



# Is It Really Epilepsy? How Nutrition Can Change the Course for Dogs With Paroxysmal Dyskinesia

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## Abstract

Paroxysmal dyskinesia (PD) is an underrecognized canine movement disorder often misdiagnosed as epilepsy due to overlapping clinical presentations. Unlike during seizures, dogs remain conscious during PD episodes. Although PD may be inherited or acquired, a subset of patients are gluten-sensitive and respond well to dietary modification (i.e., gluten-free diets). This article presents 2 cases of dogs with diet-responsive PD, which showed marked improvement or complete resolution of clinical signs after transition to a gluten-free diet, highlighting the value of considering dietary intervention in the standard of care for patients with PD. Early recognition and nutritional management may improve patient outcomes, reduce caregiver burden, and decrease the risk for unnecessary pharmacologic treatment or euthanasia.

## Take-Home Points

- Dogs with paroxysmal gluten-sensitive dyskinesia (PGSD) can exhibit a variety of signs, including abnormal movements along with gastrointestinal signs.
- A factor that differentiates PD from seizures is that PD-affected dogs remain responsive and do not lose consciousness during the episodes.
- Affected dogs can experience multiple episodes per day.
- Patients with PGSD can quickly respond to a gluten-free diet but may not respond at all to medications.

Nutrition and neurology are 2 fields of veterinary medicine that are not often considered together. Although awareness of the interconnectedness of nutrition and several aspects of veterinary medicine is increasing, the role of nutrition can be overlooked, especially when managing dogs with neurologic conditions such as seizures or tremors. Although diet is not typically considered a first-line therapy for neurologic conditions, paroxysmal dyskinesia (PD) offers a unique opportunity for dietary modification, which can be an effective primary treatment strategy.

## Paroxysmal Dyskinesia

Movement disorders are characterized by involuntary movements without changes in consciousness and can be divided into 2 categories: hyperkinetic and hypokinetic. Hyperkinetic disorders can be further classified as dyskinesia, involuntary active movements, or dystonia (sustained muscle contractions).<sup>1</sup>

*Dyskinesia* is defined as self-limiting, episodic, involuntary movements in animals.<sup>1</sup> Dyskinesia and dystonia occur without changes in consciousness. In dogs, distinguishing dyskinesia from hypermetria (excessive flexion of limb joints during voluntary movement) can be difficult.

Canine PD is a subtype of movement disorders that involves recurrent episodes of abnormal, involuntary movement. Voluntary movements, such as walking, are often impaired during episodes and may be overridden by involuntary movements. Episodes often occur spontaneously at rest but can be triggered by sudden movement. A paroxysmal exertion-induced dyskinesia is recognized in humans; however, this syndrome has not been reported in veterinary medicine.<sup>1</sup> Of the movement disorders in dogs, PD is among the more difficult neurologic conditions to identify, in part because diagnosis is made by observing an episode.<sup>1</sup> The episodes can vary in frequency and are at risk for being underdiagnosed or misdiagnosed as focal seizures because the veterinarian may not be able to witness the episode. The popularity of smartphones has increased awareness of these conditions as they enable clients to record an episode and share it with their veterinarians. Observing episodes in real time has allowed greater recognition of these conditions.

Unlike dogs experiencing seizures, dogs with PD remain conscious during episodes, display no

autonomic signs, and do not experience a pre- or postictal phase. PD can be classified as inherited or acquired, the preferred terminology over primary or secondary.<sup>1</sup> Acquired PD can result from medications (e.g., propofol, phenobarbital), intracranial structural lesions, or gluten sensitivities.<sup>1</sup> Regardless of whether PD is acquired or inherited, dietary modification should be considered part of the therapeutic strategy for affected patients.

Paroxysmal gluten-sensitive dyskinesia (PGSD), often referred to as Spike's disease (**BOX 1**) among dog owners, is a condition in which a dog experiences sudden, temporary episodes of abnormal movement, such as shaking, stiffness, or difficulty walking; lip licking is also commonly seen. A feature of PD is that there is no loss of consciousness during the episode. The dogs typically appear completely normal between episodes, showing no signs of neurologic impairment.<sup>2</sup> Although the border terrier is the only breed in which gluten intolerance has been documented, dogs of other breeds may also show clinical improvement while being fed a gluten-free diet.<sup>3,4</sup> The mechanism by which gluten causes the abnormal movements, however, is still not fully understood.

