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### **Living with...Seizures** **Written by: Linda Aronson, DVM**

The account accompanying my notes was written by the owner of a Bearded Collie who does not want to be identified. Seizures are scary for an owner – especially the first time – so I wanted to include a first hand account.

A seizure is a symptom and not a diagnosis. It is estimated that about 1% of dogs will experience a seizure over the course of their life, and while they are more common in certain breeds (affecting 15-20% of animals) they are relatively infrequent in Beardies. A seizure represents a transient paroxysmal disturbance in the electrical activity of the gray matter, most often in the cerebral cortex but sometimes in the thalamus, hypothalamus or midbrain. The appearance of the seizure can reflect the area of the brain affected. It may involve changes in behavior, consciousness, muscle activity, sensation or autonomic (unconscious) actions.

Behaviorally seizures can manifest as confusion, dementia, delirium, rage or fear. Muscular changes can produce involuntary spasms that can be rigid (tonic) or jerky (clonic) or result in limb paddling. The jaw may be locked or the dog may make chewing, licking or lip smacking motions. The dog may spin, pace or run if he remains upright. In humans we know that seizures are often accompanied by sensory changes, but these are harder to appreciate in dogs. Pawing at the face, attacking the tail or chewing and biting the flanks may indicate changes in body sensation. Biting at invisible flies may be a manifestation of visual hallucination. Increased sensitivity to sounds, light, and/or touch may be appreciated, as well as increased sniffing suggesting increased awareness of smells. Rapid eye movements (nystagmus) may be noticed along with loss of balance. Increased salivation along with uncontrolled urination and defecation represent over-activity of the autonomic nervous system. Rarely paroxysmal vomiting and diarrhea will be part of the seizure.

Seizures are classified as general or partial/focal and can be mild or severe. In mild general seizures the dog may appear confused and have muscle tremors – rippling skin/shaking. He may seek comfort from his owner and reassurance may actually curtail the seizure. Mild seizures can build into severe ones, however. Electroencephalograms recorded during mild seizures show symmetrical alterations in electrical activity, while in severe ones there is massive electrical discharge throughout the



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cortex. Partial seizures show localized, asymmetrical changes and the symptoms reflect the part of the brain affected. In the motor cortex there will be spasms of the face or limbs on the opposite side from the brain activity. Partial seizures affecting the limbic system result in outbursts of abnormal behavior – frantic running, aggression, rage and/or hallucinations.

Seizures can have many causes. Recurrent seizures of no known cause are referred to as idiopathic epilepsy. This condition is usually inherited and is usually first seen when the dog is between one and three years of age. However, some “idiopathic” epilepsy is likely the result of trauma to the brain, with seizures starting 6 to 12 months after the injury. In dogs under 9 months of age, seizures are often the result of congenital problems (hydrocephalus, lissencephaly, storage disorders, metabolic disorders, portosystemic shunt); infection (distemper and other viral diseases, fungal, protozoal or bacterial encephalitis); toxicity (lead, organophosphates); trauma; hypoglycemia; thiamine deficiency. From 9 months onwards infection, trauma, toxicity, hypoglycemia, metabolic disorders, and idiopathic epilepsy are joined as potential causes by meningoencephalitis, acquired hepatic encephalopathy (secondary to liver disease); as well as brain cancer in older animals.

During a seizure the threshold for excitation in a number of nerve cells in a region of the brain is lowered either due to an increase in excitatory neurotransmitters or reduction in inhibitory ones. (Neurotransmitters are chemicals that transmit nervous activity from nerve to nerve or from nerve to muscle.) The activity of nerves is also dependent on the concentrations of potassium, sodium, calcium and chloride ions within and outside the nerve. Changes in electrolyte levels can also result in seizures. The nerve cells at the focus of the seizure stay excited for a prolonged period and gradually excite surrounding cells in an increasingly larger area. This is called kindling. Other foci of activity can also be established. Once enough neurons are involved the seizure will be seen. A typical seizure often has three phases: the pre-ictal or prodromal period – sometimes called the aura (when the dog may realize that a seizure is coming and react in a characteristic manner), this can last more than a day; the ictus (the actual seizure); and the post-ictal phase (which may include pacing, depression, drinking, eating or sleeping, but which is characteristic for each patient) which can continue for several days. Between seizures most dogs appear totally normal.



