

SHORT COMMUNICATION

TAIL-BITING IN MINK (*MUSTELA VISON*) IS INFLUENCED BY AGE AT REMOVAL FROM THE MOTHER

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Abstract

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Previous studies have shown that male mink (Mustela vison) removed from their mothers at seven weeks of age develop more tail-biting than males left with their mothers until six months. Mink in the wild do not damage their own pelts in this way, and such behaviour may well be an indication of chronic stress.

The aim of this experiment was to investigate further the causes of tail-biting by considering female young as well as male, and by lowering the age at which the 'late-weaned' mink were separated from their mother to 11 weeks, by which age their period of socialization should be complete. This was to generate results of more practical use to farmers, who cannot leave all young with their mothers until six months of age for reasons of space. Mink removed from their mothers at seven or eleven weeks of age did indeed differ in the incidence of tail-biting. 'Early-weaned' females were more likely than late-weaned females to have bitten their tails at six months of age. A similar result was evident as a trend for both sexes at ten months. Furthermore, at this age, some animals' tail tips were completely bald, and such animals were all early-weaned.

Where provided with plastic drinker dishes, early-weaned animals were also more likely to chew these. Thus weaning age had long-lasting effects on a number of oral behaviour patterns. These results suggest that young animals predisposed to tail-bite might be diverted by the provision of other objects to chew, and that if problems of over-crowding are avoided, leaving mink kits with their mothers until 11 weeks might improve their welfare.

Keywords: *animal welfare, grooming, mink, self-directed behaviour, tail-biting, weaning*

Introduction

On every mink farm, there are animals with bald patches or areas of shortened fur (Joergensen 1984 p 338). Tails with closely clipped fur or completely bald tips are particularly common, occurring in approximately 20 per cent of the farmed mink in the Netherlands, for example (de Jonge 1989). Careful observation has shown this to be the result of animals sucking or biting their own tails (de Jonge 1989). Mink (*Mustela vison*) in the wild do not damage their pelts in this way (de Jonge *et al* 1986; Dunstone 1993 p 183), and such behaviour can therefore be considered 'abnormal' (*sensu* eg Fox 1968).

Removing fur or wool from the coat is a self-directed abnormal behaviour often considered a sign of poor welfare (eg Fraser & Broom 1990 pp 318-319). Such behaviour may possibly be related to the excessive self-cleaning shown by humans with obsessive-compulsive disorder (eg Marks 1987 p 298); the pica shown by animals lacking in specific nutrients (eg Fraser & Broom 1990 p 390), or the prolonged grooming induced by stress, novelty or injection with peptides such as adrenocorticotrophin (ACTH) (reviewed by Isaacson & Gispen 1990). In mink, tail-biting and tail-sucking are anecdotally associated with nervous or restless temperaments, the more inactive and docile animals seeming less prone to develop them (Kennedy 1951); Mason (1992) found that in two populations, adult female mink with bitten tails had relatively enlarged adrenal glands, suggesting higher levels of chronic stress. Furthermore, bald tails or those with closely clipped fur may sometimes be bitten until bleeding, perhaps because they are now thin enough to slip easily through the cage partitions to be attacked by neighbouring mink (van Iwaarden pers comm).

What causes pelt-biting is unclear. It has been linked with biotin deficiency (Joergensen 1984 p 228, p 262). Tail-biting also has a genetic component (de Jong 1988, 1989). However, aspects of experience play a role too. Male mink removed from their mothers at seven weeks of age and pair-housed with young females develop more tail-biting than males left with their mothers until six months (de Jonge 1988, 1989, 1991).

The aim of the present experiment was to investigate further the causes of tail-biting by considering female young as well as male. Furthermore, the age at which the 'late-weaned' mink were separated from their mothers was reduced from six months to 11 weeks. By this age the young mink (kits) should have been taking little or no milk (see Rice 1967; Birks 1984). Their period of socialization should also be complete, as suggested by studies of mink in the laboratory and in the wild. Male kits isolated at nine weeks do not show impaired reproductive behaviour as adults, unlike those isolated at eight weeks or earlier (Gilbert & Bailey 1969), and male kits isolated at ten weeks appear to adjust sooner than those isolated at six or eight weeks, differing from these younger animals in not spending much of the first day out in the cage (Houbak & Jeppesen 1987). Furthermore, kits in the wild start to leave the natal territory at 12 weeks old (Birks 1984) or even earlier (Gerell 1970). Hence leaving kits with their mothers for this apparently developmentally important period may be sufficient to reduce tail-biting. Such a finding would be of more practical use to farmers, who cannot leave all young mink with their mothers until six months of age for reasons of space.

