

MEDICAL CAUSES OF BEHAVIORAL PROBLEMS

Suspicion of a medical cause or underpinnings of a behavioral problem is often aroused by considerations of the age, breed, and clinical signs exhibited by the animal in question.

Age:

Behavioral problems arising in mid-life or in old age are often indicative of medical involvement. The clearest example of an age-related behavioral problem is provided by Cognitive Dysfunction.

Breed:

Breed considerations are important when evaluating behavioral problems. Certain breeds are known to have predilections for specific medical problems. Amongst dogs, Golden Retrievers, in particular, are prone to hypothyroidism (this may give rise to anxiety-based behavioral problems and aggression). Lissencephaly typically affects Lhasa Apsos.

Clinical Signs:

Subtle clinical signs of underlying medical problems may be recognized on clinical examination of animals with behavioral problems. Animals with partial seizures tend to exhibit sudden bouts of aberrant behavior associated with autonomic signs (e.g., salivation). Dogs with borderline hypothyroidism may have a dry coat and tend to shed excessively.

DOGS

Hypothyroidism:

All vets know how to recognize classical hypothyroidism. Affected dogs tend to be overweight, lethargic, and have bilaterally symmetrical alopecia. But somewhere between the normal (euthyroid) state and frank hypothyroidism is a state we refer to as borderline hypothyroidism. In this state, thyroid hormone levels are low but are within the normal range, typically in the bottom quartile of the range. Elevated TSH is not particularly helpful in confirming the diagnosis, as TSH is not as reliable in dogs it is in human medicine (only 20% of hypothyroid cases have elevated TSH). Reading thyroid panel is a bit of an art, as well as a science, but if thyroxine levels are below (say) 1.5 (normal range 1-4) in a young active dog, borderline hypothyroidism should be suspected. Subtle clinical signs that help support the diagnosis may include:

- Excess shedding
- Dry coat
- Scaly dry skin

- Allergies
- Recurrent infections
- Overweight
- Heat seeking
- Slow heart rate
- Thin skin
- Irregular estrus
- Seizures

Behaviors that have been associated with the borderline hypothyroid state include:

- Aggression
- Untoward anxiety
- Compulsive behavior

So, for example, if a 2-year-old Golden Retriever presents with a history of owner-directed (“dominance”) aggression, and the dog is found to have dry skin and sheds excessively, it would be prudent to run a thyroid profile (FT4, TT4, FT3, TT3, and autoantibodies). If T3 and T4 levels are in mid- or high-normal range, then thyroid is not an issue. If thyroid hormone levels are low, it may be worth 6-week trial treatment with thyroid hormone (thyroxine, Soloxine®), followed by behavioral re-evaluation and retest of thyroid hormone levels after 4-6 weeks (sample should be taken 4-6 hours after a pill to obtain “peak” levels). A positive behavioral result is to have anxiety lessen and/or aggression to become less (or disappear). Thyroid hormone levels should be at the upper end of the normal range or 25% above top normal.

Behavioral Seizures:

Sometimes called partial seizures or limbic epilepsy, behavioral seizures are returning to prominence as a possible cause for certain bout-like, extreme, or anomalous behaviors. In behavioral seizures, the electrical event is confined to a part of the brain controlling emotion or a particular behavioral drive. True (tonoclonic) seizures may herald or develop from partial seizures but are not a necessary prerequisite for diagnosis. Diagnostic features include:

- Tend to occur in seizure-prone breeds (e.g., beagle, Bernese)
- Often first develop at or around puberty (8-10 months of age); usually before 2 years
- Pre-ictal mood change (e.g., depressed, irritable, or flat mood)
- Behavioral event is often sudden in onset and bout-like
- Behavioral expression is variable (may be aggression, fear, predatory/consummatory)
- Behavior is often extreme and irrational (unproved)
- Behavior may be triggered by stress or an environmental event (noise, flashing light)
- May be associated with autonomic signs (salivation, urination, anal gland discharge)
- Post-ictal depression/unresponsive

“Rage” (Episodic Dyscontrol):

- Best known in Springer spaniels (“Springer rage”); also occurs in other breeds, such as cocker spaniels, bull terriers, retrievers
- Violent uncontrolled aggression
- Owner senses pre-ictal mood change (knows something will happen)
- Trivial or no provocation
- Lasts longer than dominance aggression (minutes or hours)
- May be days or weeks between events (unlike dominance-related aggression)

Diagnosis

Based on clinical signs and response to treatment (EEG will confirm but its equipment is not commonplace).

