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## **Seizure Disorders**

### **What is a Seizure?**

Any involuntary behavior that occurs abnormally may represent a seizure. Seizures are classified into several categories.

#### ***Generalized (Grand Mal) Seizures***

This is the most common form of seizure in small animals. The entire body is involved in stiffness and possibly stiffness/contraction cycles (tonic/clonic action). The animal loses consciousness and may urinate or defecate.

#### ***Partial Seizures***

This form of seizure originates from some specific area in the brain and thus involves the activity of a specific region of the body. Partial seizures may generalize to involve the whole body.

#### ***Psychomotor Seizures***

This type of seizure is predominantly behavioral with the animal involuntarily howling, snapping, circling, etc. The abnormal behavior may be followed by a generalized seizure.

Seizures (neurological events) are often difficult to differentiate from fainting spells (cardiovascular events). Classically, true seizures are preceded by an aura, or special feeling associated with a coming seizure. As animals cannot speak, we usually don't notice any changes associated with the aura. The seizure is typically followed by a post-ictal period during which the animal appears disoriented, even blind. This period may last only a few minutes or may last several hours. Fainting animals are usually up and normal within seconds after the spell.

**\*\*\*POST-ICTAL DISORIENTATION IS THE HALLMARK OF THE SEIZURE\*\*\***

### **Causes of Seizures and Diagnostics**

Seizures may be caused by situations within the brain (such as trauma, tumor, or infection) or by situations centered outside the brain (such as low blood sugar, circulating metabolic toxins, hypothyroidism, or external poisons). The first step is to rule out situations centered outside the brain, accomplished with blood testing. An ophthalmic exam may also be performed as the retina may show signs of a brain infection. If these tests are negative, the next step is determined by the age of the pet.

#### ***Animals less than One Year old***

Seizures are usually caused by infections of the brain. Analysis of cerebrospinal fluid, obtained by a tap under anesthesia, would be important.

#### ***Animals between Ages 1 and 5***

In these animals, usually no cause can be found and the term "epilepsy," which simply means "seizure disorder," is applied. If seizures are occurring frequently enough, medication is used to suppress

them. Schnauzers, Basset hounds, Collies, and Cocker spaniels have 2-3 times as much epilepsy as other breeds.

### ***Animals over 5 Years old***

In this group, seizures are usually caused by a tumor growing off the skull and pressing on the brain (a "meningioma"). Most such tumors are operable if found early. A CT scan or MRI would be the next step. Special referral is necessary for this type of imaging. For patients where surgery is not an option, corticosteroids may be used to reduce swelling in the brain. Treatment to suppress seizures may also be needed (see below).

Epilepsy is the name given to seizure disorders for which no cause can be found. It is not a unique disease in and of itself. In dogs, epilepsy is a common diagnosis but in cats most of the time a complete work up (including a CSF tap and imaging study of the brain) leads to a diagnosis.

***Seizures resulting from metabolic problems or toxicity (i.e., when the brain itself is normal) are called REACTIVE SEIZURES.***

***Seizures resulting from an identifiable brain abnormality are called SECONDARY SEIZURES.***

***Seizures for which neither of the above problems apply (i.e., when no cause can be found) are called PRIMARY SEIZURES.***

### **Medication to Suppress Seizures: Phenobarbital**

Treatment of any seizure disorder is aimed at suppressing the seizure with medication. The drug of choice is still phenobarbital.

#### ***When to Begin Treatment:***

- When seizures occur in clusters, that is one after the other
- Seizures greater than 4 minutes long
- When isolated seizures occur once a month or more
- When special circumstances exist regarding how often the animal is observed (if an animal cannot be observed, there is no way of knowing how frequently seizures are occurring. It may be best to play it safe.)

### **What You Should Know about Phenobarbital**

This medication is a long-acting barbiturate capable of suppressing seizure activity in the brain. It is an inexpensive drug, although the appropriate monitoring blood tests amount to about \$200 to \$300 per year.

It takes 1 to 2 weeks to build up a blood level capable of suppressing seizures. This means that the effectiveness of a given dose cannot be assessed before this period. After this time, a phenobarbital blood level should be run to determine the effectiveness of the dose being used. Phenobarbital blood levels, once therapeutic, are checked every 6 months or sooner if breakthrough seizures occur.

Twenty to thirty percent of epileptic dogs cannot be controlled with phenobarbital alone. If an animal on phenobarbital continues to have seizures, a blood level must be drawn. Before adding other drugs, however, it must be shown that the maximum therapeutic phenobarbital blood level has been ineffective; most animals in this situation are nowhere near the maximum level and simply require a dose higher than what they are receiving. If phenobarbital is simply not effective or has unacceptable side effects, potassium bromide (see below) may be used to complement phenobarbital at a lower dose.

