Animal Behavior Case of the Month

This feature is sponsored by the American College of Veterinary Behaviorists. Readers of the *JAVMA* are invited to submit reports, which should include a brief description of a behavioral problem, the evaluation and treatment, and a succinct discussion of the case.

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Statement of the Problem

Two dogs were evaluated for episodic bouts of bizarre behavior termed "glugging" and "snoofing" by their respective owners. In both dogs, the episodes began with frantic wandering, frenzied sniffing, and swallowing and progressed to anxious searching and consumption of nonfood items. One of the dogs became aggressive if its owner attempted to interrupt the behavior.

Signalment

The dogs were a 4-year-old 19-kg (42-lb) sexually intact female English Springer Spaniel (dog 1) and a 2.5-year-old 17-kg (37-lb) castrated male Soft Coated Wheaten Terrier (dog 2).

History

Dog 1 had been obtained from a breeder at 10 weeks of age. The behavior began at 1.5 years of age and had continued for 2.5 years prior to the time of admission. The owners provided videotape footage of the dog while it was engaged in a bout of the behavior. On the videotape, the dog could be seen frantically searching and sniffing inside the owners' home. The dog's pupils were dilated, and it protruded and retracted its tongue frequently while swallowing or gulping ("glugging"). The dog ingested clumps of hair and other debris lying on the floor and tore up and ingested a portion of the linoleum flooring in the kitchen. The owners reported that if they allowed the dog to go outside during one of these episodes, it would tear up and consume wads of dirt and grass. Reportedly, bouts of this behavior occurred in clusters lasting for several hours, with some minutes or hours of normal behavior between episodes of intense "glugging." The owners reported that individual bouts of the behavior might occur several times a day for several consecutive days or, alternatively, that several months might elapse between bouts. Bouts of the behavior had increased in frequency in the 2 months preceding examination and tended to occur in the evening. Once a bout began, the dog could not be interrupted. After bouts of the behavior, the dog would play with rocks if outside in the yard or play with its owners if inside the house and would then chew a rawhide for a while before settling down. It would then sleep for at least an hour. The owners could not identify a trigger for the behavior, and it appeared that the owners did not reinforce the dog's behavior during episodes. The dog did not have any history of aggression toward its owners, strangers, or other dogs. The only notable behavioral issue other than the "glugging" was fear of wind and thunderstorms.

Dog 2 was obtained from a kennel at 4 months of age and lived in a house with 3 people. The premonitory phase of this dog's behavior episodes consisted of stalking some unseen prey while exhibiting a glazed expression. The dog then engaged in frenzied sniffing, licking, and swallowing and frantically began to ingest nonfood items, such as dust, leaves, twigs, carpet, or, on 1 occasion, its own vomitus. The latter phase of the behavior was brief. The owners of dog 2 were shown a videotape of dog 1's behavior and were amazed at the similarity. The only difference was that dog 2 sometimes displayed aggression to its owners in the latter phases of a bout of the behavior unless they were able to lure the dog into its crate with food treats. Once in the crate, the dog would growl or show its teeth for approximately an hour. During the most recent incident prior to examination, the dog began to bite at itself while in the crate and removed some hair from its legs. The owners' verbal attempts to deter this behavior were ignored by the dog. The ingested hair caused a gastric obstruction that necessitated gastroscopic surgery for its removal. The first "snoofing" episode was witnessed when the dog was around 2 years old. Since then, the dog had had approximately 1 episode a month. Episodes had increased in intensity after the dog's owners moved from an urban area to a country setting. The owners reported no identifiable triggers for the episodes and stated that the dog could not be safely interrupted once a bout began. The owners reported 2 other behavior problems in addition to the "snoofing." When confined, the dog compulsively licked the inside of its crate. The dog also displayed owner-directed aggression at times other than during bouts of "snoofing." The aggression occurred when the dog was startled by a loud sound, such as the apartment buzzer, a knock on the door, or loud voices, and all 3 persons living with the dog had been bitten on separate occasions.

