Is it Medical or Is it Behavioral
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Behavioral signs can be the first or only indication of an underlying medical health issue. Therefore a simplistic approach to this question is to identify all presenting signs and do a comprehensive diagnostic assessment to determine if there is an underlying medical cause. Conversely the presence of a behavioral inciting factor or a known breed predisposition for a behavior disorder (in the absence of abnormal medical findings), should point to a behavioral cause. Even with an in depth history evaluation and extensive diagnostic testing, there will be cases where a therapeutic response trial is the necessary to confirm a suspected diagnosis. In addition, stress may cause or contribute to both health and behavioral disorders.

Medical Causes of Behavior Signs

a) Neurological

With neurological deficits, altered mental status, increased sleep, circling, head pressing, seizures, emesis, or altered eating and drinking, a neurologic diagnosis is likely. However, a neurological disorder may present with behavioral signs in the absence. Changes in behavior, personality, or mood, decreased responsiveness to stimuli, or loss of previously learned behavior including housetraining indicate forebrain disease. Altered responsiveness to stimuli can also arise from sensory or motor dysfunction.

Epilepsy is a rule-out when pets are presented with focal motor or sensory signs or altered mood or temperament. Seizures may be generalized with convulsions and loss of consciousness but focal seizures may present with motor or sensory signs such as fly biting, chewing, swallowing, star gazing, tailing chasing and aggression. In one study of dogs with fly snapping or “fly catching syndrome” (10 of which were CKCS), 34% of 11 dogs improved with phenobarbital and 100% of 11 dogs with fluoxetine. Two of the dogs were CKCS with Chiari malformation. Concurrent signs in some of the dogs included licking in the air; face, neck and ear scratching; tail chasing; and hind limb biting.

Behavior causes must also be differentiated from other episodic events including tremors, narcolepsy, and syncope. In addition, epilepsy may be comorbid with behavior signs in dogs including fear/anxiety, defensive aggression, and abnormal perception.2 Behavior pathology with alterations in serotonin metabolism have also been identified in aggressive cases.3,4 In senior pets, cognitive dysfunction syndrome may present with behavioral signs (see CDS notes).

b) Metabolic and Endocrine

Endocrine diseases including hyper- and hypo-thyroidism, and hyper and hypoadrenocorticism may be associated with changes in behavior. In dogs it has been suggested that hypothyroidism in its early stages might lead to fear and aggression together with hyperactivity, poor focus and learning, separation related behavior problems, coprophagia, and aggression primarily toward family members and some case series have found a correlation in dogs with low thyroid resultss.5-7 Since cortisol inhibits TSH release, stress can also diminish thyroid levels. A recent study evaluated the effects of thyroid hormone replacement therapy on client owned dogs with owner directed aggression. In this study dogs with low FT4 and those in the bottom 20th percentile of the normal range were considered affected. However, while there was a significant decrease in frequency of aggression in both groups, there was no significant difference between the two groups.7 In two studies comparing a control group to dogs with behavior problems there were no significant differences between the two groups and all thyroid profiles were within normal ranges; in fact in one of the studies TT4 levels were significantly higher in aggressive dogs.8,9 Therefore, unless low thyroid levels can be documented, thyroid
therapy is not likely indicated and might lead to elevated thyroid levels. A decline in organ function (e.g. liver, kidneys) may also affect behavior, but other concurrent medical signs would be expected. Diseases affecting the urogenital system can cause or contribute to housesoiling.

c) Gastrointestinal / Ingestive
Medical problems and drug therapy can increase or decrease appetite or drinking and can lead to picas. Any medical condition affecting stool volume, frequency or consistency could contribute to fecal soiling. Oral behaviors including licking, sucking, pica, smacking lips, gulping or even fly snapping can be a compulsive behaviors but medical differentials including partial complex seizures and gastrointestinal disorders must first be ruled out.10,11

