

Cat sex differences in major allergen production (Fel d 1)

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Cats and dogs are one of the most common sources of allergic disease caused by domestic animals, with cat allergy being the most common form. Symptoms of cat allergy include rhinoconjunctivitis and asthma. It is a widespread clinical problem. In the United States it is estimated that more than 2% of the population are allergic to cats. Of these, more than a third have a cat at home. Several recent reports have confirmed the strong association between asthma and sensitization to domestic animals. The main cat allergen (Fel d 1) is a heterodimine glycoprotein with two 17 kd subunits, each of which is composed of two chains.

Fel d 1 is mainly produced by the skin, especially the sebaceous glands, and deposited on the fur. Recent studies from our group have shown that castration of male cats significantly decreases the production of Fel d 1 and that injections of testosterone can reverse this phenomenon.¹ However, it is not known if the decrease can be maintained over a prolonged period of time and if males produce more Fel d 1 allergen than females.

The aim of this study was to determine, in a large group of domestic cats, whether Fel d 1 levels on cat fur are significantly different between males and females and whether there is a long-term effect of castration on the production of Fel d 1 in both sexes.

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J Allergy Clin Immunol 1998;101:282-4.

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0091-6749/98 \$5.00 + 0 1/54/86356

METHODS

Seventy-four healthy cats of European origin were included in the study during visits to the veterinary clinic. Thirty-three males (age, 5.46 ± 5.21 years) and 41 females (age, 5.94 ± 5.55 years) were compared. Among males and females, 19 (age, 8.39 ± 5.00 years) and 25 (age, 9.13 ± 4.88 years), respectively, had been castrated at the age of 8 to 12 months.

Shaving was done after general anesthesia was obtained. Fur was shaved as close to the skin as possible at the same site (the axillary area) on each cat. The fur was stored at -20°C . All the fur samples were analyzed at the same time.

One hundred milligrams of fur from each sample was weighed and placed in 2 ml of 5% borate-buffered saline buffer (pH 8.2). After incubating for 24 hours, samples were centrifuged at 3000 rpm for 20 minutes. Fel d 1 assay was done in the supernatants with monoclonal antibodies provided by Indoor biotechnologies and the ELISA method as previously described.¹ The comparison of the geometric mean values was done by analysis of variance.

To verify the results in case of small sample size, a nonpara-

TABLE I. Fel d 1 levels in fur extracts (geometric means and ranges)

	Males (U/gm)	Females (U/gm)
Intact	5.46 (1.7-23.8) (n = 14)	1.53 (1.0-6.6) (n = 16)
Castrated/ Sprayed	1.28 (0.7-7.2) (n = 19)	1.93 (0.6-13.2) (n = 25)

Castrated males versus intact males, $p < 0.0001$; spayed females versus intact females, $p = \text{NS}$; castrated males versus intact females, $p = \text{NS}$; spayed females versus intact males, $p = 0.002$; castrated males versus spayed females, $p = \text{NS}$; all males versus intact females, $p < 0.0001$.