Physical Examination Findings and Laboratory Results

Dog 1's behavior was unremarkable in the consulting room, and a physical examination did not reveal any identifiable abnormalities. Careful direct visual inspection of the oropharynx ruled out the possibility of a pharyngeal foreign body. Samples were taken for a CBC, serum biochemical profile, measurement of serum thy-

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roxine concentration, and determination of blood lead and magnesium concentrations. Results of the CBC and chemistry profile were within reference limits. The blood lead concentration (0.025 ppm) was less than the concentration expected following exposure (0.06 to 0.35 ppm) and the toxic concentration (> 0.35 ppm). The magnesium concentration (1.6 mg/dL) was slightly less than the lower reference limit (reference range, 1.8 to 2.4 mg/dL). The serum thyroxine concentration was within reference limits (3.0 µg/dL; reference range, 0.8 to 3.4 µg/dL).

Dog 2 was calm and composed during the behavioral consultation. Results of a physical examination, including direct inspection of the pharyngeal region, were unremarkable. One month prior to the appointment, the referring veterinarian had submitted samples for a CBC, serum chemistry profile, and assessment of thyroid function. Results of the CBC and chemistry profile were unremarkable. The dog's total thyroxine concentration was 1.8 µg/dL (reference range, 1.3 to 2.9 µg/dL). Two months later, a thyroid function profile was performed to obtain a more comprehensive evaluation of thyroid function. Serum total thyroxine concentration was low (1.26 µg/dL; reference range, 1.5 to 3.0 µg/dL), as was serum total triiodothyronine concentration (0.85 ng/mL; reference range, 1.0 to 2.0 ng/mL). Serum free thyroxine concentration, determined by means of equilibrium dialysis (0.78 ng/dL; reference range, 0.7 to 2.6 ng/dL), and serum thyroid-stimulating hormone concentration (0.06 ng/mL; reference range, < 0.50 ng/mL) were within reference limits.

Diagnosis

For both dogs, a provisional diagnosis of partial seizure disorder was made on the basis of the clinical signs. The initial differential diagnosis had included compulsive disorder, displacement behavior, and pharyngeal foreign body. Compulsive behavior was not considered likely because of the form of the behaviors and the marked change in both dogs' affect during bouts. Displacement behavior was ruled out because of the absence of a triggering stimulus or situation. Pharyngeal foreign bodies were ruled out by direct inspection of the oropharynx. Neither dog had signs typically associated with an alimentary disturbance. The provisional diagnosis of partial seizure disorder was confirmed on the basis of each dog's response to anticonvulsant therapy. Dog 2 was considered to have suboptimal thyroid function, even though it was receiving phenobarbital at the time the thyroid function profile was performed and phenobarbital is known to suppress serum thyroxine concentrations by approximately 25%.[1]

Treatment

The treatment plan for both dogs was multifaceted. Owners of both dogs were advised to use clicker training methods to teach new obedience commands and food puzzles to enrich the dogs' environments and decrease stress. Daily bouts of aerobic exercise were encouraged, as was a well-structured routine. Dog 1 was treated with phenobarbital at a dosage of 45 mg, PO, every 12 hours. Dog 2 was treated with phenobarbital at a dosage of 32 mg, PO, every 12 hours. The owners of dog 2 were shown how to use a head halter to control the dog and were instructed to implement a leadership program, requiring the dog to work for all resources by obeying verbal commands.

Follow-up

The owners of dog 1 initially reported that the frequency of the bouts of abnormal behavior dramatically decreased in the first few weeks following the consultation and that the behavior had eventually ceased altogether. Sixteen months after the initial appointment, the owners reported that the glugging behavior had returned at a low frequency, with bouts occurring once a month on average. The dog's blood phenobarbital concentration was measured and found to be in the lower end of the therapeutic range (20 µg/mL; therapeutic range, 15 to 45 µg/mL). Therefore, the owners were advised to increase the phenobarbital dosage to 90 mg, PO, every 12 hours and to have the dog's blood phenobarbital concentration rechecked in 3 weeks. The owners reported that following the increase in phenobarbital dosage, the frequency and duration of glugging episodes decreased. There were only 2 bouts of abnormal behavior during the following year, with each bout lasting about 12 hours. The blood phenobarbital concentration at this time was 31.3 µg/mL. At no time did the dog's appetite change, and it did not exhibit any signs of sedation. Between 22 and 28 months after the initial examination, the dog had 3 bouts of the glugging behavior, 1 of which lasted 12 hours and 2 of which lasted 3 days each.

