

Aggression



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Aggression: Medical Differentials



DEFINITION/OVERVIEW

When an animal exhibits aggressive behavior, the first step should be to rule out any possible medical contribution. Classically, the veterinary profession tends to separate the causes of behavioral changes such as aggression into “behavioral” and “metabolic/organic” diseases. This may be inappropriate, since some aggression that is characterized as “behavioral” in nature may in fact be due to primary organic brain disease that has yet to be characterized, such as abnormalities in serotonin receptors. For the purposes of this chapter, medical causes associated with aggression will encompass those diseases for which we can currently identify an established pathology associated with the disease. Metabolic or organic diseases that may present with aggressive behavior include a vast assortment of disease categories, including degenerative diseases, developmental disorders, endocrine and metabolic diseases, nutritional imbalances, neoplastic disease, neurological disorders, immune-mediated or allergic disease, infectious disease, idiopathic or iatrogenic disease, toxin exposure, traumatic injury, and vascular disorders. The presentation of some diseases may be affected by age (see Table 1.1). Please note that this chapter does not include every possible medical illness that could present with aggression as a complaint.

TABLE 1.1. Neurological Conditions to Consider for Behavioral Changes, by Age

Pets < 1 year of age	Pets > 5 years of age	No age association
Hydrocephalus	Cerebral neoplasia	Meningioencephalitis
Lissencephaly	Hypoglycemia secondary to insulinoma	Thiamine deficiency
Lysosomal storage diseases	Acquired hepatic disorders	Toxicity
Trauma	Trauma—infarcts	Trauma
Lead poisoning		
Hypoglycemia		
Hepatic disorders—portocaval shunt		
Metabolic diseases secondary to congenital diseases		

MEDICAL CONSIDERATIONS FOR AGGRESSIVE BEHAVIOR

Degenerative/Developmental

- Lissencephaly.
 - A rare disease that has been described in Lhasa Apsos, Beagles, and Irish Setters, and in cats, in which the gyri and sulci of the cerebral cortex fail to form properly, resulting in a smooth surface.
 - Behavioral complaints are often apparent by 3 months of age, and can include difficulty in training (especially house training), irritability, aggression, dementia, and depression.
 - By 1 year of age, most pets suffering from this condition exhibit seizure activity.
 - Imaging studies can confirm this non-treatable disease.
- Hydrocephalus.
 - Hydrocephalus is usually a congenital problem, but can be acquired secondary to functional CSF obstructions or infectious diseases.
 - Behaviorally, these pets may present with non-specific clinical signs such as “difficult to train”, “stubborn”, demented, aggressive, or irritable, or with seizure activity.
 - Hydrocephalus may present solely as aggression and irritable behavior in very young dogs.
 - It is estimated that hydrocephalus accounts for 0.8% of aggressive behaviors.
 - Signalment can lead a clinician to suspect hydrocephalus, and imaging studies can confirm this diagnosis.
- Fucosidosis.
 - This has been reported in American-bred English Springer Spaniels.
 - It is a heritable condition involving an alpha-L-fucosidase enzyme deficiency.
 - Affected animals will experience abnormal accumulation of fucose in cells throughout the body.
 - Neurological signs predominate, and may include confusion, inability to recognize the owner, and seizures. Fearful behavior can develop into defensive aggression. The disease is progressive and results in death.
- Hepatic encephalopathy.
 - As a result of congenital shunts, enzyme deficiencies, or severe liver disease, animals may show signs of hepatic encephalopathy.
 - Owners often report periodic behavior changes, including listlessness, depression, pacing, circling, head pressing, hysteria, and viciousness.
 - The behavioral signs are most evident after a protein-rich meal.
 - Behavioral changes may be associated with alterations in perception, or due to incoordination.
- Feline ischemic encephalopathy.
 - This unique vascular disorder of the CNS is thought to be related to *Cuterebra* larva myiasis.
 - Unilateral cerebral disease is often noted, and signs may include paresis/ataxia, tonic-clonic seizures, blindness, circling toward the side of the lesion, dilated pupils, and severe aggression.

