4.4 Venison

K.R. Drew

The genus Cervus provides much of the genetic resource for venison production and this ranges from the small sika and rusa deer through the intermediate red deer to the very large wapiti (*Cervus canadensis*). The genus Dama or fallow deer is also of major importance in venison production. Roe deer are not farmed because of their behaviour but provide much feral product in Europe. Game venison differs from the farmed product mainly in variation of quality. The quality of carcases from feral animals largely depends on the handling of the carcase in the field. Factors like nutrient content, tenderness and even taste are very similar in both farm-reared and feral deer. There are widely

differing opinions about perceived flavour differences between the two products. A strong "gamey" flavour in feral deer can sometimes be due to method and time of storage rather than flavour *per se*.

Carcase composition

Prime deer for the market,one and two years old, are very lean when compared with other livestock (Table 4.4.1).

Table 4.4.1. Animal carcase composition.

Species	Age (months)	Weight (kg)	Percentage Yield			Lean/Bone
			lean	fat	bone	
Beef	24	239	59	23	18	3.3
Lamb	6	16	51	27	22	2.3
Chicken	Young	1.2	59	15	24	2.5
Red deer	26	63	73	7	20	3.6
Wapiti	26	83	73	4	23	3.1
Wapiti/red hybrid	11	68	76	5	19	3.9
Fallow deer	16	26	74	10	16	4.6

It is obvious that deer are very low in fat, high in lean and in lean/bone content. Venison has been shown to be very high in iron content and this is an important human health benefit, particularly for women.

Age and sex

Although one and two-year-old deer are very lean both males and females do get fat with age. Pre-rut stags older than four years can have backfat thickness over the twelfth rib of 3 to 6 cm and have carcases that are 21 per cent fat. While carcases from hinds may yield less saleable venison than from stags there is no evidence that meat tenderness is inferior. In fact rather the reverse. Topside and striploins from hinds can remain uniformly good in tenderness even when the animals are as old as 13 years. Stag carcases increase significantly in toughness after three years of age. In older stags the meat from pre-rut animals is more tender than that from stags slaughtered after the rut.

Carcase pH and venison quality

An ultimate pH of < 6.0 is necessary to ensure good quality in venison. It takes at least six hours after slaughter in red deer before the pH reduces to < 6.0 and if carcases are chilled before pH < 6.0 is reached there is a real danger of cold shortening and tough meat. The use of electrical stimulation on the carcase soon after bleeding can reduce the post-slaughter time period to pH < 6.0 to 1 to 2 hours. The consequences of high pH venison can be increased toughness, poor quality and deteriorating colour during storage.

Tenderness

Tender venison is best produced by the use of electrical stimulation of the carcase and may be aided by a period of conditioning and ageing in a chiller. Two or three days hold at 4°C after an initial period of 24 hours at 10°C will improve tenderness by about 20 per cent. When no electrical stimulation is used tenderness is improved by 40 to 50 per cent by holding carcases at 10°C for 24 hours post-slaughter before chilling compared with putting the carcases into the chiller two hours after slaughter.

Packaging and storage

Trade in high value meat is towards chilled rather than frozen products. Quality factors such as careful handling of deer on farms, good transportation and management at slaughter plants, clean processing in the plant and meticulous storage at -1°C during transport are essential to achieve best recognition by the consumer. Vacuum packaging is widely used for venison storage and as long as the product is bacteriologically excellent (no more than 1.5×10^3 c.f.u./cm^2) then a shelf life of 12 to 16 weeks at -1°C is possible. Controlled atmosphere packaging with CO_2 or gas mixtures may improve shelf life and appearance. Recent work has shown that venison held at -12°C or -18°C has a shelf life as healthy food of greater than two years although colour does deteriorate in vacuum packs very quickly with storage time.

Age and venison colour

Venison is perceived to be a dark meat (some of that may be due to the high iron content) especially after prolonged storage and this may be detrimental to consumer acceptance since it is known that venison colour is important for product acceptability. All packaging systems used in producing chilled venison lead to a product with a very short display life due to poor colour when the meat has been stored for more than 12 weeks at -1°C. Relatively long periods of storage do not seem to have much effect on odour and this may be due to the very low fat levels and, therefore, a reduced tendency towards rancidity.

Carcase colour does change with the age of the animal and it has been shown that the carcases from one and two-year-old stags are "more red" than the "browner" ones from older stags when both have been slaughtered pre-rut.

Further reading

Kay, R.N.B. & Staines, B.W. (1981). The nutrition of the red deer. *Nutritional Abstracts and Reviews - Series B, Commonwealth Bureau of Nutrition*, **51**: 601-622.

Drew, K.R. (1990). Venison and other deer products. *In* The Biology of Deer (R.D. Brown, ed.). Springer-Verlag. 225-232.

Drew, K.R. (1991). Carcass characteristics and optimal slaughter time in deer. *In* Wildlife Production: Conservation and sustainable development (L.A. Renecker and R.J. Hudson, eds). University of Alaska Fairbanks, 543-547.

Drew, K.R., Stevenson, J.M. & Fennessy P.F. (1991). Venison - a marketable product. *In* Proceedings of a Deer Course for Veterinarians, Deer Branch of the New Zealand Veterinary Association. **8** , 31-35.

