WAPITI AND HYBRIDS - SPECIAL MANAGEMENT NEEDS

A.J. Pearse
Technical Manager MAFDeer
Invermay Agriculture Centre

Deer farming now has a maturity of outlook in that the production of young lean venison animals over an extended supply period is becoming the corner-stone of deer farming profitability.

Last season the traditional fluctuations in venison schedule became less so, but worthwhile incentives exist for those venison producers that can finish stags to market required weights (55-65 kg carcass) at 10-13 months of age.

In addition the major exporters now offer a premium lean heavy weight schedule targeted at well-grown autumn-winter finished rising 2 and 3 year old red deer, or the younger prime NZ wapiti/hybrid cross and the various elk-wapiti interbreeds now being produced.

As market forces influence the profitability of traditional breeding units and live sale prices for female stock reflect their productive worth, breeding strategies on many deer farms now consider the controlled use of large, lean, heavy weight sires to improve venison and velvet production. The NZ wapiti-type bull, the "pure" North American elk or wapiti and its crosses and the so-called NZ hybrid have become sought after for this purpose. They present as individuals, or as a group, some new management requirements.

There are two basic situations where these large animals are being used:

a) Hybrid production, where a small number of wapiti-type stags are retained as sires only and the progeny from red hinds, both male and female, are sold as weaners or finished at 10-15 months.

b) A herd bred on large sized (eg, wapiti-type) dams, where the herd is being upgraded by crossing with North American elk.

HYBRIDISATION

In productive terms wapiti or their hybrids are larger, faster growing and leaner at the same age than their red counterparts. In terms of relative antler yield per unit liveweight the animals are comparatively superior velvet producers at an earlier age and maintain that advantage in maturity. This productive versatility allows a great many options in selection of slaughter age, carcass weight or extent of hybridisation.

Profitability of a hybridisation programme has been expressed in terms of the effect in the biological efficiency of production (Fennessy 1987).

"The efficiency of any meat production system from a biological and by implication an economic point of view relates output (kg of carcass

produced) to input (kg of feed eaten). The most efficient approach will involve mating a genetically large male to a genetically small female so long as there is little effect on the calving rate and the survival of the progeny."

Deer, particularly of the Cervus genus, are renowned for their diversity in size and a natural ability to hybridise successfully, producing fertile viable hybrids (Dratch and Fennessy 1985). In controlling such hybridisation a breeding programme requires consideration of the following elements.

The Dam

The two basic alternatives are the standard NZ red hind or a "megared".

New Zealand Red Hind (95 - 110 kg): Selected and performance recorded for temperament, calving ability, mothering ability. Bred for type - carrying genes for leanness, growth rates and superior velvet production; they also must become pregnant early to calve in November.

"Megared" (125 - 140 kg): Base New Zealand red x Red European bloodlines selected for ultimate size and the traits mentioned previously. Alternatively some farmers are using wapiti-type stags to produce this type of "megared".

The advantages of the smaller type of hind (ie, up to 140 kg) in a hybridisation programme compared with the larger NZ wapiti-type herd in an upgrading programme are:

* The hinds are easily handled in paddock and yards and responsive to intensive farm management programmes.

* Well grown yearlings are sexually mature.

* Smallest practical size for efficient cross breeding.

* More effective use of land as stocking rate is not compromised by the size, or increasing size of the breeding female.

* Farm feed costs are minimised on a per animal basis but may be at the expense of a more intensive stock management.

* Hinds are readily available as base stock.

* Selection parameters are well established allowing substantial within herd genetic improvement of breeding stock.

However there are a number of factors to be considered in the practical situation.

* Hinds must be managed to shed surplus fat in winter and have intake restricted in late pregnancy to avoid calving difficulties. On intensive farms an element of "fitness" must be maintained.

* Hinds should be mature and experienced calvers and well grown.