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Because most dogs are normal by the time they see a veterinarian, history is most important in evaluating seizures. A single seizure is scary to owner and Beadie, but may never happen again, so apart from watching to see if there are more seizures little else needs to be done. If a dog suddenly starts having multiple seizures within a week, it suggests active brain disease and it would be wise to initiate a more aggressive diagnostic plan. Partial seizures or partial seizures that generalize suggest a structural, localized problem – encephalitis, tumor, injury or stroke. If the owner notices a characteristic turn of the head, spasms, on one side of the face or the lifting of one leg before the seizure it suggests a localized seizure that has generalized. Asymmetry of the signs also suggests partial versus generalized seizures. Partial or mild general seizures can last over 30 minutes, but partial seizures that generalize or severe general seizures last less than five minutes – although it can seem like hours! A video of the seizure can provide important diagnostic information. Changes in behavior and/or gait between seizures indicate an active disease process in the brain.

A thorough history will gather information about the various body systems – respiratory, gastrointestinal, renal, etc. – which may indicate a systemic disease altering brain function. Information on diet; exposure to toxins and drugs; known traumas; similar signs in other animals in the same household or in related animals; current medications can all provide relevant diagnostic data. The physical examination should include examination of the eyes and a complete neurological examination. Typically, testing would include a complete blood count, fasting biochemistry profile, thyroid profile, bile acids, serum lead and/or cholinesterase levels (if toxicity is suspected), urinalysis and if neoplasia is suspected chest and abdominal X-rays. Hypothyroidism, electrolyte imbalances, metabolic disorders and/or toxicity must all be ruled out. If the dog is having frequent seizures, further testing would include MRI or CT of the brain, EEG and testing of the cerebrospinal fluid to find the underlying cause.

If the primary cause of the seizures is discovered treatment is directed at treating this, although anticonvulsant therapy may be initiated while it is brought under control, and then gradually phased out. If a cause cannot be discovered and seizures occur more frequently than twice a month, or in clusters, treatment is aimed at reducing frequency to an acceptable level. The treatment of all underlying causes is beyond the scope of this article. The drugs most frequently used to control seizures are phenobarbital and/or potassium (occasionally sodium)



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bromide. Phenobarbital is the cheapest and most effective drug, but it is also toxic to the liver, and because absorption is variable blood levels must be carefully monitored – the therapeutic level being close to the lethal one. Combining the two drugs may allow lower doses of phenobarbital to be given effectively and more safely, as bromides have no liver toxicity. Both drugs – given alone or in combination – can produce a level of sedation unacceptable to the owner. However, in general, either alone or in combination these drugs can be used safely and effectively to control seizures. Diazepam is too short acting in dogs to be of value in preventing seizures, but can be given intravenously or rectally to quickly stop cluster seizures (status epilepticus). If these are unchecked, loss of oxygen can cause irreparable brain damage. Newer drugs are also being used to treat some seizures in dogs. These include gabapentin (Neurontin), zonisamide (Zonegran) and levetiracetam.

Patients with seizures should be fed a balanced diet without extra supplementation. They should avoid chemicals and drugs which could make them more susceptible to seizures. While clinical studies are lacking heartworm preventatives containing ivermectin and flea preventatives Program and Advantage may lower seizure threshold and make seizures more difficult to control. Organophosphate insecticides should be avoided. Interceptor and Frontline appear to be safer for patients with seizure disorders.

Acupuncture can be effective in some cases, including those that resist pharmaceutical intervention. Valerian root is a traditional anticonvulsant, which may be beneficial and could be tried before turning to more potentially toxic treatments. Milk thistle might help to protect the liver during phenobarbital therapy.

Chances are good that you and your Beardie will never experience a seizure. If you do, try to stay calm and not panic.

