Reconciling the differences between the length at which lambs' tails are commonly docked and animal welfare recommendations

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ABSTRACT

The rationale for the length at which lambs' tails are docked was investigated by comparing lambs with No-tail, Short, Medium (covering the vulva in ewe lambs and at a similar length in males), Long, and Undocked tails. In Experiment 1, dagging and shearing required additional effort in Long and Undocked animals. There were no differences in average dag scores, but few lambs had dags. Shorter tail docking resulted in significantly ($P<0.05$) lighter recto-coccygeal muscles (from 8.9 ± 0.5g in Undocked to 6.6 ±0.4g in No-tail). The tail stumps of half of the No-tail, Short and Medium showed evidence of neuroma development and degenerative nerve changes compared with few of the Long and Undocked lambs. In Experiment 2, restlessness, an indicator of pain and distress in rubber ring docked lambs, tended to be more pronounced the shorter the tail was docked. Experiment 3 compared typical farm practices (Short), with the AWAC-recommended length (Medium). The slightly longer length was associated with (1) more lambs difficult to dag (11/44 Medium *vs*. 4/44 Short; $P<0.001$); and (2) no perceived benefits in increasing tail length. While the traditional Short and Medium tails appear to be the most appropriate, pain and distress, neuroma development and rectal muscle function may also be affected by tail length. It is yet to be determined if these additional factors justify a change to current practices but that possibility is considered unlikely.

Keywords: sheep; lamb; tail docking; length; dags; flystrike; welfare.

INTRODUCTION

Tails have many functions – as varied as locomotion, balance, sexual selection, territory marking, protection and defence, and even providing shade – in different species. Sheep presumably kept their tails during evolution in order to manage insects, to communicate with others, and to assist with urination and defecation (Kiley-Worthington, 1976).

However, domestication (Zeuner, 1963; Clutton-Brock, 1999) has evidently brought longer tails (up to 35 tail vertebrae compared with 10 in wild sheep) and a fleece of wool (wild sheep have hair and an undercoat of wool). Combined with changes in diet and management associated with modern farming in more temperate climates, long tails now collect dags, thereby increasing the risk of flystrike (Leathwick & Atkinson, 1995), and their management consumes significant husbandry resources. Tail docking is a traditional practice in sheep husbandry, but it usually causes a short period of acute pain (Mellor & Murray, 1989; Molony & Kent, 1997; Mellor & Stafford, 2000). Apart from the beneficial effects of reducing dags and risk of flystrike, there may be other longer-term consequences.

A review of the scientific literature (Fisher *et al.*, 2004) suggested that short tails were associated with most flystrike, some evidence of rectal prolapses and cancer of the tail region, and slower healing. Medium length tails were associated with least flystrike and urine staining, and longer tails with dags and flystrike and consequently greater effort was required to manage them. However, these observations are confounded by variations in breed, location and geography, climate, nutrition and docking techniques.

The objective of the present study was to reconcile the difference between the short tail length at which most New Zealand lambs are docked (Fisher *et al.*, 2006), and the slightly longer length (covering the vulva in ewe lambs and a similar length in males) recommended by the Animal Welfare Advisory Committee (AWAC, 1996) and subsequent National Animal Welfare Advisory Committee (NAWAC, 2005). Here we report on the consequences of different tail lengths for the presence of dags, ease of dagging and shearing, and for the degree of pain and distress at docking, formation of tail stump neuromas (complicated nerve regrowth seen after amputations), and the weight of the recto-coccygeal muscles. These muscles connect the rectal and vaginal walls to the tail vertebrae (Schummer & Nickel, 1979), and are thought to maintain the position of the rectum and vagina and assist in defecation.

MATERIALS AND METHODS

Romdale lambs (¾ Romney x ¼ Perendale) run on hill country in the Gisborne region, were randomly assigned to different tail length groups and docked with a rubber ring at approximately 4-8 weeks of age. In Experiments 1 and 2, tail length treatments (see Table 1 for measures) were:

(1) No-tail (docked as short as possible leaving little or no tail);
(2) Short (intermediate between No-tail and a Medium length tail);
(3) Medium (covering the vulva in ewe lambs and at a similar length in males), the length recommended by AWAC;
(4) Long (docked to leave approximately half the tail); and
(5) Undocked.

In Experiment 3, only Short and Medium lengths were compared. Other management procedures imposed at docking included vaccination for tetanus and pulpy kidney, ear-marking, shortening of the scrotum (cryptorchid) of the males, and insecticide application to the perineal region.