The Sire

There are a number of possibilities for the sire. They could be:

Canadian Elk (380 - 450 kg or greater),
Canadian Wapiti X NZ Wapiti/NZ Wapiti-type (360 - 400 kg),
NZ Wapiti-type (300 - 350 kg),
F_1 (Canadian Wapiti X NZ Red) (280 - 320 kg),
NZ Wapiti X Red hybrid (220 - 280 kg), or possibly
Eastern European Red (280-320 kg).

The important requirements are that the sires be:

* Highly selected for economic traits, ie, velvet production, growth rates, temperament, leanness, and from an elite known genetic base with good production records.

* Largest feasible sire for the size of hinds available, ie, chosen for the appropriate farm management system.

A major advantage of a hybridisation, compared with an upgrading situation is that it means that the skilled management required for Wapiti animals will be confined to only a few males. The animal health problems known to affect these types (ryegrass staggers, copper deficiency, wasting syndrome) may be easier to manage.

The Hybrid Progeny

The hybrid progeny will show a number of features:

* Annually fertile and breed as yearlings.

* Predictable weaning weight, growth rate and slaughter weight from known sires.

* Higher return at weaning if sold ($/kg) at a similar age.

* The genetic potential for growth can be identified in setting up a breeding programme (based on known blood type) and a production system established slaughtering to a required weight, rather than peak weights at defined ages.

* Progeny will be lean and grow rapidly.

* Both male and female progeny are suitable for venison production.

There will also be some hybrid vigour which will be greater the further apart the parents are genetically. However with parents far apart (eg, Canadian wapiti X NZ red), there is the danger of compromising the viability of the cross, particularly in calving performance.

There is a down side - hybrid progeny when compared with reds also present some challenging management tasks:

* Behaviourally hybrids can be unpredictable and difficult to handle in yards although paddock temperament is generally quiet.

* Mating enthusiasm or libido in wapiti or wapiti crosses seems lower especially under multi-sire or intensive mating management.

* Fast growing hybrid calves put heavy lactational demands on their mothers and may create feeding problems in late summer in drought risk areas. At worst some hinds may be slow to cycle next season or fail to conceive.

* Hybrids, particularly those with Elk genes, may be more susceptible to the debilitating diseases of wapiti under farmed conditions (rye grass staggers, copper deficiency, "nutritional" scours, elk/wapiti wasting syndrome).

* Longer gestation for the wapiti/red deer cross can further complicate late spring management and increase perinatal losses from dystocia.

* Market requirements for heavyweight carcasses from fast growing animals are only now becoming defined.

* The growing young hybrid animal requires high levels of feeding dependent on liveweight to sustain growth potential, but at maturity comparatively less per relative body weight for maintenance.

Table 1 quantifies carcass production data from yearling F_1 (Elk X Red) and yearling and 2 y.o. red deer slaughtered at peak venison schedule November.

Table 1: Carcass production parameters for yearling elk X red F_1, yearling red deer and 2 year old red deer.

Strain: Age:	Elk/Red[1] 11 months (n=8)	Red[2] 12 months	Red 2 years (n=53)
Liveweight (kg)	116.4	91.3	123
Cold CW (kg)	66	50	70
Dressing %	56.7	55.1	56.9
Carcass components (% CCW)			
Saddle %	11.8 (18%)	7.0 (14%)	9.8 (14%)
Hind	26.6 (40%)	20.5 (41%)	28.0 (40%)
Shoulder	12.9 (20%)	9.5 (19)	13.3 (19%)
Neck and ribs	14.8 (22%)	13.0 (26%)	18.9 (27%)
Mean Tissue depth (mm)	4.7	3.0	10.0
$ return/carcass[3]	396	290	420

[1] Drew (unpublished)
[2] Drew (1985)
[3] AP_2 grade 60-70 kg $6.00; AP 45-60 $5.80; <45 $4.80

Management

Success in producing these hybrid carcass weights at an early age relies on appropriate animal management. Particular aspects are summarised below.