Gluten may be present in the diet through inclusion of gluten-containing carbohydrates; however, cross-contamination during processing is also possible. Because the pet food industry does not routinely test for gluten, definitively ruling out gluten sensitivity, even when feeding a diet that does not list gluten-containing ingredients, can be difficult. One report from Italy concluded that risk for gluten contamination in pet food was minimal<sup>5</sup>; however, it is unknown whether the same is true for commercial pet food.

### BOX 1

#### Alternate Names for Paroxysmal Gluten-Sensitive Dyskinesia

- **Gluten-sensitive paroxysmal dyskinesia** (GSPD)
- **Canine epileptoid cramping syndrome** (CECS)
- **Spike's disease**, named after the first dog to receive this diagnosis, a Dutch border terrier named Spike.<sup>1</sup>

products in North America. According to multiple studies that have demonstrated the presence of undeclared protein sources in over-the-counter (OTC) products, OTC dry and canned diets are likely at risk for gluten cross contamination.<sup>6,7</sup> Many of the therapeutic diets used for allergies do not use any gluten-containing ingredients; these diets are usually the first to go through the processing line, which makes cross contamination (from gluten or another protein source) less likely. The therapeutic novel protein diets are checked for contamination of other animal sources after processing, which also makes gluten cross contamination less likely. The risk for cross contamination in fresh-style diets has not been well characterized; however, based on oral communication with 2 companies that produce this type of diet, gluten contamination seems to be lower due to their manufacturing processes (K. German, DVM, June 2025). To determine if a diet is appropriate for pets with gluten sensitivity, veterinarians and pet owners alike should contact individual companies to ask if gluten testing is performed in addition to that company's manufacturing and quality control protocols.

One study of PGSD (referred to as epileptoid cramping syndrome at the time of the study) in border terriers showed that all affected dogs had elevated levels of antibodies to gluten proteins, which lowered over 9 months while the dogs were fed gluten-free diets.<sup>8</sup> Sixty percent of the dogs were reported to have clinically improved immediately after the diet change, and the others improved after 1 month. The 1 dog that did not respond to the diet change was found to be sneaking food from another source; after that behavior was eliminated, the dog showed the same improvements. The study was conducted in Europe, where gluten antibody testing is commercially available. In the United States, however, gluten antibody testing is not commercially available. In a recent study based in Germany, researchers observed a strong improvement in signs for 64% of dogs and a partial response to diet for 14%.<sup>3</sup> Those results support the consideration of dietary modification, including gluten elimination, as a primary treatment strategy for select cases of canine PD.

## Feeding Tips

No discussion of diet trials would be complete without addressing the role of treats. In the authors' experience,

client compliance is highest if clients are given specific treat replacement options rather than instruction to eliminate treats altogether. In cases of suspected PGSD, the safest treat options during the diet trial are fruits and vegetables as well as homemade dehydrated meats (without seasonings) as these items pose minimal cross-contamination risks. Commercial limited-ingredient treats may be introduced after the initial month-long diet trial; however, the potential for cross contamination during manufacturing can complicate interpretation if the dietary response is incomplete.

Other pets in the house should also be considered. Patients with PD are reported to be extremely sensitive to any reintroduction of gluten.<sup>8</sup> Dogs with PD should not be given access to other pets' food and water bowls if the other pets are eating food that is not gluten-free. Alternatively, if medically appropriate, feeding all pets in the household a gluten-free diet may help reduce the risk for inadvertent exposure.

