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Tail Docking and Animal Welfare

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Introduction

Removal of the lower portion of the cow's tail is commonly referred to as "tail docking." Tail docking is thought to improve cleanliness and potentially reduce exposure to potential mastitis pathogens by reducing contact between tail hair and manure. Some farmers believe that shortening tails improves milking hygiene and allows for more thorough premilking udder preparation. The use of tail docking as a routine dairy farm management tool apparently originated in New Zealand and 35% of Victorian dairy farms responding to a survey reported that they routinely docked tails (Barnett et al., 1999). Survey responders believed removal of the tail resulted in faster milking, reduced risks to the operator and reduced rates of mastitis. Over the last decade, an increasing number of U. S. dairy farmers have adopted the use of tail docking because of the belief that it improves milking hygiene and comfort of milking personnel (Johnson, 1991, McCrory, 1976).

A variety of methods are used to dock tails. The process is performed on calves, preparturient heifers and occasionally on adult lactating cows (Kirk, 1999, Tucker and Weary, 2002). Application of elastrator bands to the tail of preparturient heifers below the level of the vulva is the most common method of removal. After application of the bands, tails undergo a process of atrophy and in most instances spontaneously detach 4-8 weeks post-banding. On many farms, banded tails that fail to detach are manually removed.

While the dairy industry has enjoyed a generally favorable public image, tail docking is considered as one of its' most controversial management issues. Concern about animal welfare has grown with urbanization, and as predicted 20 years ago, media attention supportive of urban viewpoints is having an increasing impact on agricultural practices (Kilgour and Dalton, 1984). Concerns about tail docking also exist within the agricultural community. Controversy followed an editorial in a popular dairy trade magazine that called for elimination of this practice (Quaife, 2002). Advocates for tail docking cite cow cleanliness and worker convenience as reasons to consider tail docking. Opponents consider tail docking as mutilation and cite increased fly avoidance behaviors, increased need for insecticides, reduced ability for cows to communicate (through tail movement), potential pain and infections in tail stumps, and ethical concerns about the process (Halverson, 2002).

Regulations preventing "unnecessary mutilation" of animals exist in a number of European countries and tail docking has been prohibited in the United Kingdom for almost 30 years (Taylor, 1974). A number of other countries allow tail docking but have laws that regulate the procedure. The Canadian Veterinary Medical Association officially opposes the routine use of tail docking of dairy cattle. The Animal Welfare Committee of the American Association of Bovine Practitioners issued a position statement in 1997 that stated "The committee is not aware of information, clearly supporting or condemning tail docking..." but this statement has not been updated. The authors of a review of scientific literature dealing with tail docking recently stated that "there are no apparent animal health, welfare, or human health justifications to support this practice <*tail docking*>" and concluded that "the routine practice of tail docking should be discouraged" (Stull, et al., 2002). The issue of tail docking of dairy cows remains controversial and the objective of this paper is to review current research about the behavioral and physiological effects of tail docking in dairy cattle.

Physiological and Behavioral Responses to Tail Docking.[1]

Researchers have examined several potential adverse affects of tail docking (Stull et al., 2002). Important welfare issues that have been examined have included pain caused by tail docking, changes in fly avoidance behavior, immune responses and changes in levels of circulating plasma cortisol (Eicher et al, 2000, Eicher et al., 2001, Petrie et al., 1996, Schreiner and Ruegg, 2002b, and Tom et al., 2002). Experiments have been performed on both calves and preparturient heifers.

Physiological responses to tail docking in calves. Petrie et al (1996) compared cortisol responses of calves that were docked using rubber rings or a hot cautery iron (commonly used in lambs) with or without the use of local anesthesia. Sixty-three calves (three to four months of age) were monitored for eight hours post treatment. Calves that were docked using rubber rings had no significant change in plasma cortisol concentration throughout the sampling period. Of 9 calves in the rubber ring groups, 8 showed almost no cortisol response. Calves that received local anesthesia and rubber rings showed a small drop in plasma cortisol concentrations that returned to normal within one hour. Calves that were docked using a cautery iron had a significant increase in plasma cortisol concentration for up to 45 minutes post treatment. The use of local anesthesia in calves that were docked using a cautery iron significantly increased cortisol concentrations for one hour. Control calves exhibited a significant increase in cortisol concentration for the first 15 minutes of observation. The authors concluded that there was little evidence to suggest that cortisol responses to tail docking were more distressing than restraint caused by blood sampling. Additionally, they concluded that local anesthesia had no detectable benefits due to little apparent distress.

