Research in Veterinary Science 119 (2018) 276–284

Contents lists available at ScienceDirect

Research in Veterinary Science

journal homepage: www.elsevier.com/locate/rvsc

Investigating owner use of dietary supplements in dogs with idiopathic epilepsy

Benjamin Andreas Berk[a,b,*], Rowena Mary Anne Packer[a], Tsz Hong Law[a], Holger Andreas Volk[a]

[a] Royal Veterinary College, Department of Clinical Science and Services (CSS), Hatfield, United Kingdom
[b] Tierarztpraxis Strassenheim, Ortsstraße, Mannheim, Germany

ARTICLE INFO

Keywords:
Veterinary neurology
Neurodietetics
Epilepsy
Diet
Dietary supplement
Seizure

ABSTRACT

Epilepsy is the most common chronic neurological disorder in dogs. Some diets have been shown to have a positive impact upon the seizure activity in dogs with idiopathic epilepsy (IE), while other diets and dietary supplements (DS), although marketed as providing health benefits, lack conclusive scientific evidence on their actual beneficial effects.

A web-based owner questionnaire was designed to assess how and why owners of dogs with IE use different dietary regimes and DS. The study cohort, with 297 valid responses, consisted mainly of pure-breed (82.5%) male neutered (52.9%) dogs. Over two-thirds of owners (67.7%) changed their dog's diet after their dog received a diagnosis of IE. Nearly half of the owners (45.8%) reported giving DS, the most common being coconut oil or derived medium-chain triglyceride oil (71.3%). Some owner justifications of DS use included improvement of seizure frequency (88.2%), seizure severity (61.8%) and protection from potential drug side effects (62.5%).

Many owners give DS to their dog with IE. The pharmacokinetic properties of anti-epileptic drugs, such as efficacy, absorption and clearance can be influenced by other medications, diets and possibly by DS. We propose that use of DS should be considered and monitored by veterinary surgeons in epilepsy management.

1. Introduction

Epilepsy is defined as the enduring predisposition of having epileptic seizures (Berendt et al., 2015), and is the most common chronic neurological disorder in dogs, affecting an estimated 0.6% of dogs in the general population (Kearsley-Fleet et al., 2013). The chronic, often lifelong administration of seizure-suppressing drugs, such as phenobarbital, potassium bromide and imepitoin, currently represents the most important form of treatment in veterinary medicine (De Risio et al., 2015; Royaux et al., 2017). However, anti-epileptic drug (AED) usage can be accompanied by undesirable side effects including polyphagia, sedation, restlessness or ataxia which might outweigh the seizure supressing benefits of these medications (Charalambous et al., 2014; Charalambous et al., 2016) and negatively affect quality of life (QoL) (Wessmann et al., 2016). When conventional AEDs fail to achieve satisfactory seizure control, finding an appropriate and effective epilepsy management for the individual can be a difficult and lengthy process (Munana, 2013; Podell, 1998; Podell and Fenner, 1993). New treatment strategies are needed in epilepsy management (Martle et al., 2014; Munana, 2013; Munana et al., 2012).

Diet is increasingly recognized as having an impact upon the seizure activity and behavior of dogs with epilepsy (Bosch et al., 2007; Law et al., 2015; Packer et al., 2016). Ketogenic diets (KD) have been shown to be efficient in reducing seizure frequency and severity in human patients and rodent models of epilepsy (Achanta and Rae, 2017; Augustin et al., 2018; Lusardi et al., 2015; Mantis et al., 2014; Martle et al., 2014; Patterson, 2014; Wijnen et al., 2017). The mechanism of antiepileptic action is not yet fully understood, but might be led by a rise in brain ketones improving brain function. KD may have anti-inflammatory properties (Dupuis et al., 2015) and prevent neuronal hyperexcitability via pH, direct inhibition of ion channels, influencing mitochondrial functions and alteration in amino acid metabolism linked to inhibitory neurotransmitter production (Degiorgio et al., 2015; Degiorgio & Taha, 2016).

In addition to complete dietary interventions such as the KD, dietary supplements (DS) of different vitamins (Snoeijen-Schouwenaars et al.,

Abbreviations: DS, Dietary supplement/s; AED, Anti-epileptic drug; ADHD, attention-deficit/hyperactivity disorder; CS, Cluster Seizure; LCT, Long chain triacylglyceride; MCT, Medium chain triacylglyceride; Ω-3 FAs, omega-3 fatty acids; QoL, Quality of Life; SE, Status Epilepticus; VFI, Voluntary food intake

* Corresponding author at: The Royal Veterinary College, Department of Clinical Science and Services, Hawkshead Lane North Mymms, Hatfield, Hertfordshire AL9 7TA, United Kingdom.
E-mail address: bberk@rvc.ac.uk (B.A. Berk).

https://doi.org/10.1016/j.rvsc.2018.07.004
Received 18 March 2018; Received in revised form 1 June 2018; Accepted 21 July 2018

2015), minerals (Kumar et al., 2015; Yuen and Sander, 2012), fatty acids (Bromfield et al., 2008; Chang et al., 2013; Degiorgio et al., 2015; Degiorgio & Taha, 2016; Taha et al., 2010; Yuen et al., 2012; Yuen et al., 2005) or other nutrients (Ciarlone et al., 2016) have been extensively explored in rodent models of epilepsy (Betti et al., 2011; Flores-Mancilla et al., 2014; Girotto et al., 2013; Liu et al., 2012; Smeland et al., 2012) and human patients (Jackson et al., 2015; Lee and Chung, 2010; Neal et al., 2012; Zupec-Kania and Zupanc, 2008). While some studies found that dietary supplementation with individual nutrients can improve seizure control (Degiorgio & Taha, 2016; Kumar et al., 2015; Scorza et al., 2009b), reduce seizure frequency (Ciarlone et al., 2016; Yuen et al., 2005) and improve other health aspects of epileptic patients, others have failed to confirm similar findings (Matthews et al., 2012; Sarmento Vasconcelos et al., 2016; Yuen et al., 2012).

