From Brain to Bladder: is it Medical, Behavioural, or Both?

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When faced with a behaviour that an owner considers inappropriate in one of our patients, we often ask the wrong question: Is the behaviour medical or behavioural in origin? After all, what is behaviour other than the result of the integrated activity of all of the animal's organ systems as they respond to their environment?

The more appropriate question is:

Which professional is best positioned to help this patient?

Should the patient be referred to an internal medicine specialist, a veterinary behaviourist, or a dog trainer? Answering this question requires a structured approach to ensure that our patients are directed to the most appropriate care.

Is the Inappropriate Behaviour Normal or Abnormal?

Inappropriate behaviour may be entirely normal if the animal has learned that the behaviour is rewarding. For example, a cat opens the garbage can and finds fish inside. The behaviour is inappropriate, but the cat's behaviour itself is normal.

If the behaviour is abnormal, an underlying medical problem should be considered, whether gastrointestinal, dermatological, neurological, or anxiety-related. In such cases, an appropriate medical diagnosis and treatment may be necessary.

It is obviously difficult to establish a clear boundary between normal and abnormal behaviour, as behavioural variation exists along a continuum. We can therefore use several criteria to help us assess behaviour, including **context, behavioural sequence, severity/intensity, and frequency**.

If an animal responds differently from 95–99% of other animals of the same species under the same conditions, the behaviour may be considered abnormal. However, behaviour must always be interpreted within its context.

A dog that bites someone who is hitting it is not necessarily exhibiting abnormal behaviour. A dog that chases its tail once is not abnormal. If the dog spends four hours a day chasing its tail, however, this will appear abnormal.

Context

- Context helps determine whether the behaviour is justified under the circumstances.
- For example, a dog that is being attacked and bites in response has a justification, unlike a dog that attacks a person who was not interacting with it in an environment where the dog had sufficient space to escape.
- All antecedents—both immediate and more remote—of the undesirable behaviour should be identified.
- This allows us to identify potential triggers for aggressive behaviour.
- We should also identify the consequences of the behaviour. Whether a behaviour increases or decreases over time may be related to its consequences.
- For example, if a cat is afraid of a person and the person leaves after the cat bites them, the cat is likely to repeat the behaviour in the future because, from the cat's perspective, the consequence was positive or desirable.

Behavioural Sequence

A "normal" behavioural sequence generally includes:

- **Precursor/warning signals** (initiation)
- **Pause**
- **Aggression** (action)
- **Recovery** (refractory period)

An abnormal animal may exhibit an altered behavioural sequence. For example, the initiation phase may be absent (e.g., the animal does not growl before biting), and the refractory period may be abnormally prolonged (e.g., a dog remains under the bed for six hours after a thunderstorm has ended).

Whether evaluating aggression or behaviours compatible with anxiety (e.g., urine marking), careful description of the behavioural sequence is essential for identifying abnormalities that may warrant referral to a veterinary behaviourist.

Severity/Intensity

The more intense a behaviour is (e.g., uncontrolled, repeated biting resulting in injury or daily urine marking), the greater the likelihood that the animal may have a behavioural disorder, such as anxiety.

Frequency

As with any other clinical sign, it is important to document when the inappropriate behaviour first occurred and how it has evolved over time.

Frequency is an important component of the diagnosis of behavioural disorders. The more frequently an “abnormal” behaviour occurs, the greater the potential impact on the animal’s quality of life and, in cases of aggression, on the quality of life of its victims.

If the behaviour is determined to be normal and the dog is therefore not considered “ill,” behavioural therapy combined with environmental modifications may be recommended. If this approach fails, the possibility of an underlying medical problem should be reassessed.

If the behaviour is suspected to be abnormal, it is important to determine whether the dog is primarily experiencing anxiety or another neurotransmitter imbalance (in which case referral to a veterinary behaviourist is appropriate) or whether another type of problem is present.

Recognizing Signs of Anxiety

If a group of freely moving dogs is observed in a large, quiet consultation room for approximately 15 minutes, it is often easy to identify a small proportion of dogs that behave very differently from the others.

The following signs are compatible with anxiety:

- **Increased vigilance:** drooping eyelids and apparent fatigue after some time, yet the dog remains awake even when the consultation lasts two hours.
- **Increased reactivity:** barking at the slightest noise, stiffening in response to the slightest movement, and startling easily.
- **Motor activity:** decreased (e.g., remaining hidden under a chair) or increased (e.g., pacing back and forth around the room).
- **Exploratory behaviour:** decreased or exhibiting a star-shaped pattern of movement.
- **Progression of these observations during the consultation:** sensitization, with increasing intensity over time.

When increased vigilance and reactivity are present both during the consultation and at home, together with abnormal behaviour, referral to a veterinary behaviourist should be considered. Treatment of anxiety or another underlying neurochemical imbalance may be essential to enable successful behavioural therapy by allowing the animal to reach a more appropriate emotional state.

Conditions Commonly Mistaken for Behavioural Problems in Dogs

Whenever a new behavioural problem develops in a mature animal, an underlying medical condition should be suspected.

Gastrointestinal Disorders

Presenting complaints:

- Aggression
- Surface licking
- Ingestion of non-food objects
- Body licking, sometimes resulting in skin lesions
- Fly-biting/fly-catching behaviour
- House-soiling

Signs to look for:

- Surface licking
- Yawning
- Lip licking
- Lip smacking
- Belching
- Borborygmi
- Flatulence
- Swallowing outside of mealtimes
- Air swallowing
- Neck extended
- Fly-biting/fly-catching behaviour
- Any abnormal sign that consistently occurs or worsens after meals (gastroesophageal reflux should be considered)
- Dermatological abnormalities (e.g., food allergies)
- Vomiting
- Diarrhea

Dermatological Disorders

Presenting complaint:

- Compulsive licking, with or without skin lesions

Signs to look for:

- Perform a complete dermatological evaluation, as this may be the only sign of an underlying problem.

Neurological Disorders

Presenting complaints:

- “Panic attacks” that are actually focal seizures
- Excessive pruritus
- Any type of unusual episode (e.g., focal seizures)
- Tail chasing
- Aggression

Signs to look for:

- Seizure activity
- Cervical, thoracic, lumbar, or other pain
- Any subtle signs compatible with meningitis, particularly in cases of aggression
- Refer to a neurologist when in doubt
- Obtain videos of the episodes.

Various Causes of Pain

Presenting complaints:

- Aggression
- Irritability/impatience

Signs to look for:

- All signs of osteoarthritis
- Any other signs of pain appropriate to the underlying cause

Other Situations

Certain medications can cause behavioural changes, which may occasionally become clinically significant. Particular attention should be paid to dogs receiving **corticosteroids or Apoquel**.

Conditions Commonly Mistaken for Behavioural Problems in Cats

Urinary Disorders

Presenting complaints:

- House-soiling
- Excessive vocalization
- Aggression

Signs to look for:

- Assess body language during urination (videos can be useful).
- Look for signs of osteoarthritis, which may be subtle in cats.
- Blood in the urine
- Perform a complete medical work-up in all cases of house-soiling.

Gastrointestinal Disorders

Presenting complaints:

- Aggression
- Ingestion of non-food objects
- Body licking, sometimes resulting in skin lesions
- Chewing on plastic, fabric, or other materials (e.g., hair)
- House-soiling

Signs to look for:

- Lip licking
- Lip smacking
- Borborygmi
- Flatulence
- Swallowing outside of mealtimes
- Air swallowing
- Any abnormal sign that consistently occurs or worsens after meals (gastroesophageal reflux should be considered)
- Dermatological abnormalities (e.g., food allergies)
- Vomiting
- Diarrhea

Dermatological Disorders

Presenting complaint:

- Compulsive licking, with or without skin lesions

Signs to look for:

- Perform a complete dermatological evaluation, as this may be the only sign of an underlying problem.
- This problem has been well documented to have a medical origin in more than 70% of cats.

