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Article *in* Journal of the American Veterinary Medical Association · March 2007

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Human-directed aggression in miniature pet pigs

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Objectives—To determine whether associations exist between human-directed aggression and sex, neutering status, age of weaning, the presence of other pet pigs, or the presence of environmental enrichment objects in miniature pet pigs.

Design—Internet survey.

Study Population—Responses from 222 owners of miniature pet pigs.

Procedures—Pet pig owners were requested to complete a 48-item multiple-choice and short-answer Internet survey for each pig that they presently owned.

Results—Among 222 surveys that met enrollment criteria, human-directed aggression that occurred on at least 1 occasion was reported in 64% (n = 142) and aggression that occurred once or more per month was reported in 31% (69). No significant differences were found in the prevalence of human-directed aggression among castrated males, sexually intact females, and spayed females. Ages of weaning and neutering and the presence of objects intended to serve as environmental enrichment were not associated with frequency of aggression. A significant inverse association was detected between presence of other pigs in the same household and human-directed aggression, such that 21% (20/95) of pigs that lived with at least 1 conspecific were aggressive on a frequent basis, compared with 39% (49/126) of pigs that lived with no conspecific. A similar inverse association was evident regarding aggression that occurred on at least 1 occasion.

Conclusions and Clinical Relevance—Results suggested that human-directed aggression is a common problem in miniature pet pigs. The presence of a conspecific can be expected to reduce the likelihood of human-directed aggression. (*J Am Vet Med Assoc* 2007;230:385–389)

Vietnamese potbellied miniature pigs were introduced to the United States in the early 1980s and were promoted as a household pet by emphasis on their small size, clean habits, and reputed intelligence. Initially, the population was small, reflecting a high purchase price. As their numbers increased, their price declined so that now they are inexpensive and easily acquired. The number of miniature pet pigs presently living in the United States is unknown. The prevalence of breed associations and pet pig information sites on the Internet suggests that they are still popular, and companion animal veterinarians are occasionally consulted about medical care and husbandry problems. Behavior problems, especially those dealing with aggression toward the owners, are another area in which companion animal veterinarians may be consulted. Pet pigs are relinquished to rescue groups for a variety of reasons, including the pig grew larger than expected; zoning restrictions; and behavior problems, especially aggression towards humans.^{1,2} Although much research has been conducted on intraspecies aggression in commercial swine, no research has been reported on the prevalence or determinants of aggression directed towards humans, to our knowledge. This is not surprising because prior to the introduction of potbellied pigs, swine in the United States rarely lived in people's homes or in direct contact with humans. Be-

cause swine social behavior differs from that of other domesticated animals, it is not feasible to extrapolate from what is known about human-directed aggression in dogs, cats, and horses and apply it to swine. Pigs frequently have aggressive behaviors towards other pigs in the form of threatening head gestures, pushing, shoving, snapping, and biting.^{3,4} Pigs are born with fully erupted deciduous canine teeth used to aggressively compete with littermates for access to productive teats of the sow.⁵⁻⁸ Mixing of unfamiliar pigs invariably involves aggressive behavior, and although this decreases within 24 hours as the pigs establish a social hierarchy,⁸ threats still occur between dominant and subordinate pigs.⁹

To collect data on human-directed aggression, in-home observations or personal interviews of owners of pet pigs were not feasible, and it was decided that an Internet survey that used strict inclusion criteria would be the most appropriate method of collecting data from a large number of owners of pet pigs. Internet surveys have been used to collect data for research on several topics of veterinary medical interest.¹⁰⁻¹² Internet methodology can provide access to samples and computerized processing of data that far exceeds that possible by more traditional techniques. In a recent review, the preconceptions that have been raised about limitations of Internet surveys were examined and the authors concluded that the data and findings provided by Internet methods are, at least, as good in quality as data and findings provided by traditional methods.¹³

The main disadvantage of Internet-collected data about the behavior of companion animals is that one

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is relying on observations of the animal owners. This is a problem in companion animal behavior research regardless of whether one is dealing with clinical interviews with pet owners, telephone interviews, or Internet methodology. Internet studies are known to involve participants who are self-selected for the topic of interest. Because we were interested in responses from pet pig owners who were particularly interested in pig behavior and motivated enough to return an Internet survey, this self-selection was considered an advantage. However, interest in aggressive behavior was disguised, and no mention was made of enrollment criteria, so as to not influence responses.

