Veterinarian in Attendance

EPILEPSY and SEIZURES in DOGS

Are They the Same?

Part I

By Samuel Hodesson
D.V.M., M.P.H.

Seizures cause more concern to owners and doctors and less to the patient than many other diseases:

1. Watching a dog undergo a seizure is a frightening experience for anyone, much more for human members of the immediate family. The first thought in the minds of many is that the dog is rabid. Rabies virus can cause seizures but, in my experience, usually doesn't.
2. As with many non-infectious diseases the cause of the problem is difficult for veterinarians to determine and treatment is not always effective.
3. Although extended seizures can cause permanent injury or death, the dog usually remains unconscious during the worst part of the event and comes out of it none the worse for the experience. Many patients are unaware that anything unusual has happened.

Part I of this series of two will concentrate on what goes on in a dog's head just before and during a seizure, terminology, and common causes. The subjects of breeds at risk, treatment, and management with concluding comments will appear in a later issue of *Dog News*.

"The terms seizure, convulsion, epilepsy and fit are synonyms for a brain disorder expressed as...transitory disturbance of brain function that has a sudden onset, ceases spontaneously and has a tendency to recur. The term epilepsy is more often used for seizures that are recurrent and of unknown cause...." (A. de Lahunta, *Veterinary Neuroanatomy and Clinical Neurology*, W.B. Saunders Co., page 32, Chapter 18.) Doctor de Lahunta's text provided an excellent source of information for the discussion that follows.

When no brain lesions can be found the term "idiopathic" epilepsy (of unknown cause) is applied. The words "true" or "inherited" are sometimes used in place of "idiopathic."

The nerve cell, called a neuron, is the basic building block of the extremely sophisticated mammalian nervous system. The neuron consists of a cell body and its axon, a fiber of varying length. Students of neuroanatomy estimate that the human nervous system consists of some hundred thousand miles of nerve fibers.

The cell body has an arbor of nerve endings, called dendrites, that connect with endings of other nerve cells. The actual area of transmission of nerve impulses between fiber endings is known as a synapse. When an electrical charge originates in a cell body, it can be transmitted to any one or all of that cell's fiber endings and then to any one or combination of a myriad of other cells across the synapse.

Neurons of the brain control the course of a nerve impulse through the system's network like the automated electronic switchboards of a modern fiber optic telephone system. This impulse conducted through axons of motor neurons can activate muscle fibers causing them to contract.

In an epileptic animal, a spontaneous uncontrolled discharge may occur in one or more neurons of the brain and spread to other neurons. This may induce surrounding nerve cells to discharge and the seizure spreads or generalizes. Resistance to uncontrolled discharge varies somewhat in each individual.

Most seizures in dogs are the generalized type known as grand mal. Observant owners will notice a change in behavior for a brief period during which their pet may become restless, look worried, seek attention or stare into space. Loss of consciousness follows and pupils of the eyes dilate.

Excessive salivation and chewing movements, commonly called chewing fits, may follow. Legs stiffen and the dog falls on its side. Paddling or running movements may alternate with periods of rigid extension of the legs and arching of the back. The patient may urinate or defecate during or after the seizure.

Most attacks last but a minute or two and the recovery period is usually short though it can persist for as much as a day. During this stage the dog may appear confused or wander about and bump into objects in the room.

Inexperienced persons and young children should not attempt to handle a dog during any of the stages of a seizure. These animals are not responsible for their behavior at this time. Some clients felt that wrapping a small dog in a blanket and holding it tight shortened the period of convulsions. Anything that limits the animal's movement decreases risk of self inflicted injury.

Toxic substances such as strychnine, pesticides and lead; changes resulting from heat stroke; and inflammation caused by infection can alter the response of a neuron to an electric charge. When this occurs seizures can result in otherwise normal animals. Fatigue, hyperventilation, fever, estrus, and bright lights can stimulate others to convulse.

A third group consists of individuals who have spontaneous seizures with no external stimulus. These are animals subject to true or idiopathic epilepsy. Their genetic background has predetermined the structure and function of their nervous systems.

The cause of changes in neuron function leading to seizure can originate outside the central nervous system (extracanial). Hypoglycemia is a common extracanial cause. De Lahunta states that Boxers, Poodles and terriers are at highest risk but many of my cases were toy breeds under the age of four months.

Hypoglycemia frequently follows malnutrition or heavy parasitism in puppies but may result from an excessive release of insulin after a feeding. Intravenous or oral doses of fifty percent sugar solution brings immediate response and puppies usually outgrow the problem.

Hunting dogs can develop hypoglycemia following heavy exercise. Some recommend that hunters carry candy bars when working their dogs in the field.

Nursing or pregnant bitches can develop eclampsia, convulsions caused by low blood calcium levels. If not corrected in the early stages, this disease can progress to coma. The history will readily distinguish the problem from epilepsy. In my opinion a lactating bitch with a large litter, wide awake and conscious of its predicament, doesn't look like one with epilepsy.

After many years of preventing reoccurrence of this disease by adding vitamin D and calcium to the diet of the bitch during her next pregnancy, experts now tell us that this practice is contraindicated. It reduces her ability to produce the extra calcium needed immediately after whelping. These recommendations prove that the only thing constant in medicine is that nothing is constant.

Treatment for eclampsia, intravenous calcium gluconate, is specific and almost immediately effective although relapses can occur. The regularly available solutions can cause ugly sloughs if any escapes from the vein; injections should be given by professionals. Vitamin D and calcium are usually added to the bitches diet until the puppies are weaned.

Inflammation of neurons within the brain can result from severe liver disease or infectious processes. Before the development of effective vaccines, distemper virus was the most frequent cause of seizures in dogs. Many a heartbroken client and veterinarian nursed a dog with distemper to an apparently successful conclusion only to euthanatize it when continuous intractable seizures develop.

Toxoplasma, single cell parasites, and fungi such as *Cryptococcus* can cause seizures when localizing in the brain. Tumors within the skull frequently cause seizures. The slow, relentless progress and other characteristics of this affliction usually differentiate it from epilepsy. Trauma to the head can cause violent, intractable convulsions.

An anxious family came into my office one day carrying a young female mixed dog. Diagnosis didn't require any expertise. The patient was stiff and unconscious. An automobile had struck the dog in the head and fractured the frontal bones of the skull. The skin over the fracture was torn and a portion of the brain could be seen under the wound. The owners received a very dismal prognosis but gave permission to see what could be done.

The surgery went well. Under anesthesia, fragments of bone were removed along with injured bits of brain tissue. A net of stainless steel wire woven over the exposed brain gave some protection. Muscle tissue sutured to the wire provided an additional safeguard against future injury. Sutured skin covered the repair job.

The dog regained consciousness the following day and was apparently normal. The wound healed without problems but a month after discharge the family returned the patient and requested euthanasia.

The bitch had suffered a complete change in personality. A sweet affectionate pet had turned into a mean sullen animal that couldn't be trusted around the children. Neurosurgeons tell us that this is a common aftermath of brain damage. Scars form in nerve tissue weeks or months after injury and can cause a marked change in behavior.

The above description of some of the more common causes of convulsions in animals concludes part one of "Seizures and Epilepsy." A brief description of cellular structure and function of the nervous system, also included, was intended to program our brain cells in preparation for Part II. Our neurons should now be tuned to accept a discussion of hereditary epilepsy which will include breed susceptibility, methods of diagnosis, treatment and management. This article is scheduled for a later issue of *Dog News.*

Source: *Dog News*, pp. 30, 116, 120 & 124.