

Factors associated with aggression between pairs of domestic ferrets

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Objective—To identify factors (eg, familiarity, sex, neutering status, and time of year) associated with aggression between domestic ferrets and test a method for reducing aggression when introducing ferrets.

Design—Prospective trial.

Animals—56 healthy domestic ferrets.

Procedure—To identify variables associated with aggression, pairs were placed in an enclosed area and observed. To test whether increasing familiarity would decrease aggression when introducing ferrets, pairs of ferrets were housed in separate cages next to each other or in separate rooms for 2 weeks prior to introduction.

Results—49 of 82 pairs of strangers fought, but 31 cage mate pairs did not. Time of year had no apparent effect. Pairs consisting of 2 neutered females or 2 sexually intact males were significantly more likely to fight than were pairs consisting of a neutered female and a sexually intact male. Pairs caged next to each other for 2 weeks prior to introduction were no less likely to fight than were control pairs.

Conclusions and Clinical Relevance—Results suggest that familiarity, sex, and neutering status are important determinants of aggression between ferrets. If unfamiliar neutered ferrets are introduced, then pairing 2 males or a male and female would likely result in the lowest levels of aggression. However, neutered females and sexually intact males are not indiscriminately aggressive, as a neutered female can be paired with a sexually intact male without resulting in aggression. Caging ferrets next to each other for 2 weeks does not decrease aggression when the ferrets are introduced. (*J Am Vet Med Assoc* 2003;222:1709–1712)

Aggression among animals is not uncommon, and for pet owners, aggression among new pets can be stressful. Domestic ferrets (*Mustela putorius furo*) are becoming increasingly popular as pets in the United States and generally are considered tame, playful, curious, and docile.¹⁻³ Still, when strange ferrets are introduced for the first time, highly aggressive fights sometimes occur. In studies⁴⁻⁶ of European polecats (the closest living relatives of domestic ferrets) and polecat-ferret hybrids, a true fight, as opposed to a play fight, was described as an incident during which each animal attempted to bite the back of its opponent's

neck with a sustained, immobilizing hold. Successful bites (ie, those during which the opponent was unable to break free) were sometimes accompanied by shaking or dragging of the immobilized animal. When the attacked animal was able to break free, it sometimes displayed evidence of intimidation, including screaming, defensive biting, hissing, fleeing, urinating, or defecating. However, serious injury did not usually occur.

Familiar ferrets are unlikely to engage in a true fight.^{2,4,5,7} But, while a lack of familiarity is perhaps the best predictor of true fighting between ferrets, not all strangers fight. Previous studies of sexually intact ferrets indicated that males may be more aggressive than females,^{5,8} especially during the breeding season.^{2,4,9} Ferrets sold as pets in the United States are almost always neutered, and some authors^{1,10} have suggested that castrating male ferrets might reduce aggression. However, although studies^{11,12} of dogs have shown that neutered animals may be less aggressive than sexually intact animals, to our knowledge, this has not been demonstrated in ferrets.

Knowing what variables might affect the likelihood of aggression between unfamiliar ferrets may help pet owners adding a new ferret to their household to select one that is less likely to fight with a resident ferret. However, even with careful planning, pet owners may have to deal with fighting. Because familiar animals are less likely to fight than unfamiliar animals, it would be ideal if potentially aggressive animals could become familiar with each other without having the opportunity to fight. Studies with pigs,¹³ kangaroo rats,¹⁴ and mice¹⁵ have attempted to use preexposure to reduce aggression. These studies have indicated that visual exposure,¹³ olfactory exposure,¹⁴ and sharing a common substrate¹⁵ may all be key factors in establishing familiarity and reducing fighting behavior.

Identifying factors associated with aggression between ferrets and developing methods for introducing unfamiliar ferrets will be of benefit for owners of pet ferrets. The purposes of the study reported here were to identify factors (eg, familiarity, sex, neutering status, and time of year) associated with aggression between domestic ferrets and test a method for reducing aggression when introducing ferrets.

Materials and Methods

Study design—The study consisted of 2 parts. The first part was designed to identify factors associated with aggression between pairs of ferrets. For this part of the study, pairs of ferrets were placed in a small area and observed for fighting behavior. The second part of the study was designed to determine whether housing ferrets in separate cages next to each other for a 2-week period prior to introduction would decrease fighting behavior.

