

In: **Recent Advances in Companion Animal Behavior Problems**, Houpt K.A. (Ed.)
Publisher: International Veterinary Information Service (www.ivis.org)

Feline Urine Spraying (11 Oct 2000)

K. Seksel

Seaforth Veterinary Hospital, Seaforth, New South Wales, Australia.

Introduction

In most western countries, apart from Australia, it appears that pet cat numbers are growing [1]. The choice of the cat as a pet may be a reflection of increased urban consolidation. Consequently, many cats are living in closer contact with their owners and concurrently are also being exposed to increased conspecific contact. These factors may be associated with some of the behaviour problems that owners are experiencing with their cats.

As cats are considered to be clean in their elimination habits, owners find it unacceptable, as well as very distressing, when their cat urinates on the carpet or sprays on the furniture. While inappropriate elimination is not generally considered to be a dangerous problem like aggression, it can be life threatening to the cat, as it is socially unacceptable to owners and hence leads to euthanasia. It is important to remember, however, that what the owner may consider inappropriate may not be so for the cat. Elimination problems are the most common behavioural problem reported in cats accounting for between 40 - 75% of behavioural problems [2-4]. Blackshaw (1992) reported that 33% of the behavioural referrals to The University of Queensland Companion Animal Practice involved inappropriate elimination. Of these 32% involved urine spraying, 32% involved urination, 10% involved defaecation while 19% involved both urination and defaecation [5].

Both males and females, neutered and entire present with elimination problems and they have been reported in all breeds and across all age groups. It is estimated that 10% of castrated males and 5% of spayed females spray [6]. Spraying appears to be more common in multi-cat households with a 100% chance of at least one cat spraying in a household with more than 10 cats [7,8]. Male cats that live with a female cat are more likely to spray than those living with another male cat [7].

Elimination problems are generally very responsive to treatment provided the underlying cause is determined and can be addressed. Spayed females and cats living in multicat households appear to be the most refractory to treatment [7,9].

Diagnosis is based on accurate history taking and observation. Careful questioning of the owner is important to differentiate urine marking from inappropriate urination. A complete physical examination, full blood screen, urinalysis and possibly even radiography is necessary prior to treatment. Medical problems need to be dealt with prior to or at least concurrently with any behavioural therapy that is instigated. The treatment of a nonspecific sign such as inappropriate elimination is not acceptable and will ultimately lead to treatment failures.

Owners and veterinarians should be aware that there are no quick fixes and no magic pills for behavioural disorders. In many cases behaviour problems take time to develop and it will therefore take time to modify the behaviour. Once behavioural modification is achieved it needs to be maintained by the lifelong commitment from the owner and continued support from the veterinarian. Many behaviour problems are not "cured", but can be managed or controlled. An appropriate medical analogy is diabetes mellitus which can be controlled with medication combined with diet and lifestyle modification, but is not considered cured.

Behaviour modifying drugs are increasingly used in the treatment of companion animal behaviour problems [2,8,10,11]. However, most drugs in common use are not registered for this purpose in animals. Additionally, most information on behaviour modifying drugs is derived from human literature and cannot necessarily be extrapolated to include cats.

The use of drugs to treat behaviour problems without a concurrent behaviour modification program cannot be condoned as many behaviour problems can be managed by behaviour modification alone. Drugs should

always be considered as an adjunct to behaviour modification therapy not a replacement. Additionally, treatment may appear to fail when behaviour modifying medications are prescribed incorrectly. For example selection of an inappropriate medication, insufficient time allowed for effective treatment, no concurrent behaviour modification program or an incorrect diagnosis can all contribute to an apparent lack of success.

Client Consent and Compliance

Before prescribing any medication basic pharmacodynamic as well as pharmacokinetic knowledge of the drug is needed. As most medications used in veterinary behavioural therapy are not registered for use in animals the rationale for drug use and potential side effects should be clearly explained and informed consent should be obtained from the owner.

Client compliance is important as behaviour modifying drugs may take up to six to eight weeks to reach therapeutic blood concentrations. Owners should be made aware that it will take time to see the desired behavioural changes.