Neurological Disorders

Presenting complaints:

- "Panic attacks" that are actually focal seizures
- Excessive pruritus
- Any type of unusual episode (e.g., focal seizures)
- Tail chasing
- **Feline hyperesthesia syndrome**
- Aggression

Signs to look for:

- Seizure activity
- Cervical, thoracic, lumbar, or other pain
- Any subtle signs compatible with neurological pain, particularly in cases of aggression
- Refer to a neurologist when in doubt
- Obtain videos of the episodes.

Various Causes of Pain

Presenting complaints:

- Aggression
- **Petting-induced aggression**
- Feline hyperesthesia syndrome
- House-soiling

Signs to look for:

- All signs of osteoarthritis, which may be subtle in cats
- Any other signs of pain appropriate to the underlying cause
- Signs of neoplasia in older cats

Other Situations

Certain medications can cause behavioural changes, which may occasionally become clinically significant. Particular attention should be paid to dogs receiving **corticosteroids or oclacitinib** (to our knowledge, this has only been reported in dogs to date).

Take-Home Message

There is a significant overlap in behavioral signs of anxiety, pain, endocrine diseases, and even cognitive dysfunction.

Abnormal behaviors seen in young patients may be more likely related to behavioral diseases (with the rare exceptions of congenital disease and juvenile neoplasia).

Behaviors suddenly occurring in middle-age to older animals may be more likely related to painful or other strictly medical conditions (with the exceptions of separation anxiety and noise phobia that can start around 5 years of age in dogs).

Obtaining a detailed medical and behavioral history is important to include all potential differential diagnoses.

Aggression can be secondary to a very large number of conditions, from anxiety to all painful conditions, endocrine diseases, congenital malformations, etc.

Behavioural modifications is essential for the successful treatment of anxiety, as medication alone will not modify the animal's behaviour in most cases.

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Mind the Meds: Psychopharmacology Without the Headache

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- To prescribe or not to prescribe psychotropic drugs in cats and dogs?
- How do psychotropic drugs work?
- How to choose the right molecule?
- What to expect from psychotropic drugs?
- How to choose the right dose?
- How to adjust the dose?
- How to know if it is working or not?

Key points

◊ Psychotropic drugs can be used ethically in small animal medicine if prescribed for the appropriate indications (ex. anxiety disorders, panic disorder, compulsive disorder, aggression secondary to anxiety, etc.).
◊ They will have no effect on behavioural problems caused by lack of training or underlying medical conditions (other than anxiety).
◊ They will also have no effect on behavioural problems linked to inappropriate environment or exercise levels.
◊ Psychotropic drugs should be prescribed only when a diagnosis of a neurotransmitter disorder/mental health problem is made, and always combined to a behavioural and environmental modification plan.
◊ Psychotropic drugs are meant to allow behavioural and environmental modifications to be implemented in animals whose anxiety/reactivity levels is currently too high to allow good communication/training.
◊ We can expect these drugs to place the patient in an emotional state compatible with learning.
◊ Most common antidepressants work by acting on pre- and post-synaptic serotonin receptors, and most of the time also on dopamine and norepinephrine transporters.
◊ Many also act on adrenergic and histaminic receptors, sigma-1 and muscarinic receptors and even nitrous oxide receptors.
◊ The induce a cascade of events leading to neurogenesis and synaptogenesis, basically building new neurons and new behaviours.
◊ A lot is still to discover on their mechanisms of action.
◊ Choice of a molecule is based on a thorough analysis of the problem behaviour and medical condition of each patient.

- ◊ Two molecules are approved for dogs in Canada: fluoxetine (Reconcile) and clomipramine (Clomicalm).
- ◊ Paroxetine is also often used when an SSRI is recommended but fluoxetine is poorly tolerated (especially GI effects).
- ◊ In cats, venlafaxine, a SNRI (serotonin and norepinephrine reuptake inhibitor) has been used successfully in cats with house soiling (promising for anxiety-related feline cystitis).
- ◊ Trazodone is another antidepressant drug very commonly used in veterinary medicine.
- ◊ Trazodone can be used either for situational anxiety (ex. veterinary visits, separation anxiety, etc.) or as an adjunct treatment to another antidepressant.
- ◊ Psychotropic drugs should always be started at a low dose and slowly increase to effect, to avoid side effects and overdosing (which increases anxiety!).
- ◊ Dose needs to be adjusted slowly every 4-6 weeks for most drugs based on every patient progress assessment.
- ◊ Doses for dogs: see table 1. Doses for cats: Fluoxetine and clomipramine 0.25-1 mg/kg PO q24h, venlafaxine 0.9 – 1.9 mg/kg PO q24h, gabapentin 25-100 mg per cat, alpha-casozepine 30 mg/kg PO q24h
- ◊ Additional side effects of antidepressants in cats: urinary retention.
- ◊ Side effects can be seen at the beginning of treatment, with potential increased reactivity in the first 3-5 days after each dose increase.
- ◊ Treatment usually last between 6 and 18 months, then patients can slowly be weaned while keeping the behaviour they have learned during treatment.
- ◊ Other drugs used in psychopharmacology includes benzodiazepines, gabapentin, clonidine, detomidine and dexmedetomidine.
- ◊ Benzodiazepines are very rarely used in behavioural medicine. Despite their very strong anxiolytic effects, they are associated with significant side effects such as memory impairment, disinhibited aggression, sedation, ataxia, increased appetite, dependance, liver toxicity, etc.
- ◊ Gabapentin is very commonly used as an adjunct drug in behavioural medicine.
- ◊ Gabapentin is a GABA analogue, binding with high affinity to the α2-delta subunit of voltage activated Ca2+ channels.
- ◊ A combination of trazodone (3-7 mg/kg PO) with gabapentin (20-30 mg/kg PO) can be used in very aggressive or reactive dogs before veterinary consultations. Each drug needs to be individually tested at home days before the visit to find the appropriate dose for each patient.
- ◊ Clonidine, detomidine and dexmedetomidine are an alpha-2 agonists, and can be used either for situational anxiety (ex. thunderstorm) or as an adjunct treatment to an antidepressant.

- ◊ Cannabinoids are often mentioned as an antianxiety treatment. There is currently no strong evidence of any clinical efficacy for their use in behavioural medicine in cats and dogs.
- ◊ Many natural products can also be used in behavioural medicine.

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Psychotropic drugs used in dog behavioural medicine

Molecule	Class	Mechanism of action	Indications	Starting dose	Maximum dose	Main side effects	Comments
Fluoxetine	SSRI	Acts mainly on SERT and 5HT2C	High reactivity, anxiety, hyperactivity, compulsive disorders	0.5 mg/kg q24h PO	2-3 mg/kg q24h PO	Decreased appetite, lethargy, increased anxiety	Tend to decrease appetite
Paroxetine	SSRI	Acts on SERT, M1 and NOS	High reactivity, anxiety, hyperactivity, compulsive disorders	0.5 mg/kg q24h PO	2-3 mg/kg q12h PO	Lethargy	Less GI effects than fluoxetine Some dogs do better on twice a day dosing
Trazodone	SARI	Acts on SERT, 5HT2A, 5HT2C, α1 and H1	Adjunct to SSRI for the same indications – Situational drug	2 mg/kg if combined or 3 mg/kg PO if alone	8-10 mg/kg PO q8h	Sedation, increased anxiety, agitation	Short acting Sedation may be a wanted effect.
Clomipramine	Tricyclic	Acts on SERT, NET, h1, α1 and M1	Anxiety, compulsive disorders, fear	1 mg/kg q12h PO	2 mg/kg q12h PO	Sedation, vomiting	Tend to increase appetite, some dog livers do not tolerate clomipramine (reversible effects).
Gabapentin	δ ligand	Acts on α2-delta subunit of VSCC	Adjunct to SSRI for the same indications – Situational drug	10 mg/kg q12h PO	30 mg/kg q8h PO	Sedation, increased appetite, lethargy	A few dogs react poorly to gabapentin (increased agitation and appetite).
Clonidine	α2 agonist	Acts on α2 and imidazoline	Adjunct to SSRI for the same indications – Situational drug	0.01 mg/kg q8-12h PO	0.05 mg/kg q8-12h PO	Sedation	Very short acting
Dexmedetomidine	α2 agonist	Acts on α2 and imidazoline	Situational drug – Firework phobia	125 $\mu g/m^2$ TM	NA	Sedation / cardiovascular depression	Sileo™ gel approved in the USA
Detomidine	α2 agonist	Acts on α2 and imidazoline	Situational drug	0.35 mg/m^2 TM	0.5 mg/m^2 TM	Sedation / cardiovascular depression	Can use the equine Dormosedan™