Acute responses to tail docking using rubber rings or a hot cautery iron were also examined in 7-17 day old calves (n = 36) (Tom et al., 2002). Calves were randomly allocated to 3 groups: docked using rubber rings, docked using cautery iron or control (tail handled). Cortisol responses were repeatedly (7-9 times) measured on day 0 and day 1, and intake, weight gains and health were monitored for 3 weeks. No significant differences in cortisol concentrations were found among treatment groups, except at 60 min after treatment, when control animals had lower levels than the calves that were docked using rubber rings. No significant differences in milk intake, weight gain, body temperature or fecal consistency were identified. The authors concluded that tail docking of 7-17 day old calves resulted in few acute effects.

Physiological responses to tail docking in heifers. Immunological and endocrine responses to tail docking with rubber rings were examined using primiparous heifers (Eicher et al, 2000).

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[1] Adapted from Schreiner, D. A.2001. Effects of tail docking on behavior, physiology and milk quality of dairy cattle. MSc. Thesis, University of Wisconsin, Madison.

Twenty-one animals were observed for 24 hours pre and post banding and then four days later were monitored for 24 hours pre and post removal of the atrophied tail. Plasma haptoglobin concentration had a significant treatment by time interaction, but no overall treatment effect was detected. There was a significant haptoglobin increase at 168 h and 240 h post docking ($P < 0.05$) for all treatments. Circulating cortisol concentrations in banded heifers were lower than the control group 12 hours post banding ($P < 0.05$). A similar trend was detected at 46 hours post docking ($P = 0.06$). The authors concluded that tail banding did not significantly affect cortisol or immune measures in primiparous heifers.

Long term physiological responses of the process of tail docking and tail atrophy have been determined for preparturient heifers (Schreiner and Ruegg, 2002b). Pregnant heifers (n = 24) that were approximately 2 to 4 mo prepartum at the beginning of the study were randomly assigned to one of 4 treatment groups: 1) tails were cleaned and handled; 2) tails were cleaned, handled and an elastrator band was applied to the tail; 3) an epidural was administered 15 min before cleaning and handling, and 4) an epidural was administered 15 min before application of an elastrator band. Atrophied tails were allowed to fall off without assistance, until 42 d post-treatment when remaining atrophied tails (7 of 12) were removed. Behavioral observations and physiological responses were collected for 6 wk. Heart rates and body temperatures were collected at least once daily. Blood samples were obtained at -45, -15, and -1 min before application of tail bands, and 15, 30, 60, 90, 120, 180, 240, 360, and 720 min after application of tail bands. Additional blood samples were obtained after the morning observation period on days 4, 14, and 21. Plasma cortisol concentrations remained within limits previously described for non-stressed animals and no significant differences were detected among groups ($P = 0.49$). There was no significant difference in plasma cortisol concentration within groups over the observation period ($P = 0.16$) or any significant treatment by time interaction ($P = 0.36$). All hematological data, except for neutrophils, were within normal limits for the entire study period and there were no significant changes in hematological data among groups that could be related to treatment ($P > 0.17$). There were no significant differences ($P = 0.99$) in heart rate among treatment groups throughout the study. Body temperatures were within limits previously described for healthy cattle and no significant differences were observed among treatment groups ($P = 0.42$). We concluded that there were no significant immunological or hormonal responses caused by the process of tail banding or tail atrophy.