Treatment

- Phenobarbital → 3 weeks to plateau
- Bromide → up to 4 months for maximum effect
- Combination of phenobarbital + bromide
- Correct any underlying thyroid problem
- Advise owners about management (special attention to avoidance/safety)

Prognosis

The prognosis is fair for producing a reduction in the frequency of bouts. The problem is that even one attack per year may be too much for an owner to accept.

Fly Snapping:

While the common interpretation of fly snapping is that it is a canine OCD, there are a number of scientific papers that mention it in association with seizures. An epileptic focus in the lateral hypothalamus would cause untoward (misdirected/undirected) predatory behavior, and this may be what is going on in some cases.

Light Chasing:

The same argument (as above) applies to this odd behavior that was once thought to be a seizure-based condition affecting the visual cortex. However, unlike fly snapping, EEG evidence for light chasing is lacking.

Tail Chasing:

An EEG study showed that 6 of 6 tail-chasing bull terriers had an abnormal “epileptiform” EEG. Whether this is cause or effect is not clear. Some tail-chasing German Shepherds refractory to

anti-obsessional medication respond positively to treatment with phenobarbital.

Abnormal Ingestive Behavior:

Recent case reports describe an episodic form of ingestive behavior in which dogs eat inedible materials like linoleum, dust balls, or dirt. In addition, they may stare vacuously and make swallowing/gulping motions. In one case, anomalous aggression always occurred in the recovery phase of such ingestive behavior.

Paroxysmal Fear:

We have seen a few cases of extreme and irrational fear in dogs that seems to be seizure based as determined by a) the bout-like nature of the problem and b) a positive response to anticonvulsant medication. It seems most likely that the amygdala is the seizure locus of this bizarre type of fear.

House Soiling:

Before attempting to retrain a dog that is house soiling, it is important to rule out medical conditions that may be causative or contributory. Although urinary tract infection is the leading medical cause of house soiling, there are others. Any condition that causes polydipsia/polyuria—including diabetes, chronic nephritis, and Cushing's disease—may contribute to house soiling. In addition, cognitive dysfunction in old dogs may lead to a breakdown of house training. UTIs can be diagnosed from urinalysis +/- urine culture and sensitivity. The urine sample should be collected by cystocentesis. Metabolic problems can be ruled out by blood chemistry analysis. Cognitive dysfunction is diagnosed with reference to the context of its development and from other clinical signs (see below).

Canine Cognitive Dysfunction (Canine Alzheimer's, CD, or CCD):

As veterinary medicine has become more sophisticated, and careful nurturing of pets has become the rule rather than the exception, the population of geriatric small animal pets has grown steadily, mirroring the increase in the human elderly population. As an animal advances into its twilight years, inevitable aging changes take place in all organ systems, including the brain. Most small to medium-sized dogs are considered geriatric when they reach 10 years of age, or when 75 percent of their anticipated life span has elapsed. But this does not mean that when they have exceeded this arbitrary limit they will necessarily show signs of senile dementia. Some dogs appear normal mentally long after the empirical cutoff, and some remain bright to the end of their natural life span. These dogs are referred to as "successful agers", same as their human counterparts. Dogs that do not weather aging so well and who show obvious signs of mental deterioration constitute unsuccessful agers.

The Signs

Though variable in degree and expression, the classical signs of cognitive dysfunction in elderly dogs include:

- Reduced activity
- Increased sleeping
- Reduced responsiveness to commands/apparent deafness
- Lack of interest in surroundings/events
- Confusion/disorientation
- Inability to recognize familiar people
- Increased thirst
- Excessive panting
- Difficulty eating and/or reduced interest in food
- Loss of bladder and bowel control
- Difficulty navigating the environment (e.g., stairs)



Not all dogs show all of these signs, and some will show paradoxical behaviors, such as agitation and/or barking, for no particular reason. However, the signs of CD are progressive and eventually will completely incapacitate the dog. It is interesting to note that the percentage of dogs affected with CD at 10 years old, 12 years old, 14 years old mirrors the age-related demographic for cognitive dysfunction in humans. A good way to remember/classify these signs is using the acronym **DISH**:

D = Disorientation

I = Altered social interactions

S = Sleep disturbances

H = Housesoiling

Central Nervous System

Though not identical to the changes in human Alzheimer patients, pathological changes in the brains of dogs with CD are similar to those in human Alzheimer's patients and are proportionate to the severity of the clinical syndrome. Many different changes have been reported, but the most significant are deposits of beta-amyloid and its formation of plaques in the brain. It is these pathologic changes and their functional sequelae that are thought to be responsible for the cognitive/behavioral deterioration associated with CD.