SSRI: Selective serotonin reuptake inhibitors / SARI: serotonin antagonist and reuptake inhibitor / SERT: serotonin transporter / 5HT: serotonin / M: muscarinic / NOS: nitrous oxide synthase / NET: norepinephrine transporter / H: histamine / VSCC: voltage sensitive calcium channels

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Psychotropic drugs used in cat behavioural medicine

Molecule	Class	Action mechanism	Starting dose	Maximum suggested dose	Potential side effects	Notes
Fluoxetine	SSRI	Mainly acts on SERT and 5HT2C	0.25 mg/kg q24h PO	2 mg/kg q24h PO	Decreased appetite, lethargy, increased anxiety	
Clomipramine	Tricyclic	Mainly acts on SERT, NET, H1, α1 and M1	0.5 mg/kg q24h PO	2 mg/kg q24h PO	Sedation, vomiting	Can increase appetite
Venlafaxine	SNRI	Inhibits the reuptake of both serotonin (SERT) and norepinephrine (NET)	0.5 mg/kg q24h PO	2 mg/kg q24h PO	Sedation, constipation, decreased appetite	Effexor™ granules are easy to hide in treats which increases compliance.
Gabapentin	δ2 ligand	Mainly acts on voltage-gated calcium channels α2-delta subunit	5 mg/kg q8-12h PO	30 mg/kg q8-12h PO	Sedation, increased appetite, lethargy, ataxia	High individual variability. Acts in 2 to 4h.
Trazodone	SARI	Inhibits SERT and blocks some key post synaptic serotonin receptors	5 mg/kg q8-12h PO	10 mg/kg q8-12h PO	Sedation	Highly variable results in cats.

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Molecule	Class	Mechanism of action	Starting dose	Maximum dose	Main side effects	Comments
Trazodone	SARI	Acts on SERT, 5HT2A, 5HT2C, α1 and H1	2 mg/kg if combined 3 mg/kg PO if alone	8-12 mg/kg q8h PO	Sedation, increased anxiety, agitation	Short acting Sedation may be a wanted effect.
Gabapentin	δ ligand	Acts on α2-delta subunit of VSCC	10 mg/kg q12h PO	30 mg/kg q8h PO	Sedation, increased appetite, lethargy	A few dogs react poorly to gabapentin (increased agitation and appetite).
Clonidine	α2 agonist	Acts on α2 and imidazoline	0.01 mg/kg q8-12h PO	0.05 mg/kg q8-12h PO	Sedation	Very short acting
Dexmedetomidine	α2 agonist	Acts on α2 and imidazoline	4.65 µg/kg 125 µg/m^2 TM	250 µg/m^2 TM	Sedation / hypersalivation /vomiting	Sileo™ gel
Detomidine	α2 agonist	Acts on α2 and imidazoline	0.35 mg/m^2 TM	0.5 mg/m^2 TM	Sedation / cardiovascular depression	Can use the equine Dormosedan™
Tasipidimine	α2 agonist	Acts on α2 and imidazoline	30 µg/kg PO	15 µg/kg PO	Sedation / cardiovascular depression	Tessie™ Start at the higher dose and decrease if not tolerated
Imepitoin	Imidazolone	GABA-A receptor agonists	30 mg/kg q12h PO	?	Ataxia / sedation	Pexion™
Alprazolam	Benzodiazepine	Positive allosteric modulation of GABA-A receptors	0.02 mg/kg q12h PO	0.1 mg/kg q12h PO	Ataxia / paradoxical excitation	Possible behavioural disinhibition
Lorazepam	Benzodiazepine	Positive allosteric modulation of GABA-A receptors	0.02 mg/kg q12h PO	0.5 mg/kg q12h PO	Ataxia / paradoxical excitation	Possible behavioural disinhibition / No active metaoblite – safer in geriatricand hepatic patients

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Pre-visit drug dosages

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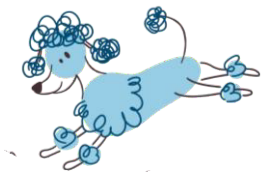

Molecule	Class	Mechanism of action	Starting dose	Maximum dose	Main side effects	Comments
Trazodone	SARI	Acts on SERT, 5HT2A, 5HT2C, α1 and H1	2 mg/kg if combined 3 mg/kg PO if alone	8-12 mg/kg q8h PO	Sedation, increased anxiety, agitation	Short acting Sedation may be a wanted effect.
Gabapentin	δ ligand	Acts on α2-delta subunit of VSCC	10 mg/kg q12h PO	30 mg/kg q8h PO	Sedation, increased appetite, lethargy	A few dogs react poorly to gabapentin (increased agitation and appetite).
Clonidine	α2 agonist	Acts on α2 and imidazoline	0.01 mg/kg q8-12h PO	0.05 mg/kg q8-12h PO	Sedation	Very short acting
Dexmedetomidine	α2 agonist	Acts on α2 and imidazoline	4.65 µg/kg 125 µg/m^2 TM	250 µg/m^2 TM	Sedation / hypersalivation /vomiting	Sileo™ gel
Detomidine	α2 agonist	Acts on α2 and imidazoline	0.35 mg/m^2 TM	0.5 mg/m^2 TM	Sedation / cardiovascular depression	Can use the equine Dormosedan™
Tasipidimine	α2 agonist	Acts on α2 and imidazoline	30 µg/kg PO	15 µg/kg PO	Sedation / cardiovascular depression	Tessie™ Start at the higher dose and decrease if not tolerated
Imepitoin	Imidazolone	GABA-A receptor agonists	30 mg/kg q12h PO	?	Ataxia / sedation	Pexion™
Alprazolam	Benzodiazepine	Positive allosteric modulation of GABA-A receptors	0.02 mg/kg q12h PO	0.1 mg/kg q12h PO	Ataxia / paradoxical excitation	Possible behavioural disinhibition
Lorazepam	Benzodiazepine	Positive allosteric modulation of GABA-A receptors	0.02 mg/kg q12h PO	0.5 mg/kg q12h PO	Ataxia / paradoxical excitation	Possible behavioural disinhibition / No active metaoblite – safer in geriatricand hepatic patients