c) Pain
Behavioral measures are an important means of measuring pain. Clinical signs vary with whether the pain is acute or chronic and the source of pain. Since animals have adaptive mechanisms which may mask signs of pain, the absence of overt signs does not mean absence of pain. In addition, physical examination and physiologic parameters may not be reliable measures. Therefore behavioral measures including a change from normal behavior including activity, social interactions, play, or vocalization; a change in temperament (e.g. aggression, avoidance) or the expression of abnormal behaviors (e.g. housesoiling) might be an indication of pain. For chronic pain associated with osteoarthritis in dogs, there may be alterations in gait, mobility, behavior, and demeanor which might be consistent with orthopaedic and radiographic findings. In cats with degenerative joint disease, changes in lifestyle (including activity and mobility) and behavior (including grooming and temperament) are more commonly identified than altered gait or lameness.12

e) Drug therapy
Drugs may have both desirable and undesirable effects on behavior. In one study administration of glucocorticoids was associated with increased nervousness, startle responses, food guarding, avoidance, irritable aggression and barking.13 Paradoxical excitement, agitation, irritability and aggression are potential side effects of some psychotropic medications.

The Stress Response
A stress response is caused by physical or emotional factors that trigger behavioral, psychological, endocrine and immune effects. In the acute response, the autonomic nervous system, HPA axis, and cardiovascular, metabolic and immune systems work together to manage stress and return the pet to homeostasis that can affect both health and behavior. While the stress response is an adaptive mechanism, recurrent and chronic stress may lead to dysregulation, altered immune function, and an inability to return to homeostasis. Stress may contribute to gastrointestinal, dermatologic, respiratory, urologic, reproductive and cardiac conditions, behavioral disorders and a shortened lifespan.14,15

Abnormal Repetitive Behaviors
Repetitive behaviours in companion animals have been termed compulsive, obsessive-compulsive, and stereotypies, or may arise from other behaviour pathology including hyperactivity disorders and dissociative syndrome. One recent paper identified a link between tail chasing in Bull Terriers and autism in humans.16 Since these behaviours likely represent a heterogeneous group of conditions with differing pathologies, abnormal repetitive behaviour (ARB) is used to describe the clinical presentation. When presented with an ARB, the first step is to identify all presenting signs and to determine whether these signs are due to an underlying medical cause. The diagnostic dilemma is further complicated by the fact that the behaviour
Compulsive disorders are abnormal, repetitive, variable in form and fixated on a goal. They may be sufficiently exaggerated, intense, or sustained that they cannot be easily disrupted or switched to another behavior. In addition, there may be a lack of control in initiating or terminating the behavior. Compulsive disorders such as self-trauma, circling or tail chasing might initially arise as displacement behaviors in situations of conflict or frustration. Conflict is when the pet has competing motivations or uncertainty, while frustration is when the pet is motivated to achieve a goal but physically or behaviorally prevented. Displacement behaviors might resolve if the inciting factors are avoided and the conflict or frustration addressed. They are derived from normal behaviors such as grooming, predation, or ingestion that are displayed out of context. Dogs displaying repetitive behaviors at times of high arousal likely differ from those displaying stereotypic behaviors in which arousal is low. The problem has become compulsive when signs begin to arise outside the original context and begin to impact on normal daily functions. There may be a genetic disposition with breed predilections such as tail chasing in German Shepherds, spinning in Bull Terriers, wool sucking in Oriental cats and flank and blanket sucking in Dobermans, for which a genetic locus has been identified. Abnormal serotonin transmission has been identified as a primary mechanism by which compulsive disorders are induced. Brain areas of interest include the prefrontal cortex and amygdalae. As in humans with obsessive compulsive disorders, drugs that inhibit serotonin reuptake (e.g. clomipramine, fluoxetine) are most effective. However, multiple neurotransmitters have been implicated including alterations in dopaminergic and glutamatergic pathways or opioid receptors.

Stereotypies are defined as repetitive behaviors that are unvaried in sequence and have no obvious purpose or function. They have been commonly reported in farm, zoo, and laboratory animals and arise in situations of conflict or frustration related to confinement, husbandry, or deficits in housing. They may arise when the environment lacks sufficient outlets for the animals full behavior repertoire, with maternal deprivation, and due to neurologic disorders. Stereotypic behaviors, at least in their early stages, may provide a mechanism for the pet to cope. For example, non-nutritive suckling in calves may aid in digestive processes. Stereotypies might be induced by dopaminergic stimulation.