Given that human-directed aggression is both a public health issue and a reason for relinquishment of pet pigs, this study was undertaken to determine associations between sex, neutering status, age of weaning, presence of conspecifics (other pet pigs), or environmental enrichment and human-directed aggression in miniature pet pigs.

Materials and Methods

Recruitment—A 48-question Internet survey that included check-off or scroll-down choices as well as short-answer questions was initially pilot tested among pig owners, revised, and then posted to an Internet survey site.¹⁴ The survey and instructions for accessing it were advertised in the newsletter of the North American Potbellied Pig Association and on several Internet sites pertaining to potbellied pig care and training. Once the site was accessed, owners of pet pigs were invited to complete the survey. Surveys were accepted for each pig in a household.

Survey design—The survey included questions about the pet pig's age, sex, age of acquisition, age of weaning, age of neutering, and where it was acquired. Included were questions about the pig's housing, use of toys or other objects in the form of environmental enrichment, and presence of other pet pigs in the same household. Additional questions were asked about whether or not the pig had ever charged, snapped at, or bitten a person; if an answer to these questions was yes, a question followed pertaining to the frequency of those aggressive behaviors. To distinguish pigs with apparent ongoing aggressive behavior from those that had aggression on just 1 or a few occasions, pigs with an aggressive encounter with a person on 1 or more occasions/mo were referred to as having frequent aggression. Thus, the data included pigs with a history of at least 1 instance of aggression (also referred to as any aggression) and a subset with frequent aggression. The study was closed after the survey was posted for 60 days.

Relatively strict criteria were applied to obtain a group of respondents that were as uniform as possible and to ensure that respondents were as knowledgeable about the early history of their pig as possible. Accordingly, exclusion criteria comprised those surveys in which the respondents were not the first owner of the pig, surveys on pigs in which the age of weaning was not known, surveys that were incomplete, surveys in which the respondent was not the primary caretaker, and duplicate surveys.

Statistical analysis— χ^2 Tests were used with the 2-tailed level of significance set at $P < 0.05$ to test for significant associations between aggression and household or husbandry variables such as sex of pig, age of weaning, and presence of enrichment toys.¹⁵

Results

Surveys reporting on 725 pigs were returned, of which 226 met the inclusion criteria. Most of the surveys that were excluded were provided by people who were not the first owners of the pig for which they were responding. In addition to the pigs that were excluded according to the a priori exclusion criteria, there were only 4 sexually intact males represented, so they were also excluded. Of the remaining 222 pigs, 45% (99/222) were neutered males, 21% (47/222) were sexually intact females, and 34% (76/222) were spayed females. Of the 175 pigs that had been neutered, 86% (151/175) had the procedure performed prior to 6 months of age. Of all 222 pigs, 43% (95/222) had been weaned prior to 6 weeks of age. Forty-three percent (96/222) lived in households with other pigs, and the remainder represented the only pig in the household, although other species may have been present. All data analyzed on aggressive behavior were analyzed on a per-pig basis, not on a per-household basis.

Owners of 64% (142/222) of pigs reported that their pigs had snapped at, charged, or bitten a person at least once; 31% (69/222) reported frequent aggression (≥ 1 occasion/mo). Most pigs for which aggression was reported had the first appearance of the behavior prior to 3 years of age (108/142). Examination of sex, age of weaning, and age of neutering with regard to the occurrence of aggression on 1 or more occasions, as well as the subcategory of frequent aggression, revealed no significant associations (Table 1).

Owners of 95% (211/222) of the pigs reported providing some form of environmental enrichment, including food-dispensing devices, blankets, stuffed animals, cardboard boxes, or straw (all referred to as toys). Of these pigs, 76% (160/211) were provided with multiple toys. No association with aggressiveness could be attributed to this type of enrichment (Table 1).