Drug therapy should always be gradually withdrawn. An attempt to wean off medication may be made once the desired result is achieved and maintained for a period of 2 - 3 months. However, there are some patients that will require life long medication and this should be made clear to the owner at the outset of therapy. Owners should be warned that the behaviour could recur, especially if the initiating cause is still present and the cat may again require medication.

Establishing a Diagnosis

To achieve a successful outcome it is important to differentiate between urine spraying or marking and inappropriate urination. In multicat households it is also important to determine which cat(s) are spraying. Urine marking or spraying is an innate behavioural pattern and there are many underlying causes. Spraying may not respond to environmental manipulation alone so medication may be necessary.

| | Spraying | Inappropriate urination |
|--------------------------|--------------------------------|--------------------------------|
| Position | stand, squat | usually squat |
| Amount of urine | small quantity | large quantity |
| Location of urine | usually vertical surfaces | horizontal surfaces |
| Scratching after | rarely | often |
| Reason | territorial, sexual, agonistic | elimination of waste |

Predisposing Factors

One or several of the following should be considered as contributing to the possible underlying causes.

1) Disease

Many medical conditions ranging from those associated with the urogenital system such as renal calculi, renal failure and cystitis, viral diseases such as FIV and FELV to impacted anal glands are among the many factors that have been associated with spraying. [2,12,13]

2) Hormonal

Entire cats spray more than neutered cats and male cats spray more than female cats. [2,6]

3) Territorial, agonistic behaviours

or any highly arousing circumstances have been thought to precipitate spraying behaviour. [2,6,12]

4) Environmental stimuli

The sight, sound and/or smell of another cat, within the household as well as without, have been implicated as factors predisposing to spraying. [2,12,14]

5) Anxiety Related Problems

Cats very dependent on their owners may exhibit separation anxiety. Thus, they are thought more likely to spray. Cats that have experienced many changes in their routine such as moving house, the introduction of a new spouse, new baby or new cat in the household are considered to be more likely to spray. [2,4,12,14]

Treatment Options

1) Disease

Treat any concurrent disease.

2) Environmental Manipulation

Although this is always advocated and theoretically should work well, it can often be difficult to achieve in practice. It is rarely practical, or even possible, to remove the cat next door, the new baby, or the new partner, or entirely prevent other anxiety provoking circumstances such as moving house. However, the following has been suggested [4,8]:

- Decrease the number of cats within the household.
- Decrease access to windows and doors to decrease the sight, sound and smell stimuli.
- Change the amount of time spent indoors vs outdoors.
- Make the sprayed areas less attractive to the cat by making them feeding or play areas.

3) Surgery

- Neuter the cat. Spraying is a marking behaviour and in 87% of male cats, castration alone is reported to solve the problem. [6]
- Olfactory tractotomy is reported to be effective in about 50% of refractory cases in males and in most females [6,15,16]. The surgical transection of the olfactory tract causes anosmia (loss of sense of smell) which is thought to be an important factor in spraying. This technique is rarely used these days.
- Bilateral ischiocavernosus myectomy where the muscle is cut at the pelvis and penis has been reported to be successful initially in 7 of 10 of male cats resistant to other therapy. It is thought that it may be the inability to erect and extend the penis or the inability to direct the urine to a specific area that leads to the resolution of the problem. This technique is currently not in common usage nor recommended [17].
- Experimentally induced lesions in the medial preoptic hypothalamic nuclei reportedly stopped spraying but the surgery is difficult and needs specialized equipment and the side effects such as hyperphagia and an increased "startle" response are unacceptable. This is not a realistic option for treatment [12].

4) Pharmacological Treatments

These treatments are aimed at reducing the anxiety level of the cat. In conjunction with the behavioural modification and environmental manipulation techniques there is usually a reduction in spraying to the owner's satisfaction. A number of medications have been prescribed with varying rates of success reported.