Drew, K.R. and Stevenson, J.M. (1992). Venison processing, packaging and storage. *In* Proceedings of a Deer Course for Veterinarians, Deer Branch of the New Zealand Veterinary Association, **9**, 10 - 12.

Drew, K.R. and Seman D.L. (1987). The nutrient content of venison. *In* Proceedings of the Nutrition Society of New Zealand. **12**, 49-55.

Drew, K.R., Crosbie, S.F., Forss, D.A., Manley, T.R. & Pearse, A.J. (1988). Electrical stimulation and ageing of carcasses from red, fallow and New Zealand wapiti-type male deer. *Journal of Food and Agriculture*, **43**, 245-259.

Stevenson, J.M., Seman D.L. & Littlejohn, R.P. (1992). Seasonal variation in venison quality of mature farmed red deer stags in New Zealand. *Journal of Animal Science*, **70**, 1389-1396.

4.5 Other Products

K.R. Drew

Deer are the most comprehensive medicinal animals in Chinese medicine, occupying the paramount position equivalent to that of ginseng among the medicinal plants. A huge range of deer body parts are claimed to have disease prevention or curative properties against conditions such as the consumptive diseases, abnormal menstruation, retained afterbirth, dermatitis, traumatic injury and impotence. The whole tradition of oriental medicine is one of the pursuit of health rather than the treatment of ill-health. Velvet antler is the most important and valued deer medicinal product. Other deer parts that are of commercial importance to deer farmers are the skin, tail, pizzle (penis) and ligaments.

Velvet antler

This product is the entire partly grown antler removed from the stag before calcification has gone very far. When velvet antler is harvested at the appropriate stage for use as a high quality product in oriental medicines, it is an actively growing cartilage-type tissue and is not of uniform composition. The degree of mineralization of the velvet antler is generally regarded as an indicator of the likely pharmacological quality, with heavily calcified product being downgraded.

Velvet harvest

Since the actively growing antler at the time of harvest (about two thirds ultimate size) is networked with blood vessels and nerves, cutting needs to be done under analgesia and veterinary supervision so that the animal does not suffer pain. In the United Kingdom and parts of Europe the practise of velvet antler removal is prohibited on grounds of "mutilation". New Zealand as the world's largest supplier has laws that protect animal welfare and require that harvesting be done under veterinary supervision. A typical harvesting procedure is to use a small dose of xylazine to calm the stag in the yards, restrain it quietly in a whole body crush, using a ring block around the base of the antler with xylocaine, apply a rubber tourniquet below the cut and then remove the velvet antler about 2.5 cm above the junction of pedicle (part of the frontal bone of the skull) and antler proper. The process takes about 10 minutes an animal, the tourniquet is easily removed after a few minutes and the animal is turned out to pasture where grazing commences almost immediately.

Storage and drying

The harvested antler is allowed to cool and then stored frozen pending sale. Traditionally antler drying is a mixture of blanching (immersion in very hot water for short periods) and drying. The New Zealand industry has now developed sophisticated electronic drying plants that simulate the traditional process over several weeks. Research programmes are now examining the chemistry of bioactive compounds in velvet antler.

Pharmacology and medicinal use

Different parts of the antler have different uses. The upper two sections which are high in active lipid ingredients and low in calcium are used as preventative medicines or tonics in children and young people while the middle portion is used in the treatment of osteomyelitis. The lower part is regarded as being of particular benefit to older people subject to calcium deficiency. The relative concentration of antler lipid reduces rapidly from 43 to 65 days after growth starts and ash content rises. Commercial antlers are usually cut after about 60 days of growth. There is now scientific evidence that velvet antler has tonic or general performance- enhancing effects in both animals and humans. There is a

very strong positive association between relative biological activity (measured as hypotensive activity in small animals) and lipid content.

There is increasing information based on the comparative composition from New Zealand, Russian and Chinese velvet antler.

Skin, tail, pizzle (penis) and ligaments

Deer skin from undamaged animals produces a very high quality product for fashion garments. The skin is much tougher than sheep or cattle skin and it can be shaved to 0.4 mm in thickness without severe reduction in strength. A major problem with the management of deer in transport and yards is the flailing of feet. This and fighting between stags carrying hard antler can cause much hide damage and carcase bruising. If the true value of skins is to be achieved animal damage pre-slaughter must be minimized.

Deer tails, pizzles and ligaments are products from the slaughter plant that do have market value. Little is yet known outside the Orient about the processing of these items but they do appear on shop display shelves at high prices.

Further reading

Kong Y.C. & But P.P.H. (1985). Deer: the ultimate medicinal animal (Antler and deer parts in medicine). *In* Biology of Deer, (P.F. Fennessey & K.R. Drew, eds.). The Royal Society of New Zealand, Bulletin, **22**, 311-324.

Fennessy, P.F. (1991). Velvet antler: the product and pharmacology. *In* Proceedings of a Deer Course for Veterinarians, Deer Branch of the New Zealand Veterinary Association, **8**, 169-180.

Fennessy, P.F. & Duncan S.J. (1992). Comparative composition of velvet antler. *In* Proceedings of a Deer Course for Veterinarians, Deer Branch of the New Zealand Veterinary Association, **9**, 26 - 35.