Another important part of monitoring regards the toxicity of phenobarbital. This medication can be harmful to the liver, so liver function is periodically checked. A bile acids liver function test and a phenobarbital blood level twice a year are recommended.

#### **Common Side Effects:**

- **Sedation** - animals may become quite stuporous as they get used to this drug. This effect is temporary, lasting until the patient's metabolism adjusts (usually no longer than a few days). Animals with brain tumors tend to have more long-term sedation issues with this medication.
- **Excessive Thirst and Appetite** - These side effects are annoying and, unfortunately, permanent if they occur. If these side effects become too objectionable, the phenobarbital dose will have to be lowered and another medication added for seizure control. Cats on phenobarbital are generally spared these particular side effects.

#### **What if Phenobarbital Doesn't Work or Causes Unacceptable Side Effects?**

For such cases, potassium bromide becomes the next best choice. The phenobarbital dose is generally cut back and potassium bromide is given at a high dose for a day or two before dropping to a maintenance bromide dose. Potassium bromide is felt to be an investigational treatment by the FDA; still, 85% of phenobarbital failures can be controlled with potassium bromide. Bromides reach therapeutic levels very slowly (months) thus, in most cases, bromides and phenobarbital are used in combination. When both drugs are used together, their side effects become added together so, for example, if one did not see sedation or excessive water consumption as a side effect of significance with phenobarbital alone, one is much more likely to see them now.

Between 25% and 30% of epileptic dogs are still uncontrolled despite excellent blood levels of phenobarbital and/or potassium bromide, and there is a long list of anti-seizure drugs available for people. Many dog owners wonder why we seem limited to two medications when it comes to dogs. In fact, most of the drugs used on humans are either prohibitively expensive for dogs or must be used with a very inconvenient dosing schedule (pills several times a day). This said, some of these medications may be used as supplements to phenobarbital and/or potassium bromide.

#### ***Gabapentin (Neurontin®)***

This medication also requires dosing three to four times daily. On the plus side, it has little potential for side effects and reaches a stable blood level within the first week of administration. Some experts have been pleased with results on gabapentin while others have not.

#### ***Levetiracetam (Keppra®)***

This drug is popular for refractory epilepsy in dogs because it has been shown to be fairly reliable and has minimal side effects potential. Its disadvantages include expense (though several sizes are now available as generics, which helps tremendously) and the three times daily dosing schedule. Dosing may require some experimentation to hit on what is effective for a given patient.

#### ***Zonisamide (Zonegran)***

This drug is a sulfa class anti-seizure medication that is rapidly becoming a first-line treatment choice but might also be used to supplement more traditional therapies. Because it is a sulfa, it is vulnerable to the side effects associated with sulfa antibiotics: mostly tear production/dry eye issues but also some immune-mediated reactions. (Sulfa side effects are reviewed more completely in our pharmacy library under the sulfa antibiotics such as [trimethoprim sulfa](#)). Zonisamide can be used twice a day in dogs but lasts long enough in cats to possibly be used once daily.

#### **Seizures at Home (When is it an Emergency?)**

It is a lucky pet that never has another seizure after beginning medications; but an occasional breakthrough seizure (as disturbing as it may be to watch) is rarely of serious concern. It is important not to put yourself in danger around a seizing pet. You may get bitten during involuntary jaw

snapping, and in the period of post ictal disorientation the pet may not recognize you and may snap. There are, however, some emergency situations:

- **Seizure activity non-stop for 5 minutes or more** (this is called *status epilepticus*)
- **More than three seizures in a 24-hour period** If a particularly bad seizure occurs at home, or if either of the above emergencies occur, a special first aid technique can be used: Rectal administration of [Valium](#). In initial studies, the injectable product was delivered rectally with a specific syringe that could be kept at home. The rectal route avoids any danger of being bitten while trying to administer medication. Recently [compounding pharmacies](#) have been able to produce Valium rectal suppositories that may be easier to use than the syringe method. Rectal valium administration has been used successfully for many years in epileptic children; the technique has adapted well to veterinary patients.

### **Can Seizure Medication be Stopped?**

While there is some risk to discontinuing seizure medications, this may be appropriate for some patients. Dogs should be completely seizure-free for at least a year before contemplating stopping treatment. In breeds for which seizure control is difficult, it is probably best never to stop medication (German Shepherds, Siberian Huskies, Keeshonds, Golden Retrievers, Australian shepherds, St. Bernards). Phenobarbital is a medication that cannot be suddenly discontinued; if you are interested in discontinuing seizure medication, be sure to discuss this thoroughly with your veterinarian.