Identification of Factors Associated with Aggression

Ferrets—Fifty-six domestic ferrets living in households and rescue shelters in New Jersey, Pennsylvania, and Georgia

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were used for this portion of the study. All ferrets used in the study had lived in social cages with at least 2 animals/cage for at least 3 months prior to testing. There were 24 neutered and descended males, 19 neutered and descended females, 8 intact (ie, not neutered or descended) males, and 5 intact females. All ferrets were between 9 months and 4 years old at the time of the study, and none had any known health problems. In particular, ferrets with tail alopecia were specifically excluded from the study, as this may be a clinical sign of adrenal gland disease, which is associated with increased blood concentrations of various steroids, including testosterone, and may be associated with increased aggressiveness.¹⁶ Ferrets housed at different sites had different diets and daily routines; no changes were made in diet or daily routines during the study.

Experimental protocol—Ferrets were tested in pairs selected to evaluate the effects of 4 factors on fighting behavior: familiarity (pairings of cage mates vs strangers), time of year (pairings during spring vs winter), sex (male-male, male-female, and female-female pairings), and neutering status (intact-intact, neutered-intact, and neutered-neutered pairings). With a strict $2 \times 2 \times 3 \times 3$ factorial design, 36 pairing conditions would have been tested. However, not all pairing conditions were included in the present study because of limited availability of ferrets. For example, a pair of intact male cage mates was not available until the last data collection session during the spring of 2001; therefore, pairings of intact male cage mates were never tested during the winter. Most of the intact females were nursing young during the winter and were not tested.

To achieve the greatest number of pairings possible, animals participated in multiple pairings, but no individual animal participated in more than 1 pairing during any 24-hour period. Individual ferrets were used in as many pairing conditions as possible, but no ferret was used twice for the same pairing condition. Thus, unique pairings were used for each factor, with the exception of time of year, for which pairs were tested during the spring and winter.

Data collection—Data were collected from May through July 2000, from December 2000 through January 2001, and from May through July 2001. The May through July data collection period was chosen to correspond to the breeding season.⁸

For each trial, a pair of ferrets was placed in an arena, and their interactions were videotaped for 10 minutes. The arena consisted of 5 particleboard panels (61 cm high and 122 cm wide) connected with hinges. The arena was formed into the closest approximation of an equal-angled pentagon as possible; however, the exact shape depended on the location in which it was used. A piece of transparent dryer hose (10.2 cm in diameter and 3 m long) was placed in the center of the arena, and a white heavy-duty shower curtain lined the floor. All surfaces were cleaned with household cleaner between trials to eliminate scents from previous ferrets.

When similar coloring made identification difficult, ferrets were marked with colored mascara. Trials were terminated early if an interaction escalated to a fight that might have resulted in serious injury (eg, uninhibited bites directed to body areas other than the neck). Ferret owners were allowed to terminate a trial at any time.

Scoring of fighting behavior—Videotapes of each trial were viewed by the senior author (VWS) to determine whether a true fight had occurred. For this purpose, a true fight was considered to have occurred if the attacking ferret's bite made contact with the opponent (ie, the bite was not inhibited), the opponent was unable to escape, and the attacker sustained the bite for at least 2 seconds (with or without shaking or dragging the immobilized ferret) or if the attacking ferret's bite made contact but did not immobilize the opponent, and the attacked ferret screamed, urinated, or defecated while fleeing.

Data analysis—Because the primary dependent variable was dichotomous (fighting vs no fighting), nonparametric methods were used to analyze the data. Fisher exact and χ^2 tests were used to determine whether fights were significantly more frequent for some pairings than for others (eg, pairings of strangers vs cage mates).¹⁷ A Wilcoxon signed rank test was used to determine whether fights were more likely during the spring or winter for pairs tested during both seasons. For all analyses, a value of $P < 0.05$ was considered significant.

Evaluation of a Method for Reducing Aggression

Ferrets—Seventeen pairs of ferrets that had fought during trials in the first part of the study were included in this part of the study. The 17 pairs were again placed in the arena to determine whether they would fight, and the 10 pairs that engaged in true fighting were randomly assigned to a treatment or control group. Groups were balanced in regard to sex and neutering status to the extent possible. When possible, ferrets that came from separate rooms of a rescue shelter or from separate homes were paired. Pairs of ferrets that came from the same room were used only if they had not lived in adjacent cages.

Experimental protocol—Pairs of ferrets assigned to the treatment group were housed in wire cages that had been modified by adding a wire mesh divider so that the ferrets were housed side by side or were housed in smaller cages clipped side by side for 2 weeks. Ferrets in each pair were rotated between sides every 24 hours. Pairs of ferrets in the control group remained in their separate home cages.