Subjects and methods

The mink used as subjects were of the Wild Type strain and were kept in standard mink farm conditions on a research station in the Netherlands. The mink were housed in long sheds with wire mesh walls, each shed containing two parallel rows of c 200 cages. The cages were made of wire mesh, and measured 30x37x75cm. Each had a wooden nest box. Water was provided *ad libitum*; the mink drank by pressing a nipple on the water pipe that ran the length of each shed. Once a day, the mink were fed with an offal-based paste, deposited on to the top of each cage.

Fifty-one litters were selected when the young were seven weeks of age. The kits were removed from their family's cage and re-caged in sibling male-female pairs in two stages.

One pair was removed from each litter at seven weeks of age, and this was repeated at eleven weeks. Kits were selected at random, with the exception that the occasional ill or injured animal was never taken from its mother at the earlier age. This removal from the mother is henceforth referred to as 'weaning' (though see Martin 1984). Litters were also manipulated by the farm manager at about nine weeks, ie between the two stages of the experiment: kits were removed from all litters of six or more, so that just four or five kits were left with the mother. This was because in these bigger litters of now-large young, kits could be crowded out from the feeding area of the cage. In addition, the farmer observed that in a few litters there were signs of fighting or that the mothers were losing weight.

The early- and late-weaned pairs of kits were placed in alternate blocks of cages, six early-weaned pairs being followed by six late-weaned pairs, and so on, along the shed. Before data collection at six months, the pairs were re-housed, the order of early- and late-weaned pairs in the shed being randomized so that data collection would be blind.

At six months of age, mink which had had fur removed from their tail tips were noted. Such mink had no top hair on the last few centimetres of the tail, only the paler underwool, bitten very short.

At nine months of age, the now-mature mink were separated and housed singly, and at ten months of age, bitten tail tips were noted as before. At this age, some of the tail-biting animals also had 'sucked' tails, the ends of which were completely bald. These individuals were noted. Evidence was also collected of an additional, environment-directed, oral behaviour performed by the ten-month-old animals. Fifty-two females had been re-housed into cages with a new plastic dish below the drinker nipple. Mink were sometimes seen or heard chewing these vigorously, and some of these females' dishes bore the marks of gnawing. Such females were therefore noted.

Results

Table 1 shows the percentage of animals in the early- and late-weaned groups with clipped fur on the tips of their tails, and tail tips which were completely bald. As a specific prediction was being tested (that early-weaned kits would show more over-grooming), the results below represent one-tailed statistics, except where otherwise stated.

At six months of age, more early than late-weaned females had chewed their tails (Chi-squared = 7.01; $df = 1$; $P < 0.005$). Tail-biting animals tended to have tail-biting cagemates (Chi-squared = 6.82; $df = 1$; $P < 0.01$; two-tailed). Early- and late-weaned males, however, did not differ significantly. Bald tails were not seen at this age, in either sex.

At 10 months, the differences in tail-biting between the experimental groups did not quite reach significance when the sexes were considered separately (males: Chi-squared = 2.10; $df = 1$; $P < 0.10$; females: Chi-squared = 1.93; $df = 1$; $P < 0.10$). However, they did so after the sexes were combined (Chi-squared = 3.39; $df = 1$; $P < 0.05$). Bald tails were also seen among tail-biters at this age, and the difference between the two groups was clearer here. All nine females and seven males with tails that had been sucked or licked bald were in the early-weaned group (females: $G = 9.78$; $P < 0.0025$; males: $G = 10.08$; $P < 0.00025$; the G test was used here since the incidence of 'expected' values under five precluded the Chi-squared test; see Zar 1984 pp 71-72; Siegel & Castellan 1988).

Table 1 The percentage of individuals with bitten and bald tails among mink weaned at seven weeks (early-weaned) or eleven weeks (late-weaned).

Evidence of over-grooming	Age at removal from mother (weaning)					
	Seven weeks			Eleven weeks		
	F	M	All	F	M	All
<i>Tail-bitten at 6 months</i>	28.0% (n = 50)	17.6% (n = 51)	22.8% (n = 101)	7.8% (n = 51)	11.8% (n = 51)	9.8% (n = 102)
<i>Tail-bitten at 10 months</i>	26.1% (n = 46)	25.5% (n = 51)	25.8% (n = 97)	14.6% (n = 48)	14.0% (n = 50)	14.3% (n = 98)
<i>Tail-bald at 10 months</i>	19.6% (n = 46)	13.7% (n = 51)	16.5% (n = 97)	0.0% (n = 48)	0.0% (n = 50)	0.0% (n = 98)

Mink which tail-bit at six months were significantly more likely to tail-bite at ten months than animals which had not previously done so (Chi-squared = 12.59; $df = 1$; $P < 0.001$; two-tailed). However, the behaviour was not completely stable into adulthood; 11 of the 33 original tail-biters no longer showed the behaviour at ten months, while 20 of the 39 animals which tail-bit at ten months had not shown the behaviour at six months. Notice that the incidence of bitten tails did not decrease when the animals were singly-housed, suggesting that they were indeed the product of self-directed behaviour. There was no significant difference between the frequency of bitten tails in six-month-old pair-housed, and ten-month-old singly-housed animals (females: Chi-squared = 0.19; $df = 1$; $P > 0.50$; males: Chi-squared = 0.93; $df = 1$; $P > 0.70$; two-tailed).

