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Short Communication

Commentary on the Domestic Dog as a Potential Spontaneous Animal Model for Research on Functional Gastrointestinal Disease in Humans

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Abstract

Research on functional gastrointestinal disorders is hampered by the lack of an ideal animal model in which principles of diagnosis and treatment can be demonstrated. Two recent studies in domestic dogs provide some evidence that this species warrants investigation as a potential spontaneous model for functional gastrointestinal disorders. In both studies, it is speculated that the occurrence of gallbladder dysmotility could represent one component of potential functional gastrointestinal disorders in this species. Other parallels between functional gastrointestinal disorders in humans and the observations made in the two groups of dogs include: an immunological response in the form of lymphoplasmacytic inflammation in the gallbladder wall and duodenum; diet as an important factor in clinical presentation; an apparent overlap between gastrointestinal disease and other allergic or atopic disease. Further research is required to investigate whether dogs may represent an ideal animal model for research on functional gastrointestinal disorders.

Keywords: Functional gastrointestinal disorders; Gallbladder dysmotility; Immunological

INTRODUCTION

Multiple similarities have been described between human and canine Inflammatory Bowel Disease (IBD) and dogs have been proposed as an excellent spontaneous animal model for research on immunologically-mediated intestinal inflammation [1]. In humans, the role that quiescent IBD can play in functional gastrointestinal disorders (FGID) is receiving increasing attention [2]. An immunological response was recently proposed as an important factor in a new disease model for this disorder [3]. Research in FGID is progressing slowly, partly because an ideal animal model for the disease has yet to be identified [4]. Functional gastrointestinal disorders in humans include functional gallbladder disorder, a condition defined by gallbladder dysmotility that is associated with episodic abdominal pain [5]. Two recent studies in dogs have highlighted the relevance of gallbladder dysmotility as a component of potential FGID in this species [6,7]. The first study describes lymphoplasmacytic inflammation as a common concurrent finding in both the gallbladder wall and duodenum in dogs with pathological solid gallbladder sludge called non-gravity dependent biliary sludge (NDBS) [6]. The formation NDBS in dogs is accepted to be associated with gallbladder dysmotility among other factors [8,9] and gallbladder dysmotility was also a consistent finding when assessed in this study [6]. The study speculated that duodenal inflammation can impact function of the Sphincter of Oddi in dogs to result in gallbladder dysmotility, as has also been proposed to occur in humans [10]. It was further speculated that the observed clinical signs of these dogs correlated well with clinical signs described in functional gallbladder disorder in humans [5] and, also similar to humans, a cholecystectomy typically resulted in clinical improvement [6]. Unique to dogs, a specific pattern of diurnal in appetence in the morning was described in which dogs were more likely to suffer from reduced appetite in the morning compared to the rest of the day and this pattern of inappetence was reported to resolve consistently after cholecystectomy [6]. In a second study, diurnal inappetence in the morning was also observed in 14 younger dogs investigated for chronic clinical signs of the GIT in the absence of NDBS [7]. Gallbladder dysmotility was shown to be a common finding in this group of dogs and it was observed that dogs with diurnal inappetence in the morning had reduced gallbladder function compared to dogs with normal appetite [7]. It was further observed that patterns of diurnal in appetence in the morning as well as general in appetence without a diurnal pattern occurred concurrently in some dogs and it was speculated that dogs may be subject to a spectrum of FGID causing varying presentations of clinical signs, similar to humans [11]. All 14 dogs in the second study were placed on a six-week hydrolysed protein diet trial to exclude food allergies and food intolerance as

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a cause of their clinical signs and clinical improvement at the end of the exclusion diet trial was a consistent finding [7]. Diet appears to have been an important factor in the clinical presentations of these dogs and this appears to reflect the impact of diet on FGID in humans [12]. In humans with FGID, there is also a significant overlap with atopic disease [13]. Data not included in the second study but that underpins the relevance of immunologically-mediated disease, showed that nine of 14 dogs also had concurrent cutaneous adverse food reactions, atopic disease, or both which presented as otitis externa, dermatitis or both [14]. In this, these dogs appear to reflect the overlap that occurs between FGID and atopy in humans. Subsequent to the second study, based on the observation that gallbladder dysmotility occurred concurrently with or as a consequence of gastrointestinal disease, the author adjusted their protocol when investigating chronic clinical signs of the GIT by performing a gallbladder ejection fraction test together with a gastric barium outflow test. Using this protocol, gallbladder dysmotility was observed to occur concurrently with a delayed onset of gastrointestinal emptying in a majority of 44 affected dogs. However, in smaller numbers of dogs within this group of 44, gallbladder dysmotility was also observed to occur together with normal gastric emptying and normal gallbladder emptying was observed to occur in the presence of delayed onset of gastric emptying. The precise data have yet to be subjected to peer review but the author offers the above general information to illustrate that a spectrum of gastrointestinal dysfunction may indeed occur in dogs. In order to assess the clinical relevance of differing patterns of altered appetite in dogs, a study on the true prevalence of chronic clinical signs of the GIT in this species was planned for the future pending funding. To determine an assumed prevalence of FGID in dogs for the sake of this true prevalence study, the author used diurnal inappetence in the morning as a potential clinical marker for FGID in dogs. When assessing 119 dogs that represented a general population the author determined that 19 dogs (16%) displayed a pattern of diurnal inappetence in the morning either on a daily basis or on multiple days of the week. Assuming that diurnal inappetence in the morning can serve as an indicator of clinically relevant gallbladder dysmotility in dogs, this would represent a remarkable synchronicity with the prevalence of acalculous biliary pain in humans [15,16].

CONCLUSION

In conclusion, the author suspects that, if FGID occurs in dogs, it may be as prevalent and relevant in this species as it is in humans. Similar to IBD, early indications are that dogs may also provide a spontaneous animal model for research on FGID. However, FGID in dogs is currently a poorly developed concept for which there is limited supporting evidence. Further research is required on whether dogs may provide an ideal animal model to further progress our understanding of functional gastrointestinal disorders in humans.

CONFLICT OF INTEREST

The authors have declared that they have no conflict of interest.

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