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The bumping against the closet doors woke us up at 4:45 am on Tuesday, May 9, 2006. He was having a generalized seizure. That's the term they use now for what we used to call a "grand mal" seizure. I was terrified. Here was a Beardie lying there salivating, urinating, paddling, jaw clenched, breathing as if he were running, but choking at the same time and I had no idea what



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to do. This lasted about a minute. Then he calmed down and the “cool down” period lasted another minute with his breathing slowing, heart rate slowing and wanting to get up. We kept him lying down until he appeared to be back to normal. When he did get up he seemed coherent. I snapped on his leash and rushed him to the all-night emergency hospital. Of course, the vet on duty sent me home to monitor him and make sure he was ok. He was a bit unsettled and clingy over the course of the morning.

I called my regular vet the next day and put in a call to my good friend who is Professor Emeritus of Veterinary Neurology. She suggested taking him to a nearby teaching hospital for superficial neurological tests, as well as blood work. Everything came back “normal”. Meanwhile, my friend gave me a “Seizure 101” Cliff Notes version of canine seizures that night on the phone.

The advice was, just wait and see if he has another one. He recovered just fine. I spent hours Googling “seizures in dogs” and read mountains of material. After awhile, the material began to repeat itself so I felt comfortable that I was reading the right stuff. And, of course, we scoured the yard to make sure he had not gotten into any poison or other chemicals and checked all of our records for yard spraying. Shoot, we checked everything we could think of and came up empty.

Many things can cause seizures, and many of those we don’t even know about.

The next seizure happened in September of that year...Monday, September 4, 2006, 4:00 am-ish as a matter of fact. On the advice of my friend, I keep a log of each seizure, noting day, date, time of day, duration of seizure, symptoms, and length of recovery time. This time, the seizure lasted a little longer and it was stronger. Evidently, he had thrown up first. In addition to the above things, he gnashed his teeth and defecated. His tongue and gums were gray. He had a secondary seizure that lasted another minute or so, with more paddling. Afterward, his emotions were out of whack for at least a couple of hours. Again, he knew the seizure was coming on because he had come flying into our bedroom at the onset. I was calmer because I had been through this one time before.

This time I made an appointment with a veterinary neurologist who suggested we put him on Potassium Bromide (KBr) to forestall any future seizures. In addition we had a battery of blood tests done, an MRI and joint



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taps, all of which came back as those of a healthy dog. So, the decision, give KBr or not? I opted for the medicine, against my husband's and, probably, many others' wishes. He was on that for a year and was seizure-free, but the medicine did have side effects, one of them making him terribly hungry or having a terribly upset stomach. During the period he was on that medicine, we had to barricade the kitchen to keep him from climbing on the counters trying to find food. Luckily, the KBr worked fine and did not have to be paired with Phenobarbital. Three months after discontinuing the medicine, he had another seizure.

Same drill, 5:00 am, came in and jumped on our bed. This was, yet, worse than the ones he had before. I reported the seizure to all of his doctors but opted to wait and see before putting him back on KBr.

The next one came on Saturday, May 10, 2008, around 4am. Basically, it was the same as before but not, quite so bad.

The latest seizure came Friday, September 5, 2008 around 5:30 am. This one lasted around a minute, with a secondary seizure or, maybe a cool-down period of a minute and a half. He woke us up throwing up, and then he jumped on the bed to have the seizure.

All we can do during these is steady him and try to keep his throat clear (by keeping his head and neck straight as possible) so he can breathe. Until the seizures happen more frequently, he won't go back on medicine.

If you notice the dates, you'll see that 4 of them have been 2 years apart, almost to the day.

May 9, 2006

May 10, 1008

September 4, 2006

September 5, 2008

December 12, 2007

Aside from the December seizure (which was 3 months after going off of his medicine), that tells me something "otherworldly" is causing them, something that science has not identified yet. People will say I'm crazy, that statistically it's insignificant, but, to me, it means something. I don't know what, but something.



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So, we have decided to live with these until they become more frequent. I'm going to start acupuncture treatments and just monitor him, especially around May and September. During all of this, he was able to continue herding sheep but did have to stop agility when he first started KBr treatment. As the amount of KBr tapered off, he was able to resume agility practice again. In between seizures, we have a perfectly normal Beardie.