Experiment 1 (n = 5 male and 5 female lambs) examined the consequences of different lengths by collating data on the distribution of dags (0 = clean and 5 = most dags according to Larsen *et al.*, 1994), and ease of shearing (rated by two experienced shearers), between docking (October, 2003) and slaughter at eight months of age (June 2004). At the time of slaughter in a commercial meat processing facility (n = 8 or 9 per group), tail length was measured with a ruler, the number of tail vertebra counted by palpation after pelt removal, and a sample of the tail tip collected for histological examination (fixed in formalin, stained with haematoxylin and eosin and examined under light microscopy). In addition, the recto-coccygeal muscles were dissected and weighed. In Experiment 2 (n = 10 female lambs per group; November 2005), behaviour indicative of pain and distress was observed for one hour after rubber ring application. Lambs were recorded alternately spending time on the ground, be it lying, rolling *etc.*, or on their feet, as an indicator of restlessness, a significant feature of rubber ring docked lambs (Molony & Kent, 1993; Lester *et al.*, 1996). Experiment 3 (n = 25 male and 25 female lambs) assessed the beliefs of two farmers to docking their lambs at the length recommended by AWAC. One group of lambs (Short) was docked at the about the base of the caudal fold of the tail, the length at which lambs on the property are normally docked, and had been docked for many years. The second group (Medium) was docked slightly longer, so that the tail covered the vulva in ewe lambs and at a similar length in male lambs.

The effects of tail length were compared by analysis of variance and differences in proportions by the normal approximation to the binomial distribution.

RESULTS

Experiment 1

Fewest dags were noted in December and most in March with most lambs having few dags (lambs with dag scores of 0-2 comprised 98% of the group in December, 96% in January and 77% in March). There was no obvious or significant effect of tail length on the distribution of dags on the lambs, and the variation with time (December to March) was greater than that between groups. Long and Undocked tail-length lambs were difficult to dag in comparison to those with shorter tails. Shearers preferred lambs with shorter tails, but they adapted very quickly (from the shorter lengths to which they were used to) to the slightly longer Medium length tail. Long and Undocked tails, in comparison, varied between being a nuisance and being difficult, both requiring the tail to be held. Tail length and the number tail vertebrae are

Table 1: Mean (and range, in parentheses, or ± sem) tail length at docking (measured from the anus) and at slaughter (measured from the pelvis after pelt removal), number of tail vertebrae (incomplete vertebrae were counted as whole) and the weight of recto-coccygeal muscles in male and female lambs with different tail lengths (Experiment 1).

Tail length	No-Tail	Short	Medium	Long	Undocked
Proportion of original tail length retained at docking (%)	4	10	22	46	100
Tail length at slaughter (cm)	7.4 (6-9)	9.6 (9-11)	12.1 (11-13)	19.8 (15-23)	38.2 (30-46)
Number of tail vertebrae	2.9 (2-3)	3.4 (3-5)	4.6 (4-6)	8.0 (4-10)	17.8 (14-21)
Recto-coccygeal muscles (g)	6.6 ± 0.4	7.4 ± 0.7	8.5 ± 1.0	8.4 ± 0.6	8.9 ± 0.5

shown in Table 1. The recto-coccygeal muscles were bound to the rectum and vagina and their ends were inserted at the pelvis, and at the second (mainly) tail vertebra. Muscle weight was significantly ($P<0.05$) affected by tail length being lighter the shorter the tail (Table 1). Neuromas and other nerve damage were noted in the tips of 15/26 No-Tail, Short and Medium length tail stumps, but from only 3/17 Long and Undocked lambs ($P<0.05$). Tail length was not of concern for the meat processor, except where it compromised cleanliness. An unexpected observation was that 5 lambs (Long or Undocked) had evidence of relatively recent trauma to the base of the tail (broken tails or bruising of the muscles) suggestive of relatively recent (post-farm) injuries.