Benzodiazepines

These anxiolytics work by enhancing the action of GABA (gamma-aminobutyric acid), an inhibitory neurotransmitter [19].

| Anxiolytics | Dose | Comments |
|-------------|--|---|
| Diazepam | 0.2 - 0.4 mg/kg po sid-bid [2,8,17] | Reported that 57% of males and 50% of females responded to therapy [9] |
| Alprazolam | 0.125 - 0.25 mg/cat po bid. Or 0.1mg/kg tid or as needed [2,8] | |
| Oxazepam | 0.2 - 0.5 mg/kg po sid-bid [2,8] | As it has non active metabolites and is biotransformed by conjugation not oxidation, it is preferred in patients with liver disease [2] |
| Clonazepam | 0.016 mg/kg sid-qid [8] | |

In cats diazepam has been reported to be effective in reducing spraying in 75% of cases, with 43% stopping entirely [18]. It was reported to be more effective in males and in multicat households. However, in another study a recidivism rate of 91% was reported when medication was withdrawn [9].

When drug therapy is no longer required gradual withdrawal from therapy is recommended by reducing the daily dose by 10 - 25% per week depending on the rate of initial response. At therapeutic levels there should be a calming effect but little or no effect on motor or mental functions. Cats may stagger for the first 3 - 4 days but this should then spontaneously resolve. If it does not then the dose should be decreased or withdrawn as the potential for cumulative effects and toxicity due to the intermediate metabolite may occur [2,12]. Affects depth perception so cats may fall off objects or miss objects when they jump until they learn to compensate.

Side Effects

- increased appetite
- transient ataxia (should resolve in 3 - 4 days)
- paradoxical hyperactivity in some cats
- increased affection / friendliness
- increased vocalization in cats
- drug tolerance
- interference with memory (amnesia with intravenous dosing in people [19])
- disinhibition of suppressed behaviour eg aggression
- interference with learning conditioned responses
- diazepam may increase predation in cats (possibly due to its effects on the lateral hypothalamus [2]) or decrease predation (possibly due to its inhibitory effect on acetylcholine [8,20]).
- fatal idiopathic hepatic necrosis in cats-rare

Contraindications and Precautions

- liver or kidney failure
- use with caution in aggressive animals

Tricyclic Antidepressants

Tricyclic antidepressants (TCAs) are closely related to phenothiazines and block amine (serotonin, norepinephrine, dopamine) re-uptake. They also have antianxiety effects [19].

| Tricyclic antidepressants | Dose | Comments |
|---------------------------|----------------------------------|---|
| Amitriptyline | 0.5 - 1.0 mg/kg po sid [2,8] | Can be difficult to halve and hard to administer as it tastes bitter. |
| Clomipramine | 0.25 - 0.5 mg/kg po sid [2,8,21] | Tablet size and registration varies across the globe. |
| Nortriptyline | 0.5 - 1.0 mg/kg po sid-bid [2] | |

All antidepressants take about two weeks to produce any beneficial effects (in humans [19]) even though their pharmacological effects are produced immediately suggesting that secondary adaptive changes are important, that is the receptor sites may be modified. Up to two to three weeks or even longer are required to reach therapeutic blood levels. Success rate is reported to be up to 75% in reducing spraying [18,21-23].

Side Effects

The most predictable side effects are short term lethargy or sedation, mild and intermittent vomiting which is usually transient and increases or decreases in appetite. Anticholinergic side-effects may be encountered, often but not always at high dose rates. Other side effects include:

- sedation (antihistamine effect)
- dry mouth (antimuscarinic effect)
- constipation (antimuscarinic effect)
- urinary retention
- tachycardia

- cardiac arrhythmia
- syncope-postural hypertension (* blocking effect)
- ataxia
- decreased tear production
- mydriasis
- dilated pupils
- disturbances of accommodation

These signs usually disappear with decrease or withdrawal of medication. High doses have been associated with increased liver enzymes and hepatotoxicity and convulsions.