The Cause

Pathological changes in the brains of affected animals are directly responsible for signs of CD, but why should such changes occur in one animal and not another? Although we don't know the precise reason for individual susceptibility, inheritance probably plays a role. But some interaction between genetics and the environment cannot be dismissed as also contributing.

Treatment

There was no treatment for this degenerative condition until the advent of deprenyl (Anipryl®); this drug helps turn back the aging clock and buy affected dogs more quality time. Deprenyl is not a primary treatment for the disease process but will symptomatically reverse the clinical signs of aging in most dogs with CD by increasing brain concentrations of the neurotransmitter dopamine. Dopamine “connects thought with action” and also increases cognitive awareness. In the Oliver Sack’s movie, *Awakenings*, patients were unable to move because of the lack of dopamine. Dopamine is low in human Parkinson’s patients who have difficulty moving around. In contrast, excessive dopamine levels produce racing thoughts, paranoia, increased anxiety, and repetitive behaviors. If the canine aging theory is correct, CD patients have low dopamine, hence low activity and reduced cognitive performance. Increasing dopamine by means of deprenyl should, and apparently does, reverse the clinical signs of CD in the majority of patients—for a time at least.

One third of canine CD patients responds extremely well to treatment with deprenyl by regaining their youthful vigor; another one third responds reasonably well; and one third does not respond at all (perhaps there is a variant of CD with different neuropathology). The bottom line is that for any dog that is slowing down to the point that problems become apparent, treatment with deprenyl is the logical choice once other organic causes for reduced mental function have been ruled out.

Many people think that it is “normal” for their elderly dogs to gradually lose energy and interest in life. They therefore tolerate the cognitive aging syndrome for longer than is necessary. These folks sometimes don’t seek help or wait until bladder or bowel control is lost before trying to find out if something can be done. The latter is the main cause for concern for owners of geriatric dogs, who seem to be able to put up with almost any amount of senile change in their pets before the indignity of incontinence finally causes them to seek help. Incidentally, it’s often the same for human Alzheimer’s patients.

Deprenyl is marketed with the specific label instruction for the treatment of age-related cognitive dysfunction and age-related inappropriate urination. Early treatment with the drug will buy impaired dogs extra quality time, increasing their “health span”. As a side effect, Deprenyl also increases the life span of dogs over 10 years.

Nocturnal Separation Anxiety:

Though cognitive dysfunction is an important cause of sleep disturbances in older dogs, it is not the only one. Sometimes dogs that have borderline separation anxiety throughout their lives have the condition worsened in old age by painful medical conditions. The appearance is that of a dog that suddenly develops separation anxiety late in life—a separation anxiety that is much worse at night when the dog is separated from its owner by the physiological state of sleep. Nocturnal separation anxiety (a.k.a. geriatric onset separation anxiety) entails the affected dog pacing at night, panting, whining, and/or constantly seeking its owner’s attention

at night. Causes we have encountered include: cervical disk problem, lumbar disk problem, and tumors of the eye, abdomen, or bone. Palliative treatment may include the use of analgesics and anxiolytics. Definitive treatment, when possible, is to address the root cause of the problem.

Other Medical Problems:

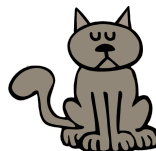
A plethora of other conditions may contribute to altered behavior. Some are congenital, like portosystemic liver shunt, narcolepsy, lethal acrodermatitis, and lissencephaly; others are acquired, poisons (e.g., lead), infection (e.g., rabies), and neoplasia (e.g., brain tumor). Lyme-related CNS disease is often a concern among clients. However, questions remain about whether *Borrelia burgdorferi* related neurologic disease is found in dogs. Altered behavior may be secondary to vision or hearing impairment. Pain may cause significant behavior change. Painful conditions (e.g., osteoarthritis, severe otitis, Lyme disease) may cause an increase in irritability and aggression. In order to rule these conditions in or out as a cause of a behavior problem requires that the clinician obtains a thorough clinical history, performs a physical examination, and makes use of appropriate ancillary diagnostic tests.

