The cost of alleviating the pain caused by the castration of beef calves

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ABSTRACT

The pain caused by husbandry procedures such as dehorning or castration is of concern to those with an interest in animal welfare. In the future farmers will be encouraged and perhaps obliged to provide analgesia for animals subjected to these procedures. In New Zealand in the last decade veterinarians have developed a service for disbudding dairy calves using the sedative xylazine and local anaesthesia and this has become popular with some dairy farmers. This paper reports a financial analysis of the impact to the individual farmer and nationally of using different forms of analgesia when castrating calves. Four scenarios and their costs were analysed: (1) the status quo ($0.28/calf); (2) the use of local anaesthesia with increased labour costs ($1.56/calf); (3) the use of local anaesthesia plus systemic analgesia with increased labour costs ($5.45/calf); and (4) the employment of a veterinarian to do the castration ($9.39/calf). National costs ranged from $160,000 to $5,368,700 ($10 to $351 per farm) for the four scenarios. The proposed scenarios were more expensive than the status quo but were still small relative to average total farm costs, i.e. $170,974 on New Zealand sheep and beef farms in 2001-02. These figures do not include any allowance for the cost of the inconvenience of having to organise husbandry activities around veterinary visits. Farmers may resist the imposition any of these 3 scenarios. In future the use of analgesics may become standard farm practice.

Keywords: calves; castration; cost; beef.

INTRODUCTION

The pain caused by management procedures such as dehorning (Stafford & Mellor, 2005) or castration (Stafford *et al*., 2002) is of considerable concern to those with an interest in animal welfare. It is possible that in the future farmers will be encouraged and perhaps be obliged to provide analgesia for animals subjected to these procedures and in Switzerland, since 2001, male ruminants can only be castrated under general or local anaesthesia. In New Zealand (NZ) in the last decade veterinarians have developed a service for disbudding dairy calves using the sedative xylazine and local anaesthesia and this has become popular with some dairy farmers because of its efficiency.

In New Zealand more than a half a million calves are castrated each year usually by rubber ring and to a lesser extent surgically, and almost all calves are castrated by the farmer or farm staff without any pain relief (Stafford *et al*., 2000). All physical methods of castration cause pain and this can be alleviated by the use of local anaesthesia and/or a systemic analgesic such as ketoprofen (Stafford *et al*., 2002). Many if not all the common anaesthetic and analgesic drugs are under veterinary control and this influences their availability to farmers should the use of analgesics become mandatory.

This paper reports a financial analysis of the impact of using different forms of analgesia when castrating calves to the individual farmer and nationally. This study compares four scenarios; the status quo, the use of local anaesthetic by the farmer, the use of local anaesthetic and systemic analgesia by the farmer and castration by a veterinarian.

METHOD

The gross margin costs of the three scenarios detailed above were compared with the status quo. Costs common to all scenarios were not included. The major assumptions made in the analysis (Table 1) (adapted from Dooley *et al.,* 2004) are that 571,900 calves are castrated each year, on average 37 calves are castrated per farm, one man can castrate about 50 calves per hour, on farm labour costs are $14/hour, local anaesthetic costs are $1/calf, systemic analgesic (ketoprofen) costs are 4.75/calf, veterinary costs include castration costs $5 per calf, a call out fee at $40 per farm, travel costs at $10 per farm, 1 to 2 hours veterinary time at $100 per hour and 2 hours on-farm labour.

A sensitivity analysis was conducted for two variables: farm labour costs ($12, $14 and $16 per hour) and the number of calves castrated per person per hour (40, 50, 60). The range and distribution of possible cost outcomes for each scenario were also simulated by running 100 iterations, assuming a normal distribution for 17 variables and selecting a value from this distribution at random for each variable for each run. The distributions are described by specifying a mean and a standard deviation (Table 1). The coefficient of variation ranged from 0.7% to 20% depending on the availability and reliability of the data: where this was more uncertain these were greater.

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TABLE 1: A summary of assumptions made in the analysis described in this paper.