Behavioral responses to tail docking in calves. There are three studies that have reported behavioral responses of calves to tail docking (Petrie et al, 1995, Tom et al., 2002 and Schreiner and Ruegg, 2002b). Behavioral responses to tail docking with a rubber ring, with or without the use of local anesthesia were examined in 45 calves that were three to four months of age (Petrie et al, 1995). The authors reported that 67% of calves elicit an immediate behavioral response to tail docking with rubber rings. Tail shaking was detected in 10 of the 15 banded calves during the first 30-minute period after treatment. Vocalization and restlessness were detected in the rubber ring group immediately after treatment and were noted in calves that received rubber ring and local anesthesia for up to 2.5 hours after treatment. Local anesthesia prior to docking inhibited all behavioral responses for approximately 2.5 hours. The authors concluded that tail docking with rubber rings elicited a behavioral response, but not enough to cause a significant difference in normal feeding and ruminating behaviors.

Video cameras were used to monitor acute behavioral responses to tail docking in 7-17 d old calves for a total of 5 days (Tom et al., 2002). Moderate behavioral effects were noted for animals that received rubber rings as compared to the control calves and calves that were docked using a cautery iron. The use of rubber rings for docking increased tail grooming behaviors for the entire observation period. Shorter periods of standing and lying and higher frequencies of those behaviors were observed for the calves that received rubber rings as compared to the other groups. The authors noted that tail docking using a rubber ring apparently caused some degree of discomfort to calves docked within the first few weeks of birth.

An influence of calf age on behavioral responses to tail docking using rubber rings was identified in another study (Schreiner and Ruegg, 2002b). Behavioral observations were recorded over 10 days for heifer calves (n = 40) that were randomly assigned to docked (rubber ring) or control groups. Separate analyses were performed for young calves ($\leq$ 21 d of age, n = 22) and older calves (> 21 – 42 d of age, n = 18). No significant differences in eating, standing or walking ($P > 0.25$) were detected based on treatment. No significant differences in behavior of young calves could be detected based upon treatment. Older calves that were docked tended to spend more time in rear visualization ($P = 0.056$) and were significantly more restless as compared to control calves ($P = 0.01$) after application of bands on the day of treatment and on days eight and nine.

Behavioral responses to tail docking in heifers. There are 2 studies that have recorded behavioral responses to the process of tail docking in primiparous heifers (Eicher et al, 2000, Schreiner and Ruegg, 2002b) and 2 studies that have reported on fly induced behaviors in docked animals (Eicher et al., 2001, Phipps et al., 1995). Acute behavioral responses to tail docking with rubber rings were observed in primiparous heifers one month before projected parturition (Eicher et al, 2000). Twenty-one animals were observed for 24 hours before and after banding and for 24 hours before and after the removal of atrophied tails 4 days post-banding. There were no significant differences in behavioral responses between treatments except for the amount of time spent eating. Docked heifers spent more time eating after banding and less time eating ($P< 0.05$) after removal of the tail as compared to control heifers ($P < 0.01$). No significant differences were found in lying, standing, walking, drinking, head-to-tail viewing, or grooming behaviors. The authors concluded that tail banding had no significant effect on behavior.

Behavioral responses of preparturient heifers were collected by trained observers during numerous observation periods on the day of treatment, twice daily for weeks 1 and 2, once daily for weeks 3 and 4, and once daily during weeks 5 and 6 (Schreiner and Ruegg, 2002). No significant differences were detected among treatments for any behaviors during any time period ($P > 0.14$) and we concluded that the process of tail banding and atrophy did not affect behavior of preparturient heifers.

Fly induced responses of dairy cattle were monitored in five sets of twin 5-year old cows (Phipps et al, 1995). One twin served as a control, and the other twin was docked at 18 months of age. All animals were monitored for four, 1-month periods throughout the year. Behavioral changes and adrenal responsiveness to ACTH were recorded and compared between sets of twins.

Results showed an increase in tail flicking in docked animals. Docked animals had a significantly greater number of flies on the rear half of the animal. Adrenocortical responses were not significantly different between the docked and non-docked animals. The authors concluded that the additional fly load on docked animals caused at most moderate distress.

Fly avoidance behaviors were compared in lactating heifers that were either docked (n = 8) or had intact tails (n = 8) (Eicher et al., 2001). Animals were observed 3 times daily for a total of 5 days. Counts of stable flies indicated that there were no significant differences in fly numbers on the front legs of cows but docked cows had almost twice as many flies on their rear legs as compared to cows with intact tails ($P < 0.01$). Fly avoidance behaviors (such as feed tossing) were increased in the docked animals while tail swinging was increased in the control animals. Foot stamping was identified only in docked animals and the authors concluded that fly numbers and fly avoidance behaviors were increased in docked animals.