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Pre-visit drug dosages

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Molecule	Class	Mechanism of action	Starting dose	Maximum dose	Main side effects	Comments
Trazodone	SARI	Acts on SERT, 5HT2A, 5HT2C, α1 and H1	50 mg per cat PO q8-12h	100 mg per cat PO q8-12h	Sedation, increased anxiety, 3rd eyelid protrusion, seizures	Give 1-2 hours before stress – Not as effective in cats.
Gabapentin	δ ligand	Acts on α2-delta subunit of VSCC	10 mg/kg q12h PO	30 mg/kg q8h PO	Sedation, increased appetite, lethargy	Reduce the dose by half in renal cats.
Pregabalin	δ ligand	Acts on α2-delta subunit of VSCC	4 mg/kg q12h PO	10 mg/kg q12h PO	Sedation, increased appetite, lethargy	Reduce the dose by half in renal cats.
Dexmedetomidine	α2 agonist	Acts on α2 and imidazoline	0.02 mg/kg TM	0.04 mg/kg TM	Sedation / hypersalivation /vomiting	Potential cardiovascular effects
Alprazolam	Benzodiazepine	Positive allosteric modulation of GABA-A receptors	0.02 mg/kg q12h PO	0.1 mg/kg q12h PO	Ataxia / paradoxical excitation	Possible behavioural disinhibition
Lorazepam	Benzodiazepine	Positive allosteric modulation of GABA-A receptors	0.02 mg/kg q12h PO	0.5 mg/kg q12h PO	Ataxia / paradoxical excitation	Possible behavioural disinhibition / No active metaoblite – safer in geriatricand hepatic patients

Pre-visit drug dosages for cats

Molecule	Class	Mechanism of action	Starting dose	Maximum dose	Main side effects	Comments
Trazodone	SARI	Acts on SERT, 5HT2A, 5HT2C, α1 and H1	50 mg per cat PO q8-12h	100 mg per cat PO q8-12h	Sedation, increased anxiety, 3rd eyelid protrusion, seizures	Give 1-2 hours before stress – Not as effective in cats.
Gabapentin	δ ligand	Acts on α2-delta subunit of VSCC	10 mg/kg q12h PO	30 mg/kg q8h PO	Sedation, increased appetite, lethargy	Reduce the dose by half in renal cats.
Pregabalin	δ ligand	Acts on α2-delta subunit of VSCC	4 mg/kg q12h PO	10 mg/kg q12h PO	Sedation, increased appetite, lethargy	Reduce the dose by half in renal cats.
Dexmedetomidine	α2 agonist	Acts on α2 and imidazoline	0.02 mg/kg TM	0.04 mg/kg TM	Sedation / hypersalivation /vomiting	Potential cardiovascular effects
Alprazolam	Benzodiazepine	Positive allosteric modulation of GABA-A receptors	0.02 mg/kg q12h PO	0.1 mg/kg q12h PO	Ataxia / paradoxical excitation	Possible behavioural disinhibition
Lorazepam	Benzodiazepine	Positive allosteric modulation of GABA-A receptors	0.02 mg/kg q12h PO	0.5 mg/kg q12h PO	Ataxia / paradoxical excitation	Possible behavioural disinhibition / No active metaoblite – safer in geriatricand hepatic patients

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Home Alone? The Full Story Behind Separation Anxiety in Cats and Dogs

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OVERVIEW OF THE ISSUE

Understanding the origin and pathophysiology of separation anxiety in dogs is very useful to help our patients and their often-distressed owners to better manage this disease. We will discuss the differential diagnoses of separation anxiety to refine our final diagnosis and avoid common errors. Treatment of separation anxiety involves behavior modification, environmental adjustments and in some cases, medication. We will discuss the latest updates on separation anxiety therapy.

OBJECTIVES OF THE PRESENTATION

- Understand better why dogs develop separation anxiety.
- Learn about the pathophysiology of separation anxiety.
- Learn how to efficiently diagnose separation anxiety.
- Discover the latest updates on the treatment of separation anxiety.

KEY ETIOLOGIC AND PATHOPHYSIOLOGIC POINTS

◊ Separation anxiety is when physical or behavioral signs of distress are presented by an animal in the absence of the owner or in the impossibility to access the owner (virtual absence).
◊ Though attachment/bonding brain pathways are involved in separation anxiety, it should not be confused or called hyperattachment.
◊ Evolutionary biology can help us understand why separation anxiety is likely to develop in domestic dogs, sharing 98.8% of their DNA with wild wolves.
◊ We can biologically expect any left alone puppy to display some separation anxiety behavioral signs.
◊ However, most dogs will rapidly adjust to being left alone and will learn to relax in this situation.
◊ A few percent of dogs will in the opposite show an increase of anxiety signs over time, when left alone.
◊ Cause is still unknown, but a genetic predisposition is likely.
◊ No environmental cause has yet been proven to cause separation anxiety in dogs. But many factors are suspected to trigger separation anxiety in genetically predisposed individuals:

early weaning, puppy mills or other understimulating early environment, no experience of being left alone before adulthood (pandemic situation).

- ◊ Separation anxiety is not caused neither by the owner's attachment to the dog, nor by the way they trained the dog.
- ◊ Interestingly, separation anxiety and panic disorder shared patterns of exaggerated emotional and respiratory response to CO2, reduced sensitivity to natural rewards and increased susceptibility to adverse events.

KEY CLINICAL DIAGNOSTIC POINTS

- ◊ Main signs of separation anxiety are vocalization, destruction, elimination, hypersalivation, anorexia, restlessness, in the absence of the any human in the environment.
- ◊ Separation anxiety can only be diagnosed by filming the dog.
- ◊ Clinical cases with various differential diagnoses will be presented.
- ◊ Differential diagnoses include: generalized anxiety, boredom, hyperactivity, noise phobia, medical conditions, iatrogenic, epilepsy, claustrophobia, cage aversion, etc.

KEY THERAPEUTIC POINTS

- ◊ Treatment includes medication and environmental modifications.
- ◊ Medication approved for separation anxiety in Canada includes:
  - Fluoxetine (Reconcile): start at 0.5 mg/kg PO q24h then slowly increase by 0.5 mg/kg every 2-4 weeks and up to 2.5-3 mg/kg PO q24h to effect.
  - OR clomipramine (Clomicalm): start at 1 mg/kg Po q12h for 2 weeks then increase to 2 mg/kg PO q12h for 4 weeks then reassess. Could go up to 3 mg/kg q12h if needed.
  - Remember that more is not always better with antidepressant drugs!
- ◊ Adjunct medication for more rapid effect and panic disorder:
  - Trazodone 2 to 8 mg/kg PO 1-2h before departure
  - OR/AND gabapentin 10-20 mg/kg PO 1-2h before departure
  - OR/AND clonidine 0.01-0.05 mg/kg PO 1h before departure (watch for cardiovascular side effects such as hypotension; does not last more than a few hours; deep sedation when dose is increased)
- ◊ Environmental modifications:
  - Start with shorter departures
  - Leave extraordinary treats and toys
  - Make the area comfortable, larger or smaller depending on the dog
  - Remove any environmental stressors
- ◊ Desensitization and counterconditioning to departures has not been proven efficient and may even worsen the clinical signs in some dogs.
- ◊ Film the dog to monitor response to treatment.

KEY PROGNOSTIC POINTS

- ◊ Prognosis is excellent in most cases.
- ◊ Owner education does not appear to prevent the occurrence of separation anxiety but may help early diagnosis and treatment.
- ◊ Look for documented comorbidities: noise phobia, thunderstorm phobia, may only develop around 5 years of age!
- ◊ Cats can also get separation anxiety. But in general cat anxiety increases with increased owner presence like during the pandemic.
- ◊ Separation anxiety sadly remains an important cause of relinquishment and euthanasia.
- ◊ The vast majority of cases can easily be managed.

SUMMARY INCLUDING 5 KEY "TAKE HOME" POINTS

1. Separation anxiety is a condition observed in multiple social species and involves exaggerated emotional and respiratory responses to CO2, as seen during panic attacks.
2. Separation anxiety is not caused by an hyperattachment to the owners or by a lack of education.
3. Main clinical signs include vocalization, destruction, elimination, hypersalivation, anorexia and restlessness in the absence of humans in the environment.
4. Separation anxiety diagnosis should include filming the dog in the absence of the owners to exclude other differentials.
5. Treatment involves environmental management and medication (SSRI or tricyclic agents, +/- adjunct drugs before departures, especially in case of panic attacks).