Mating Management: Moore (1985) has reported that rutting behaviour of dominant Canadian wapiti bulls can markedly suppress rutting behaviour and successful mating of other bulls in close proximity. Subsequent observations in elk-wapiti mating groups, and in hybrid programmes using elk X red, and young (R3 y.o.) wapiti confirm this over-dominance. It has been necessary on occasions to separate mating groups of red and NZ wapiti females run with elk bulls using terrain and contour as well as fences as barriers between groups.

Therefore multi-sire mating using wapiti bulls is not advised. This is supported by consensus among farmers that single-sire mating at 1:25, for a young animal and 1:30 for experienced older bulls in the absence of competing more aggressive red stags is desirable for best conception rates. Pure elk bulls may only be expected to mate 1:20 red hinds (Moore 1988) in an intensive situation.

As gestation lengths vary with the proportion of elk/wapiti genes (233 days NZ red; 244 elk X red; 250 elk X elk) in any hybridising programme the terminal sire should be removed ideally after one cycle (3 weeks) with the herds chased by red stags for the second and third.

Wapiti type sires, while showing comparatively lower libido than red deer, can be expected to exhibit good fertility from mid March. Thus the longer gestation does not necessarily mean a later calving.

Gestation, calving and lactational management: Both red hinds and wapiti-type cows show a dramatic ability to rapidly gain weight and body condition following early (late February-early March) weaning. Often with single sire mating under typical autumn growth conditions, hinds reach peak weights in May. This can pre-dispose these animals to overfatness and potential dystocia problems. Observations of slaughtered hinds at this time and during spring show accumulated fat depots particularly around the kidneys and in the pelvic channel area. There are indications that these reserves are the last to be resorbed under dietary restriction.

Moore (1985) reports elk X red (F_1) birth weights of 13.6 kg (male) and 13.9 kg (female) compared with birth weights for red deer of 9.5 and 8.9 kg respectively. Recorded weights of elk X wapiti progeny have been as high as 22 kg and often are 17-18 kg. The hybrid and elk X wapiti calves also have very long legs. For example Cowie (pers. comm) recorded length of limbs which were 20-25% greater in hybrids compared with red deer.

Clearly a combination of large leggy calves, overfat and possibly unfit hinds in late pregnancy spells potential disaster for calving. This is often complicated by a growing management practice of udder checking and then set stocking on high quality pasture 4-7 days before the first calves are due. In our experience sudden rumen over-fill on top of the other pre-disposing factors can lead to unnecessary calving difficulties.

In practice the NZ wapiti breeding cows and red hinds in the hybrid programme are over-wintered slightly below maintenance with good shelter, with attempts made to reduce fat content slowly over the winter period. Under such feeding pregnant animals emerge from winter at similar to peak body weights, while dry hinds may lose 6-8 kg. However winter feeding should not be restricted during periods of bad weather or potential stress.

During spring, and particularly late spring, intakes are restricted to avoid over large calves and to reduce fat accumulation. Where "extreme" sized terminal sires have been used over hinds, pasture intake of the hinds is restricted until after calving and a shedding off procedure employed. Selection of "paddock quiet" hinds further tamed by supplementation of a pelleted deer ration (or grain) allows the hind to receive adequate nutrition without rumen over-fill and allows shedding off, or removal of any hind experiencing calving difficulty without disturbance of the breeding group.

The difference in growth rates of NZ wapiti-type cross calves and elk X red calves compared with straight-bred red calves all sucking red dams highlights the management implications for feeding of hinds over this period. Elk X red calves grew at a 35% higher rate than straight bred red calves. A summary of liveweight and growth rates of various crosses is given in Table 2.

Table 2: Liveweight measurements in red and wapiti X breed types of young male deer.