Differential diagnosis

Even if no medical causes are found, a therapeutic response trial might still be required to differentiate medical (e.g. seizure, dermatologic, gastrointestinal) from behavioral. Focal seizures might be the cause of neurologic signs; self-traumatic disorders might be due to hypersensitivity reactions; and ingestive behaviors might be caused by gastrointestinal diseases. Feline hyperesthesia can have a dermatologic, neuromuscular, or behavioral cause.

Neurologic or behavioral

Signs such as fly snapping, tail chasing, pouncing, fixed staring, star gazing, head shaking, spinning, and checking may arise as a result of neurological disorders including focal seizures or abnormal repetitive disorders. Careful review of all clinical signs, video of the problem, physical and neurological exam, and diagnostic tests including blood, urine, imaging, or EEG may need to be considered if a neurologic cause is suspected. With neurological
deficits, altered mental status, increased sleep, circling, head pressing, seizures, emesis, or altered eating and drinking, a neurologic diagnosis can be made. However, behavior signs may arise in the absence of neurologic signs. Changes in behavior, personality, or mood, decreased responsiveness to stimuli, or loss of previously learned behavior may indicate forebrain disease. Altered responsiveness to stimuli can also arise from sensory or motor dysfunction. Unlike seizures repetitive behaviors can generally be interrupted or the situations in which they arise predicted or reproduced. Some pets are so intent on repeating the behavior that they will move away and repeat the behavior in the owner’s absence.

If diagnostic testing is unable to yield a definitive diagnosis, a therapeutic trial may be the next option. For focal seizures, an improvement might be expected with phenobarbital, potassium bromide, or levetiracetam while gabapentin, carbamazepine or clonazepam might be added for refractory cases. When neurogenic pain is a consideration a trial with gabapentin, pregabalin, carbamazepine or amitriptyline might be warranted. A trial with drugs or dietary management might be needed to rule out a gastrointestinal cause. For compulsive disorders, clomipramine or fluoxetine might be the first choice.

**Dermatologic or Behavioral**

To diagnose behavioral self-trauma (e.g. biting, chewing, licking, and excessive barbering) medical causes must first be excluded including pain or pruritus (e.g. neuropathies, hypersensitivity reactions), infections, tumours, endocrinopathies or systemic diseases (e.g. hepatocutaneous syndrome). The diagnostic work up should include examination, blood and urine testing (including viral or endocrine if indicated), and dermatologic testing including trichogram, fungal culture, skin scraping, cytology and possible biopsy. The presence of primary lesions and the sites of the alopecia or self-trauma might suggest potential diagnoses.

For cats with self-trauma, if diagnostic tests are negative, parasitic hypersensitivity, food hypersensitivity and atopy must still be ruled out. Therefore a therapeutic trial with a parasiticide and a novel or hydrolysed protein diet for at least 8 weeks might be instituted, followed by a steroid response trial to rule out atopic pruritus. Using this protocol in 21 cases presented for psychogenic alopecia, 76% had a medical aetiology (primarily adverse food reactions, atopy or both), 10% were compulsive and 14% were combined medical and behavioral. Although biopsies might indicate an inflammatory response, some cats with histologically normal skin had a medical cause.23

For acral lick dermatitis, when diagnostic tests do not identify the cause, therapeutic trials with antibiotics, pain medication, anti-inflammatory drugs, a food trial or parasiticides should be implemented. Antibiotic selection is a challenge since cases may be multi-drug resistant and deep cultures may not be consistent with superficial cultures.

Tail mutilation and hyperaesthesia in cats might be seen in situations of high arousal but can be due to focal seizures, spinal disease, neuropathies, FeLV induced myelopathy, neuropathic pain or compulsive disorders. While rippling skin may be the primary sign, self-directed aggression, redirected aggression, vocalization, excessive licking, running and soiling may also be signs. Therapeutic response trials might include an SSRI or clomipramine for compulsive disorders, clonazepam for seizure control and reducing arousal, gabapentin to help calm, control seizures and treat neuropathic pain, or drugs for pain management.

**References**

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