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The purr-fect storm: Stress, Environment, and Feline health

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RECOGNIZING FELINE STRESS: DECODING FELINE BODY LANGUAGE

Cats display a wide range of body language, including both readily apparent behaviours and much subtler signs. See the examples in the presentation (photographs and videos) for guidance on interpretation.

A cat's facial expression provides a great deal of information about its emotional and behavioural state.

Particular attention should be paid to:

- Overall head shape: from rounded to more triangular
- Degree of eye opening: from wide open to closed
- Direction of gaze: averted or fixed
- Pupil size: from mydriasis to miosis
- Ear position: from erect to flattened
- Whisker position: directed forward or flattened against the face
- Nostrils: flared during tachypnoea or less open
- Mouth: closed or open, with or without visible teeth

A cat's body posture also provides considerable information.
The following features should be noted in particular:

- Back posture: flat, rounded or arched downward
- Head position: elevated, lowered, etc.
- Tail position: elevated, lowered, tucked between the hindlimbs, etc.
- Presence of piloerection
- Rippling or rolling movements of the skin ("rolling skin")
- Body stiffness or relaxation

Other important signs include trembling, vocalization, the cat's manner of movement, sweating from the paw pads, shedding and grooming behaviour.

Urine marking and refusal of highly preferred treats may also be abnormal signs consistent with anxiety.

Assessment of these signs helps distinguish offensive from defensive aggression (see table on the following page).

Further information on feline body language is available from the following websites:

https://drsophiayin.com/product/body-language-of-feline-anxiety-poster-handouts/
http://www.dacvb.org/resources/position-statements/

Behaviour	OFFENSIVE AGGRESSION	DEFENSIVE AGGRESSION
Overall body	Stiff	Stiff
Ears	Erect	Flattened
Displays teeth	Rarely	May display all teeth
Eye contact	Fixed and direct	Intermittent
Pupils	Normal or dilated	Dilated
Back	Aligned in a straight line with the neck and head	Rounded
Tail	Vertical or horizontal; may move with abrupt, twitching motions	Low and held close to the body
Piloerection	Possible	Common
Overall posture	Neutral or elevated	Low
Body weight	Distributed over all four limbs, or seated	Shifted caudally
Hindlimbs	Extended	Flexed
Vocalizations	May growl	May growl and spit

CAT	Relaxed	Stressed
Posture	Hindquarters higher than the shoulders	Arched back; body held in a tight crouch
Mouth	Closed	Open; panting, spitting, growling or hissing
Pupils	Almond-shaped	Dilated and round
Ears	Forward	Flattened caudally or laterally
Tail	Vertical, slightly curved, with slow movements	Wrapped around the body or tucked between the hindlimbs; rapid movements

Simplified feline stress scale		
1 **Low stress**	**2** **Moderate stress**	**3** **Marked stress**
The cat displays no behavioural signs of stress, and rectal temperature is measured easily.	The cat displays some behavioural signs of stress. The cat may begin to display avoidance behaviour.	The cat displays marked behavioural signs of stress. Rectal temperature measurement requires more than one attempt and additional restraint.
• Lying in lateral or dorsal recumbency, or sitting • Abdomen may or may not be exposed • Slow or normal respiratory rate • Limbs extended or flexed • Tail extended, loosely curled, or held loosely in an elevated or lowered position • Slow blinking or normally open eyes • Normal pupil size • Ears directed slightly caudally or forward • Whiskers positioned laterally or slightly forward • No vocalization • Resting, calmly exploring or playing • Minimal restraint is required	• In sternal recumbency, curled up, sitting, standing or moving • Back level, or lower over the pelvic limbs • Abdomen not exposed • Normal or increased respiratory rate • Limbs flexed or extended • Tail held close to the body, curved caudally, making small rapid movements, elevated, extended downward or curled forward • Eyes normally open or wide open • Pupils normal to dilated • Ears directed slightly or completely caudally, directed forward, or partially flattened • Whiskers directed laterally, forward or caudally • Silent, meowing, plaintive meowing, yowling or growling • Lip or nose licking • Actively exploring or pacing • Alert • Attempts to hide or escape • One person is required to hold the cat	• In sternal recumbency, crouched or standing • May tremble • Abdomen not exposed • Increased respiratory rate • Limbs flexed or extended • Tail held close to the body or curled forward • Eyes fully open • Dilated pupils • Ears directed slightly or completely caudally, or partially or completely flattened • Whiskers directed forward or caudally • Silent, meowing, plaintive meowing, yowling or growling • Lip or nose licking • May pant • Possible piloerection • Alert • Pacing • Attempts to hide or escape • At least one person is required to hold the cat • More than one attempt is required to measure rectal temperature

CAT-FRIENDLY HANDLING TO REDUCE STRESS IN FELINE PATIENTS

- Handling techniques must be individualized to each patient.
- Clinicians should understand the basic principles and adapt them to each situation.
- Each procedure should be evaluated to determine whether the information it provides justifies the stress it may cause.
    - For example, is rectal temperature measurement truly necessary in a cat presented for vaccination that is reportedly well at home but displays numerous signs of fear and stress on the examination table?
- A cat carrier that opens at both the front and the top is extremely helpful.
- If the cat is unwilling to leave the carrier voluntarily, the top can be removed and the cat examined in the lower half of the carrier.
- A towel or blanket may be used to cover the cat if this helps the cat feel more secure.
- Forceful restraint is generally poorly tolerated by cats, including those with no known behavioural concerns.
- Identify treats the cat finds highly rewarding and use them appropriately and at the right time.
- Minimal restraint is therefore often the key to successful handling.
- Avoid procedures known to induce stress at the beginning of the examination, because it is very difficult to regain the cooperation of a cat that has entered an acute fight-or-flight state or become aggressive (e.g., following rectal temperature measurement).
- Slow, calm movements are always preferable when handling cats.
- Respecting the cat's warning signals is important for preventing injury.
- Avoid hospitalizing a cat in a deep cage that provides neither a hiding place nor a safe means of retrieving the cat if it becomes aggressive. This should always be considered when placing an anaesthetized cat in a cage after surgery, as the cat may be far less cooperative during recovery.
- Understand classical and operant conditioning techniques.
- Apply these techniques when teaching owners how to handle their cats at home for treatment administration.
- Use biomedical training principles for procedures such as insulin injections in cats with diabetes mellitus.

STRESS-RELATED FELINE DISEASES

Stress and inflammation

- Stress has been identified as a common risk factor in 75-90% of human diseases, including conditions associated with substantial morbidity and mortality.
- The common pathways linking chronic stress to these diverse pathophysiological processes remain incompletely understood.
- Inflammatory pathways nevertheless appear to be a key component requiring further investigation.
- Stress activates inflammatory responses both within the central nervous system and in peripheral tissues.
- Although acute stress activates a rapid immune response, chronic stress may suppress immune defences while promoting inflammation.
- Glucocorticoids released during stress inhibit lymphocyte proliferation.
- Glucocorticoids may also exert pro-inflammatory effects in some contexts (e.g., increased PGE2 production in certain experimental models).
- Noradrenaline, which is also released during stress, increases the secretion of pro-inflammatory mediators.
- Neuropeptide Y, another neurotransmitter of the sympathetic nervous system, also modulates pro- and anti-inflammatory mediators in macrophage-lineage cells according to the type of stress exposure (acute versus chronic), including transforming growth factor beta (TGF-β) and tumour necrosis factor alpha (TNF-α).
- Stress also induces central inflammation, or neuroinflammation.
- Following exposure to psychological stress, pro-inflammatory cytokines (IL-1β, TNF-α and IL-6), microglial activation, and the accumulation of monocytes and macrophages have been detected in the brain.
- Although inflammation has traditionally been regarded as an adaptive and appropriate host response to infection, increasing evidence indicates that it is also a common pathophysiological substrate for many multifactorial conditions, including cardiovascular, metabolic, psychiatric and neurodegenerative diseases, as well as cancer.