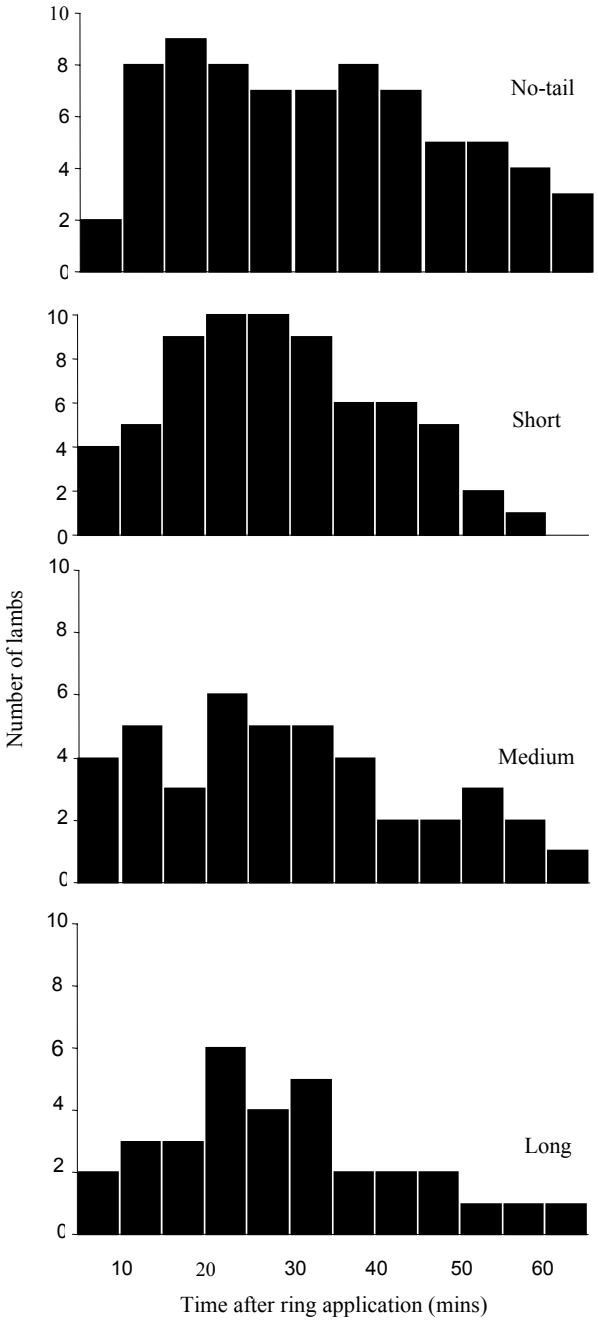
Experiment 2

Lambs displayed a variety of behaviours after rubber ring application. These included walking, standing, sitting, lying on their sides, turning towards and sometimes biting their tails, rolling on the ground, and walking on their front knees. The most obvious behaviour was alternately spending time on the ground, be it lying, rolling *etc.*, and on their feet. In contrast, undocked lambs nearly always remained on their feet. This behaviour peaked approximately 15-35 minutes after ring application in tail-docked lambs then gradually declined (Figure 1). This pattern was similar for all tail-docked groups, except that there was a tendency for more lambs to display it, and for longer periods, the shorter the tail (Figure 1).

Experiment 3

The farmers believed it was easy to adapt to the slightly longer AWAC-recommended length (Medium) tails. However, that length made dagging more awkward (necessitating a change in technique with additional blows needed). The ideal length was considered to be a little shorter than the AWAC-recommended length. Most tellingly, after two seasons of contributing to experiments with different tail lengths, there was no intention of modifying the current practice (*i.e.* Short-tails). This was due to the AWAC-recommended Medium length being more awkward to dag, without having any real advantages for either the animal or the farming system, albeit one with a relatively low prevalence of flystrike. While an even shorter tail would make dagging easier, this was not seen to be of significant benefit to warrant changing, especially since the individuals were accustomed to farming sheep with tails of that length. Moreover, it conflicted with a long-held belief that lambs needed a tail of sufficient length which they could move.

Figure 1: The affect of tail length on the number of female lambs spending time on the ground (a measure of restlessness and thus of pain and distress) in each 5 minute period after tail docking with a rubber ring (Experiment 2).



Dags were most evident in March (immediately prior to shearing) and lambs with shorter tails tended to have slightly less dags than those with medium length tails (average dag scores were 1.4 ± 0.2 and 2.0 ± 0.2 for Short and Medium tail-length lambs, respectively). However, while dag scores are a valuable experimental measure, they do not reflect the effort required to remove dags. Dagging

