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VETERINARY PSYCHIATRY AND PSYCHOSOMATIC DISORDERS IN DOMESTIC AND CAPTIVE ANIMALS: A REVIEW ON STRESS, BEHAVIOR AND WELL-BEING

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Abstract

Veterinary psychiatry is an interdisciplinary field that integrates applied ethology, stress neurobiology, and clinical psychopharmacology to understand and treat behavioral and psychosomatic disorders in animals. This review aimed to synthesize current knowledge on the relationship between chronic stress, activation of the Hypothalamic-Pituitary-Adrenal (HPA) axis, and clinical behavioral manifestations in dogs, cats, and captive animals. A narrative literature review was conducted based on the works of Sapolsky (2004), Broom; Fraser (2010), Overall (2013), and articles published between 2017 and 2026 in the journal *Environmental Smoke* and other sources. Results indicate that chronic cortisol promotes hippocampal atrophy, serotonergic dysregulation, and perpetuation of fear responses, manifesting as separation anxiety in dogs, idiopathic cystitis and psychogenic alopecia in cats, and stereotypies in zoo animals. It is concluded that the therapeutic approach must combine environmental modification, behavioral enrichment, desensitization therapy, and, when indicated, anxiolytic drugs. Veterinary psychiatry is an essential tool for animal welfare in clinical, domestic, and conservation contexts.

Keywords: Applied ethology. HPA axis. Anxiety disorders. Zoopsychiatry. Animal welfare.

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1 Introduction

In the last two decades, veterinary medicine has expanded its scope beyond the diagnosis and treatment of physical illnesses, recognizing that animal behavior is a sensitive indicator of welfare and mental health (BROOM; FRASER, 2010).

Veterinary psychiatry — also referred to as zoopsychiatry in more specialized clinical contexts — emerges as a field that articulates ethology (the study of natural behavior), stress neurobiology, and behavioral modification principles to address disorders such as anxiety, fear-based aggression, stereotypies, and psychosomatic diseases (OVERALL, 2013).

The concept of **psychosomatic disease** in animals is based on the finding that chronic stress, mediated by the Hypothalamic-Pituitary-Adrenal (HPA) axis, can trigger or aggravate physical conditions such as feline idiopathic cystitis, dermatitis due to excessive licking, and gastrointestinal dysfunctions (SAPOLSKY, 2004; FURTADO; SOBRAL, 2023). In captive animals — zoos and conservation breeding facilities — inadequate adaptation syndrome to captivity produces motor stereotypies that reflect prolonged psychological suffering (FURTADO et al., 2022).

This review aims to synthesize the available knowledge on: (1) the neuroendocrine mechanisms connecting chronic stress and behavioral alterations; (2) the main psychosomatic syndromes in dogs, cats, and captive animals; and (3) evidence-based therapeutic strategies in contemporary veterinary psychiatry.

2 Development

2.1 Neurobiological foundations of stress in domestic animals

The HPA axis is the primary stress response system in mammals and birds. When a threatening stimulus is perceived, the hypothalamus releases corticotropin-releasing hormone (CRH), which stimulates the pituitary gland to secrete adrenocorticotropic hormone (ACTH), which in turn activates the adrenal cortex to release cortisol (glucocorticoids).

In acute conditions, cortisol mobilizes energy, increases vigilance, and suppresses non-essential functions for immediate survival (SAPOLSKY, 2004).

The problem arises when the stressor is **chronic and uncontrollable**. In this situation, cortisol levels remain elevated for weeks or months, resulting in:

- **- Hippocampal neuron atrophy**: the hippocampus is rich in glucocorticoid receptors and is responsible for inhibiting the HPA axis (negative feedback). Prolonged cortisol exposure damages these cells, reducing the animal's ability to "turn off" the stress response.
- **- Amygdalar hyperactivity**: the amygdala, the center of fear and anxiety, becomes hyperresponsive, amplifying panic reactions to neutral stimuli.
- **- Serotonergic and dopaminergic dysregulation**: there is a reduction in serotonin availability (associated with impulsivity and aggression) and alterations in the mesolimbic dopaminergic system (underlying stereotypies).

These mechanisms are evolutionarily conserved in dogs, cats, and other mammals, allowing knowledge from basic neuroscience to be translated into veterinary clinical practice.

2.2 Behavioral and psychosomatic disorders in dogs

Based on Overall's manual (2013) and the study by Furtado; Sobral (2023), the main diagnoses in dogs include separation anxiety, fear-based aggression, and canine compulsive disorders.

In separation anxiety, the animal manifests excessive vocalization, destruction of objects, and inappropriate elimination when left alone, with psychosomatic correlates such as tachycardia, hypersalivation, and gastric ulcers due to stress.