Major feline diseases that may be associated directly or indirectly with stress

System	Diseases and conditions
Urinary	Feline idiopathic cystitis*** Spasmodic urethral obstruction? Chronic kidney disease
Gastrointestinal	Intermittent diarrhoea Intermittent vomiting Reduced appetite Polyphagia
Immune	Feline herpesvirus infection (FHV-1) Feline infectious peritonitis (FIP) Persistent viraemia following exposure to feline leukaemia virus (FeLV) Gastrointestinal infections
Endocrine	Hyperthyroidism (?) Type 2 diabetes mellitus
Dermatological	Psychogenic alopecia Allergic disease
Neurological and behavioural	Wool sucking and sucking on other objects Pica Cognitive dysfunction Epileptiform seizures? Feline hyperaesthesia syndrome (rolling skin syndrome)

**** The mechanisms underlying feline idiopathic cystitis will be discussed in detail later in this document.*

How can we determine whether anxiety is an important contributor to a medical condition in a feline patient?

- If a cat displays anxiety at home, its quality of life is affected and the anxiety should be treated, irrespective of whether it contributes to the concurrent medical condition.
- Feline mental health is too often underestimated; a medical indication is not required before anxiety is addressed.
- Anxiety is not a diagnosis of exclusion.
- Targeted questions can help clinicians establish a diagnosis and differentiate normal from abnormal behaviour, including possible anxiety or another underlying disease.

Features consistent with NORMAL behaviour BEHAVIOURAL AND ENVIRONMENTAL INTERVENTION	Features consistent with ABNORMAL behaviour CONSULTATION RECOMMENDED
Behaviour proportionate to the context	Reaction disproportionate to the context
Inhibited bite	Uninhibited bite
Sleeps approximately 15 hours per day	Sleeps very little during the day or at night
Rapid recovery following a stressful event	Prolonged recovery following a stressful event
Infrequent, short-lived piloerection	Frequent, prolonged piloerection
Normal behavioural sequence	Abnormal behavioural sequence
No signs of fear during play or predatory behaviour	Signs of fear during play or predatory behaviour
Fear in the veterinary clinic	Unable to relax in a familiar environment
Reacts to loud, unfamiliar noises	Reacts to familiar noises without habituating
Does not startle readily	Startles frequently
Queen defending her kittens	Pupils frequently dilated
	Redirected aggression
	New behaviour with sudden onset (pain or medical disease?)
	Persistently stares at and follows another cat
	Thunderstorm phobia
	House soiling or urine marking
	Separation anxiety

Further reading

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The case Study of Feline House Soiling, Urinary Health and the Brain-Bladder Axis

Clinical significance and diagnostic framework

House soiling is among the most common and consequential feline behavioural complaints. Reported lifetime prevalence ranges from approximately 10% to 24%, and elimination problems are frequently associated with relinquishment or euthanasia. These figures highlight the need to avoid framing periuria or inappropriate defecation as a simple litter-box problem. Elimination behaviour reflects the interaction of urinary and gastrointestinal function, pain, mobility, cognition, emotional state, learning, social relationships and the physical environment. In many cats, more than one of these domains is involved.

The first clinical distinction is between urine marking and elimination outside the litter box. Urine marking is a normal form of communication in intact males and females, although it may also occur in neutered cats, particularly in socially or environmentally challenging contexts. Marking typically involves small volumes of urine deposited on socially meaningful sites, often on vertical surfaces, whereas toileting generally involves a larger volume on a horizontal surface. These patterns are helpful but not absolute. Medical disease can alter marking behaviour, and anxious cats may void on beds, clothing or other owner-associated substrates. A diagnosis should therefore be based on the complete behavioural sequence, posture, volume and location, rather than on location alone.

A physical examination and behavioural assessment should be conducted in parallel. The objective is not to prove that the problem is either medical or behavioural, but to identify all plausible contributors and prioritize investigations according to the individual cat. Urinary disorders include feline lower urinary tract disease, urolithiasis, urinary tract infection, renal disease, diabetes mellitus, hyperthyroidism, neurological disease and incontinence. Non-urinary contributors include osteoarthritis, pelvic or spinal pain, dental and other chronic pain, cognitive dysfunction, gastrointestinal disease, constipation, diarrhoea, colitis, parasitism and

iatrogenic polyuria. Mobility and pain deserve particular attention: in one reported clinical series, surgical excision of painful retained ovarian pedicle residues was followed by resolution of house soiling in 10 of 16 cats. This illustrates why apparently behavioural elimination problems may improve only after an occult medical condition is addressed.

Age, pain and behavioural assessment

Older cats commonly present with a multifactorial syndrome rather than a single diagnosis. Osteoarthritis may make access to a high-sided or distant litter box difficult; renal or endocrine disease may increase urine volume; sensory decline and cognitive dysfunction may disrupt established routines; and chronic pain may increase anxiety or irritability. Nocturnal vocalizations, altered social proximity, reduced play, changes in sleep-wake cycles and house soiling should be evaluated together. Incontinence, although less common than other lower urinary tract presentations, should also remain in the differential diagnosis when urine leakage is passive or occurs during rest.

The behavioural history should assess fearfulness at home, hypervigilance, noise sensitivity, aggression toward people or other animals, intercat conflict, changes in social relationships, and behaviour during veterinary visits. Recent evidence suggests that aggression at the clinic may itself be associated with house-soiling presentations, supporting the view that clinic behaviour can provide clinically relevant information about a cat's broader emotional state. The history should also examine recent construction, visitors, schedule changes, owner absences, moving, the introduction of another cat, restricted access to resources and unpredictable aversive events. These variables are often labelled risk factors, but the literature frequently conflates causes, correlates and consequences. They should be treated as clues within a case formulation rather than as proof of causation.

Litter-box management: what is supported by evidence?

Normal elimination preferences develop early. Kittens begin voluntary elimination at approximately four weeks, explore substrates between three and five weeks, and usually begin using a litter area between five and seven weeks. Most cats prefer a soft, porous substrate such as sand or soil, and adult cats may visit the litter box about five times daily. Preferred toileting sites are generally away from feeding and resting areas, and some cats choose different locations for urination and defecation.

Litter-box recommendations should distinguish evidence from convention. The widely repeated rule of providing one box per cat plus one is clinically useful but largely experience-based. Better-supported preferences include large boxes, generally at least 50 cm in length, and fine, clumping substrates. Studies comparing covered and uncovered boxes indicate individual variation rather than a universal preference. Cleanliness, quiet placement and easy access are highly plausible and

clinically important, even where controlled evidence is limited. Boxes should be distributed across functionally separate locations rather than clustered together, because adjacent boxes may be perceived as a single resource. For cats with pain or reduced mobility, low entry points and placement on the cat's usual floor are essential. Substrate, box dimensions and location should be changed systematically, ideally by offering concurrent choices, rather than changing several variables at once.

Anxiety, pharmacological support and periuria

Environmental modification is the foundation of treatment when anxiety or social stress contributes to periuria. Predictability, choice, safe resting and hiding places, separated key resources, opportunities for play and foraging, and reduction of intercat competition are central. Punishment is contraindicated because it increases threat and may suppress behaviour only in the owner's presence without addressing its cause. Medication can be considered when anxiety is moderate to severe, when environmental intervention alone is insufficient, or when emotional arousal prevents learning and adaptation.
Fluoxetine and clomipramine are commonly used options in feline behavioural medicine, with typical oral dosages in the range of 0.5-1 mg/kg every 24 hours. Individual tolerance varies; adverse effects may include reduced appetite, sedation, gastrointestinal effects or constipation. Venlafaxine, a serotonin-norepinephrine reuptake inhibitor, has also been used off label in cats with idiopathic cystitis, house soiling, fear-related disorders and aggression. Reported clinical dosages are approximately 0.9-1.9 mg/kg orally every 24 hours, often near 1 mg/kg, with occasional mild sedation. Granule formulations may facilitate administration. However, the feline evidence base remains more limited than for established first-line drugs, pharmacokinetic information after oral administration is incomplete, and treatment should be individualized with appropriate monitoring. Transdermal formulations may improve feasibility in selected cats, but absorption and clinical response can differ from oral administration.