## Nutrients of Concern for Patients With Paroxysmal Dyskinesia

### Gluten-Free Diet

Many dogs with PD will respond favorably to gluten-free diets. Home-prepared diets would have the least chance of gluten cross contamination; however, therapeutic limited-ingredient diets and many of the fresh-style diets offer gluten-free options. Clinically, most dogs show improvement within 1 month, but it can take 9 months for their anti gliadin antibodies to drop to within reference range.<sup>8</sup>

### Medium-Chain Triglycerides

Although there is no direct evidence supporting the use of medium-chain triglycerides (MCTs) in dogs with PD, MCTs have shown benefits in patients with other neurologic conditions and may be considered as a potential adjunctive dietary strategy.<sup>9-11</sup>

### Omega-3 Fatty Acids (EPA and DHA)

There is no direct evidence supporting the use of omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) specifically, for PD; however, their well-documented anti-inflammatory and membrane-stabilizing properties in



### VIDEO 1

Charlie experiencing episodes of paroxysmal dyskinesia.

other neurologic conditions support their consideration as adjunctive therapy in affected patients.<sup>12-15</sup>

## Case Reports

The following 2 patients with PD were referred to the veterinary nutrition service and responded well to gluten-free diets (**BOX 2**).

### Patient 1

Charlie is a 5-year-old Havanese dog with a 2-month history of seizure-like episodes (**VIDEO 1**). During episodes, Charlie's thoracic limbs were primarily affected, but his pelvic limbs were occasionally affected and he also would lick his lips. During episodes, he was unable to walk but remained aware and responsive. He experienced multiple episodes per day, each lasting up to 5 minutes.

#### BOX 2

##### Gluten Status of Grains

###### Gluten-Containing Grains

- Wheat, including spelt and farro
- Barley
- Rye

###### Gluten-Free Grains

- Rice (all forms)
- Corn (maize)
- Quinoa
- Millet
- Buckwheat (not related to wheat)
- Amaranth
- Sorghum
- Oats\*

\*Oats are naturally gluten free but should be considered contaminated due to processing, unless specifically labeled as gluten free.<sup>16</sup>

When clinical signs developed, Charlie was being fed an OTC dry diet containing chicken, oats, and barley (**BOX 3**). The diet was then switched by his primary veterinarian for a short, unsuccessful trial of another OTC diet containing chicken, brewers' rice, chicken meal, cracked pearled barley, and whole-grain sorghum.

Charlie was then referred by his primary veterinarian to a neurologist and underwent a complete diagnostic workup including magnetic resonance imaging (MRI), CBC, blood chemistry profile, total T<sub>4</sub>, and SNAP 4Dx test (IDEXX), all showing no significant findings. The client observed that episodes completely stopped after Charlie underwent fasting for the MRI and wondered whether the episodes could be diet-associated. The neurologist prescribed zonisamide for Charlie.

Concurrently, the client initiated a transition to a gluten-free, home-prepared diet after conducting independent research on "Spike's disease," which she believed could be contributing to Charlie's condition. Immediate improvement was noted, but response to medication could not be ruled out. However, when zonisamide was discontinued 2 weeks later, there was no relapse in signs, making PGSD the suspected diagnosis. That diagnosis was further supported when Charlie exhibited an episode after he was thought to have received an unknown food item from a family member.

Based on Charlie's positive response to diet, the client requested a referral to the veterinary nutrition service to evaluate his diet. Also based on the positive response to the diet change, the nutrition service formulated a

#### BOX 3

##### Case 1: Charlie

###### Diets eaten while showing clinical signs of paroxysmal dyskinesia

- OTC diet #1
- OTC diet #2

###### Gluten-containing ingredients

- OTC diet #1: Barley, potential cross-contaminated oats
- OTC diet #2: Barley

complete and balanced, gluten-free, home-prepared diet. In addition to the home-prepared diet, several gluten-free commercial diet options were provided for use during times of travel.

The client described Charlie as a completely different dog since he began eating a gluten-free diet and reported that Charlie has done well on multiple different gluten-free diets. Initially, Charlie's diet was only the home-prepared diet, but after summer started and his family began camping more, his diet was transitioned to a base of a therapeutic veterinary diet with potato and duck plus a small amount of home-prepared diet or a commercial fresh-style diet containing lamb and rice as toppers. His commercial diet continues to be supplemented with MCT and fish oils.

