Weather conditions were warm and overcast with showers. The mob of 33 stags was mustered on foot and took between 15 and 30 minutes to muster. No difficulties were encountered during mustering. Less than 5 animals were in each holding yard and it took between 30 and 60 minutes to move from holding yards to velveting pens. Again, no difficulties or stress were encountered. 10 animals were sedated and recumbent at the same time. Sedation was with xylazine 10% at a rate of 0.5ml per 50kg (1mg/kg), given by intramuscular injection into the neck using a pole syringe. Antlers were removed 10 to 20 minutes after sedation. All animals were given reversal

approx. 20 minutes after sedation, immediately after antler removal at a dose rate of 0.1mg/kg. A hand saw which was not disinfected between every animal was used to remove velvet. Tourniquets were used on all animals and some animals were observed to spurt blood after removal of the tourniquet.

Animals were released into the paddock with the original mob immediately and monitored until the next day. Some bleeding was seen from the antler stump after release. Stag 2 showed excessive bleeding from the right pedicle 9 hours after velveting. It was brought into the yards and a tourniquet applied, but died overnight and was found at 8.00am the next day.

On post mortem examination, no sign of coagulation of the blood from the right pedicle was observed. The lungs had patches of dark pink over about 30% of the surface and were swollen and slightly firm. The heart was slightly enlarged and had a chicken fat clot in the ventricles and a few red spots on the surface. Petechial haemorrhages was seen around all heart valves, being more severe in the lower ventricles

Histopathology revealed diffuse congestion and mild oedema in the lungs with large, prominent, dilated pulmonary arteries and small numbers of fibrin thrombi within these vessels. The histopathological diagnosis was lung congestion: moderate to severe with pulmonary oedema. The cause of death was not determined but was suspected to be acute pulmonary oedema. Findings were not consistent with hypovolemic shock due to blood loss. Four other velveting occasion forms were completed on this farm with no other stags dying.

Farm 3 – Cases 3 and 4

24 December 2004

Two deaths occurred out of 58 stags sedated at this velveting occasion. The weather was fine, but not hot.

Stags were velveting in pens by the veterinarian, with three stags in each pen.

Case 3. A 6yo 180kg red stag died in the velveting pen less than 10 minutes after sedation and prior to local anaesthetic administration and velvet removal. The stag was sedated with Phoenix xylazine 10% 0.55ml. (0.31mg/kg) by intramuscular injection into the rump. Prior to death the stag was found to be gasping and heaving for air, but no air flow was detected at the nostrils. Reversal was given immediately, but the stag died within 30 seconds, allowing insufficient time to get to the truck for adrenaline. No previous illnesses or difficulties have been reported with this animal. The carcass was in lateral recumbency, and a post mortem was performed on the fresh carcass. The lungs contained patches of red, and were spongy and well inflated with some blood present in the lung tissue. The heart contained a few red spots on the surface.

Histopathology revealed marked splenic contraction with almost no red blood cells present. Geminal areas were prominent and eosinophils and neutrophils were seen indicating terminal severe stress. The kidneys had mild multifocal interstitial nephritis that was lymphocytic and neutrophilic with proteinuria. Histopathology findings indicate terminal severe hypovolaemic shock and possibly mild, chronic leptospirosis.

Case 4. A 2yo stag weighing 130kg in good body condition, died 10 to 15 minutes post velveting.

The stag was sedated with Phoenix xylazine 10% by intramuscular injection into the rump. The volume was not stated so a dose rate cannot be determined. 15mls of “Bomacaine” (lignocaine

hydrochloride) local anaesthetic was injected in a regional nerve block pattern below the antler pedicle. The stag developed respiratory distress then died in the velvet pen after antler removal. Very little post mortem information supplied. Histopathology showed bronchopneumonia that was minimal in severity, multi-focal and acute in onset, with small numbers of neutrophils within and around the bronchioles. This was not considered severe enough to cause death. The cause of death could not be determined in this case.

Farm 3, Case 5

17 January 2005

A 2-year-old New Zealand red stag, in good body condition, weighing 130kg died in the race where it sat down less than one hour after standing sedation for Tb testing. Weather conditions were fine, about 30°C, but not considered hot.

45 animals were sedated at the time with 4 to 7 animals held in each pen. The stag that died was sedated with 0.4mls of xylazine 10% (0.31mg/kg), by intramuscular injection into the rump. The stag remained standing throughout the handling procedure. It was not stated whether reversal was given. The stag was let out into a big lane in a drowsy state, where it sat down and died.

