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)

A ggression 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 Increasingly popular as pets in the United States and gen-

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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 descented males, 19 neutered and descented females, 8 intact (ie, not neutered or descented) 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. 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 × 2 × 3 × 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. 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 χ² tests were used to determine whether fights were significantly more frequent for some pairings than for others (eg, pairings of strangers vs cage mates). 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. On 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
than were pairs consisting of 2 intact males (3 fights with 3 pairs). However, pairs consisting of an intact male and intact female did not fight during 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 information 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

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

<table>
<thead>
<tr>
<th>Factor</th>
<th>Neutering status</th>
<th>Male-female</th>
<th>Male-male</th>
<th>Female-female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strangers—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>spring</td>
<td>Neutered-neutered</td>
<td>5/8</td>
<td>8/11</td>
<td>7/8</td>
</tr>
<tr>
<td></td>
<td>Neutered-intact</td>
<td>4/7</td>
<td>2/8</td>
<td>1/3</td>
</tr>
<tr>
<td></td>
<td>Intact-intact</td>
<td>3/3</td>
<td>3/5</td>
<td>0/0</td>
</tr>
<tr>
<td>Strangers—</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>winter</td>
<td>Neutered-neutered</td>
<td>1/6</td>
<td>4/8</td>
<td>4/4</td>
</tr>
<tr>
<td></td>
<td>Neutered-intact</td>
<td>3/5</td>
<td>1/3</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>Intact-intact</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>Cage mates—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>spring</td>
<td>Neutered-neutered</td>
<td>0/5</td>
<td>0/9</td>
<td>0/3</td>
</tr>
<tr>
<td></td>
<td>Neutered-intact</td>
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<td>0/3</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>Intact-intact</td>
<td>0/1</td>
<td>0/0</td>
<td>0/0</td>
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<tr>
<td>Cage mates—</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>Intact-intact</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
</tbody>
</table>

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.

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

<table>
<thead>
<tr>
<th>Neutering status</th>
<th>Male-male</th>
<th>Male-female</th>
<th>Female-female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutered-neutered</td>
<td>5/9</td>
<td>9/13</td>
<td>7/7</td>
</tr>
<tr>
<td>Neutered-intact</td>
<td>4/7</td>
<td>2/8</td>
<td>1/3</td>
</tr>
<tr>
<td>Intact-intact</td>
<td>3/3</td>
<td>3/5</td>
<td>0/0</td>
</tr>
</tbody>
</table>

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.
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 survey 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 ovolators, and a female ferret will remain in heat for 3 to 9 months if not mated. 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 proligestone) to induce ovulation if they are not going to be bred. Most male and female ferrets sold by pet stores have been desecnted 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. 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), 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. The familiarity of each animal with the introduction area has been found to affect aggression in many species, including European rabbits. In a model of assessment strategy, 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
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;26:40–49.