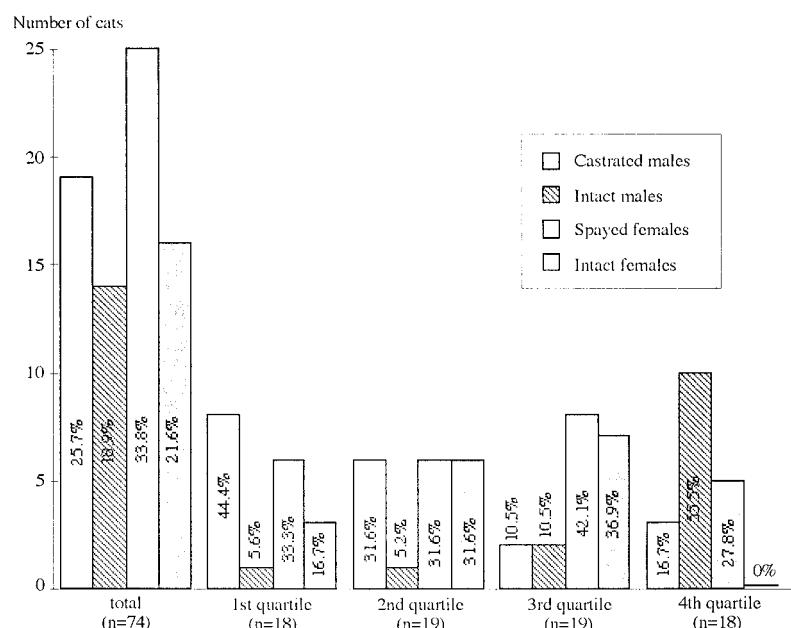


FIG. 1. Partitions of cats by quartiles.

metric analysis (i.e., Mann-Whitney U test) was used to compare the values obtained.

The 74 cats were divided into four equal groups according to the level of Fel d 1 expressed in units per gram of fur (low group ($n = 18$): 0.09 to 0.63 U/gm; medium-low group ($n = 19$): 0.65 to 1.73 U/gm; medium-high group ($n = 19$): 1.85 to 4.05 U/gm; and high group ($n = 18$): 4.42 to 15.14 U/gm).

RESULTS

Table I shows the results of Fel d 1 concentration expressed in units of Fel d 1 per gram of fur in castrated and intact cats of both sexes. When we compared the geometric means of Fel d 1, the Fel d 1 measurements were significantly higher for intact males (5.46 U/gm [range, 1.7 to 23.8 U/gm]) than for castrated males (1.28 U/gm [range, 0.7 to 7.2 U/gm]; $p < 0.0001$), spayed females (1.93 U/gm [range, 0.6 to 13.2 U/gm]; $p = 0.002$), and nonspayed females (1.53 U/gm [range, 1.0 to 6.6 U/gm]; $p < 0.0001$). There were no significant difference between females, spayed or intact, and castrated males.

Fig. 1 shows the total group of cats divided into four quartiles. The fourth quartile, with the highest Fel d 1 concentrations (4.72 to 15.14 U/gm), shows the presence of 10 of the 14 intact males (71.43%) and 0 of the 16 intact females. In contrast, the first quartile, with the lowest concentrations of Fel d 1 (0.09 to 0.63 U/gm), has only 1 intact male. Fourteen of the 19 castrated males were distributed in the first two quartiles. The female cats, spayed or intact, were distributed in all the quartiles, with intact females being absent in the fourth quartile.

DISCUSSION

Brown et al.² studied the distribution of “cat allergen 1” in 22 different tissues obtained from a single male and a single female cat and found a higher allergenic content in fur from the female cat. However, Wentz et al.³ studied a larger group of four male and eight female cats. Mean total allergenic content in shedding collected with an air sampler was five times higher in male cats, and the Fel d 1 level was 60% higher. In a recent study⁴ done on five intact males and five intact females, we found that the Fel d 1 level was higher on the skin and fur of male cats. The present study confirms that the Fel d 1 concentration on the cat’s fur is higher in males than in females. The Fel d 1 production is under hormonal control in males and decreases after castration. In contrast, castration in females does not affect Fel d 1 production. For the female cats, spayed or not, the Fel d 1 production is the same as that found for castrated males.

Miller et al.⁵ stressed the point that female or castrated male pets may produce sufficient allergen to provoke symptoms when sensitized patients live with them. We do not know whether the symptoms would be worse in the presence of noncastrated male cats. Nevertheless, even if castrated males produce less Fel d 1 allergen than intact animals, mattresses, carpeted floor, soft toys, and blankets can act as reservoirs for Fel d 1, which can reach sufficient levels to initiate clinical symptoms.

Currently, no definitive conclusions can be drawn about castration of domestic cats in the management of cat allergy, and more work is needed for the understand-

ing of the production, control, and biologic role of Fel d 1.

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