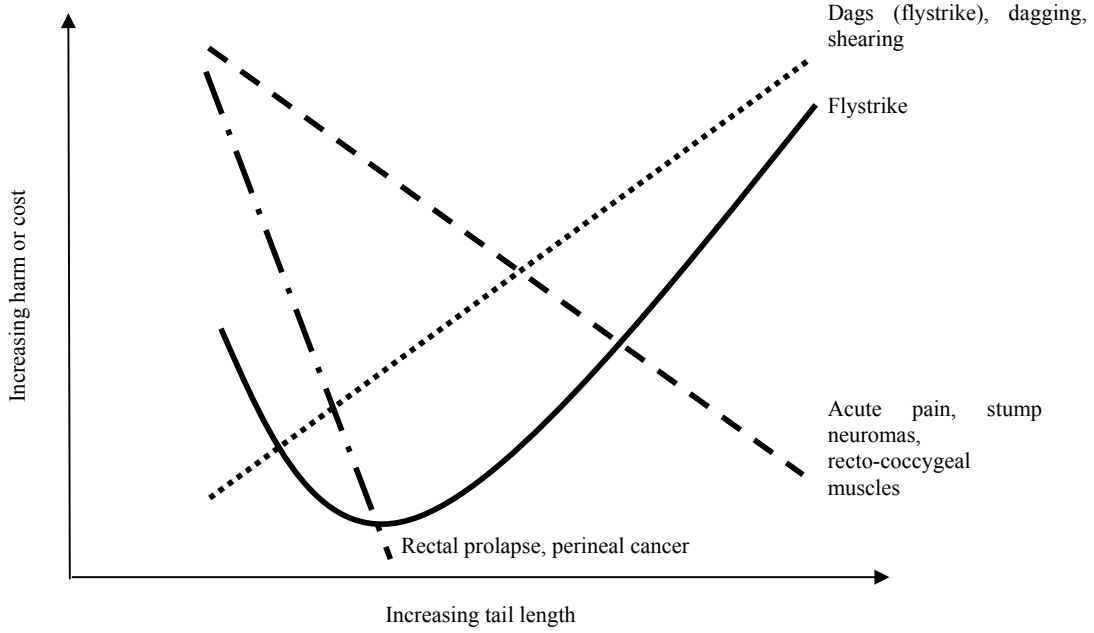
animals with dag scores of 1-3 was an accepted part of farming sheep, but there was an aversion to animals with scores of 4 and 5. Animals with extensive dags down their legs meant more effort and time was required and there was an increased risk of minor and serious cuts resulting from dags forming down to skin level and animals kicking with risk of injury to both animal and operator. With this in mind, the lambs were reclassified Clean – score 0; Daggy – scores 1-3 (*i.e*. "don't mind dagging"); and Very Daggy – scores 4 & 5 (*i.e*. "hate dagging"). This reclassification produced a significant ($P<0.001$) difference between Short and Medium tail-length groups (4/44 Short were Very Daggy compared with 11/44 Medium tail-length lambs).

DISCUSSION

What is an appropriate or justifiable length for tail docking sheep in New Zealand? Animal welfare standards and guidelines are usually determined by considering if the harm to an animal is reasonable or necessary *i.e*. is outweighed by the benefits. The stylised relationship of the harms and benefits derived from the present study, and the review of the literature (Fisher *et al.*, 2004), indicates that there is probably no universal or simple answer (Figure 2). Providing those responsible for the welfare of sheep are aware of all the potential consequences for both the animals and farm management in their particular circumstances, there do not appear to be unequivocal reasons to prescribe, or even advocate one particular tail length over another. What is required is to consider or weigh up all the potential benefits and costs by considering the pain the animal experiences, how easy it is to dag, the risks of dags and flystrike, the need for and ease of dagging, or even what the animal looks like *etc*.

Traditionally, both farmers (Fisher *et al.*, 2006) and animal welfare authorities (AWAC, 1996) appear to have been guided by concern for the welfare of animals (*i.e.* dags and flystrike) in determining an appropriate length for docking tails. In addition to these undoubtedly important aspects, the present study describes three additional, previously unreported, aspects which might also be important in determining tail length. Firstly, it is suggested that the magnitude of the acute pain associated with tail removal could be reduced by docking longer. However, this point requires more definitive research, including physiological measures, to establish the degree of reduction in pain associated with a particular increase in tail length. Secondly, neuroma and nerve degeneration appear to be related to tail length, suggesting that sheep with shorter tails could experience chronic pain or increased sensitivity long after their tails have been docked (French & Morgan, 1992). Neuromas are not necessarily, however, indicative of increased

Figure 2: A stylized representation of the complexity of the relationship between some of the actual and potential factors affecting what is an appropriate length for tail-docking sheep.



sensitivity and pain, and some neuromas resolve with time (Lunam *et al.*, 1996). The possible effects of these pathological changes on animal welfare have yet to be determined though studies are being undertaken in other species (*e.g.* Eicher *et al.*, 2006). And finally, the effect of tail length on recto-coccygeal muscle. While a relationship was demonstrated in the present study (shorter tails meant smaller muscles), further research is required to determine whether changes to the muscle do in fact compromise the animals or simply reflect muscular hypertrophy associated with greater tail-weight bearing. It is claimed that extreme or severe tail docking may result in reduced innervation to the rectum and anal sphincter resulting in pain (Jacobson *et al.*, 2006). Similarly, animals may be predisposed to vaginal prolapse (bearings) at lambing as a result of weakened pelvic ligaments or anchoring to the pelvis (Scottish Agricultural College, 2006). However, to the authors' knowledge there is little conclusive evidence either supporting or rejecting these positions, although they are intuitively attractive.