Stag: Hind:	Red X Red	NZ Wapiti X Red hinds	NZ Wapiti X NZ Wapiti	Elk X Red hinds	Elk X NZ Wapiti
Liveweights					
Birthweight	8.9	11.3	15.0	14.0	18.0
Weaning weight (Mar)	47.0	55.0	67.0	63.0	83.0
14 month weight	99.0	115.0	140.0	145.0	-
Live weight gain (g/day)					
Birth to weaning	380	440	520	520	550

Milne (1988) observed a mixed herd of red X red and elk X red calves on red hinds. Within the hybrids there was considerable evidence of multiple and cross suckling. This can occur to an extent where appreciable weight and condition loss is observed. Supply of high quality pasture with the facility to supplement with low bulk high energy concentrates under summer dry conditions are a necessary management ploy to retain any advantage gained by the use of a wapiti-type sire.

Management of young stock: On weaning, wapiti and hybrids settle quickly into autumn/winter feeding regimes, with the typical wapiti hybrid paddock placidness reducing separation stress. In our experience these animals are less prone to the pre-disposing features of yersiniosis outbreaks. The long hair and thick outer coats of elk-wapiti crosses apparently allow these animals to more comfortably cope with storm, rain and wind conditions.

If space permits in a mixed red and hybrid production system young stock of the two types are better separated particularly if supplementary feeding is normal practice. Hybrid and wapiti-type weaners are shy feeders in the face of competition from red deer, and similarly exhibit poorer production and unsettled behaviour in intensive rotational grazing systems in competition with red deer.

Both wapiti and hybrids shed their milk teeth and experience a 2-3 week discomfort as the first permanent incisors erupt in January-February, rather than November-December as in red deer. Separation of the different stock classes during this period of growth with care taken to offer quality pasture during this period can reduce production loss at a time when most venison systems seek to achieve the highest possible final weights.

Animal handling: Animal handling for routine management and veterinary treatments do not normally present any additional problems up to 15 months of age although overcrowding in yards seems to create more distress for hybrid/wapiti than red, and even at an early age these animals can kick out with the hind leg. Particular care should be taken in pushing such animals into weigh crates/crushes, etc. Sheer size at time of hard spike removal sensibly requires good physical restraint in a drop floor crush or squeeze crush door.

Special care with mixed breed types in velveting herds particularly with young animals is also warranted. On farm experience indicates that the animals are often unsettled in mixed groups. Less damage to velvet and easier animal handling can be achieved if the breed types are separated. This can readily become routine if animals are grouped on casting date as wapiti and hybrids tend to cast later and have a longer casting to harvest period, depending on the stage when velvet is cut.

However some animals, particularly NZ wapiti-type, are unpredictable and in spite of their size can move quickly and with aggression.

Complicated yarding procedures or lengthy confinement induces boredom and stubbornness in what are normally placid animals. The F_1 elk X red hybrid as 2 or 3 year olds often develop an intense dominance behaviour in yards, resulting in one or two individuals fronting up in large pens with teeth clicking and rump patches flared. This situation is difficult to deal with from catwalks, but if a clear escape route is provided, and distractions (too many people, unfamiliar routines, etc) removed these animals can be moved using a plywood shield or by using appropriate overlapping gates.

In our experience, open boarded holding pens and raceways/doors that allow animals to see others all improved hybrid handling. Ultimately good stockmanship and quiet confident handling in combination with a sound selection policy will restore the somewhat tarnished reputation of these highly profitable venison producers of the future.

WAPITI AND UPGRADING

Most features of management described in the hybridisation section also form the basis of year round management systems for wapiti, wapiti X elk herds.

Invermay/Landcorp operate a joint venture operation at Orokonui, near Dunedin, where Canadian elk are being used as sires over the base wapiti-type herd of females. Recent refinements to grazing management have resulted in a 15% increase in weaner weights and autumn/winter growth rates, with only two out of 86 cows having required assisted calvings.

Routine management

The routine management features which we practise at Orokonui, under an intensive system include the following:

1. Close and frequent familiarisation of stock and farmer.

2. CIDR induced synchronisation of oestrus.

3. Close observation of bulls during the rut to monitor any over-dominance interaction between groups. Mating ratios are restricted to 1:30 using experienced bulls with single sire mating groups physically separated as far apart as possible.