Ferrets housed at the rescue shelters were let out of their cages at least 1 hour a day for play and exercise, and ferrets in the treatment group were returned to their social groups during this period each day. However, because ferrets from multiple cages in a room were not let out simultaneously, this play and exercise time did not result in unintended exposure of study ferrets to each other. Ferrets in the control group continued to receive play and exercise time with their cage mates.

All data were collected during May through June. After the 2 weeks during which ferrets in the treatment group lived side by side, pairs were again placed in the arena and videotaped. Videotapes were viewed for evidence of fighting as described for the first part of the study.

Data analysis—A Fisher exact test was used to determine whether incidence of fighting for pairs of ferrets in the control group was significantly different from incidence of fighting for pairs in the treatment group. A value of $P < 0.05$ was considered significant.

Results

Factors Associated with Aggression

Familiarity—None of the 31 pairs of cage mates engaged in true fighting (Table 1), whereas 49 of the 82 (60%) pairings of strangers resulted in true fighting. The percentage of cage mate pairings that resulted in fights was significantly ($P < 0.001$) different from the percentage of stranger pairings that did.

Time of year—Twenty-seven pairs of ferrets were tested both during the spring and during the winter. Six pairs fought during the spring but not the winter. Four pairs fought during the winter but not the spring. Ten pairs fought during both seasons. Seven pairs did not fight during either season. The Wilcoxon signed rank test did not indicate a significant effect of time of year on fighting behavior. When the Wilcoxon signed rank test was repeated with results for only the 11 pairs that included an intact animal, there was still no significant effect of time of year. Three pairs fought during the

Table 1—Association between 4 factors (familiarity, time of year, sex, and neutering status) and aggression for pairs of domestic ferrets

Factor	Neutering status	Sex		
		Male-male	Male-female	Female-female
Strangers— spring	Neutered-neutered	5/8	8/11	7/8
	Neutered-intact	4/7	2/8	1/3
	Intact-intact	3/3	3/5	0/0
Strangers— winter	Neutered-neutered	1/6	4/8	4/4
	Neutered-intact	3/5	1/3	0/0
	Intact-intact	2/2	1/1	0/0
Cage mates— spring	Neutered-neutered	0/5	0/9	0/3
	Neutered-intact	0/0	0/3	0/0
	Intact-intact	0/1	0/0	0/0
Cage mates— winter	Neutered-neutered	0/4	0/4	0/2
	Neutered-intact	0/0	0/0	0/0
	Intact-intact	0/0	0/0	0/0

Pairs of ferrets were placed in an enclosed area and observed for 10 minutes for fighting. Data are given as number of pairs that fought per number of pairs tested.

spring but not the winter. One pair fought during the winter but not the spring. Four pairs fought during both seasons. Three pairs did not fight during either season.

Sex and neutering status—Because no effect for time of year was found, data collected during the winter and spring were combined for the remaining analyses. For pairs that were tested in both seasons, data from the first encounter were used, resulting in 55 pairs for analyses.

For pairings of 2 male ferrets, percentages of fights among intact male-intact male, neutered male-intact male, and neutered male-neutered male pairs were not significantly different (Table 2). Similarly, for pairings of 2 female ferrets, percentages of fights among neutered female-intact female and neutered female-neutered female pairs were not significantly different. Finally, for pairings of a male and a female ferret, percentages of fights among intact ferret-intact ferret, neutered ferret-intact ferret, and neutered ferret-neutered ferret pairs were not significantly different.

The percentage of intact male-intact male pairs that fought was not significantly different from the percentage of intact male-intact female pairs that fought. For pairings of neutered ferrets, percentages of fights among neutered male-neutered male, neutered male-neutered female, and neutered female-neutered female pairs were not significantly different. For pairings of a neutered ferret with an intact ferret, percentages of fights among male-male, male-female, and female-female pairs were not significantly different.

Pairs consisting of an intact male and neutered female were not significantly less likely to fight (0 fights with 5 pairs) than were pairs consisting of an intact female and neutered male (2 fights with 3 pairs). However, pairs consisting of an intact male and neutered female were significantly less likely to fight than were pairs consisting of 2 intact males ($P = 0.018$) and pairs consisting of 2 neutered females ($P = 0.001$).