- Treatment options are limited, and often cats are euthanized due to the severity of signs.
- Porencephaly.
 - This is cystic malformation of the cerebrum which usually communicates with the subarachnoid space or the lateral ventricle.
 - It can be congenital or acquired.
- Degenerative sensory changes.
 - Although degenerative sensory changes often occur gradually, and affected animals learn to adjust to them, these changes could potentially cause aggressive behavior.
 - Visual and auditory deterioration may affect the animal's ability to monitor activity, and therefore they may be startled more easily. Some startled animals react with aggression.

Endocrine/metabolic

- Hyperthyroidism.
 - Although primary hyperthyroidism in dogs is rare, it can present as aggression.
 - Iatrogenic hyperthyroidism should be considered in irritable or aggressive dogs on supplementation.
 - Hyperthyroidism in cats is the most common feline endocrine disease, and around 25% of cats with hyperthyroidism present with increased aggression.
 - Aggression usually resolves with successful treatment.
- Hypothyroidism.
 - Hypothyroidism has been implicated as a cause of many non-specific behavioral signs, such as aggression and anxiety.
 - Hypothyroidism has been reported to be the underlying problem in 1.7% of dogs with aggressive behavior.
 - These dogs do not necessarily show the other classical signs of hypothyroidism, such as thin hair coat, lethargy, and weight gain.
 - The dog acts relatively normally, but will increasingly become grumpy or aggressive in routine situations.
 - The aggression is inconsistent.
 - Dogs affected by hypothyroid aggression have been described as dominant aggressive (social conflict aggression) or fear aggressive.
 - Caution is needed to avoid quickly labeling a pet as hypothyroid instead of delving further into other possible medical or behavioral causes of the presenting problem.
 - Several recent studies have not shown a statistically significant difference in thyroid status between dogs with and without aggression.
- Sex hormones.
 - From a clinical standpoint, there are sex-linked behaviors that are testosterone driven, such as intermale aggression.
 - Neutering significantly reduces this aggression in 60–80% of dogs and cats.
 - Neutering also prevents genetic transmission of this trait.
 - Pseudocyesis may result in aggressive behavior in the bitch. Hormonal changes

may cause behavioral changes typically associated with pregnancy, although the bitch is not pregnant. Nesting, nervousness, mothering of objects, and maternal aggression may be observed. These signs tend to occur about 6–8 weeks after the heat cycle, and will gradually decline as the hormones return to anestrus levels. Ovariohysterectomy in anestrus will prevent relapse.

- Spaying bitches before 6 months of age may increase the incidence of inter-dog aggression.

Nutritional

- Thiamine deficiency.
 - This may occur in cats and dogs that are fed predominantly raw tuna, salmon, carp, or other fresh and saltwater fish, due to the presence of thiaminase in these diets.
 - Sudden and progressive onset of disease occurs, which includes the following: anorexia; diarrhea; muscle tremors; obtunded or excited and aggressive behavior; seizures and other cerebral and vestibular signs.
 - This nutritional deficiency can cause hemorrhage and necrosis of the brainstem.
- Tryptophan deficiency.
 - Tryptophan is the amino acid precursor of serotonin.
 - Escalation of aggressive behavior can be a result of this dietary deficiency.
- High levels of dietary protein.
 - High levels (32%) of dietary protein have been incriminated in aggressive behavior in dogs, and specifically in fear-based territorial aggression.
 - High levels of dietary protein may decrease the amount of tryptophan that is naturally absorbed, causing a deficiency.
 - To date, definitive studies linking tryptophan, dietary protein, and aggression have not been conducted.

Neoplasia

- Neoplasia includes intracranial masses such as meningiomas, temporal lobe, limbic system, and hypothalamic lesions.
 - Neoplasia, both primary CNS lesions and metastatic lesions, may present as aggressive behavior.
 - Although most neoplastic lesions that affect the brain will eventually cause some obvious neurological abnormalities, such as seizures or head tilt, it may take up to a year for these to become evident.
 - Any breed can be susceptible to neoplasia. However, the brachycephalic breeds have a higher incidence of astrocytomas, and the dolichocephalic breeds have a higher incidence of meningiomas.
 - The temporal lobe, limbic system, amygdala, and hypothalamus are all implicated in the modulation of aggression, and therefore lesions that affect these areas could have an impact on aggressive behavior.

