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Hair pulling: a review

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Summary
Hair pulling has been reported in humans, six different non-human primate species, mice, guineapigs, rabbits, sheep and muskox, dogs and cats. This behaviour seems to occur only in subjects who are confined in an artificial environment. It has been classified as a mental disorder in humans, as a behavioural pathology in animals. The hair is not only pulled but also, in most species, ingested. Hair pulling can be both self-directed and partner-directed, contains elements of aggression, manifests more often in females than in males, is associated with psychogenic distress, and resists treatment. Research data collected from affected animals are probably not normative, hence scientifically unreliable. The preemptive correction of husbandry deficiencies causing long-term stress may prevent the development of this bizarre behaviour in healthy subjects.

Keywords Hair pulling, barbering, wool pulling, trichotillomania, abnormal behaviour; review; primates; mice; guineapigs; rabbits; sheep; dogs; cats

Hair pulling is a behaviour pattern that occurs in humans and animals who are confined in an artificial environment. A search of the literature reveals that hair pulling has not been recorded in subjects who live in a natural, species-appropriate environment. This behaviour is receiving some attention in the medical and psychiatric literature, but has been largely overlooked in the field of laboratory animal science.

Humans


Non-human primates

In non-human primates, the terms hair pulling [Reinhardt et al. 1986], overgrooming [Steen 1995], hair plucking [Tustin et al. 1996], fur pulling [Goodwin 1997], self-depilatation [Nash et al. 1999], hair picking [Storey et al. 2000] and tearing of hair [Iglesias & Gil-Burmann 2002] have been used as synonyms for a behaviour that comprises the following sequence in rhesus macaques: pulling with the fingers or with the teeth tufts of hair from one's own or from a partner's coat (Figure 1), manipulating and chewing the hair, and finally swallowing it. When directed towards a partner, hair pulling among rhesus macaques triggers aversive responses such as bending or moving away, crouching and fear-grinning (Figure 1). This suggests that hair pulling is an aggression that inflicts pain. In almost all instances (95%), the victim is subordinate to the hair puller and, therefore, shows no retaliation to being treated so harshly [Reinhardt et al. 1986]. Serving no apparent biological function, but disrupting social relationships, hair pulling has been interpreted as a behavioural pathology [Walsh et al. 1982], reflecting adjustment problems related to confinement [Reinhardt et al. 1986].

Hair pulling has been reported in six different non-human primate species (baboons: Elton 1979, Kaufman et al. 2002; chimpanzees: Brent 2001, Smith et al. 2004; rhesus macaques: Lutz et al. 2000, Tully et al. 2002; long-tailed macaques: Watson 1992, Statz & Borde 2001; Japanese macaques: Tustin et al. 1996, Goodwin 1997; squirrel monkeys: Mendoza 1999, Iglesias & Gil-Burmann 2002]. Ethological observations of an undisturbed breeding troop of 22 rhesus macaques (infants not included) revealed that hair pulling was almost exclusively (97%) directed towards another partner and occurred only rarely (3%) as a self-directed behaviour. The majority of group members were engaged in this activity, both by performing it (86%) and serving as a recipient for it (95%). In the course of 162 h of observations, a total of 388 incidences of hair pulling were registered [Reinhardt et al. 1986]. Hair pulling is associated with moderate or intense crowding conditions that expose subjects to social stress [Elton 1979, Reinhardt et al. 1986]. Females tend to pull hair more often than males [Reinhardt et al. 1986].

In single-caged primates, hair pulling can be one of the most pervasive behavioural disorders [Tully et al. 2002]. Some subjects overgroom their hair to the point that they are almost bald [Tully et al. 2002]; others focus the hair pulling to specific areas of the
body, leading to the development of localized patches of alopecia (Tustin et al. 1996, Brent 2001), which may eventually start bleeding (Smith et al. 2004).

Promoting more species-typical behaviour patterns in an otherwise boring living environment can distract primates from behavioural disorders [Reinhardt & Reinhardt 2005]. There are numerous reports showing that hair pulling can be ameliorated by providing the subjects more opportunities for exercise [Tustin et al. 1996, Storey et al. 2000], social interaction [Statz & Borde 2001], positive interaction with humans [Goodwin 1997], food-searching activities [Boccia 1989, Watson 1992, Steen 1995, Boccia & Hijazi 1998, Marshall et al. 2002] and exploration of destructible objects [Smith et al. 2004]. This quasi-occupational therapy reduces the frequency in which hair pulling occurs, but it does not cure the subject from this behavioural pathology.