Variable	Mean	SD[4]	Scenario
No. of NZ sheep and beef farms	15300	100	
Number of breeding cows[1]	1300000	50000	
Breeding cows/farm	85		
Calving %	88%	1%	
Sex ratio (% males)	50%	2%	
Percent castrated	95%	1%	
Number castrated & reared	543400		
Beef calves reared ex dairy cows	600000	50000	
Sex ratio of above calves (males)	95%	1%	
No. male calves reared ex dairy	570000		
Percent castrated	5%	1%	
Number castrated and reared	28500		
Total number of cattle castrated/year	571900		
Status quo castration rate/man/h[2]	50	5	1,2
Extra time multiplier (x status quo)[3]			1,2
Labour cost on-farm ($/h)	$14.00	$1.00	1,2,3
Extra cost/castration ($)	$1.00	$0.05	1
Ketoprofen cost/castration ($)	$4.75	$0.25	2
Vet cost/castration ($)	$5.00	$0.50	3
Vet call-out fee/farm ($)	$40.00	$5.00	3
Mileage cost/farm ($)	$10.00	$1.00	3
Vet cost $/h	$100.00	$5.00	3
Vet time/farm (h)	1	0.1	3

1 = Number of cows in 2002, Compendium of NZ Farm Production Statistics, NZMWBES Publication No. G2251.
2 = One farmer spoken to says he can castrate 40 to 50 bull calves (3 months old) per hour using the elastrator ring device. Another said a team of 2 men can castrate the same calves at the rate of 120 per hour i.e. 60 bull calves per man per hour.
3 = 2.0 for scenario 1, 2.5 for scenario 2.
4 = Assumptions of standard deviation values were provided by D Smeaton.

The scenarios and their calculations were as follows:
Status quo: Cost of castration 571,900 calves/50 calves/h x $14/h
Scenario 1: Cost of castration using local anaesthetic ($1/calf x 571,900 calves) plus (2 times the labour cost x 571,900 calves/50 calves/h x $14/h)
Scenario 2: Cost of castration using systemic analgesic and local anaesthetic ($4.75/calf x 571,900 calves) plus (2.5 times the labour cost x 571,900 calves/50 calves/h x $14/h)
Scenario 3: Cost of castration by a veterinarian ($5/calf x 571,900 calves) plus ($40/farm call-out fee x 15300 farms) plus ($10/farm travel costs x 15300 farms) plus (($100/h vet labour + $14/h farm labour) x 1h/farm x 15300 farms. Local and systemic analgesia used in this scenario.

RESULTS AND DISCUSSION

The national, average on-farm and per calf costs are shown in Table 2.

TABLE 2: Calculated national, average per farm and per calf castration costs.

Scenario	National cost	Per farm cost	Per calf cost
Status quo	$160,132	$10	$0.28
Local anaesthetic	$892,164	$58	$1.56
Local anaesthetic and systemic analgesic	$3,116,822	$204	$5.45
Castration by veterinarian	$5,368,700	$351	$9.39

Castration on-farm with local anaesthetic was calculated to cost almost six times the cost of the status quo, largely because of the $1/calf cost of anaesthetic. Costs increased considerably with the use of a systemic analgesic (almost 20 times more than the status quo). Where castration was by a veterinarian, estimated costs were 33 times higher than the status quo. Call out and travel costs comprised 14% of this total cost and veterinary time 29% of total costs. Calf costs at $5 per calf were 53% of the cost, whereas on-farm labour costs were only 4% of the total cost for this scenario.

Table 3: Sensitivity analysis results for labour costs and castration rate. National cost (above) and average per farm costs (below) are shown**.**

Farm labour cost ($/h)	12	14	16
Status quo	137,256 8.97	160,132 10.47	183,008 11.96
Local anaesthetic	846,412 55.32	892,164 58.31	937,916 61.30
Local anaesthetic plus systemic analgesic	3,059,665 199.98	3,116,855 203.72	3,174,045 207.45
Veterinarian	5,338,100 348.90	5,368,700 350.90	5,399,300 352.90

TABLE 4: The distribution of castration costs calculated for the different scenarios.