Tail Docking and Udder Health

Many farmers and consultants perceive that tail docking results in improvements in animal cleanliness and udder health. To date, these perceptions have not been scientifically validated. Tucker et al. (2001) evaluated the effect of tail docking on cow cleanliness and SCC in a single herd, housed in freestalls, over an 8-wk period. Tails were either docked (application of rubber ring followed by removal after 2 weeks of atrophy; n = 275 enrolled, 169 completed study) or left intact (n = 212 enrolled, 105 completed study). Cleanliness scores (using a 4 pt scale) were recorded for available animals on a weekly basis by counting debris in a grid placed on the midline of the back (5 cm anterior to the base of the tail) or on the rump (3 cm from midline). Udder cleanliness was scored twice during evening milking using the same grid applied to the back of the udder (above the teats) and separately by counting the number of teats that contained obvious debris. There were no significant differences in cleanliness scores for any of the measured areas between docked and intact animals ($P > 0.17$). No significant differences in SCC or udder cleanliness were identified ($P > .31$). The authors concluded that there was "little merit to adopting" tail docking.

A study with more animals and for a longer duration was conducted to determine the effect of tail docking on SCC, intramammary infection and udder and leg cleanliness in eight commercial dairy herds housed in freestalls (Schreiner and Ruegg, 2002a). Lactating dairy cows (n = 1250) were blocked by farm and randomly allocated to tail docked or control groups. Milk samples, somatic cell counts and hygiene scores were collected for eight to nine months. The prevalence of IMI was determined for each of the five occasions when milk samples were obtained. Udder and leg cleanliness were assessed during milk sample collection using a standardized scoring method. Docked and control animals were compared by logSCC, prevalence of intramammary infection, and leg and udder cleanliness score. At enrollment, there were no significant differences in parity, daily milk yield, logSCC, or DIM between treatment groups. At the end of the study period 76 (12.16%) and 81 (12.96%) of cows had been culled in the docked and control groups, respectively. There were no significant differences between treatment groups for somatic cell count (Fig. 1) or udder or leg hygiene scores (Figure 2). Prevalence of contagious, environmental and minor pathogens did not significantly differ between treatment groups (Table

1). This study did not identify differences in udder or leg hygiene or milk quality that could be attributed to tail docking.

Conclusions

Many individuals in the dairy industry have perceptions about tail docking and there are an increasing number of research studies available on this subject. Available data clearly fails to indicate that the process of tail docking results in measurable increases in indicators of animal stress. A number of studies have found no significant differences in cortisol levels based on tail docking and there have been no indications of stress leukograms in studies that have examined blood. No measurable differences in feed intake, calf growth or immune function have been attributable to the process of tail docking. Several mild behavioral effects of tail docking of calves have been identified based on age but very few behavioral responses have been identified for preparturient heifers. Current research suggests that preparturient heifers may be less sensitive to the application of tail bands than younger animals. Fly avoidance is an important function of the tail and research has identified several modest changes in behavior that docked animals exhibit to reduce fly exposure. Farmers that utilize tail docking should use appropriate management to reduce potential exposure to flies. Contrary to popular opinion, there does not appear to be any influence of tail docking on cleanliness of udders or legs, nor does there appear to be a relationship between tail docking and milk quality. It is highly likely that other factors (individual animal behavior, housing, handling and facility management) have much greater influence on animal hygiene and mastitis than tail docking. Comfort and cleanliness of farm personnel are often cited as reasons to dock tails and research on this issue is needed. It is likely that arriving at a consensus about tail docking within the dairy industry will be difficult and the dairy industry will need to balance public perception about tail docking with legitimate farm management needs.

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Figure 1. Log somatic cell count by treatment and month. (from JDS 85:2503-2511).