Neurologic

- Psychomotor epilepsy.
 - This behavior can present as aggressive outbursts.
 - These random, vicious attacks can be difficult to confirm diagnostically.
 - The syndrome is characterized as having no other behavioral or medical diagnosis, and the pet responds well to antiepileptic drugs.

Immune/allergic

- Systemic lupus erythematosus.
 - This autoimmune disease in dogs may progress to CNS lupus.
 - Although rarely reported, these dogs may exhibit periodic disorientation and aggression.
- Allergic skin disease.
 - Chronic pruritus can increase irritability in both dogs and cats.
 - Aggression may result when the animals are handled or groomed, or during treatment of excoriated or infected skin and ears.
 - Research studies have noted an association between a history of a pruritic or malodorous skin disorder that received veterinary treatment and biting behavior directed toward family members.

Infectious Diseases

- These may include viral, fungal, bacterial, protozoal, and rickettsial agents. Infectious diseases usually have an acute onset and may present initially with only behavioral changes, but within hours to days there are usually CNS abnormalities.
- Viral.
 - Dogs: Rabies, pseudorabies, and infectious CDVE.
 - Rabies: The behavioral manifestations of rabies infection vary widely, and can include disorientation, dementia, aggression, pruritus, coprophagia, pica, excessive sexual behavior, and excessive playfulness. Usually it is a rapidly progressive disease that results in death within 8 days after the first clinical signs.
 - CDVE: The distemper virus can attack many different body tissues, including the nervous system. Due to the variability of infection sites, clinical signs can be quite variable, but they are usually acute in onset and progressive in nature. Young unvaccinated dogs are most susceptible to this disease. There can be a post-vaccination encephalomyelitis seen 1–2 weeks after vaccination with a modified-live vaccine. Compulsive circling and dementia can be noted with frontal lobe lesions. If the cerebral cortex is involved, seizures are common. Chomping the jaws while staring off into space is a classic sign of distemper encephalitis. Ataxia, paresis, and head tremors are seen with cerebellar involvement. A sensory neuritis may be responsible for the self-mutilation that occurs in some dogs. There is an “old-dog” form of distemper encephalitis that

presents in the older patient as progressive behavioral problems such as circling, dementia, blindness, and pacing.

- Cats: Rabies, pseudorabies, feline immunodeficiency virus (FIV), and feline infectious peritonitis (FIP).
 - Rabies is an example of a viral infectious agent that can present as acute onset of aggressive behavior in cats and dogs.
 - FIV: This can cause aggressive behavior as well as other non-specific clinical signs, such as dementia and inappropriate elimination.
 - FIP: The dry form can cause a pyogranulomatous meningoencephalomyelitis and hydrocephalus. The cat may present as demented. It may also have signs of vestibular disease, cerebellar deficits, seizures, and pelvic limb abnormalities. This disease is usually progressive over several weeks or months.
- Bacterial.
 - Bacterial abscesses in the brain tissue are infrequent in small animals, but could present as aggressive behavior.
 - Usually the dysfunction is slow in onset and progressive.
 - Clinical signs may start with unilateral visual deficits and then progress to aggression, head tilt, circling, head pressing, mania, depression, convulsions, and coma.
- Protozoal infections.
 - *Toxoplasma gondii*
 - This is a common protozoal disease in cats (40% of cats test seropositive), but it can cause infection in most other mammals, including dogs.
 - Clinical disease is not as common as infection, and the presentation of clinical disease depends on where the organism migrates or localizes.
 - Although aggression is not a common sign, it is within the realms of possibility, as the site of inflammation could be anywhere in the CNS. This also means that other neurological changes can occur, such as depression, blindness, tremors, seizures, hyperexcitability, and paralysis. Serological testing is recommended to confirm infection if this is suspected.
 - *Neospora caninum*.
 - This can cause CNS and musculoskeletal disease that is similar to toxoplasmosis infection.
- Parasitic infections.
 - Aberrant migration of common parasitic infections can present as acute and progressive aggression.
 - Cats that present with an acute onset of vicious aggressive behavior may have *Cuterebra* infarcts.
 - Other parasites that sometimes migrate into CNS tissue include *Dirofilaria*, *Toxascaris*, *Ancylostoma*, *Taenia*, and *Angiostrongylus*.