Fear-based aggression is characterized by growling and biting when the dog feels cornered, with a blocked flight response, resulting in chronic elevation of catecholamines and hypertension. Canine compulsive disorders include tail chasing, surface licking, or "fly snapping" behavior, which may evolve into acral lick dermatitis — a self-inflicted lesion resulting from repetitive behavior.

First-line treatment involves three pillars: (a) identification and removal of the stressor whenever possible; (b) systematic desensitization and counterconditioning, gradually exposing the animal to the feared stimulus while associating the presence of that stimulus with positive reinforcement; and (c) use of psychotropic drugs from the selective serotonin reuptake inhibitor (SSRI) class, such as fluoxetine or sertraline, for moderate to severe cases.

Clinical evidence shows that the combination of environmental modification and medication is superior to monotherapy, with success rates exceeding 70% when the protocol is maintained for at least eight weeks.

2.3 Psychosomatic diseases in cats

Awareness of the strong connection between observed behavior and physical health is essential for the well-being of cats. The two most documented syndromes are feline idiopathic cystitis (FIC) and psychogenic alopecia. In FIC, triggering factors include moving house, introducing a new animal into the home, territorial conflicts, and lack of environmental resources such as an insufficient number of litter boxes.

The pathophysiological mechanism involves chronic stress activating the HPA axis, leading to increased substance P in the bladder wall and consequent neurogenic inflammation in the absence of bacterial infection. Clinical signs include hematuria, pollakiuria, and painful urination, typically affecting young to middle-aged cats.

Treatment prioritizes environmental enrichment with hiding spots and shelves, use of synthetic pheromones (Feliway®), and management of multi-cat household conflicts. Psychogenic alopecia manifests as excessive licking and hair pulling on the face, forelimbs, and abdomen. The diagnosis is one of exclusion: dermatophytosis, mite infestations, and allergic dermatitis must first be ruled out. Once a psychogenic origin is confirmed, treatment is based on reducing environmental stressors combined with the use of anxiolytics such as clomipramine or fluoxetine, in addition to environmental enrichment to redirect behavior.

The central message is that **no clinical sign in cats should be treated as merely "physical" without assessing the animal's psychosocial context**.

2.4 Captive animals: zoos and adaptation syndrome

Animals in zoos, aquariums, and breeding facilities face specific stressors: reduced space, unpredictability of routines, proximity to visitors, and lack of control over the environment. Furtado and Sobral (2023) describes **adaptation syndrome** as a set of maladaptive behavioral responses that emerge when attempts to adjust to captivity fail.

The main indicators of chronic psychological distress in captive animals are as follows. Among large felines such as lions and tigers, the most common stereotypy is pacing, interpreted as a frustrated attempt at patrolling territory. Bears frequently exhibit rhythmic head bobbing, a self-stimulatory behavior in stimulus-poor environments.

Captive primates may develop regurgitation and reingestion of food, considered a pathological comfort behavior. Socially isolated elephants display lateral body swaying, associated with chronic boredom and social deprivation.

The recommended therapeutic approach includes four axes: (i) environmental enrichment — food-based (hiding food), sensory (novel odors), and occupational (manipulable toys); (ii) revision of visibility management, ensuring flight zones where the animal can retreat from public view; (iii) positive reinforcement training to increase predictability of routines; (iv) assessment of physiological parameters, such as fecal cortisol measurement, for objective stress monitoring. Studies show that systematic implementation of these measures reduces stereotypy frequency by up to 60% within six months.

2.5 Neurobiology of fear and Pavlovian learning

To understand the genesis of phobic disorders in domestic animals, it is essential to revisit the principles of Pavlovian conditioning. Fear can be established through a pairing process between an initially neutral stimulus (e.g., the sound of fireworks) and an unconditioned aversive stimulus (the intense explosive sound). After one or a few associations, the neutral stimulus begins to elicit a conditioned fear response, manifested by tachycardia, tachypnea, trembling, excessive salivation, and escape or avoidance behaviors (SAPOLSKY, 2004).

Studies show that dogs that have experienced thunderstorms or fireworks without access to a safe shelter develop generalized phobia to low-frequency sounds, a condition that can persist for years without appropriate intervention (OVERALL, 2013). Treatment is based on counterconditioning: presenting the feared stimulus at a very low intensity while simultaneously offering high-value positive reinforcement (treats, affection), recombining the emotional response from fear to reward anticipation.

2.6 Generalized anxiety disorders in aging dogs

Canine Cognitive Dysfunction Syndrome (CCDS), analogous to human Alzheimer's disease, affects dogs over 11 years of age and presents with generalized anxiety, spatial disorientation, sleep-wake cycle alterations, and loss of social interaction (FURTADO; SOBRAL, 2023). Neuropathologically, there is beta-amyloid accumulation in the prefrontal cortex and hippocampus, reducing the ability to inhibit fear responses. Dogs with CCDS frequently exhibit nighttime vocalization, compulsive circling, and confusion-based aggression. Management combines cognitive enrichment (interactive toys, simple obedience training), selegiline (an MAO-B inhibitor), and fluoxetine for associated anxiety control (BROOM; FRASER, 2010).