The only variable that was significantly associated with aggression (inversely) was the presence of another pig in the household (Table 1). Without respect to sex or neutering status, 75% (95/126) of pigs in single-pig households were reported to be aggressive on 1 or more occasions and 39% (49/126) were reported to have frequent aggression. In contrast, 49% (47/96) of pigs in multipig households were reported to be aggressive on 1 or more occasion and 21% (20/96) were reported to have frequent aggression. There was a significant difference between single-pig and multipig households with respect to aggression on 1 or more occasions ($P < 0.001$) and frequent aggression ($P = 0.01$). When considered by sex and neutering status, castrated male and sexually intact female pigs from multipig households consistently engaged in less aggression than those from single-pig households, although this difference was not significant (Figure 1). Among neutered females, pigs from multipig households had significantly less aggression on 1 or more occasions ($P = 0.01$) and frequent aggression ($P = 0.01$).

Table 1—Distribution (No. [%]) of miniature pet pigs (n = 222) in which human-directed aggressive acts were reported, expressed as any level of aggression (\geq episode), infrequent aggression ($<$ 1 episode/mo), or frequent aggression (\geq 1 episode/mo).

Variable	No. of pigs	Occurrence of aggression		
		Any level	Infrequent	Frequent
Sex				
Male, neutered	99	63 (64)	28 (28)	35 (35)
Female, sexually intact	47	26 (55)	15 (32)	11 (23)
Female, spayed	76	53 (70)	30 (39)	23 (30)
Age of weaning				
$<$ 6 wk	95	63 (66)	28 (29)	35 (37)
\geq 6 wk	127	79 (62)	45 (35)	34 (27)
Enrichment toys				
None	11	5 (45)	3 (27)	2 (18)
1	51	18 (35)	2 (04)	16 (31)
$>$ 1	160	57 (36)	6 (04)	51 (39)
Household status				
Single pig	126	95 (75)	46 (36)	49 (39)
Multiple pigs	96	47 (49)	27 (28)	20 (21)

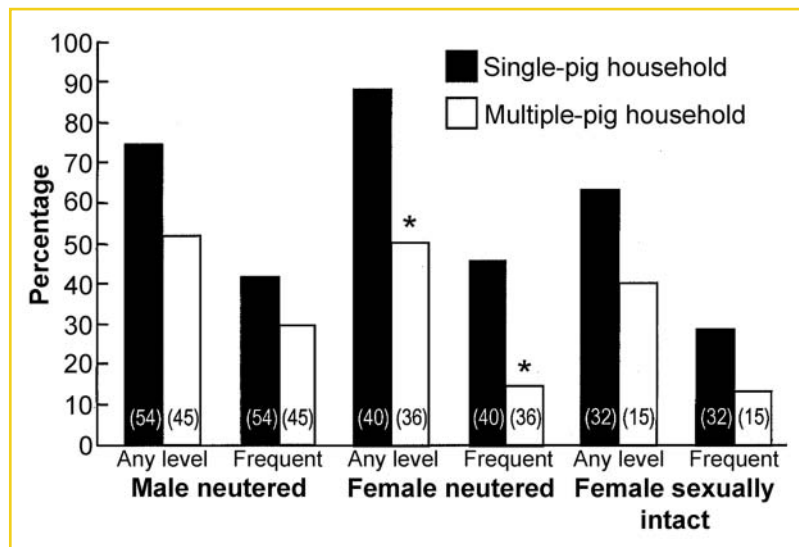


Figure 1—Distribution (%) of sexual status of miniature pet pigs (n = 222) in which human-directed aggressive acts were reported as any level of aggression (\geq 1 episode) or frequent aggression (\geq 1 episode/mo) in single-pig and multiple-pig households. Values in parentheses indicate numbers of pigs in each category. *Significant ($P \leq 0.05$) difference from single-pig households.

Discussion

The sample size of 226 surveys was a much larger sample than would have been possible to obtain via in-home visits with pet pig owners or even via telephone interviews. Given that Internet surveys yield data that may be as reliable as that obtained via traditional methods such as interviews,¹³ these data presumably reflect the experience people have with their pet pigs as well as the general demographic data about pet pigs residing in homes.

The study was limited to pigs that were in the original home because one of the a priori goals was to determine associations between the pigs' early months of life and future aggression. Most of the excluded surveys were provided by people who were not the first owners of the pig for which they were responding. Unfortunately, it is extremely common for people to

acquire pet pigs and then decide that they cannot keep them. These pigs are then rehomed. Current owners of these pigs could not answer what were believed to be extremely important questions regarding the early months of the pet pig's life and the development of any aggression, such as the age of weaning, age of neutering, and age of the first incidences of aggression. Although results indicated no evidence of aggression being associated with early weaning, this information was important because early weaning has long been suggested as a possible cause for aggression in pet pigs.