Post mortem was performed by the veterinarian on the same day. The animal was found on a flat area of the lane, in partial sternal recumbancy. Blood was found coming from the anus as observed on the rectal thermometer. The lungs had patches of red, and were full of blood and fluid. The heart was enlarged with red spots on the surface. Areas of the small intestine were very haemorrhagic with red inner surfaces and full of bloody fluid contents.

Histopathology of the lung, lymph node, small intestine and abomasums showed widespread congestions and haemorrhage. The lungs also had plueritis, which was minimal fibrosing and neutrophilic with focal chronic areas. The small intestine had mild neutrophilic diffuse, subacute enteritis. Death was likely to be due to massive vaso-dilation, but the cause of this is uncertain.

Farm 4, Cases 6,7, and 8

21 February 2005

Three of 10 animals in hard antler died on the same occasion after sedation for antler removal. The weather was fine, hot and still. The animals were mustered on foot and took less than 15 minutes to bring into the yards. However, they were reluctant to leave the paddock. There were fewer than 5 animals in each holding yard and the stags were slightly agitated during yarding. The stags were held for less than five minutes before sorting into pens where they became agitated and were jumping on top of one another. There was no separation of stressed animals and sedation was required before they settled down. Three operators, the owner, the veterinarian and an assistant were present at antler removal.

Sedation was with 5% Phoenix Xylazine at a rate of 8ml per 250kg (1.6mg/kg) administered by intramuscular injection into the rump with a pole syringe. All 10 stags were recumbent during antler removal, which was performed 10 to 20 minutes after sedation. No local anaesthetic was used as the antlers were considered to have no nerve supply after shedding of the velvet.

Tourniquets were not applied as the blood supply had regressed from the antler. Antlers were removed with a velveting saw, which was not disinfected between animals.

The stags were held for less than 30 minutes before returning to the original mob where they were monitored until the end of the day. The stags were also given an unspecified “wormer”.

Of the three stags that died, only one (stag 6) was examined post mortem. This was a 250kg stag in good body condition that died nine hours after antler removal. Sedation was as described above and 4 ml of Phoenix Reversal was given by intravenous injection into the jugular vein. After recovery, the stag ran out of shed and appeared bright. Later it sat down then progressed to lateral recumbancy with the head below the body. The owner propped the stag up and called the veterinarian. The stag was making a gurgling sound when breathing and was panting. 4mls of Reversal was given intravenously and 10 mls of Depocillin (penicillin antibiotic) was given intramuscularly after which the stag got up staggered off to some trees, sat down and later died.

On post mortem examination, the lungs had firm areas and patches of red on the surface. There was a large amount of froth present in the trachea. The heart sac contained straw coloured blood tinged fluid and very little blood was present in the heart chambers. Red spots were present on the surface of the heart. The internal lining of the bladder contained 1-2 mm haemorrhages, which were also seen on the internal lining of the abomasum and external lining of the caecum. The abomasum also contained red-brown watery contents and the jejunum had very bloody contents and reddened intestinal walls.

No samples were submitted for histopathology and the suspected cause of death was severe stress.

Farm 5, Case 9

20 December 2004

A 2-year-old elk stag was found dead the day after velveting. The stag was found in right lateral recumbancy approximately 500 metres from the shed in a hilly paddock. The carcass was fresh with some bloat and rigor mortis at the time of post mortem. There was white froth from the mouth and nostrils. Externally visible mucous membranes were red. The thoracic cavity contained excess yellow-straw coloured fluid resembling serum. The lungs were pink and red marbled in colour, were spongy, not inflated and filled with froth and fluid. There was froth in the trachea. The liver was bluish in colour and the abomasal lining was slightly reddened. The major histological pathology was found in the lungs. Marked oedema was visible throughout the lungs with large quantities of eosinophilic fluid distending the alveoli. Interlobular septa and periarteriolar areas were also distended with eosinophilic fluid. Large quantities of inflammatory cells, predominantly neutrophils were visible, but these were not considered to be due to infection. In summary, there was severe, acute, marked pulmonary oedema with intralobular neutrophils. The heart had an area of mild, chronic fibrosing myocarditis, thought to be incidental. The adrenal glands were congested with haemorrhage. This is commonly seen as a result of severe stress.

The cause of death is likely to be severe pulmonary oedema. Although it is not possible to definitively determine the cause, it could be due to anaphylactic reaction.

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