It is not uncommon in rhesus and stump-tailed macaques that specific individuals of group-housed animals develop alopecia independent of the season, their health, and reproductive status, and independent of nutritional factors. In contrast to hair pulling, which typically leads to partial alopecia, spontaneous depilation usually develops into complete alopecia. Removing the affected subjects from the group and transferring them to species-adequate cage-housing arrangements resolves the problem very quickly (author’s unpublished observation). This suggests that it is caused by environmental stressors such as social distress [Bürge et al. 1997] or heat stress [Venatesan et al. 2004].

Mice

Hair pulling in mice appears as whisker-eating [Hauschka 1952], fur and whisker trimming [Garner et al. 2004a], or barbering [DeLuca 1997]. The behaviour is shown to be both self-directed and partner-directed. Fur of ventral and genital areas of the body is the primary target for self-directed hair pulling, while whiskers are the primary target for partner-directed hair pulling (Garner et al. 2004a). In the social context, self-directed hair pulling seems to be rare [Garner et al. 2004a]. There is usually – but not always [Garner et al. 2004b] – only one member of the group who engages in partner-directed whisker trimming [Long 1972]. The so-called barber holds a partner down and removes hair by plucking with the incisors. This appears to be painful because the victim winces and adopts a submissive posture (Figure 2A; Sarna et al. 2000). The plucked hair is often chewed and/or ingested by the barber (Figure 2B; Hauschka 1952, Sarna et al. 2000). Barbering is not the exclusive privilege of dominant mice, but subordinate partners also show this gesture (Garner et al. 2004a).
Female mice perform barbering significantly more often than male mice (Garner et al. 2004a).

Experimental evidence suggests that barbering affects normal brain function both in the barber (Garner 2002, Garner et al. 2003) and in the victim (Kuljis 1992, Vees et al. 1998, Sarna et al. 2000). It has been proposed that this bizarre behaviour is a form of coping with inappropriate housing conditions (Van den Broek et al. 1993).

In a population survey, the incidence of self-directed barbering was 5.7% in 88 single-caged animals versus 0.6% in 1891 group/pair-housed animals. The incidence of partner-directed barbering was 7.5% in the group/pair-housed mice (Garner et al. 2004a). The prevalence of mice showing hair loss as a result of being barbered may be as high as 60% (DeLuca 1997).

The provision of regularly replaced toys can reduce barbering, but fails to eliminate this activity altogether (DeLuca 1997).

Guineapigs
In guineapigs, hair pulling has been described only in the social context. One guineapig grasps the hair of another with his/her teeth, pulls it out and often ingests the mouthful. This behaviour has an element of aggression and is used to displace another animal at water spouts and feeding dishes. Especially under conditions of crowding or stress, hair pulling may become so exaggerated that it results in marked alopecia (Harper 1976).

Hair pulling has not been documented in rats, gerbils, voles or any other rodents.

Rabbits
In rabbits, hair pulling occurs in both sexes in single- and in group-caged animals (Brummer 1975, Maertens & DeGroote 1984, Jackson 1991). The behaviour sequence and the reaction to it have not been described in detail in the literature. Subjects not only pluck fur but may also ingest it (Brummer 1975, Gunn & Morton 1995, Boers et al. 2002). It is not uncommon that the gradual development of fur balls leads to intestinal stasis and fatal rupture (Jackson 1991). Hair pulling and fur balls are seen more often in singly-caged than in group-housed rabbits (Kraus et al. 1994, Vera Baumans 2004, personal communication).

There are no data-supported reports of attempts to treat rabbits who engage in hair pulling, but there is empirical evidence that the development of hair pulling can be prevented by raising rabbits in an environment that is provisioned with straw, and hence allows for species-adequate foraging behaviour (Brummer 1975).

Sheep
Wool pulling in sheep seems to be always partner-directed (Done-Currie et al. 1984, Marsden & Wood-Gush 1986). This activity is performed most of the time by the highest-ranking individual of a group, who is pulling strands of wool from the fleece of other sheep (Fraser & Broom 1990, Lynch et al. 1992, Fraser 1995). At first, the wool puller takes wool from the back, but in time all areas of a victim’s body can become denuded (Fraser & Fox 1983). This abnormal behaviour (Fraser & Broom 1990) is associated with the constant stress resulting from crowding (Fraser 1995). There is no published documentation of rams showing this behaviour.