Evaluation of a Method for Reducing Aggression

One control group pair and 1 treatment group pair

Table 2—Association between sex and neutering status and aggression for pairs of unfamiliar domestic ferrets

Neutering status	Sex		
	Male-male	Male-female	Female-female
Neutered-neutered	5/9	9/13	7/7
Neutered-intact	4/7	2/8	1/3
Intact-intact	3/3	3/5	0/0

Pairs of ferrets were placed in an enclosed area and observed for 10 minutes for fighting. Data are given as number of pairs that fought per number of pairs tested.

did not fight following the 2-week experimental period. The other 4 pairs in both groups fought, and the percentage of control group pairs that fought was not significantly different from the percentage of treatment group pairs that fought.

Discussion

As predicted, pairs of cage mate ferrets did not fight in the present study. However, 49 of 82 (60%) pairs consisting of strangers did fight. The fights often involved sustained bites and shaking of the immobilized ferret and may have resulted in injury if allowed to continue. The attacked ferret usually screamed and sometimes urinated and defecated while attempting to flee. These results highlight the difficulties faced by owners bringing a new ferret into an established household and by shelter workers.

One of the main purposes of the present study was to identify factors associated with aggression between ferrets in the hope that this information would be helpful in predicting the likelihood of a fight. Time of year did not have a significant effect in the present study, even for intact animals in which blood hormone concentrations are likely to change with season. This lack of a season effect may have been attributable to the fact that animals were housed under artificial lighting, and the amount of light was not altered to mimic the increase in daylight that triggers the breeding season in ferrets. Owners of both rescue shelters that participated in the study indicated that in their experience, intact males tended to stay in season (ie, the testes were descended) longer than the literature indicates for a normal breeding season and that intact males did not necessarily come out of season during the times of year described in the literature. In addition, they indicated that in their experience, although females came into heat once or twice a year, they did not necessarily do so during a particular time of year as described in the literature.

Prior to this study, we had hypothesized on the basis of previous information⁵ that intact male ferrets would be highly aggressive, attacking any ferret with which they were placed. Pairings of 2 intact male strangers did result in a fight every time. However, subjectively, such fights did not appear to be more intense than fights between an intact male and an intact female. In addition, none of the 5 pairs consisting of an intact male and a neutered female fought, indicating that intact males were not indiscriminately aggressive.

Females were not, in general, less aggressive than males in the present study. In fact, all 7 pairs consisting of 2 neutered females fought. However, neutered females

were not indiscriminately aggressive, as pairs consisting of a neutered female and intact male did not fight.

To our knowledge, aggression in neutered ferrets has not been studied previously. However, on the basis of findings in other species, we predicted that neutered animals would be less aggressive than intact animals. The data, however, indicated that pairs of neutered males were no less likely to fight than were pairs of intact males.

A survey¹² of behavior problems in dogs found that sexually intact males had the highest frequency of aggression problems with other dogs and that neutered females had the second highest frequency. Thus, 1 approach to decreasing aggression problems in groups of dogs might be to neuter the males and leave the females intact. However, this approach would not be appropriate with ferrets, as female ferrets are induced ovulators, and a female ferret will remain in heat for 3 to 9 months if not mated.⁸ During this time, female ferrets eat and sleep less, lose their hair, and become quite sick. Breeders typically house intact females with a vasectomized male or administer hormones (human chorionic gonadotropin or proligestone⁸) to induce ovulation if they are not going to be bred. Most male and female ferrets sold by pet stores have been descended and neutered.

One drawback to the present study was that analyses for the effects of sex and neutering status on aggression involved small numbers of pairings. Thus, some effects may have been present but undetected. In addition, other variables, such as age, should be considered in future studies.

In the second part of the present study, we attempted to determine whether increasing familiarity by housing ferrets next to each other would reduce fighting when ferrets were introduced. Unfortunately, this method did not seem to have any effect. In fact, owners reported that some aggressive behavior occurred through the wire mesh separating ferrets in the treatment group. In some monkey species, gradual introductions may actually increase aggression between strangers, as conflict resolution is not possible.¹⁸ While 2 weeks may not have been a sufficient time for familiarity to develop, we do not believe that a longer period would have had a different effect, particularly given the aggressive displays that occurred during the experimental period.

Because only animals that fought during the first part of the study were used in the second part, it may be that these animals were inherently more aggressive. It also seems likely, however, that only owners with animals that are fighting would be seeking alternative introduction methods.