4. Controlled winter grazing to maintain liveweight or to lose a little with restricted nutrition during spring rotational grazing, with hinds grazing hill blocks with the aim of maintaining fitness. Limit on mob size to about 40-60 animals per ha on tight grazing situation. High stock concentrations appear to be much less appropriate in terms of behaviour and for wapiti and elk than red deer.

5. Intensive pre-birth preparation with 2 or 3 udder-checkings and drafting into suitable calving mobs.

6. Post-calving (at 3 weeks) rotational grazing of cows and calves on a 3 or 4 day shift as in a "dairy cow" type situation.

7. Rising 2 and 3 year old stock are managed as individual groups and do not join the main herd until they are second calvers.

8. Supplementation through spring and autumn with lucerne hay in anticipation of nutritionally linked scouring problems.

While many of the management techniques are in themselves a consequence of intensification rather than the special needs of the wapiti per se, this system has evolved to improve calving performance, to reduce losses due primarily to dystocia and provide the most suitable grazing management without inducing some of the animal health problems peculiar to wapiti - scouring, wasting syndrome and ryegrass staggers. However there are a number of special management needs which need discussion.

Reproduction - Oestrus synchronisation and udder checking: Some wapiti farmers have reported concern about calving dates and calving spread, particularly in purebred elk herds, and in those upgrading NZ wapiti using elk. The mean calving date is slipping and the incidence of December/ January born calves increasing. Without much tangible supporting evidence a feeling exists that vigorous elk-wapiti progeny create heavy lactational demands and unless the progeny are weaned early (eg, late February early March) cows fail to ovulate and conceive to the first cycle.

There was a suggestion of this problem at Orokonui. To improve conception and to control excessive weight gains in late spring, a CIDR/PMSG regime over 20% of the mating group was used. These synchronised cows induced oestrus in the bulk of the group 19-21 days later (Moore and Cowie 1986) and is similar to results reported by Moore & Cowie (1986) in red deer.

Cows are weaned late February and CIDRs (2 X 9%, + 350 iu PMSG at CIDR withdrawal) placed for 11-14 days (8 March-22 March) in 25% of (6 out of 25 cows) hinds per group. Bulls are joined with groups on CIDR removal from 22 March.

Performance from the mature cows in 1987 produced 20% (11/53) calving to the synchronised oestrus, ± 6 days, 61% (32/53) calving after a 5 day lull between 13-22 days after the first calf was born, and the remaining 9 calving after a further 8 day lull in broad synchrony to the end of the second cycle. "Stag effect" may be somewhat masked in these animals because of the variable gestation lengths from hinds with degrees of red/wapiti hybridisation. However this technique, combined with udder checking has allowed good within herd grouping for calving patterns and subsequent lactational management. Udder scoring using a simple 1-5 or dry system works well with mature stock although there are difficulties with yearlings. Cows are checked about 3-7 days prior to expected birth dates.

The animals are grouped quietly in a small working pen, or individually in a weigh crate or handling box and allowed to relax for 30 seconds minimum to avoid tensing of the abdomen and withdrawal of the udder. Animals are not "groped" - for handler protection (!) but observed quietly from behind - using a torch if required. The scoring system used is:

Dry	No visible udder/teats
Score 1	Late, 2nd/3rd cycle Hind teats just visible, no enlargement No udder quarters visible
Score 2	2nd cycle Hind teats enlarged, fore teats visible Udder shows as a flat swelling
Score 3	Late 1st cycle/early 2nd cycle Hind teats prominent Udder quarters rounded - golfball size in diameter Fore teats enlarged
Score 4	1st cycle + 7-14 days est. Udder quarters at tennisball diameter but no turgidity shown Fore teats prominent
Score 5	Imminent - 7 days. 1st cycle Udder swollen, obviously "full" Mammary veins visible

Dimensions are obviously greater in wapiti cows than in red deer but time development patterns are consistent.