Clearly, there is much to determine before advocating any changes to current tail-docking practices. Furthermore, if there are benefits, then they would most likely to be only realised with tails significantly longer than the Short or Medium lengths characteristic of common practices and animal welfare recommendations, respectively. Any benefits of longer tails would have to be further weighed up against the costs of likely increases in husbandry procedures required to deal with the probable increase in dags and risk of flystrike characteristic of longer tails. Given that handling and husbandry procedures also come with a cost to the animal (for example; muscle glycogen levels took 3-8 days to recover following yarding, weighing and crutching in one study - Devine *et al.,* 2006) any benefits of longer tails would have to be significant to warrant changing current practices.

Although the justification for a particular tail length is complex, some recommendations are possible. Firstly, where there is a predisposition towards rectal prolapses and perineal cancer, tails should not be docked too short. While the incidence of both rectal prolapses and perineal cancer is apparently unknown in New Zealand, many farmers (and veterinarians) are aware of the risk of rectal prolapses with very short tail docking. Docking at this length has the added benefit of making dagging, crutching and shearing practicable if not the easiest to perform, and, to some at least, the animal is cosmetically or aesthetically attractive (the leg looks deeper and fuller because more of it is showing, and the rump is more level). In contrast, the sheep cannot effectively move its tail (essentially it does not have one). Short-tails and Medium tails seem to be appropriate lengths – the animals still have a tail which can be moved (although its effectiveness and importance for managing insects or communicating is unknown, at least to animal science), and dagging, crutching and shearing are practicable. Long and Undocked tails can result in more dags, and dagging and shearing are more difficult. It is noted that where dags and flystrike are not an issue, tails do not need to be docked, *e.g.* when lambs are slaughtered early in the season in some locales.

It is interesting to speculate on why there are differences between the AWAC-recommended length (Medium) and the most common practice (Short). On the one hand, perhaps farmers know better, are unaware of the consequences of their practices, or place greater value in aspects which science has yet to adequately address. Do farmers put their faith in tradition for good reasons? The two most common beliefs influencing tail length encountered while undertaking this work were (1) if rectal prolapses occur in lambs, then you need to dock longer, and (2) you've got to leave the lamb with a bit of a tail so that it can shake it at flies, or lift it in order to facilitate defecation. On the other hand, the AWAC stance can be questioned. In part it may have been derived from the unquestionable link between very high flystrike rates and tail length demonstrated in Australian studies with Merinos some 6-7 decades ago (Riches, 1942). Or perhaps the prevalence of perineal cancer (Swan *et al.*, 1984). The AWAC (1996) rationale appeared to be related to defecation – the particular length ensuring that when the tail is lifted "the caudal folds on either side are raised and the faeces directed away from the body, thereby helping prevent faecal contamination of wool and helping prevent blowfly strike. If tails are very short the caudal folds are not raised and soft faeces are more likely to soil the area below and on either side of the tail." It is doubtful that the presence or absence of caudal folds fully accounts for the presence of dags (and risk of flystrike), especially given the complex relationship between diet and dags (Gregory, 1997; Waghorn *et al.*, 1999). It is more likely that intact caudal folds reflect a greater integrity of the tail musculature, but this has yet to be demonstrated. Whatever the rationale for the AWAC recommendation, it is considered unlikely that there is sufficient information to favour a Medium length tail over a Short one.

A final perspective is that Medium and longer tail lengths are perhaps representative of a more

"natural" length tail in keeping with the view natural represents good animal welfare (Fraser, 2003). The question remains as to what is a natural tail length in sheep – that which it has prior to tail docking, or that which it had prior to domestication? While it would seem attractive to value the latter, it is important to acknowledge other changes which have occurred during domestication (*e.g.* in the fleece, diet and possibly anatomical changes affecting the rectum and anus) which could compromise animal welfare if lambs were docked at a "natural" tail length.

In conclusion, Medium and Short tails appear to be an appropriate length for tail docking lambs. No-tails are less defendable because of the possible risk of rectal prolapse and the inability of the animal to actually have and use its tail. Long and Undocked tails are the least justified unless dags and flystrike are not a problem, although additional effort is required to shear them.

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