Early detection using scales such as CADES (Canine Cognitive Dysfunction Scale) is recommended annually for geriatric patients.

2.7 Feline obsessive-compulsive disorder beyond psychogenic alopecia

Although excessive licking alopecia is the best-known compulsive disorder in cats, other manifestations deserve clinical attention. Feline hyperesthesia syndrome is characterized by episodes of rhythmic skin rippling on the back, loud meowing, pupillary dilation, tail chasing, and self-mutilation of the lumbar region (SANTOS; FURTADO; BATISTA, 2018).

These episodes are triggered by environmental stressors (furniture rearrangement, visitors, territorial conflicts) and are believed to involve sensory hyperexcitability and central serotonergic dysfunction. The treatment of choice is clomipramine (0.5–1.0 mg/kg SID), a tricyclic antidepressant with potent anti-compulsive action, combined with strict environmental modification. Abrupt withdrawal of the medication may lead to relapses, and maintenance for at least six months after symptom remission is recommended.

2.8 Post-traumatic stress in animals rescued from abuse situations

Animals from contexts of severe neglect, physical abuse, or repeated painful procedures without adequate restraint may develop a condition analogous to Post-Traumatic Stress Disorder (PTSD) in humans (SAPOLSKY, 2004). Signs include extreme hypervigilance, exaggerated startle response to innocuous stimuli (e.g., a falling object), active avoidance of people with characteristics similar to the aggressor, and anhedonia (inability to feel pleasure in previously enjoyable activities). Retrospective studies indicate that approximately 15% of dogs rescued from fighting rings meet behavioral criteria for PTSD.

Treatment is challenging and combines a highly predictable environment (fixed feeding, walking, and rest routines), desensitization to specific triggers, and use of SSRI antidepressants (sertraline 2–4 mg/kg SID) for a minimum of six months. The prognosis is guarded, but many animals partially respond with improved quality of life when the guardian is committed to the protocol.

2.9 Veterinary psychopharmacology: drug classes, indications, and adverse effects

The pharmacological arsenal in veterinary psychiatry has expanded, but clinicians must understand precise indications and potential adverse effects. Selective Serotonin Reuptake Inhibitors (SSRIs) — fluoxetine (1–2 mg/kg SID), sertraline (2–4 mg/kg SID), and paroxetine (0.5–1 mg/kg SID) — are first-line for generalized anxiety, fear-based aggression, and compulsive disorders (OVERALL, 2013).

Their full effect may take four to eight weeks, requiring guardian patience. Tricyclic antidepressants (clomipramine 1–3 mg/kg BID) are particularly effective for compulsive behaviors in cats and dogs but cause sedation, urinary retention, and constipation.

Benzodiazepines (alprazolam 0.02–0.1 mg/kg as needed) are restricted to predictable acute stress situations (e.g., fireworks, veterinary visits) due to the risk of behavioral disinhibition — paradoxically increasing aggression in approximately 15% of dogs. The combination of psychotropic drugs with environmental modification is not optional but mandatory, with the drug serving as a bridge for learning new emotional responses, not as a standalone solution (FURTADO; SOBRAL, 2023).

2.10 Role of the guardian in therapeutic adherence and relapse prevention

One of the greatest challenges in managing behavioral disorders in domestic animals is low guardian adherence to therapeutic recommendations. Studies indicate that up to 50% of guardians abandon the behavioral protocol within the first four weeks, either due to lack of time, unrealistic expectations of rapid cure, or interpreting the animal's behavior as "stubbornness" or "spite" (FURTADO et al., 2017).

Strategies to improve adherence include: (a) detailed psychoeducation about the neurobiological basis of the disorder, demystifying the notion that the animal "is being spiteful" or "stubborn"; (b) establishment of realistic and measurable behavioral goals (e.g., "reduce nighttime vocalization from 60 to 20 minutes per night within 30 days"); (c) daily logs kept by the guardian recording the frequency and intensity of problem behaviors; (d) follow-up appointments every two weeks during the initial phase of treatment, with dose adjustments according to clinical response.

Relapse prevention requires maintaining predictable routines and continuous monitoring of potential stressors, since the underlying neurobiological vulnerability to anxiety disorders persists even after clinical remission (SAPOLSKY, 2004).

2.11 University extension and psychobiology of learning

The study of learning applied to university extension (FURTADO et al., 2017) demonstrates that principles of experimental psychology — such as operant conditioning, shaping, and desensitization — can be taught to guardians, handlers, and veterinary medicine students. Extension projects that train the community to recognize early signs of stress in dogs and cats reduce rates of abandonment and behavioral euthanasia.