Handling young stock: Good stockmanship and decisive handling pre- and post-weaning are basic for improving long term yard temperament in wapiti. Close handler/stock relationships are improved in yards of simple design with a well established routine. Drenching/ear tagging, etc are best

achieved in small square or circular pens where 4 or 5 animals can be contained and treated as a group. From this situation individuals easily learn a routine involving raceways, weigh crates, etc. Elk and elk X wapiti will often lie down under such conditions, but treated one at a time or grabbed and wrestled they learn to react accordingly. Avoiding sudden movement, noise distractions and too many people at one time are all sound rule of thumb actions. A quiet confident handler with the attribute of patience will make considerably more progress than someone handling under time pressure.

Handling adult stock: A number of techniques have been described in the Wapiti issue of the Deer Farmer (November 1987) and most successful and relatively inexpensive systems feature a raceway or crush gate system which include an open framework type system with horizontal bars running full length of the raceway or crush gate at ≈ 1.2 m above floor height. Below this may be either a close boarded, or open framework of vertical bars. This allows the animals to be confined, but not physically squashed against wall or door, and the animal can clearly see handlers, and gain a confidence in their surroundings. Wapiti will move easily into these "boxes" up raceways with appropriate sliding gates, or at worst can be "walked" using a shield in comparative safety. Because these animals will kick with both front and back legs, care must be taken when in close contact. A raceway and handling box eliminates this area of difficulty.

Larger type hydraulic crushes do work and are appropriate, but only if animals can routinely be moved into them without stress or belligerence.

Velveting and sire bulls require as much space as can be given when in full head. Rather than risk confinement in very small pens or races, pole syringes or blow darts, etc, have a valuable role at this time of year.

Handler over-confidence probably remains the biggest single cause of problems. As these large animals can move from stand-still to full speed in an incredibly short distance, misreading the animal's signs of agitation (eg, teeth clicking, raised rump patch, raised front feet) or opening exit doors without fore-thought can lead to previously docile bulls charging without warning. The cows are even more unpredictable. The use of shields and protective equipment are always a warranted safety measure. These adult animals should not be handled in groups unless two people are in the yards during the operation.

Problem management

Animal health

Most wapiti farmers and their veterinarians have by now experienced, at no little cost, the four major health problems that affect their animals and are often difficult to treat specifically and successfully. Bringans (1987) lists these as ryegrass staggers, copper deficiency, nutritional scour and wasting elk syndrome.

Elk and wapiti are apparently more susceptible to all four, but recent refinement to management allows these problems to be controlled on farms without the productive losses previously experienced.

1. Ryegrass staggers

Perennial ryegrass cultivars containing high endophyte toxin (lolitrems A & B) levels are often sown in normal pasture mixes to combat stem weevil predation and assist in establishment. However these cultivars prove particularly dangerous to elk in late summer and autumn. The condition exhibits as a slight tremor in the head, lethargy and ataxia in mild cases to an excited uncontrolled gait, collapse and convulsion if the animal is herded or put under pressure in advanced cases (Mackintosh et al., 1982; Orr and Mackintosh, 1985).

Pastures normally considered safe may become "toxic" to elk under late summer drought conditions when the available pasture is grazed to low residual levels. Seed heads and the leaf sheaths usually contain the most toxins. Paddocks with any history of recently sown high endophyte ryegrasses , or recorded as previously inducing staggers should be avoided and grazed by other classes of livestock during these periods.

Affected animals can safely recover if removed quietly to a "safe" paddock or feedlot situation and fed browse, lucerne hay and concentrates. Yarding or other stressful situations should be avoided if symptoms are noticed. In re-establishing pasture, low endophyte ryegrasses or alternative species could be considered. Wana cocksfoot, new cultivar fescues, Matua prairie grass and chicory are being established at Invermay for assessment purposes, and should find a ready role in elk-wapiti farming systems providing additional sources of palatable roughage. Selecting ryegrass seed that is at least one season old before sowing or treating new seed with appropriate fungicides also reduces the risk of high endophyte levels at the considered cost of lower germination and/or susceptibility to insect predation.