Other methods of introduction have been tried in other species and may be effective in ferrets. For example, 2 groups of cage mates may be introduced at once. While this did not result in fewer aggressive encounters than individual introductions in rhesus monkeys (*Macaca mulatta*),¹⁹ it may be more effective with ferrets. Other methods of introduction focus on the characteristics of the introduction area. Increasing the number of hiding spaces in the introduction area has had mixed results in reducing aggression in several monkey species.¹⁹ The familiarity of each animal with the introduction area has been found to affect aggression in many species, including European rabbits.²⁰ In a model of

assessment strategy,²¹ most species of animals were found to use perceived size as a factor in deciding whether to escalate aggression during an encounter. Future studies could investigate the relationships between weight, differences in weight between opponents, and aggression.

In summary, results of the present study indicate that unfamiliar ferrets are more likely to engage in aggressive behavior than are familiar animals. The best advice for owners, then, would be to buy or adopt ferrets in established pairs, not singly, if multiple ferrets are desired. Mixed pairings of a male and a female would be the least likely to result in aggression when a new neutered pet ferret is introduced. However, all introductions should be monitored carefully to break up fights that could result in injury.

References

1. McKay J. *The ferret and ferreting handbook*. Marlborough, UK: The Crowood Press, 1989;11–110.
2. Wellstead G. *Ferrets and ferreting*. London: TFH Publications Inc Ltd, 1982;20–121.
3. Willis LS, Barrow MV. The ferret (*Mustela putorius furo* L) as a laboratory animal. *Lab Anim Sci* 1971;21:712–716.
4. Poole TB. Aspects of aggressive behaviour in polecats. *Z Tierpsychol* 1967;24:351–369.
5. Poole TB. The aggressive behaviour of individual male polecats (*Mustela putorius*, *M furo* and hybrids) towards familiar and unfamiliar opponents. *J Zool Soc Lond* 1973;170:395–414.
6. Poole TB. An analysis of social play in polecats (Mustelidae) with comments on the form and evolutionary history of the open mouth play face. *Anim Behav* 1978;26:36–49.
7. Marler P. On animal aggression: the roles of strangeness and familiarity. *Am Psychol* 1976;31:239–246.
8. Lloyd M. *Ferrets: health, husbandry, and diseases*. Boston: Blackwell Science, 1999;14–77.
9. Poole TB. Detailed analysis of fighting in polecats (Mustelidae) using ciné film. *J Zool Soc Lond* 1974;173:369–393.
10. Moody KD, Bowman TA, Lang CM. Laboratory management of the ferret for biomedical research. *Lab Anim Sci* 1985;35:272–279.
11. Beaver BV. Clinical classification of canine aggression. *Appl Anim Ethol* 1983;10:35–43.
12. Wright JC, Nesselroete MS. Classification of behavior problems in dogs: distributions of age, breed, sex and reproductive status. *Appl Anim Behav Sci* 1987;19:169–178.
13. Jensen P, Yngvesson J. Aggression between unacquainted pigs—sequential assessment and effects of familiarity and weight. *Appl Anim Behav Sci* 1998;58:49–61.
14. Thompson KV, Roberts M, Rall WF. Factors affecting pair compatibility in captive kangaroo rats, *Dipodomys heermanni*. *Zoo Biol* 1995;14:317–330.
15. Connor JL, Lynds PG. Mouse aggression and the intruder-familiarity effect: evidence for multiple-factor determination. *J Comp Physiol Psychol* 1977;91:270–280.
16. Hillyer EV, Quesenberry KE. *Ferrets, rabbits, and rodents: clinical medicine and surgery*. Philadelphia: WB Saunders Co, 1977; 91–98.
17. Agresti A, Finlay B. *Statistical methods for the social sciences*. 3rd ed. Upper Saddle River, NJ: Prentice-Hall Inc, 1997;222–226.
18. Bernstein IS. Social housing of monkeys and apes: group formations. *Lab Anim Sci* 1991;41:329–333.
19. Fairbanks LA, McGuire MT, Kerber W. Effects of group size, composition, introduction technique and cage apparatus on aggression during group formation in rhesus monkeys. *Psychol Rep* 1978; 42:327–333.
20. Mykytowycz R, Hesterman ER. An experimental study of aggression in captive European rabbits, *Oryctolagus cuniculus*. *Behaviour* 1975;52:104–123.
21. Parker GA. Assessment strategy and evolution of fighting behavior. *J Theor Biol* 1974;47:223–243.