CATS

Hyperthyroidism:

Matching but opposite bookend to hypothyroidism in dogs, feline hyperthyroidism is a common condition affecting older cats, and one that can adversely affect their behavior. Hyperthyroid cats typically are over 10 years of age. Behavioral signs include:

- Weight loss
- Voracious appetite
- Restlessness
- Increased vocalization
- Increased irritability/aggression



Diagnosis

Clinical signs and blood test (T4 and T3 suppression in hard-to-diagnose cases).

Treatment

- Radioactive iodine therapy
- Surgical ablation
- Medical therapy with methimazole (Tapezole®)

Behavioral Seizures:

Two conditions that are thought to be associated with partial seizures in cats are a) Feline Hyperesthesia and b) Episodic dyscontrol (“rage”).

Feline hyperesthesia syndrome (FHS) has been dealt with in the compulsive disorder section as it has many features in common with OCD. Some cats with FHS display marked aggression akin to rage when they are handled. This may be a result of seizures affecting the medial hypothalamus.

Episodic dyscontrol is a new and not widely recognized diagnostic category in cats. Affected cats suddenly, and periodically thereafter, enter a period of unstable mood in which they show fear, stalking, hostility, and frank—sometimes violent—aggression toward their owners. The hostile mindset can last for several hours or days. So violent and explosive are the mood swings that owners often resort to shutting their cat in a room which they may or may not feel brave enough to enter. Sometimes owners have to get an animal control officer to apprehend the cat so that they can take it to the veterinarian for treatment. The aggression displayed by these cats is so extreme and so dysfunctional as to be difficult to confuse with more normal, adaptive forms of aggression. Treatment is with an anticonvulsant, like phenobarbital, +/- a mood stabilizer such as fluoxetine (Prozac®). The response to this line of therapy is usually quite rapid and sometimes very dramatic. Several cases we have treated have been “cured” by this approach, though one should always remain cognizant of possible relapses. The consequences of this type of aggression are so severe that public health concerns must be addressed at the time of the consultation. Owners should be advised to distance themselves from cats showing this type of behavior, preferably shutting the cat in a separate room in the house until advice can be given and treatment instituted.

House Soiling:

House soiling by cats may be a result of hormonal influences, litter box aversion, or anxiety. However, it may also arise secondary to medical issues that must be considered first. Medical problems that may initiate or contribute toward “inappropriate elimination” include cystitis (FLUTD) and any condition that causes PU/PD (e.g., chronic nephritis, diabetes, Cushing’s disease). Such conditions should be ruled out by proper testing prior to attempting behavior modification therapy. A minimal database prior to embarking on treatment of a house soiling problem would be urinalysis (+/- urine culture and antibiotic sensitivity). FLUTD may lead to litter box aversion by causing the cat to associate the box with painful elimination. Frequently, such cats start to eliminate in the bathtub. Urinary tract infections and/or struvite calculi may also initiate urine spraying in some cats. The reason for this is not exactly clear.

Feline Cognitive Dysfunction:

Like dogs, cats can be affected by cognitive dysfunction (FCD) in their later years. Typically, an affected cat would be >12 years of age and would be showing signs of disorientation, altered

social interactions, nocturnal restlessness (+/- nocturnal vocalization), and a breakdown of normal litter box habits. The pathology of this condition has not been established in cats but it is probably similar to the canine condition (i.e., anomalous deposition of beta-amyloid in the CNS). Treatment with L-deprenyl (Anipryl®) is apparently quite successful at temporarily alleviating the clinical signs of FCD.

Feline Ischemic Encephalopathy (FIE):

FIE causes clinical signs of depression, head tilt, anisocoria, circling, change in attitude/behavior, hyperexcitability, aggression, blindness, and seizures. The condition is thought to be due to infestation and aberrant migration of the larvae of *Cuterebra spp.* (bot fly). Clinical signs appear in the summer months (July-September). Treatment is largely supportive/symptomatic.

Other Conditions:

Various other medical conditions may cause behavioral alternations. As with dogs, rabies must always be considered. Vision impairment, hearing loss and pain (e.g. osteoarthritis) can also cause significant changes in feline behavior, as seen in dogs. Brain tumors in older cats may cause behavioral changes, including increased aggression. Neurological signs, however subtle, usually accompany brain tumors. Thiamine deficiency, in cats fed raw fish diets, may cause depression and seizures. Organophosphorus poisoning (e.g., by certain flea products) may also cause behavioral changes—notably aggression—in cats.