2. Copper deficiency

Elk and wapiti appear to be more prone to copper deficiency and enzootic ataxia than red deer and have a greater requirement although absolute levels defining deficiency are not well known (Mackintosh et al., 1986) although marked seasonal fluctuations are recorded.

Signs include ill-thrift and loss of condition in adults and ataxia and incoordination in the hind legs especially in yearlings and 2 year olds and dry dull coats (perhaps analogous to steely wool in sheep) in small, non-thriving weaners and yearlings, often with marked ginger coats and a "fluffy" appearance. Brittle limb bones have been reported in elk-elk/wapiti weaners.

Copper needles appear to be the most effective remedy (Lawrence, 1987)with the programme concentrated on young growing animals in autumn and spring, but dose rates should be carefully adjusted taking into consideration a full farm history, pasture and soil trace element analyses, and serum and/or liver Cu analyses. Experience shows that farmers may overlook previous fertiliser history, particularly the inclusion of molybdenum and copper (and sulphur?) during brassica and clover establishment or in routine pasture maintenance. Copper injections and topdressing with copper may also be considered.

3. Nutrition scouring
Purebred elk, or NZ wapiti recently relocated from extensive "natural" farming to developed pasture conditions may show significant scouring during spring flush or under late autumn regrowth conditions. High quality meadow hay or more effectively lucerne hay in feeders during these periods provide sufficient roughage to alleviate this condition and prevent excessive weight loss. In large herd situations if a number of individuals are affected, removal of these to allow more effective feeding of roughage may be an advantage as often the same individuals are affected and may be potential candidates for the "wasting elk syndrome". An area of roughage, older type English or native grasses, or cocksfoot, prairie grass, saved for breeding bulls in late summer, allows these animals to gain condition pre-rut without the risk of weight and condition loss. There is some evidence (Fennessy, pers. comm) that this "nutrition scour" may be associated with fungal mycotoxins present in lush pasture in spring and autumn.

4. "Fading disease - Wasting elk syndrome"
Significant production losses, (poor calving performance, infertility during rut, massive weight loss and death) have been experienced in a number of pure elk herds and in isolated cases of "pure" NZ wapiti-type animals. Affected animals, typically 2-5% of elk in a district and in one case 5/19 mature cows and 3/8 bulls, lose weight dramatically and rapidly, generally in association with a loose smelly scour, apparent depressed appetite and lethargy.

Treatment has encompassed "shotgun" therapy, involving copper, other trace elements, anthelmintics, scour medicines, broad spectrum antibiotics and removal of affected animals to a feedlot for lucerne/concentrate supplementation. Often the condition follows what has been assumed to be seasonal nutritional scouring.

The condition is reported as rare from extensive farming conditions on more natural pasture or from dry land lucerne grazing regimes, but equally is consistently reported throughout the country under most elk farming systems.

While no clear and consistent pattern of predisposing factors or treatment exists, the problem appears to be more prevalent in pure and imported animals.

Elk wapiti crosses tend to be only rarely affected. Early detection and intuitive therapy (ie, drenching and high or total diet supplementation) at the first sign of scour seems to prevent rapid deterioration. Extra management and observation particularly during spring and pre-calving and again in pre-rut periods appears worthwhile.

Post-mortem and supportive analytical diagnoses of animals affected often reveal no significant findings but for the purposes of discussion the following three case studies are reported and some areas of cause/risk and treatment nominated for future investigation (Mackintosh pers. comm).

i) Imported adult elk cows - 7 affected out of 19 (3-7 years old)
Clinical signs: 45-70 kg weight loss over a four week period, (Dec-Jan), not pregnant, severe diarrhoea, most failed to respond to typical broad action therapy and total supplementation with lucerne hay and concentrates. Death during February (4/7) following transport and relocation on a feedlot. The remaining 3 animals have been in too poor condition to mate this season.