One month after the initial appointment, the owners of dog 2 reported that the number and intensity of snoofing episodes were decreasing. Additionally, they were now able to intervene during an attack without eliciting an aggressive response from the dog. The owners reported that they had implemented the leadership program and begun agility training at a local beach. The dog's blood phenobarbital concentration was measured and found to be in the low end of the therapeutic range (17 µg/mL). Therefore, the phenobarbital dosage was increased to 48 mg, PO, every 12 hours. One month later, the owners reported that the dog had not had a single snoofing episode since the last communication and that no adverse effects associated with phenobarbital administration had been seen. However, aggression toward family members unassociated with snoofing episodes continued. The dog's blood phenobarbital concentration was checked and found to be adequate (22.9 µg/mL). Trial treatment with thyroxine (0.3 mg, PO, q 12 h) was implemented at this time to possibly help reduce the dog's aggression.[2,3] Four months later, the owners reported that the dog had not had any additional snoofing incidents but had lost 2.5 kg (5.5 lb). The thyroid function profile was repeated, and total thyroxine (2.91 µg/dL), total triiodothyronine (1.06 ng/mL), free thyroxine (1.26 ng/dL), and thyroid-stimulating hormone (< 0.03 ng/mL) concentrations were all within reference limits. Although the weight loss was likely incidental, the owner was instructed to decrease the dosage of thyrox-

ine to 0.2 mg, PO, every 12 hours. After consulting with their local veterinarian, the owners elected to decrease the dosage to 0.3 mg, PO, every 24 hours instead. Five months later, the dog's weight was approximately 1 kg (2.2 lb) greater than its baseline value, and the dog was reportedly much less aggressive than ever before.

Discussion

Partial seizures differ from grand mal seizures in their clinical appearance in that there is no loss of consciousness. Instead, a mood change or distortion in perception is thought to occur, which can cause a dog to react with aggression, excessive fearfulness, or some predatory-derived behavior, depending on the site of the central disturbance.[4] Both dogs described in the present report fit a diagnostic profile for complex partial seizures (ie, behavioral seizures). Specifically, both dogs had a preictal phase (ie, stalking) prior to the behavior; a presumed ictal phase (ie, mood change and compulsive consummatory behavior) that included autonomic nervous activation, as evidenced by pupillary dilation and vomiting; and a postictal phase (ie, sleeping in dog 1 and aggression or an altered mood in dog 2).

During bouts of the abnormal behavior, dog 1 displayed compulsive consummatory behavior, including ingestion of foreign objects and compulsive licking and swallowing. Dog 2 also displayed compulsive consummatory behavior during bouts, which in this dog was manifested as ingestion of nonfood items. The dog also displayed spontaneous aggression during and after bouts of the behavior. Aggression of this type could be a manifestation of behavioral (limbic) epilepsy.[5] Functional causes for aggression associated with snoofing in dog 2 were ruled out on the basis of a lack of clear aggression-provoking triggers and the sustained and undirected nature of the behavior. Dog 2 was occasionally aggressive to its owners when startled by loud noises, but did not clearly have dominance-related aggression, as determined by its canine overt aggression score (determined by use of a published chart[6]). Rather, the aggression was considered to be a form of redirected fear aggression.

Activation of specific parts of the limbic system or hypothalamus initiates specific autonomic and behavioral responses.[7] Stimulation of the lateral portion of the hypothalamus, for example, causes effects consistent with predatory behavior (both appetitive and consummatory components) and rage.[7–9] It seems likely that partial seizures affecting this area of the brain were involved in the pathogenesis of the behaviors in both dogs described in the present report. Abnormal electroencephalographic activity has been linked with episodic dyscontrol syndrome, a partial seizure disorder of humans and dogs associated with bouts of excessive and inappropriate aggression.[10] An abnormal electroencephalographic recording, although supportive of the diagnosis of a seizure-based problem, is not critical to the diagnosis and was not obtained for either dog described in the present report. Instead, the diagnosis was confirmed on the basis of the positive dose-related response to phenobarbital administration. In our experience and in the experience of other authors,[10–13] phenobarbital appears to be a good first choice for the treatment of complex partial seizures in dogs.

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