Seizure-alerting and -response behaviors in dogs living with epileptic children

Adam Kirton, MD; Elaine Wirrell, MD, FRCPC; James Zhang, MSc; and Lorie Hamiwka, MD, FRCPC

Abstract—There is little evidence for the ability of dogs to anticipate human seizures. Families of epileptic children were surveyed to investigate seizure-related behaviors in dogs. Approximately 40% of families owned a dog, about 40% of these had seizure-specific behavior, and about 40% of these (approximately 15% overall) showed anticipatory ability. Anticipation occurred early and was both sensitive and specific. Quality of life was higher in families with a dog that responded to seizures.

NEUROLOGY 2004;62:2303–2305

The remarkable ability of some dogs to anticipate human seizures has been recently documented.1–4 Seizure-alerting behavior may develop spontaneously in dogs living with epileptic adults.4 New evidence suggests that some dogs can be reliably trained to anticipate seizures1,2 and that owning a seizure-alerting dog (SAD) may reduce seizure frequency.3 Few studies have focused on seizure-alerting behaviors in dogs living with epileptic children. The inadequacy of current treatments to alleviate the enormous global, family, and individual burdens of epilepsy merits exploration of alternative management strategies. SADs may improve quality of life (QOL) for people with epilepsy.

Methods. We surveyed the families of all children (1 to 18 years old) followed through the Refractory Epilepsy Clinic at our tertiary care pediatric neurology center. A screening survey selected children who had lived with a dog for at least 1 year while having at least 1 seizure/month. Information about these children (age, gender, intelligence), their seizures (type, frequency, medications, etc.), and the dog (age, gender, breed, etc.) was obtained. Dog breeds were categorized into the seven groupings of the American Kennel Club (AKC). All families completed the Impact of Pediatric Epilepsy Scale,5 a validated tool for the assessment of QOL in epileptic children. Families reporting seizure-related behaviors then underwent a detailed telephone interview using a standardized template. All questions are listed in table 1.

A “seizure-response dog” (SRD) demonstrated specific behaviors during or immediately after a seizure. An SAD demonstrated specific behaviors prior to any appreciation of an impending event by the child or an observer.

Average values are expressed as medians (25th, 75th percentiles) for descriptive variables or means (95% CI). Differences between groups were determined using a two-tailed Student t-test.

Results. Of 238 families surveyed, 122 responded (51%). The median age of the child was 10 years (6.8, 17.5), and 64% were girls. All varieties of seizure type were represented. Forty-eight (39%) had lived with a dog for at least 1 year while having seizures. The total number of dogs was 62. No dogs were previously trained for assistance work.

Twenty families (42%) reported specific seizure-related behaviors by their dog (SRDs). The total number of SRDs was 22 (13 female and 8 male). Most SRDs (68%) were larger animals (>40 lbs) as compared with nonresponsive dogs (38%; p < 0.05). All seven AKC breed groups were represented, but most SRDs were mixed breeds (9/22, 41%), a frequency similar to the nonresponsive group (15/40, 38%). The average time required for the SRD to acquire its behavior was 1.0 (0.0, 3.0) month, but 9 of 22 families (41%) felt it was seen with the first seizure. Of 152 response behaviors observed, 114 (75%) occurred during the event and 38 (25%) occurred afterward. Behaviors were very specific as no family reported observing the same collection of behavior(s) at any other time.

The most common response behavior was licking, often of the face, observed in 13 of 22 SRDs (59%). Other common responses included decreased motor activity (55%), “protective” behavior without aggression (50%), and whimpering (36%). Each of the other behaviors listed in table 1 (except tail wagging) occurred, but less frequently.

Variables including age of child at seizure onset, child gender, seizure type/frequency/duration, medication history, and developmental ability as well as dog gender, age, and time living with child were comparable between the SRD and nonresponsive groups (table 2).

Nine (41%) SRDs were also SADs. Therefore, of all families living with a dog, 20% (9/48) witnessed anticipatory behavior, which corresponded to 15% (9/62) of all dogs studied. Female dogs comprised approximately 80% of the SAD subgroup, and larger animals were again more common (7/9, 78%). SAD breeds included Golden Retriever, Standard Poodle, German Shepherd, Akita, Rough Collie, Rottweiler, Cairn Terrier, Great Pyrenees, and one mixed breed. Children in the SAD subgroup were similar to the nonresponsive and SRD groups (see table 2).

The median anticipation time was 2.5 (0.9, 15.0) minutes with a range from 10 seconds to 5 hours. The accuracy of alerting behaviors was high, with a median sensitivity estimate of 80% (66, 92). Anticipatory behaviors were never demonstrated without a subsequent seizure.
majority of families (6/10) believed the anticipation abilities existed with the first seizure, whereas the rest reported it developing within 1 month.

Behaviors often were protective, but no instances of overt aggression or harm were reported. Alerting behaviors could be both seizure type and child specific. Six of the nine SAD families felt the mechanism of anticipation was a unique sensory ability outside of the traditional five senses. Two others felt it was likely related to smell.

A Sheltie–Spitz cross would forcibly sit on her toddler and not allow her to stand prior to a drop attack. An Akita would push her young girl away from the stairs 15 minutes before a drop attack. An Akita would push her young girl away from the stairs 15 minutes before a drop attack.
before a convulsion. A Golden Retriever could anticipate nocturnal events from sleep by up to 20 minutes. A Rottweiler would lick his toddler’s feet with absence seizures but forcibly position himself on either side before a drop attack. A Great Pyrenees would attach itself to its 3 year old at the exclusion of all else, including eating and drinking, hours before she had a generalized convulsion. The same dog would forcefully lie on the 8-year-old sister 10 minutes before she had a complex partial event with wandering.

QOL scores were higher in families living with a dog, particularly if that dog responded to seizures (figure). QOL = quality of life

**Discussion.** Approximately 40% of families owned a dog, about 40% of these had seizure-specific behavior, and about 40% of these showed anticipation. A similar proportion of epileptic adults appear to live with dogs, but fewer reacted to seizures, with only 14% showing response and 5% showing anticipation. The reason for this discrepancy is unclear but may relate to differences in seizure types, body habitus, or increased observation of children. Seizure anticipation behaviors appear to be sensitive and specific with no false-positive behaviors reported. Although this may reflect in part a selection bias, it is consistent with other reports of SADs and argues for true seizure detection.

Somatosensory stimulation can affect both seizure activity and other forms of pathologically increased brain activity such as the **geste antagoniste** of dystonia. Owners of seizure-sensitive dogs have reported that licking may abort or even prevent their seizures. That licking was the most common behavior we observed may suggest a conditioned response by the dog to shorten or abort a seizure.

Visual cueing on subtle early seizure behaviors has been suggested as the mechanism for seizure anticipation, whereas olfactory sensation seems less likely. Alternatively, being able to sense behavior would confer a significant survival advantage to a dog and be perpetuated through natural selection. The ability to instill or “bring out” this skill by operant conditioning may further support its existence in dogs. Intriguing new and controversial research has begun to explore the abilities of animals to sense human brain activities. Simple experiments with SADs could solve the mystery.

A previous report suggested an inherent danger for people with epilepsy having untrained dogs as pets. In contrast, our results argue that not only is it safe to own a seizure-sensitive dog, but that such a dog may even improve QOL. Future efforts to validate SADs and establish reputable training programs to increase their availability will help uncover the mechanism by which detection occurs, while benefiting those living with epilepsy.

**References**