When the client was asked for an update in preparation for this article, she responded, "Charlie has so much energy now that, at 5, he is wearing us out! He was practically dead when having the PD! You have worked a miracle and given our precious pup back to us and given him back a joyful, healthy life!"

## Patient 2

Dusty is a 3-year-old spayed female Biewer terrier that was referred to the nutrition service by her veterinary neurologist for suspected PGSD. She had a year-long history of abnormal movement events that had been increasing in frequency and severity. Some of her episodes lasted 45 minutes and resulted in her being admitted to the local emergency clinic. The patient's episodes did not improve with administration of midazolam for acute episodes, nor did they respond to long-term therapy with levetiracetam.

Workup included a CBC and blood chemistry profile, which showed no significant findings, along with a SNAP 4Dx test with all negative results. An MRI performed on a littermate that was showing similar clinical signs did not reveal any answers; therefore, the client declined an MRI for Dusty.

At the time that her episodes started, the patient was being fed a "beef and rice" OTC diet that also contained whole-grain wheat and wheat bran (**BOX 4**). The client requested a referral to the veterinary nutrition service for a home-prepared diet formulation. A complete and

balanced, gluten-free, home-prepared diet containing ground turkey, quinoa, and pumpkin was formulated. In addition, several commercial gluten-free diet options were provided at the client's request.

During a follow-up visit, the client reported that Dusty had improved but still had occasional PD episodes while being fed the home-prepared diet. Although the episodes were less severe and less frequent after the diet change, a transition to a non-quinoa-based diet was elected, and Dusty was switched to a commercial fresh-style diet containing turkey and sweet potato.

Six weeks later, the client reported that Dusty's signs had resolved 100%. All medications had been discontinued. Potential reasons for the incomplete response with the first diet trial could have been some cross contamination during the processing of the quinoa or a specific type of quinoa cultivar, which might still trigger a response from the immune system in gluten-sensitive individuals.<sup>18</sup>

## Summary

Before diet change, the 2 patients with PGSD described in this article had experienced significantly impaired quality of life and caused considerable stress for their families. Chronic neurologic conditions that fail to respond to conventional therapy place patients at risk for humane euthanasia; PGSD, however, is a neurologic condition for which diet change can enhance the quality of life as it did for the 2 patients reported here, highlighting the potential role of dietary intervention for improving clinical outcomes and reducing caregiver burden. Clients who wish to feed their pet a home-

### BOX 4

#### Case 2: Dusty

#### Diet eaten while showing clinical signs of paroxysmal dyskinesia

- "Beef and rice" OTC diet

#### Gluten-containing ingredients\*

- Whole-grain wheat, wheat bran

\*Corn gluten was a listed ingredient, but it is not the same protein as wheat gluten and does not cause reactions in humans with celiac disease.<sup>17</sup>

prepared diet should be directed to a board-certified veterinary nutritionist for help formulating a complete and balanced recipe. However, as with the 2 patients reported here, PGSD can also be controlled with commercial diets. If a commercial diet is selected for the initial diet trial, the manufacturing company should be contacted to inquire about quality control measures as well as risk for gluten cross contamination rather than relying only on the lack of gluten-containing ingredients on the package. **TVP**

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Dr. Torres attended Colorado State University (CSU) for her undergraduate and veterinary education. After earning her DVM degree in 2001, she went into small animal private practice before joining CSU's James L. Voss Veterinary Teaching Hospital in 2008. Dr. Torres became a diplomate of the American Board of Veterinary Practitioners (Canine & Feline Practice) in 2011 and a diplomate of the American College of Veterinary Internal Medicine (Nutrition) in 2021. She enjoys spending time with her husband, 2 sons, 2 cats, yorkiepool, and French bulldog.



### Kyle German

Dr. German pursued a nutrition residency after 13 years of general practice experience. Originally from Oklahoma, he earned his veterinary degree from Oklahoma State in 2010. Dr. German has always been fascinated by the effects of nutrition on health and firmly believes in the transformative power of food as medicine. Before joining Colorado State University, he resided in the mountains, indulging in his love for nature alongside his canine companions. When not working, he can be found enjoying the great outdoors, mountain biking, snowboarding, or hiking with his dogs.