Wool pulling has not been recorded in goats, but a total of 253 incidences of wool pulling has been observed in a group of 13 muskox (ungulates related to sheep: Ovibos moschatus) calves confined in a paddock for physiological research purposes. One animal would nibble and pull at the coat of another partner who typically interrupts this gesture by moving away slightly, without, however, trying to retaliate or escape (Figure 3). Both dominant and subordinate partners engage equally in this behaviour (Reinhardt 1984).

During the shedding period, the animals pull strands of wool and ingest them (Figure 3; Reinhardt & Flood 1983). Females show wool pulling significantly more often than males (Reinhardt 1984).

Therapeutic attempts to stop wool-pulling behaviour in sheep or muskox are not documented in the literature.
Cats and dogs

Hair pulling in cats and dogs is a behavioural component of psychogenic alopecia, a syndrome characterized by the continual licking/chewing and/or pulling of fur (Moon-Fanelli et al. 1999). Dogs typically, and cats occasionally, focus this behaviour on one particular area, with resulting alopecia, abrasions, ulceration and secondary infection (Muller et al. 1989, Moon-Fanelli et al. 1999). Boredom- and anxiety-inducing circumstances are risk factors for the development of this abnormal behaviour (Hetts & Estep 1995, Moon-Fanelli et al. 1999), which is exacerbated by environmental stressors (Sawyer et al. 1999). Female cats seem to be affected by this behavioural problem more often than males (Moon-Fanelli et al. 1999). It is not clear if such sex difference applies also to dogs. Neither in cats nor in dogs has hair pulling been described in the social context.


It has not been documented if environmental modifications can eradicate this behavioural pathology once it has been established in a dog or cat.

Discussion

Hair pulling is not a normal behaviour, yet it is not uncommon in a variety of animals kept in research facilities. It shows striking similarities with trichotillomania in humans: the hair is not only pulled but also ingested; hair-pulling behaviour is associated with distress, can be both self-directed and partner-directed, contains elements of aggression (inflicting pain) in the social context, manifests more often in females than in males and resists treatment. The American Psychiatry Association classifies hair pulling in humans as a mental disorder that is associated with clinically significant distress (American Psychiatry Association 1987). It is difficult to say whether hair pulling is also a mental disorder in animals, but it is reasonable to assume that affected subjects experience similar psychogenic disturbances as humans do, namely boredom and/or anxiety and/or depression. The Institute for Laboratory Animal Research categorizes hair pulling in animals as a maladaptive behaviour that relieves the intensity of distress resulting from the chronic exposure to environmental stressors (Institute for Laboratory Animal Research 1992).

The observation that hair pulling can affect normal brain function and the fact that hair pulling resists treatment suggest that this behaviour is associated with...
irreversible neuropathological changes. The association with distress further implies that the hair-pulling subject is not in a state of equilibrium. It is, therefore, questionable that research data collected from affected animals are normative, hence scientifically reliable. Data obtained from animals who are repeatedly the target of hair pulling also need to be interpreted with reservations because the subjects show clear signs of aversion to such painful treatment, which may even affect their brain function.

It is an ethological puzzle that partner-directed hair pulling is not an unequivocal expression of dominance even though the passive partner shows signs of submission. How is it possible that a subordinate muskox (Figure 3), or a subordinate mouse, can dare to pull the hair of a dominant partner and inflict pain without being punished in retaliation? The possibility has to be taken into consideration that the victim of hair-pulling experiences not only moderate pain but also, at the same time, relief from tension resulting from boredom. This positive side-effect would quasi-reinforce the hair-pulling behaviour, both when it is partner-directed and self-directed. It is noteworthy that human patients suffering from trichotillomania often report a distinctly pleasurable feeling while pulling their hair (Mansueto 1990).

The clinical and empirical evidence available indicates that hair pulling reflects chronic stress resulting from husbandry deficiencies. Environmental modifications have so far been ineffective in curing animals who have developed this behavioural pathology. Correcting pre-emptively husbandry conditions that are prone to cause permanent stress – e.g. social deprivation, barren living quarters, no opportunity to forage, lack of shelter area, insufficient social space – would be the most reasonable strategy to prevent the development of hair pulling in animals who are still behaviourally healthy.

The implications of hair pulling on the validity of scientific data and the welfare of the affected subject warrant more attention on the prevalence and prevention of this serious behavioural disorder not only in humans but also in animals kept in research facilities.

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