In veterinary medicine, there remains a lack of data regarding dietary intervention for epilepsy management. In comparison to human medicine, few studies exist on the use of nutritional management in dogs with IE (Matthews et al., 2012; Scorza et al., 2013; Scorza et al., 2009b). In 2004, a trial of eight dogs with drug-resistant epilepsy and signs of gastrointestinal hypersensitivity treated with an exclusion diet was reported (Lujan et al., 2004). In this preliminary study, seven out of eight dogs had a reduction in seizure frequency. In a randomised, double-blinded, placebo-controlled study, dogs with IE fed with a medium-chain-triglyceride (MCT) enriched diet over three months showed significantly lower seizure frequency in comparison to placebo diet (Law et al., 2015). Improvements in seizure outcome was accompanied by positive modification in attention-deficit/hyperactivity disorder (ADHD) related behaviours and potential anxiolytic effects (Packer et al., 2016). The effects of other DS in canine epilepsy have been mixed. A positive impact of omega-3 fatty acids (Ω-3 FAs) supplementation was reported in one dog with drug-resistant epilepsy (Scorza et al., 2013; Scorza et al., 2009b). In contrast, Matthews et al. (Matthews et al., 2012) reported no reduction in seizure frequency and severity in fifteen dogs with IE when supplemented with and oil containing long essential fatty acids (eicosapentaenoic acid, docosahexaenoic acid, Vitamin E) for 12 weeks.

Many online epilepsy support groups recommend dietary interventions in epilepsy management, often based on anecdotal evidence. Currently, the type of DS recommended from owner to owner, the source of their recommendations and exactly which DS owners use for their dogs with epilepsy is unknown. As with any 'therapeutic' intervention, there is the potential that certain dietary interventions could benefit or have no effect, but also potentially harm the patient either directly or through diet-drug interactions (Table 1).

This study aims to increase our understanding on the current use of diets and DS in canine epilepsy management. The objectives of this study are:

(i) To describe owner use of DS and nutritional management in canine IE
(ii) To describe reasons for and against DS use by owners of dogs with IE
(iii) To identify information sources utilised by owners to choose DS
(iv) To describe owner-perceived side effects of DS use

As DS are becoming increasingly available to owners, this study will equip veterinary surgeons with important insights to be considered when managing a patient with IE.

2. Materials and methods

From April to June 2017, an online questionnaire study was hosted on SurveyMonkey™ (SurveyMonkey Europe, Shelbourne Road, Dublin, Ireland). Owners of dogs with IE were recruited via social media. Consent was gained via a statement at the start of the questionnaire, and the study was approved by the Royal Veterinary College's Ethics and Welfare Committee (approval number URN 2016 1558).

2.1. Epilepsy data

To be included in the analysis, the dog must have met the International Veterinary Epilepsy Task Force (IVETF) tier I confidence level for the diagnosis of idiopathic epilepsy (De Risio et al., 2015). Dogs with a history of seizures that did not meet these criteria (e.g. those with epilepsy with an identifiable cause, insufficient diagnostic testing, where seizure onset was < 6 months old or > 6 years old with no MRI to rule out structural causes) were excluded from the study. Only completed questionnaires were considered in the analysis. Based on supplementation habits, owners were allocated to one of three groups: (1) owner recently used, (2) previously used or (3) never used dietary interventions for epilepsy management. Details on their dog's signalment, seizure phenotype (total number of seizures, number of seizures over the last three months, history of cluster seizures and/or status epilepticus), AED medication, diet (type, frequency, routine, purchase, and treats) and owner demographics were gathered.

2.2. Dietary supplement data

According to the United States Food and Drug Administration (FDA) under the US Dietary Supplement Health and Education Act of 1994 ((FDA), 1994) and the European Union's (EU) Food Supplements Directive of 2002 (R 2002/46/EG) (UNION, 2002), the term DS is defined as a product taken by mouth that contains a dietary ingredient intended to supplement the diet. The FDA and EU regulations require supplements to be demonstrated as safe, both in dosages and purity. However, these definitions apply to human consumers and not companion animals (Vandeweerd et al., 2013). Because the term DS has no overall regulatory or legal definition in veterinary medicine, for the purposes of this study, a DS was defined as "*an edible product added to a dog's main diet on a regular or irregular basis which is intended to provide additional support to health*".

Owners were asked to report details of the DS they currently or previously used in their dogs epilepsy management, including what

Table 1
The most common DS side effects reported by owners.

Side-effect	Not present	Present	Very mild	Mild	Moderate	Severe	Very severe
Sleeping more than before	81.5%	18.5%	9.6%	4.5%	3.2%	0	1.3%
Drinking more	84.7%	15.3%	6.4%	6.4%	1.9%	0.6%	0
Gaining weight	85.4%	14.6%	5.7%	3.8%	3.8%	1.3%	0
Urinating more	87.9%	12.1%	3.8%	4.5%	3.2%	0.6%	0
Wobbly/ not coordinated when walking	93.6%	6.4%	3.2%	1.9%	0	0.6%	0.6%
Restlessness/ Pacing	93.6%	6.4%	4.5%	0.6%	0.6%	0	0.6%
Itchiness or skin rash	91.7%	8.3%	3.2%	1.3%	3.8%	0	0
Diarrhea	91.7%	8.3%	5.1%	2.5%	0	0	0.6%
Coughing	86%	14.0%	2.5%	5.7%	4.5%	0.6%	0.6%