Idiopathic or Iatrogenic

- Granulomatous meningoencephalitis.
 - This idiopathic, inflammatory proliferation of mononuclear cells in the white matter of the nervous system can occur rarely in cats, but is more commonly seen in dogs such as Poodles and Airedale Terriers.

- Behavioral signs depend on the site of these space-occupying lesions, but circling, dementia, compulsive pacing, aggression, and seizures have all been noted with this disease.
- Idiopathic feline cerebral infarction.
 - There is no breed, gender, or age predilection.
 - Lesions are often confined to the middle cerebral artery, and can result in massive cortical damage.
 - Neurological clinical signs are often unilateral with hemiparesis.
 - Resultant seizure and behavioral disorders may be so severe as to make the animal unacceptable as a pet.
- Iatrogenic.
 - Corticosteroids: An adverse drug effect should be considered in cats or dogs that are receiving exogenous steroids and present with aggressive behavior.
 - Psychotropic medication: Due to serotonin syndrome or bite disinhibition.

Toxins

- Lead poisoning.
 - Inquisitive young animals are considered to be at higher risk for accidental lead ingestion, but any animal with exposure could develop lead poisoning.
 - Ingestion of lead can cause behavioral changes such as hysteria (including crying, barking, and running and biting at things), dementia, aggression, hyperexcitability, and compulsive pacing.
 - Gastrointestinal signs often precede behavioral signs.
- Zinc phosphide.
 - In dogs, rodenticide can cause behavioral signs associated with CNS stimulation.
 - Aimless running, vocalization, snapping, snarling, and seizures are possible presenting signs.
- OP/CIHC.
 - These commonly used insecticides can be implicated in a toxicity that involves behavioral, motor, and muscle abnormalities.
 - Usually there is a history of contact with the insecticide, and the animal is salivating, has miotic pupils, and has seizures.
 - CIHC causes a true cerebral encephalopathy.
 - Aggression is possible as part of the presenting profile.
- Methylphenidate or other street drugs.
 - The animal may present with aggressive behavior.

Trauma

- Cranial injury.
 - Damage to the cerebrum or limbic system from cranial injury may present as aggression.
 - A history of cranial injury should make this a differential diagnosis.
- Pain.
 - This may result in irritable, defensive, or redirected aggression.

- Animals in pain have an activated sympathetic nervous system.
- Catecholamine release reduces the aggression threshold, thus making animals in pain more likely to be aggressive.

Vascular

- Cerebral vascular disease.
 - Primary vascular disease (arteriosclerosis) is rare in animals.
 - Atherosclerosis may result from atherogenic diets; it may be more common in dogs with hypothyroidism.
 - It may develop as a result of disseminated intravascular coagulopathy, but behavioral signs are likely to be preceded by systemic changes.
 - Cerebrovascular accidents may occur due to spontaneous intracranial hemorrhage. Neurological signs are acute, non-progressive, and may be followed by chronic behavioral changes such as aggression.
- Cerebral infarcts in cats (see “Idiopathic or Iatrogenic” above).
- *Cuterebra* larval infarcts (see “Infectious Diseases” above).

Abbreviations

CDVE = canine distemper viral encephalitis
 CLHC = chlorinated hydrocarbon intoxication
 CNS = central nervous system
 CSF = cerebrospinal fluid
 FIP = feline infectious peritonitis
 FIV = feline immunodeficiency virus
 OP = organophosphate

Suggested Reading

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