	Average	Minimum	Maximum	SD
National costs ($)				
Status quo	$161,180	$114,566	$227,762	$19,689
Local anaesthetic	$884,785	$720,697	$1,053,936	$62,779
Local anaesthetic plus systemic analgesic	$3,147,326	$2,472,007	$3,685,900	$229,202
Veterinarian	$5,381,038	$4,257595	$6,097,005	$337,414
Average per farm cost ($)				
Status quo	$10.55	$7.49	$14.90	$1.30
Local anaesthetic	$57.79	$47.06	$69.17	$4.10
Local anaesthetic plus systemic analgesic	$205.74	$160.66	$240.66	$15.00
Veterinarian	$351.80	$280.19	$401.06	$22.42

Although costs were considerably higher where anaesthetic, analgesics and/or a veterinarian were required, costs relative to total farm costs were still low, e.g. $351 per farm for the most expensive scenario compared with the $170,974 'weighted average all classes' total cash expenditure (excluding interest charges) on sheep and beef farms in New Zealand in 2001-02 (MWI Economic Service 2002). Other factors may also affect the decision as to how to castrate calves or not; e.g. convenience, availability of veterinarians, access to drugs, training and confidence in handling anaesthetics, availability of suitable facilities. These factors will have a progressively greater impact for the three scenarios e.g. the last scenario is the most 'inconvenient' in terms of having to organise farm activities around veterinary visits. It is possible that any increased cost and inconvenience may result in a higher proportion of calves being left entire.

Sensitivity analysis results for farm labour costs and castration rate are shown in Table 3. Increasing the labour cost by $2 per hour increased the costs per farm between $1.25 and $4.57 depending on the scenario. This cost increase was lower for the status quo ($1.25) which required less time to castrate calves because of the lower on-farm labour input compared with the other scenarios. However, the greater on-farm labour component relative to other costs in the status quo (labour costs only) and when local anaesthetic was used meant that proportionally the cost increase in these two scenarios was greater, i.e. costs increased 14%, 5%, 2% and 1% for the status quo scenario and scenarios 1, 2 and 3, respectively (Table 3).

A decrease in castration rate of 10 calves per person per hour increased castration costs between $1.50 in the status quo and $7.50 when local anaesthetic was used. As for labour costs, the percentage increase was greater for the status quo (25%) than the other two scenarios (9% and 3% respectively) for a decrease in castration rate from 50 to 40 calves per person per hour at a labour cost of $14/hour. There was no difference when a veterinarian was used as it was assumed castration took a set one hour per farm.

The calculated results demonstrate that the effects of farm labour costs and castration rate are insignificant relative to the differences between scenarios. Per calf costs are likely to have a more significant impact. An increase of $1 per calf will increase national costs by $571,900 and farm costs by $37.38 per farm.

The distribution of costs for the four scenarios from 100 repeated runs where variance information was added to the model are shown in Table 4. The co-efficient of variation for average on-farm costs is 12%, 7%, 7% and 6% for the four scenarios, respectively. The distribution was close to normal for all scenarios, and all scenarios are significantly different from the others, i.e. there is no overlap between the distributions.

CONCLUSION

The proposed scenarios were considerably more costly than the cost of calf castration on most farms today. If veterinarians were required to carry out the castration, costs increased markedly (33 times the status quo) compared with the status quo, of which 43% were veterinary time, call out and travel costs. Despite this, costs per farm for all scenarios were still relatively small compared with other costs on the average farm ($170,974, MWI Economic Service 2002). Even so, we speculate that farmers would not react well to the imposition of any of the three scenarios proposed. Other factors will also affect the decision as to whether to, or how to, castrate calves, e.g. convenience in planning farm activities, availability of veterinarians, access to drugs, training and confidence in handling anaesthetics, availability of suitable facilities. These were not factored into the financial analysis.

The scenarios modelled provide an overview of how changing regulations to improve the welfare by reducing the pain experienced by cattle during one procedure may affect costs. Castration is only one rather simple component of cattle production where pain relief could affect the cost of production. If analgesia was required for other known painful procedures carried out on cattle (dehorning, ear tagging, ear notching,

branding) then costs could start to be significant, particularly if the drugs had to be administered by veterinarians.

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