Although less popular than in the past, pigs are still kept as pets, as indicated by several hundred responses to our survey. Castrated male pigs and female pigs (both sexually intact and neutered) were approximately evenly represented. A fairly high number of pigs (n = 142) were reported to have human-directed aggression

on at least 1 occasion, with 69 reported to have frequent aggression. Thus, according to this Internet survey of > 200 pet pigs, human-directed aggression may be a serious problem for a high percentage of pet pig owners.

The only factor significantly associated with aggression was that pigs from households with a single pig were more likely to have had an aggressive incident. Although it is typical for people to want to adopt just 1 pig, at least initially, this may lead to conditions that encourage aggressiveness. This is consistent with the observation that social isolation appears to be an important cause of chronic stress and may lead to aggression in pigs.^{16,17} However, it may also be related to the fact that owners of multiple pigs may be more knowledgeable about pig behavior and therefore better at training, socializing, and interacting appropriately with their pet pigs.

A finding, perhaps somewhat surprising, was that neutered males were no more likely to be aggressive than sexually intact or neutered females. Although inconsistent with results of a study¹⁸ on dogs and cats, this was consistent with results of several studies^{8,9,19,20} on commercial swine that did not indicate that barrows are more aggressive than gilts. Under natural conditions, the intensity of female aggression towards males increases with maturity and sows may dominate boars until the boars leave the group, remaining solitary except during breeding season.³

Pigs weaned prior to 6 weeks did not have more aggression than those weaned at later ages. A variety of health and behavior problems that occur when piglets are weaned prior to 6 weeks of age have been reported in studies of commercial swine. Early weaned pigs may have low weight gain and high aggression and may be more likely to develop belly-nosing behavior, massaging, and nibbling on others.²¹⁻²³ Early weaned pigs may also spend less time interacting with their environment and pen mates, which suggests that they are more apathetic and stressed than pigs weaned at a later age.²³ However, no study has determined that the increased aggression of early-weaned pigs persists into adulthood.

The fact that age of neutering did not appear to be associated with subsequent aggression has some implications for the husbandry of pet pigs. Because male pigs develop an unpleasant odor and dangerous tusks as they mature, most potbellied pig breeders either sell male pigs already neutered or recommend that the procedure be performed soon after purchase. It has not been common for breeders to recommend that female pigs be routinely spayed until recently. Because it has become commonly known that sexually intact female pet pigs are likely to engage in destructive nesting behavior, soil the house with urine, and become overly restless and vocal, breeders are likely to recommend routine spaying of female pigs prior to 6 months of age. Although the optimal time for spaying has not been determined, results of this study suggest that the age of gonadectomy should not be expected to influence the likelihood of aggression.

Although studies^{24,25} in commercial swine reveal that barren environments result in chronic stress and increased levels of aggression, the present study failed

to uncover any effects of enrichment toys, such as food-dispensing devices, blankets, stuffed animals, or cardboard boxes. This finding is not a valid test of the potential role of enrichment versus a barren environment because the home environment, with or without toys, undoubtedly represents considerable enrichment, compared with the environments provided for most commercial swine.

Some degree of aggressive behavior in pet pigs is common irrespective of sex and neutering status, age of weaning, or use of enrichment toys. Pigs are inherently more aggressive than other domesticated species. Throughout their lives, pigs use aggressive physical contact whenever they meet an unfamiliar individual. They appear to rely less on subtle gestures, postures, or eye contact than do other species.^{4,8,9} Aggression directed towards humans may be a manifestation of intra-specific aggression.

The clinical implications of this study suggest that, as opposed to most other domestic species in which males are often more aggressive than females, veterinarians can recommend equally the acquisition of male or female pigs for pets because there seems to be no difference in the development of aggression between sexes if the pig is neutered. In addition, companion animal veterinarians should be prepared to educate prospective pet pig owners about the challenges inherent in keeping a pet pig and suggest that keeping 2 pigs as pets may have an advantage over keeping a single pig. More research is needed to determine the best way to control or treat human-directed aggression in pet pigs, and there are other resources available to the practicing veterinarian who wishes to help clients with pet pig behavior problems.²⁶

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