



### What is Paroxysmal dyskinesias?

These are episodic movement disorders in which abnormal movements are present only during attacks. Although increasingly being recognised, they are often poorly characterised in veterinary literature and are commonly mistaken for an epileptic seizure, both by owners and by vets.

The term 'paroxysmal' indicates that the signs occur suddenly against a background of normality. The term 'dyskinesia' broadly refers to a movement of the body that is involuntary, which means that the animal has no control over the movement and remains fully aware of its surroundings. Between attacks, affected animals are totally normal and there is no loss of consciousness during the attacks, though some animals may find the episodes disconcerting and do not respond normally. The attacks can last anything from a few minutes to a couple of hours and can sometime occur multiple times in a day.

### What causes Paroxysmal Dyskinesia?

Most neurologists consider that PD results from dysfunction an area of the brain called the basal nuclei (often call the basal ganglia) and the cerebellum which is a fundamental part of the brain that involves in coordinating movement. Nerve cells in the basal nuclei play an important role in initiating and controlling movement. It is thought that abnormal signal from the cerebellum causes abnormal activity of the basal nuclei, which results in spontaneous and uncontrolled muscle activity and, therefore, movement and posture.

The underlying cause of many PDs is unknown, with the majority being described as idiopathic (meaning of unknown cause) and presumed to be related to abnormal brain signalling between different parts involved with movement or its feedback control. Very rarely, PD can be associated with brain diseases such as tumour, malformation or brain inflammation (encephalitis), although it is not known if these diseases are the direct cause or the trigger in an animal that is otherwise predisposed to PD.

PDs have been described and studied in many breeds, such as Cavalier King Charles Spaniel, Border Terrier, Cairn Terrier, Scottish Terrier, Dalmatian, Norwich Terrier, Boxer, Bichon Frisé, Pug, Chinook, Labrador Retriever and Jack Russel Terrier

### What does an episode of PD typically look like?

Typically, animals with PD show 'cramping/spasm' of the limbs and sometimes twisting of the body and fine tremors of the head. While all four limbs may be affected, the hind limbs are often affected to a greater degree than the fore limbs, and may appear over-flexed or over-extended. During an attack, animals can be severely incapacitated and reluctant to move or stand, since the spasm overcomes any attempts at voluntary movement; however, many dogs will still attempt to walk.

Compared to most epileptic seizures, animals are aware of their surroundings and fairly responsive to commands during the event, although they may appear confused. There is also no loss of bladder control, nor profound drooling, as often seen with epileptic seizures. In some cases, episodes can be triggered by excitement, exercise or in Border terriers by exposure to gluten in their diet (see below).

### How is PD diagnosed?

Video footage of the episodes are a vital part of the diagnosis of PD and help to rule out other neurological episodes such as epileptic seizures, which are the main mimics.

MRI scan of the brain and analysis of the cerebrospinal fluid (CSF) analysis are usually normal in the vast majority of affected animals since the issue is often abnormal signalling in the brain (e.g. functional brain disorder) as opposed to an underlying disease (eg structural brain disorder such as tumour or inflammation). These tests are mostly performed if there is a suspicion of a possible underlying brain disease in older animals and/or if the animal is abnormal between the episodes.

### What is known about PD diagnosis and treatment?

Very little in fact, aside from a handful of breeds which have been extensively studied.

In Cavalier King Charles Spaniels, episodic falling syndrome (EFS) was the name given in the past to PD in that breed. Episodes are triggered by exercise, stress or excitement and characterised by a gradually worsening muscle spasm in the fore and hind limbs during an attack, with the trunk also affected; this results in a characteristic 'deer-stalking' or 'praying' position. Episodes begin between fourteen weeks and four years of age and dogs are normal between episodes. The condition gets its name from the fact that all four limbs will often cramp during exercise, which can cause falling.

Other conditions, including heart problems, can also cause collapse during exercise, but EFS causes no loss of consciousness or colour change in the gums. Other clinical signs that sometimes occur include facial muscle stiffness, stumbling, a 'bunny-hopping' gait, arching of the back or vocalisation; again, other conditions can sometimes cause similar behaviour.

Canine Epileptoid Cramping Syndrome (CECS also known as ‘Spike’s disease’) was also the term used to describe PD in Border Terriers. Episodes in this condition are very variable, ranging from ataxia (a wobbly gait) to an inability to stand, contractions of abdominal, neck and back muscles; which result in abnormal posturing and contractions/cramping of the leg muscles (extensor rigidity or flexion of the limbs). The duration of the episode is also very variable, ranging from a few seconds to half an hour or longer; throughout this time, the dog remains aware of their surroundings, though they may be more subdued than normal.

In many affected dogs, there is increased gut motility during an episode, which manifests as borborygmus (stomach rumbling). A genetic basis for the syndrome is suspected, but no specific genetic abnormality has been found.

A recent study published by Mark Lowrie and Laurent Garosi, neurologists at CVS Referrals, has revealed a link between CECS, in Border Terriers, and gluten sensitivity, which has since given the name of Gluten Sensitive Paroxysmal Dyskinesia in that breed. A serological test for gluten sensitivity in this breed is available and assists in the diagnosis as well as monitoring response (and compliance) to a gluten free diet. Currently, the most effective way to manage CECS in Border Terriers is to use a gluten-free diet, though it can take several weeks for an improvement to be noted and not all dogs will respond.

Scottie cramp is a syndrome observed in young adult Scottish or Cairn Terriers. In this condition, there are again sustained muscle contractions, primarily affecting the hind limbs. With excitement, the hind limbs typically assume a stiff, extended position, though affected dogs occasionally display exaggerated flexion of the limbs; the forelimbs can also cramp. During an attack, affected dogs develop a stiff, stilted gait over a few minutes. Severely affected dogs assume an arched posture over their back and may fall onto their side, with their head and tail flexed. The disease has a presumed autosomal recessive inheritance pattern with variable expression of the clinical signs. Diagnosis is based on a dog having typical episodes and no evidence of other conditions that might appear similar. Treatment is aimed at using drugs to improve muscle relaxation or to increase serotonin levels.

### Can PD be treated?

Paroxysmal dyskinesia can be extremely frustrating to treat. Aside from Cavalier King Charles Spaniels, who respond to Acetazolamide, and Border Terriers, who generally respond to exclusive gluten free diets, most cases of PD do not respond to medication. In particular, the large majority of PDs do not respond to anti-epileptic medication. Episode duration and frequency varies dramatically, even within an individual, with animals often having many episodes during a few days/weeks with long periods of normality in-between. In many breeds, episodes significantly reduce in terms of frequency and duration with age.

Most affected dogs are therefore not medicated and will live a perfectly normal life in-between the episodes, which are not life-threatening but more distressing for everyone involved. We usually only advise trying treatment if the frequency of the episodes of PD is reaching one, or more than one, episode a week and if the animal's quality of life seems particularly affected. Anecdotally, Keppra (Levetiracetam) has helped some affected Labradors.