A few cases of urine retention have been reported in cats after treatment with clomipramine and this effect is likely to be the result of decreased bladder muscle tone, which decreases intraluminal pressure and allows collapse of the trigone area, obstructing urinary outflow. Hence animals treated with clomipramine should be monitored daily for signs of urine retention or constipation. If urine retention or constipation occurs, stop administration until normal urination or defaecation is observed then reinstate at a lower dose.

Contraindications

- cardiac dysrhythmia
- urinary retention
- interact with hypertensive drugs
- narrow angle glaucoma
- seizures
- within 2 weeks of administration of a monoamine oxidase inhibitor

These drugs may also interfere with thyroid medications and should be used with caution in these patients.

Selective Serotonin Re-Uptake Inhibitors

Anecdotally, their success rate is around 80% for urine spraying and other anxiety related disorders. Cost generally prohibits SSRIs as being the drug of first choice in companion animal therapy however, they are a valuable option.

| Selective Serotonin Re-Uptake Inhibitors | Dose | Comments |
|--|--|--|
| Fluoxetine | 0.5 mg/kg po sid-bid [2,8] | |
| Fluvoxamine | 0.25 mg/kg po bid up to 1 - 2 mg/kg bid (Dehasse J., 2000, personal communication) | It reduces the clearance of diazepam, its active metabolite nordiazepam and alprazolam, so concurrent use should be avoided [19] |
| Paroxetine [8] | 1.0 mg/kg po sid | |

Side Effects

- Nausea, gastrointestinal disturbances, lethargy, weight loss, tremors, agitation have been reported in people.
- Increased liver enzymes
- Constipation has been seen in cats

Contraindications

- Concomitant MAOI therapy to avoid serotonin syndrome. At least 2 weeks should be allowed as a washout period between SSRI and MAOI therapy, 5 weeks for fluoxetine.
- Allergy to SSRIs

Buspirone

This is a novel antianxiety agent that is not chemically or pharmacologically related to the benzodiazepines [19].

| Buspirone | Dose | Comments |
|-----------|-----------------------------|--|
| Buspirone | 0.5 - 1 mg/kg sid-tid [2,8] | 55 % of cats stop or markedly reduce spraying [24] |

Reported not to work as well in single cat households [2]. Care with cases that involve aggression [2,12]. Advantages include lack of sedation and high safety margin however the frequency of dosing and cost can present problems.

Side Effects

- Bradycardia/tachycardia
- Nervousness
- Gastrointestinal disturbances
- Stereotypic behaviours
- Restlessness has been reported in people

Contraindications

- Allergic reactions
- Caution is needed as treatment can lead to an increase in aggression as it may decrease the inhibitory effects of fear

Progestins

Should only be given to neutered animals and used with caution. Owners should be informed of potential side effects. They are generally considered the treatment of last choice.

| Progestins | Dose | Comments |
|-----------------------------|--|---|
| Megestrol Acetate | 2.5 - 5 mg po once a day for 3 - 7 days then reduce to minimum effective dose [25] | It has been reported that 48 - 80% of males and 13 - 20% of females respond to progestin therapy [25] |
| Medroxyprogesterone Acetate | 10 (females) - 20 (males) mg/kg sc - maximum 3 injections per year [8,25] | |

Side Effects

- increased appetite
- weight gain
- transient hyperglycaemia
- diabetes mellitus
- mammary gland hyperplasia and carcinomas
- bone marrow suppression
- adenocarcinoma
- pyometra
- adrenocortical suppression
- depression, lethargy

Contraindications

They should be avoided in intact females, breeding animals and in animals with diabetes mellitus. They are also contraindicated with concurrent corticosteroid use.

Comments

The use of progestins is generally outdated as better drugs are available that produce fewer side effects and have a greater success rate as they target the underlying cause.