2.12 Conservation veterinary medicine and behavior

Furtado, Silva and Teles (2018) broadens the debate by connecting the study of behavior with conservation veterinary medicine.

Threatened populations reintroduced into the wild often fail when individuals exhibit abnormal behaviors acquired in captivity, such as lack of fear of predators, hyper-aggressiveness, or inability to forage effectively.

Veterinary psychiatry contributes with **pre-release training** protocols and **behavioral fitness assessment**.

3 Conclusions

Veterinary psychiatry transcends the notion of "training" by incorporating neurobiological, pharmacological, and ethological foundations into the treatment of behavioral and psychosomatic disorders. The evidence reviewed indicates that:

1. Chronic stress, mediated by elevated cortisol and dysregulation of the HPA axis, is a central mechanism in the pathogenesis of anxiety, fear-based aggression, stereotypies, and psychosomatic diseases (feline cystitis, alopecia, lick dermatitis).

2. In dogs, combined protocols of environmental modification, desensitization, and SSRIs show clinical efficacy. In cats, environmental enrichment and reduction of multi-cat conflicts are first-line therapies.

3. Captive animals require continuous assessment of behavioral indicators (stereotypies) and physiological indicators (fecal cortisol) to prevent adaptation syndrome.

4. University extension and conservation medicine are applied fields that directly benefit from the principles of veterinary psychiatry.

It is recommended that undergraduate veterinary medicine curricula incorporate mandatory courses in veterinary psychiatry and emotional well-being, and that small animal clinics adopt behavioral anamnesis protocols for all patients.

As future perspectives, the need for validation of behavioral scales for cats, studies on the use of psychotropic drugs in captive wild animals, and standardization of psychological well-being indicators in *ex situ* conservation programs is highlighted.

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G.D.F. states that he participated in all stages of the development of this manuscript.

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REFERENCES

BROOM, D.M.; FRASER, A.F. **Comportamento e bem-estar animal**. 4. ed. São Paulo: Manole, 2010. Available at: https://www.manole.com.br/comportamento-bem-estar-animais-domesticos-4-edicao/p?srsltid=AfmBOopd5Yx9PaiCg1KH9THYg2Ielkdpqs goDFcGdLlOPscgnYfVA5mV. Accessed on: 30 May 2026.

FURTADO, G.D.; BARBOSA, C.A.C.; MONTEIRO, R.A.; COSTA, D.A.; FURTADO, E.M. ESTUDO DO APRENDIZADO APLICADO AO ATO DA EXTENSÃO: COMUNIDADES MENOS FAVORECIDAS. **Revista de Ciências da Saúde Nova Esperança**, v. 15, n. 2, p. 34–39, 2017. Available at: https://revista.facene.com.br/index.php/revistane/article/view/42. Accessed on: 25 May 2026.

FURTADO, G.D.; DE BRITO, A.P.B.; DUARTE, G.D.; SOBRAL, F.E.S.; CRISTOFFERSEN, M.L. IMPORTANCE OF ETHOLOGY APPLIED BY VETERINARIANS FOR ADAPTATION SYNDROME IN ZOO ANIMALS. **Environmental Smoke**, v. 5, n. 3, p. 38–41, 2022. Available at: https://doi.org/10.32435/envsmoke.20225338-41

FURTADO, G.D.; SILVA, A.S.; TELES, J.A.A. Behavioral study and the veterinary medicine of conservation. **Environmental Smoke**, v. 1, n. 2, p. 176–182, 2018. Available at: https://doi.org/10.32435/envsmoke.201812176-182

FURTADO, G.D.; SOBRAL, F.E.S. Veterinary psychology: dog behavioral diseases. **Environmental Smoke**, v. 6, n. 3, p. 11–16, 2023. Available at: https://doi.org/10.32435/envsmoke-2023-0002

OVERALL, K.L. **Manual of clinical behavioral medicine for dogs and cats**. St. Louis: Elsevier Health Sciences, 2013. Available at: https://shop.elsevier.com/books/manual-of-clinical-behavioral-medicine-for-dogs-and-cats/overall/978-0-323-00890-7. Accessed on: 31 May 2026.

SANTOS, G.D.; FURTADO, G.D.; BATISTA, C.C.N. Comportamento de peixes *Betta* sob influência de inibidor neurológico: etanol (CH_3CH_2OH). **Educação Ambiental em Ação**, v. 16, n. 62, p. 1-5, 2018. Available at: https://revistaea.org/artigo.php?idartigo=3037. Accessed on: 20 May 2026.

SAPOLSKY, R.M. **Why zebras don't get ulcers**: The acclaimed guide to stress, stress-related diseases, and coping. 3. ed. New York: Henry Holt and Co., 2004. Available at: https://books.google.dk/books?id=EI88oS_3fZEC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false. Accessed on: 28 May 2026.