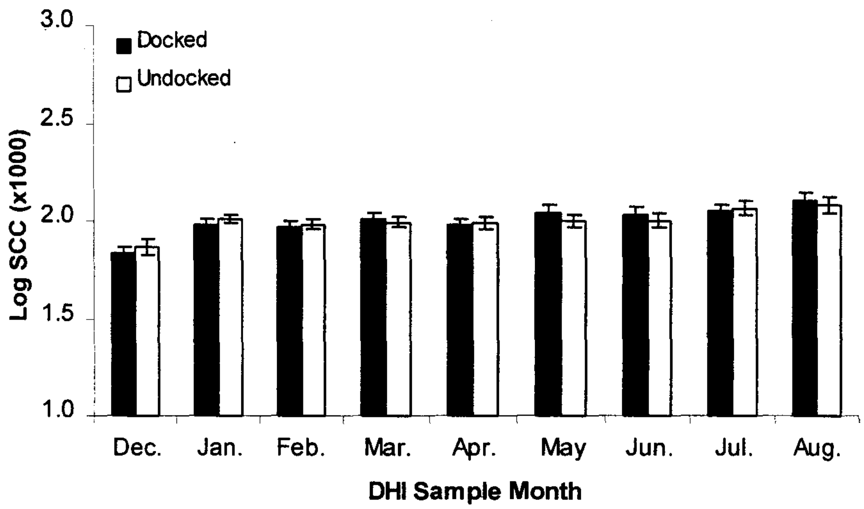

Figure 2. Udder hygiene scores by treatment and month (from JDS 85:2503-2511). Scale is 1 (cleanest) to 4 (dirtiest).

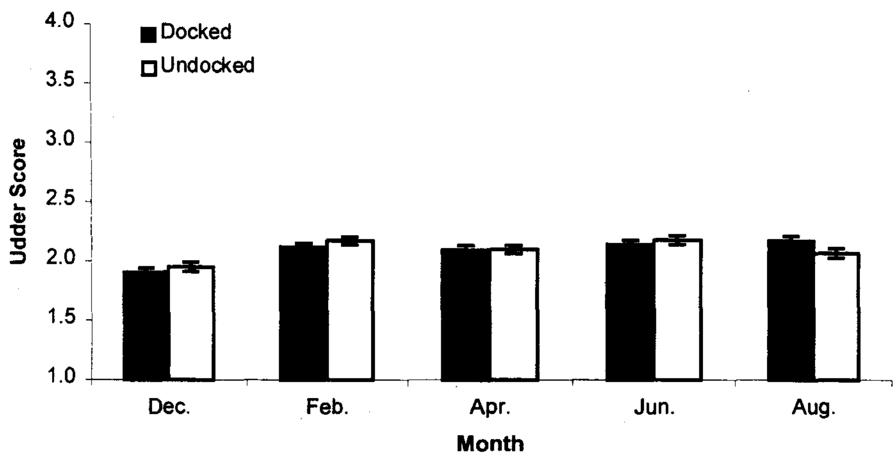

Table 1. Prevalence of intramammary infection by treatment and month (SE).[a] (from JDS 85:2503-2511)

	December	February	April	June	August
			% (SE)		
Contagious[b]					
Docked	2.2 (1.1)	4.1 (1.8)	5.7 (3.3)	8.1 (2.8)	8.6 (3.8)
Control	2.1 (0.9)	3.4 (2.0)	4.8 (3.2)	5.3 (2.8)	8.3 (4.8)
Environmental[c]					
Docked	10.4 (3.0)	10.9 (2.1)	11.8 (1.8)	12.6 (2.3)	7.6 (2.3)
Control	12.0 (2.4)	13.4 (2.2)	11.3 (1.5)	8.0 (1.7)	7.6 (1.9)
Minor[d]					
Docked	38.6 (6.8)	38.9 (4.0)	35.2 (3.7)	28.9 (3.1)	24.6 (3.9)
Control	39.0 (6.1)	39.4 (4.4)	36.1 (3.4)	30.7 (3.7)	28.0 (2.8)

[a]columns may sum to >100% because of multiple isolates from single samples; [b]*Staphylococcus aureus* and *Streptococcus agala* [c]*Escherichia coli, Klebsiella* spp, *Streptococcus spp, Enterococcus spp.*; [d]coagulase negative *Staphylococcus spp, Actinomyces spp, Corynebacteria spp.*