Calving pasture consisted of an old established sward with abundant roughage in the form of cocksfoot and some older grasses (fogs and fescues) and a low proportion of ryegrass cultivars and red and white clovers. The sward was laxly grazed with 15-20% of pasture dead material or in seed head. Sparse ragwort was observed but not apparently grazed.

No Johnes disease, salmonella or yersinia isolated.

Anaemia - indications of haemorrhage via the abomasum. The abomasum in all showed dramatic hyperplasia with thick corrugated mucosa. Pepsinogen levels only slightly elevated.

All cows had been copper dosed (2 X 4 g copper needles) and drenched (Synanthic plus minerals in October prior to calving) but case histories indicate a residual parasitic infection, most likely Ostertagia or related strongylids. Subsequent damage to the abomasum and residual worm burden may have affected copper uptake. Familton (pers. comm) has reported that a thickening of the abomasal wall in sheep has been shown to interfere with the uptake of copper from copper needles.

As stated above there is a suspicion that unidentified fungal toxins may be involved in this syndrome. Pasture analyses have revealed many fungal species in dead material, some of which have been shown to produce extremely potent mycotoxins.

ii) Imported adult elk cows and bulls
Autumn affected cows and bulls showed similar clinical and gross post-mortem pathology with elevated lungworm and ostertagia egg counts. Resistance in adults may have been reduced by stress or inadequate (drench type or dose rate weight) drenching practice. 3/6 breeding bulls developed the syndrome over the rut and ceased herding and mating activity. 3/56 older NZ wapiti-type cows were also affected.

iii) Pure bred elk calves
Clinical signs: poor condition, growth rates < 100 g/day in comparison to wapiti X elk herd mates ≈ 450 g/day, scouring, initiating rapid weight loss. Death in 1/6. All were removed from the group post-weaning and relocated indoors for wintering.

Pepsinogen levels were all elevated indicating abomasal damage. Lungworm and strongyles egg counts were all elevated in spite of regular pre-weaning and post-weaning drenching practices with synanthic. Lungworm burdens were removed with a change to Ivomec. It is assumed that either errors in drenching practice, or ineffectiveness of white drenches in elk at dose rates recommended for red deer, or a drench resistance problem resulted in these high worm burdens.

The influence of fungal toxins may also have been involved.

A general implication can be made in cases typical of this wasting condition that unless initial scouring is quickly detected and controlled at the critical spring/autumn times of the year, the compounding factors (poor copper uptake, abomasal worm burdens, or inadequate drenching practices, rank pastures containing a lot of dead plant material offering, particularly under moist humid conditions) can lead to a critical management problem. Indications from these studies imply that the wasting and scouring may be initiated from an abomasal condition, which if not detected and treated early enough can be very difficult to control.

There is a strong suspicion that the condition itself may have some genetic basis. Further investigation is clearly warranted.

In spite of these specific animal health problems which, in perspective, only affect small numbers of individuals, wapiti and elk are poised to play an increasingly important role in venison production and will assert their greatest influence in hybridisation programmes in base red deer herds.

Specialist wapiti farmers have evolved inexpensive but specialised handling techniques that complement the quiet paddock nature of these large animals.

As long as the objectives of a hybridisation programme are clearly defined and understood and simple and effective management strategies are in place to extend the basic husbandry of red deer to allow for increasing size in progeny in the two major areas (calving and growth of young stock). Farmers who are unfamiliar with wapiti or hybrids can confidently use the animals as sires. The potential profitability of such a system will ensure the additional care required is a worthwhile investment. Handling will always require respect and any hybrid production system must include a willingness to cull for behavioural unsuitability, even though this is often merely an animal's expression of dissatisfaction of poor stockmanship skills, rather than a problem of the breed per se.

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