Antihistamines

Cyproheptadine has been reported to be successful in some cases of spraying [26].

| Antihistamines | Dose |
|----------------|---|
| Cyproheptadine | 0.4 - 0.5 mg/kg po bid (2 - 4mg/cat bid-tid) [26] |

Pheromones

A new approach to dealing with urine marking is the use of pheromones. Feliway contains a synthetic analogue of the F3 fraction of feline facial pheromone along with a cat attractant (the alcoholic extract of the plant *Valeriana officinalis*). It is said to decrease anxiety and hence the cat should be calmer in its environment. It has the added benefit for owners in that it does not require that the cat be handled so is useful with fractious cats. As it also does not rely on the treatment of a specific cat it may be useful in multicat households [27].

| Pheromones | Dose | Comment |
|------------|--|--|
| Feliway | Spray daily for 30 days in areas the cat sprays or bunts | Claimed to be effective in up to 95% of cases [28] |

Side Effects

None reported.

Other Important Considerations

Punishment

The use of punishment in these cases is not recommended. It is not a reliable or effective way of changing behaviours. It often makes things worse by increasing the cat's anxiety and affects the relationship between the cat and the owner. The cat may also continue to spray but turn into a "sneaky sprayer", that is, wait until the owner is not present. [29]

Cleaning

Many products that are commonly used to disinfect the area the cat has soiled are ammonia or chlorine based. This may exacerbate the problem and inadvertently increase the chances of the cat spraying. Using an enzymatic cleaner, then rinsing the area first with copious amounts of water is generally more effective. Products such as Anti-Icky Poo have also been advocated as successful in eliminating odours [30]. Additionally, neutralisers such as Bac to Nature used after cleaning can be effective in removing the odour.

Multicat Households

One way of trying to determine which cat is spraying in a multicat household is to administer fluoresceine to each cat in turn. All cats should be tested as it is not unusual to for more than one cat to spray. Place five or six fluoresceine strips (or liquid) in a gelatin capsule and give once daily until the cat(s) is identified. An ultraviolet light will make it easier for the owner to detect in urine. A washout period of 24 - 48 hours between each cat has been recommended [6].

References

1. Baldock C. Australia's declining household cat population - forecasts, impacts and reasons, a report of an analysis. Aus Vet Animal Health Services Pty Ltd 1999; Petcare Information and Advisory Service.
2. Overall KL. Feline elimination disorders. Clinical behavioral medicine for small animals. St Louis: Mosby 1997; 160-194. - Available from amazon.com -
3. Borchelt PL, Voith VL. Elimination behavior problems in cats. Comp Cont Ed Pract Vet 1986; 8:197-205.
4. Borchelt PL, Voith VL. Elimination behaviour problems in cats. In: Voith VL, Borchelt PL, eds. Readings in Companion Animal Behavior. Trenton: Veterinary Learning Systems, 1996; 179-190. - Available from amazon.com -
5. Blackshaw J K. Feline elimination problems. Anthrozoös 1992; 5:52-56.
6. Hart BL, Hart LA. Urine spraying and urine marking in cats. In: Canine and Feline Behavioral Therapy. Philadelphia: Lea and Febiger, 1985; 134-145. - Available from amazon.com -
7. Hart BL, Cooper LL. Factors relating to urine spraying and fighting in prepubertally gonadectomised cats. J Am Vet Med Assoc 1984; 184:1255-1258. - PubMed -
8. Landsberg G, Hunthausen W, Ackerman L. Elimination behaviour problems. In: Handbook of Behaviour Problems of the Dog and Cat. Oxford: Butterworth Heinemann, 1997; 79-95. - Available from amazon.com -
9. Cooper L, Hart BL. Comparison of diazepam with progestin with effectiveness in suppression of urine spraying behavior in cats. J Am Vet Med Assoc 1992; 200:797-801. - PubMed -
10. Simpson BS, Simpson DM. Behavioral pharmacotherapy. In: Voith VL, Borchelt PL, eds. Readings in Companion Animal Behaviour. Trenton: Veterinary Learning Systems, 1996; 100-115. - Available from amazon.com -
11. Eckstein RA, Hart BL. Pharmacologic approaches to urine-marking in cats. In: Dodman NH, Shuster L. eds. Psychopharmacology of Animal Behavior Disorders. Abingdon: Blackwell Science, 1998; 264-276. - Available from amazon.com -
12. Cooper LL. Feline inappropriate elimination. In: Houpt KA, ed. Progress in Companion Animal Behavior. Vet Clin North Am Small, Anim Pract. 1997; 27:569-600. - PubMed -
13. Frank D, Erb HN, Houpt KA. Urine spraying in cats: presence of concurrent disease and effects of a pheromone treatment. J Appl Anim Beh Sci 1998; 61(3):263-272. - PubMed -
14. Horwitz D. Feline elimination problems: behavioural and environmental factors associated with elimination problem behaviour. In: Mills DS, Heath LJ, eds. Proceedings First Int Conf Vet Behav Med. Universities Federation for Animal Welfare, Potters Bar 1997; 120-126.
15. Hart BL. Olfactory trachotomy for control of objectionable urine spraying and urine marking in cats. J Am Vet Med Assoc 1981; 179(3):231-234.
16. Eger C. The treatment of urine spraying in cats by olfactory trachotomy; a safe and humane option. Aust Vet Pract 1998; 18(4):147-154.
17. Komtebedde J, Hauptman J. Bilateral ischiocavernosus myectomy for chronic urine spraying in castrated male cats. Vet Surg 1990; 19(4):293-296. - PubMed -
18. Marder AR. Psychotropic drugs and behavioural therapy. In: Marder AR, Voith VL, eds. Advances in Companion Animal Behavior. Vet Clin North Am 1991; 21(2):329-342.