Early separation from the mother also predisposed kits to another oral behaviour: drinker-dish chewing. Of the 27 early-weaned females with plastic water dishes, the dishes of 17 had been chewed; while of the 25 late-weaned females with plastic dishes, only eight had chewed them. This difference was significant (Chi-squared = 4.987; $df = 1$; $P < 0.05$; two-tailed).

Females that chewed their water dishes were no more nor less likely than other females to chew their tails (though sample sizes were small here, only eight of the females provided with water dishes also tail-biting; Chi-squared = 0.43; $df = 1$; $P > 0.70$; two-tailed).

Discussion

Mink removed from their mothers at seven or eleven weeks of age developed differences in over-grooming behaviour that were stable into adulthood. Early-weaned kits were more likely to perform this behaviour. Early-weaned females were also more likely than their late-weaned sisters to chew their drinker dishes. The persistence of the effect on oral behaviour into adulthood is interesting as previous reports of such long-term effects of early weaning have been largely anecdotal. For example, in cats weaned when very young, 'wool-sucking' behaviour has been reported as persisting into adulthood (Hart & Hart 1985 p 201; Morris 1987 p 41).

Abnormal oral behaviour is common in farm animals removed from their mothers before the transition from milk to relying on solid food. Oral behaviours such as sucking non-nutritive objects and nosing at the bellies of conspecifics appear to substitute for suckling or udder-massaging in calves and piglets (eg Fraser & Broom 1990 p 314, pp 330-331; de Passillé *et al* 1992). Speculatively, the predisposition to oral behaviours induced by early separation in mink may similarly be a product of the lack of opportunity to suckle. However, this seems unlikely to be the full explanation for two reasons. First, even the youngest kits were eating mostly solid food when removed from their mothers (the switch to reliance on solid food occurs at 4-5 weeks [Mason 1994], although low levels of suckling may continue for longer). Second, the oral behaviour often involved biting or gnawing, not plausibly explained in terms of suckling. Interestingly, early-weaned calves display similarly unexplained excessive coat-licking (Fraser & Broom 1990 p 319).

What aspects of early weaning might cause kits to develop these oral behaviours? Loss of the mother often has a profound effect on young animals even after they stop depending on her for milk. Mothers are often a secure base from which to explore, and to retreat to when frightened or tired (eg Bowlby 1988 p 27, pp 39-40). Furthermore, the loss of its mother can sensitize an individual to subsequent adverse events, rendering it more vulnerable to psychological disturbance (Rutter 1981 pp 120-121 and Bowlby 1988 p 36, reviewing the work of eg Brown and co-workers). However, why these adverse effects on early-weaned kits might be manifest as abnormal oral behaviours is unclear. One possibility is that they derive from play: Houbak & Jeppesen (1987) report that kits isolated at 6-10 weeks playfully pounce and bite on their own tails and limbs, behaviour which develops into nibbling and sucking over the ensuing weeks. More research is clearly needed on the aetiology of the behaviour, and also to determine whether remaining with the mother, or simply staying with several littermates, is the most influential factor.

Animal welfare implications

In mink, over-grooming of the tail appears to be a sign of chronic stress (see Introduction). The results of this experiment suggest that this form of over-grooming is reduced if young mink are left in family groups until 11 weeks of age. This is not surprising given that, for example, mink in the wild would not naturally leave their mothers until about 12 weeks old. On farms where mink are bred for their fur, most young are actually removed from their mothers and re-housed in male-female pairs by the age of eight weeks, with some authors even recommending that this occurs by six weeks (Schneider & Hunter 1992). Leaving a litter together for longer might therefore help improve the welfare of farmed mink. However, some of our litters experienced problems at c 9 weeks (and were partially split down). If late weaning is adopted, care must be taken to supply ample food, and to monitor closely and control both the stress (see eg Heller *et al* 1988) and health of the mother, and fighting in the litter. Enlarging the cages would also reduce the drawbacks of late weaning.

Furthermore, as early weaning evidently plays a role in environment-directed oral behaviour, it is possible that providing young mink with objects to chew would reduce over-grooming, although this would depend on finding toys in which the kits do not lose interest (see Jeppesen & Falkenberg 1990). Preventing tail-biting in this way would reduce the injuries that can stem from this behaviour.

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