Feline idiopathic cystitis and the brain-bladder axis

Feline idiopathic cystitis (FIC) is a diagnosis of exclusion within feline lower urinary tract disease and should not be interpreted as a purely local bladder disorder. Reported risk factors include young to middle age, neutering, male sex, indoor living, excess body weight, low activity, dry-food feeding, moving and the introduction of a new cat. Cats described as fearful or nervous, prone to hiding, or aggressive may also be overrepresented. These associations are not uniformly demonstrated and should not be used diagnostically in isolation.

Current models emphasize an altered systemic response to stress. Findings reported in affected cats include increased sympathetic innervation of the bladder, increased

urinary catecholamine excretion, impaired hypothalamic-pituitary-adrenal regulation and smaller adrenal glands. The resulting mismatch between heightened sympathetic activation and an inadequate or dysregulated endocrine stress response may contribute to changes in bladder permeability, sensory processing, neurogenic inflammation and pain. Chronic stress-related inflammatory pathways provide a broader biological context for this interaction. The clinically useful implication is that the bladder, brain, endocrine system and environment should be considered together: a normal behavioural history does not rule out FIC, and a urinary diagnosis does not make emotional or environmental assessment optional. FIC may also represent a heterogeneous group rather than a single disease entity.

Cats with an isolated episode may differ from cats with recurrent disease, and behavioural phenotyping may help identify clinically meaningful subgroups. In a 2025 study of behavioural factors and recurrence, Caudron and colleagues found that fear of unfamiliar people was associated with recurrent FIC, whereas several other measured behavioural and environmental variables were not significantly associated with recurrence. Fear of familiar people showed a non-significant trend. These findings do not establish that fear causes recurrence, but they support routine assessment of fear and anxiety in cats with FIC and suggest that recurrent cases may benefit from more explicit behavioural intervention.

A practical case formulation should therefore integrate urinary diagnostics, pain and mobility, the pattern of elimination, social and environmental stressors, litter-box design and access, and the cat's fear and anxiety profile. Treatment is most likely to succeed when medical care, analgesia where indicated, hydration and dietary strategies, environmental modification and behavioural or pharmacological support are coordinated rather than applied sequentially as competing explanations.

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RECOGNIZING AND TREATING FELINE ANXIETY

KEY ETIOLOGIC AND PATHOPHYSIOLOGIC POINTS

- ◊ Feline anxiety pathophysiology appears to be similar to other species, with an involvement of serotoninergic pathways.
- ◊ Fear is often observed in feline anxiety, which explain why drugs acting on GABA receptors are effective in many cases.
- ◊ Hyperactivity and impulse-control disorders also occur and may cause anxiety in cats.
- ◊ Early environment and developmental conditions may play an important role.

KEY CLINICAL DIAGNOSTIC POINTS

- ◊ Classical signs of feline anxiety include reduced sleep time, abnormal reactivity, fearful behaviors in abnormal contexts for a cat, inter and intraspecific aggression.
- ◊ However, some anxious cats may only present with increased appetite or being overweight, marking or house soiling, vocalizations in absence of the owners, overgrooming, pica, cystitis or urinary blockade, etc.
- ◊ Feline anxiety can be very difficult for clients to suspect as many anxious cats are not aggressive and are very affectionate.

KEY THERAPEUTIC POINTS

- ◊ Treatment includes medication, behavioral and environmental modifications.
- ◊ Each case is unique and should receive a management plan with individually designed recommendations.
- ◊ Most commonly used medications include fluoxetine and clomipramine, as they have both shown a very good efficiency for feline anxiety.
- ◊ Fluoxetine may be chosen preferentially in cats that are overweight, have food-related anxiety, display house soiling, pica, impulse-control aggression, or hyperactivity due to the tendency of fluoxetine to decrease appetite, to cause urinary retention and to be more specific for serotonin receptors involved in impulse-control disorders.
- ◊ Clomipramine may be chosen preferentially in cats with decreased appetite, compulsive disorders, fear-based/withdrawn behaviors, and separation anxiety as it has a tendency to increase appetite and be more “calming” with an action on H1 receptors.
- ◊ Adjunct medications include gabapentin and trazodone.
- ◊ Venlafaxine has been used in several cases of feline anxiety and appears to be promising for a variety of feline anxiety cases.

- ◊ Behavior modifications include desensitization/counterconditioning (i.e. for intercat aggression, for phobias) and operant conditioning (train to respond to their name, reinforce wanted behaviors, etc.). Punishment was strongly discouraged.
- ◊ Environmental modifications should be chosen based on each case. They include adding places to hide, appropriate resource distribution, ad libitum feeding in toys, enrichment, adding litter boxes, etc.

Molecule	**Class**	**Action mechanism**	**Starting dose**	**Maximum suggested dose**	**Potential side effects**	**Notes**
Fluoxetine	SSRI	Mainly acts on SERT and 5HT2C	0.25 mg/kg q24h PO	2 mg/kg q24h PO	Decreased appetite, lethargy, increased anxiety	
Clomipramine	Tricyclic	Mainly acts on SERT, NET, H1, α1 and M1	0.5 mg/kg q24h PO	2 mg/kg q24h PO	Sedation, vomiting	Can increase appetite
Venlafaxine	SNRI	Inhibits the reuptake of both serotonin (SERT) and norepinephrine (NET)	0.5 mg/kg q24h PO	2 mg/kg q24h PO	Sedation, constipation, decreased appetite	Effexor™ granules are easy to hide in treats which increases compliance.
Gabapentin	δ2 ligand	Mainly acts on voltage-gated calcium channels α2-delta subunit	5 mg/kg q8-12h PO	30 mg/kg q8-12h PO	Sedation, increased appetite, lethargy, ataxia	High individual variability. Acts in 2 to 4h.
Trazodone	SARI	Inhibits SERT and blocks some key post synaptic serotonin receptors	5 mg/kg q8-12h PO	10 mg/kg q8-12h PO	Sedation	Highly variable results in cats.

SUMMARY INCLUDING 5 KEY "TAKE HOME" POINTS

1. Feline anxiety is mainly associated with dysfunction of the serotoninergic pathways.
2. Fear is often an important component of feline anxiety.
3. Clinical signs can be typical (aggression, marking, fearful behaviors) or atypical (cystitis/urinary blockade, separation anxiety, food-related anxiety/being overweight, pica, etc.).
4. A thorough behavioral assessment of each case should lead to an individual diagnosis and will allow the design of an appropriately targeted management plan.
5. Treatment should include environmental modifications, behavioral training and medication.

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ENVIRONMENTAL INTERVENTION IN FELINE BEHAVIOUR

Environmental modification is an essential component of each case, both to reduce undesirable behaviour and to promote desirable alternatives.

Every case is unique, and no single recommendation is appropriate for all patients. However, a range of environmental adjustments can be considered and adapted to the individual situation.

Play and physical activity

- Physical activity is known to help regulate several neurotransmitter systems, particularly in humans.

- Although anxiety cannot be treated simply by increasing physical activity, some dogs and cats appear less anxious on days when they have opportunities for substantial exercise.
- If going outdoors causes fear in a dog, however, encouraging outdoor exercise may be counterproductive.
- Play may also be problematic if it triggers aggression through excessive arousal.
- The activity selected should therefore reduce stress without increasing reactivity, which may require careful individualization.
- Dogs that are anxious on walks may benefit from planned play sessions in a familiar yard.
- Cats can learn to retrieve objects or chase appropriate lure toys.