19. Rang HP, Dale, MM, Ritter JM, Gardner P. Drugs used in affective disorders. In: Rang HP, Dale MM, Ritter JM, Gardner P. eds. Pharmacology. New York: Churchill Livingstone 1995; 576-596. - Available from amazon.com -
20. Dodman NH. Pharmacologic treatment of aggression in veterinary patients. In: Dodman NH, Shuster L. eds. Psychopharmacology of Animal Behavior Disorders. Abingdon: Blackwell Science 1998; 41-63. - Available from amazon.com -
21. Seksel K, Lindeman MJ. The use of clomipramine in the treatment of anxiety-related and obsessive-compulsive disorders in cats. Aust Vet J 1998; 76:5: 317-321. - PubMed -
22. Houpt KA. Communication. In: Houpt K A ed. Domestic Animal Behavior for Veterinarians and Animal Scientists. Ames Iowa: Iowa State Press 1998; 3-32. - Available from amazon.com -
23. Dehasse J. Feline urine spraying. Appl Anim Behav Sc 1997; 52:365-371.
24. Hart BL, Eckstein RA, Powell KL, Dodman NH. Effectiveness of buspirone on urine spraying and inappropriate urination in cats. J Am Vet Med Assoc 1993; 203:254-258. - PubMed -
25. Overall KL. Behavioral pharmacology. In: Overall KL. Clinical behavioral medicine for small animals. St Louis: Mosby, 1997; 293-322. - Available from amazon.com -
26. Schwartz S. Use of cyproheptadine to control urine spraying in a castrated male domestic cat. J Am Vet Med Assoc 1999; 215(4): 501-502. - PubMed -
27. Heath S. An ethologically sound treatment for the spraying cat? Vet Times 1996; 26(2): 21.
28. White JC, Mills DS. Efficacy of synthetic feline facial pheromone (F3) analogue (Feliway) for the treatment of chronic non-sexual urine spraying by the domestic cat. In: Mills DS, Heath LJ, eds. In: Proceedings First Int Conf Vet Behav Med. Universities Federation for Animal Welfare, Potters Bar, 1997; 242.
29. Seksel K. Feline elimination problems. In: Proceedings Animal Behaviour. University of Sydney, Post Graduate Committee in Veterinary Science, Sydney, 1993:147-153.
30. Melese-d'Hospital P. Eliminating urine odors in the home. In: Voith VL, Borchelt PL, eds. Readings in Companion Animal Behaviour. Trenton: Veterinary Learning Systems, 1996; 191-197. - Available from amazon.com -

All rights reserved. This document is available on-line at www.ivis.org. Document No. A0801.1000 .