Cognitive stimulation

- Positive-reinforcement training involving cues, tricks or obstacle courses can be an excellent way to focus the patient's attention and strengthen the human-animal bond.
- Many training resources are available for dogs and cats.
- Babineau's Cat Training in 10 Minutes is an inexpensive and accessible reference for clients.
- Providing opportunities to perform natural behaviours is also highly beneficial.
- For example, dogs can participate in scent-detection activities, and NoBowl feeding mice can be used with cats.

Use of available space

- Modifying the layout of a house or apartment can be a highly effective way to reduce stress and anxiety.
- For example, a dog that barks intensely whenever someone passes outside may benefit from curtains or another visual barrier that blocks the view of the street.
- An animal that is reactive to noise may benefit from a white-noise machine.
- Cats almost invariably benefit from having multiple hiding and resting locations at different heights.
- Placing an animal in a separate room, or behind a barrier in an open area, may also help manage certain problems effectively.

Access to resources

- Providing multiple, spatially separated feeding, water and litter-box stations helps reduce stress in multi-animal households.
- Some cats cope poorly with restricted meal feeding at fixed times, which may generate substantial anxiety that resolves with free-choice feeding. Canned food

or a lower-energy diet may facilitate the transition to free-choice feeding while limiting the risk of obesity.
- Removing toys or chews that trigger aggression between dogs is a straightforward way to prevent such incidents.

Other forms of enrichment

- A wide variety of environmental-enrichment strategies can be adapted to different species and clinical situations.
- The aim is to stimulate multiple sensory modalities—for example, by offering catnip to responsive cats or hiding treats in boxes for dogs.

Environmental adjustments to consider in cases of feline aggression (adapt according to the individual situation)

	Suggested adjustments
Access to resources	Increase the number of litter boxes and distribute them among separate locations
	Increase the number of water and food bowls and distribute them among separate locations
	Increase the number of resting areas and hiding places
	Place visual barriers between resources
Safety	Trim the cats' claws regularly
	Separate the cats when the owners are absent
	Microchip- or collar-activated cat flap providing an individual refuge
Use of space	Increase use of the vertical and three-dimensional space: boxes, carriers, crates, beds, shelves, etc.
Feeding enrichment	Puzzle feeders; food-filled toys and balls; safe scents such as cinnamon or cardamom; catnip; etc.
	Toss food or treats for the cat to pursue
	Offer canned food occasionally
	Cat-safe plants
	Water fountains
Play	Balls, laser toys used appropriately, feather toys, chase games, toy rotation, toys or food hidden under blankets or in boxes, foil balls or clean Vetrap remnants, shreddable paper, floating toys in a shallow water container, etc.
Training	With or without a clicker or ClikStik: teach retrieving, sitting, orienting to the cat's name, etc.
Visual stimulation	Aquarium; window access (avoid when redirected aggression is a concern); open interior doors; screened windows; patio; outdoor enclosure; etc.
Other	A variety of scratching surfaces and untreated logs

Behaviour modification

Two preliminary steps are required before behaviour modification, in addition to establishing a diagnosis:

- Identify what motivates the animal. Which suitable treat is highly valued (while considering allergies)? Alternatively, does the animal prefer petting, verbal reinforcement or a particular toy?

- Teach the owner to interpret the animal's body language and explain why the timing of reinforcement is critical.

For anxious cats, I recommend beginning with two very simple foundation exercises to establish clear communication between the cat and owner.

First foundation exercise

- **Teach Minou to orient in response to his name. Call his name periodically without any additional request and reinforce him when he looks toward you. The goal is for him to orient automatically when he hears his name, making it easier to interrupt undesirable behaviour. Failure to respond in a particular situation may also indicate that he is in an acute fight-or-flight state. Keeping a treat pouch readily available allows frequent practice.**

Second foundation exercise

- **Minou should sit before any positive or neutral interaction with a person—for example, before receiving food, water, toys, access through a doorway, attention or petting.**

- He thereby learns that he can request access to desired resources by sitting first. The objective is not obedience, but the spontaneous use of sitting as an appropriate requesting behaviour.

- This teaches an appropriate way to communicate with people—a behavioural equivalent of saying "please." When worried, he may also sit in front of the owner to seek information. A calm verbal cue such as "good" can then signal that the situation is safe.

- Ask him to sit in a calm, neutral tone. If he does not respond, the cue may be repeated once in the same calm manner. If he still does not sit, move away and/or withdraw attention; access to the desired resource is delayed until he sits. If Minou normally sits reliably but cannot do so in a difficult context, he is

communicating discomfort. Remove him from the situation and resume training under conditions in which he can succeed. Behaviour modification is a two-way communication process.

- Consistently asking for a sit before subsequent interactions also encourages the owner to observe the cat closely. Regular observation facilitates reinforcement of desirable behaviours offered spontaneously and early detection of anxiety or reactivity.

- **Minou learns that "sit" reliably predicts a pleasant outcome. The cue becomes predictable and signals the absence of danger.**

- Minou should therefore never be reprimanded while sitting, as this would undermine the use of "sit" as a predictor of neutral or positive consequences.

- Provide positive feedback for all desirable behaviours, using petting, treats or verbal reinforcement as appropriate. This communicates clearly which behaviours are desired.

- In summary, this recommendation has two principal objectives: (1) sitting becomes Minou's way of "saying please" and appropriately requesting what he needs; and (2) he learns that a person asking him to sit predicts exclusively neutral or positive consequences. The person giving the cue thereby becomes a reliable source of information.

These two simple exercises can be incorporated readily into daily life by most owners and establish effective communication:

1. The owner knows how to obtain the animal's attention.

2. The owner knows which alternative behaviour to request in place of an inappropriate behaviour.

3. The cat has a suitable default behaviour that is reassuring because it is consistently followed by a positive outcome. This behaviour is more strongly reinforced than inappropriate alternatives.

4. With repetition and time, the two cues—name response and sit—become well established.

5. These exercises require only the owner's voice and the cat's ability to hear and sit; they can therefore be adapted to almost any setting.

These exercises can be adapted to many situations. For example, they may help interrupt aggression between household cats or toward a person: call the cat by name and cue a sit, a behaviour incompatible with continuing the aggressive sequence.

Exercise for "leave me alone" biting during petting

- Treatment proceeds in two stages. First, the owner must learn to anticipate aggression and stop petting, or stand and allow the cat to jump down. Do not pick Henri up or push him away when a change in body language is observed; end the interaction immediately.
- The owner must identify the earliest warning signs of biting and stop the interaction at the first indication. The cat can subsequently be habituated gradually to longer contact by pairing that contact with a pleasant consequence.
- The owner pets the cat for a predetermined interval that remains below the threshold for the undesirable response. If the cat remains calm, as assessed from body posture, facial expression and ear position, he is reinforced with a highly preferred treat.
- Once the cat tolerates the interaction comfortably, its duration can be increased gradually while calm, non-aggressive behaviour is reinforced with treats. Progress slowly.
- It is important to identify the type and location of touch preferred by the cat. Some cats prefer scratching around the head or neck rather than stroking over the entire body. Henri may prefer contact over the neck, beneath the chin and along the back.
- Treatment may be more complex when underlying anxiety is present. Anxiety is identified from a constellation of clinical signs and may sometimes require pharmacological treatment.

Feline behavioural disorders often also require substantial environmental modification; behaviour modification alone may be insufficient.

Aggression between cats in the same household is complex and requires medical and behavioural assessment of every cat involved.

House-soiling problems are often multifactorial and are rarely resolved through a single behavioural intervention.

The quality of life of indoor cats must remain a central consideration. Their living conditions should be improved continually through environmental enrichment that permits the expression of species-typical behaviour. Many behavioural problems in domestic cats are associated with an inadequately adapted environment.

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