Research Article

Semi-elemental diet Gut-cumin I is capable of switching fecal scoring to fabric settings to those of acceptable levels in dogs with inflammatory bowel disease: further evidence of proof for gut-brain axis

Kerem URAL*, Hasan ERDOGAN, Serdar PASA, Songul ERDOGAN

Deparment of Internal Medicine, Aydın Adnan Menderes University, veterinary Faculty, Efeler, Aydın, Türkiye

*ORCID: 0000-0003-1867-7143
ORCID:0000-0001-5141-5108
ORCID:0000-0003-4957-9263
ORCID:0000-0002-7833-5519

***Corresponce:**
Kerem Ural
Aydın Adnan Menderes University, Veterinary Faculty, Department of Internal Medicine, Aydın, Türkiye, 09900

Phone : +90 533 382 12 44
E- mail : uralkerem@gmail.com
Doi : 10.5281/zenodo.14754748

Abstract

Polypharmacy without precise diagnosis cause harmless effects to those with gastrointestinal issues. Moreover unnecessary antibiotic usage might hasten dysbiosis, which could be detected in several dogs with gastroenteritis. Use of a novel and completely natural nutraceutical [Gut-cumin I Liquid Fomulation] against dogs with inflammatory bowel disease (ibD) whether if this natural trophic aminoacid and nutraceutical complex was capable of restoration for gastrointestinal health as detected by fecal scoring and clinical recovery/remission. A total of 59 dogs with ibD referred to the Intestinal Permeability Measurement Center (İPÖM) were entered into the study. All dogs participated, were completed the nutritional intervention protocole. Gut-cumin I was prescribed for each participant dog at a dose of 2 to 5ml/dogs based on weight of the animals for 1 week. Prior to treatment mean, median, quartile 1 (25%) and 3 (75%) fecal scoring values were deemed 2.9, 2.5, 2.0 whereas semi-elemental diet Gut-cumin I was capable of switching fecal scoring post-treatment values for mean, median, quartile 1 (25%) and 3 (75%) ranges as 3.5, 3.5, 3.,0 and 4.0, respectively. It should not be unwise to draw preliminary conclusion that semi-elemental diet Gut-cumin I was throughly altered gastrointestinal health conditions, as determined by limited access data throughly via inspeciton of fecal indices.

Keywords: Dog, Fecal consistency, Nutraceutical, Inflamatory bowel disease

Introduction

Regarding dogs, the quality of fecal matter could be changeable due to self-individual characteristics (age, size etc.), pathogenic microorganisms at the gastrointestinal system, dietary habbits and residing environment (stress) (Hernot et al., 2006; Sokolow et al., 2005; Stavisky et al., 2011; Weber et al., 2002, 2003). Several different manure interpretations were suggested for evaluating the quality of fecal matter among adult dogs (Allenspach et al., 2007; Hernot et al., 2006; Meyer et al., 1999; Rolfe et al., 2002a,b; Propst et al., 2003,). Aforementioned scoring systems were subclassified into 1 to 7 (Lappin et al 2022) or 4 to 10 points, with lower end points came accross to dry feces or diarrhea, along with an optimal scoring altered from 2 to 7.5 Allenspach et al., 2007; Hernot et al., 2006; Rolfe et al., 2002a,b). In the present study the purpose was to clearly define whether if semi elemantal diet Gut-cumin I, could reverse fecal scoring results in dogs with ibD.

Materials and methods

Data collection from dogs involves all relevant facilities were deemed available for all participant dogs: (i) İPÖM standard owner questionnaire gathering data from owners about case demographics, quality of life, feeding habits, water consumption, environmental exposures as detected by Quantum Pet Analysis Device, ii) the weekly/ monthly veterinary visit (medical past background, vaccination, anti-parasitic medication, data for disease or health conditions, entire physical examination, iii) and collection and submission of clinical samples from the participating dog (whole blood/serum).

Diagnostic interpretation and inclusion criterias

Dogs were enrolled based on presence of IbD (Cave, 2003) [chronic enteropathy with evidence of existence for more than 21 days (Washabau et al 2005, exclusion of other differential diagnosis for enteritis (Hall and German, 2009; Kleinschmidt et al., 2007; Schreiner et al., 2008; Washabau et al., 2005), colonoscopic examination] along with World Small Animal Veterinary Association (Washabu et al., 2010) guidance. Furthermore clinical disease activity (Jergens et al 2003), through scoring system, well recognized as the canine IbD activity index, CIBDAI was deemed available for first occasion criteria, similar to Ural et al. (2024) study.

Fecal indices

Fecal consistency, the vast majority interpretation of manure moisture and could thus be determining alterations in colon health and other relevant issues (Lappin et al 2022). In a healthy dog, a stool sample preferably be firm, not solid, flexible, segmented and easily handled (score 2) (Lappin et al 2022).

At the present study daily, fecal scores were detected into a simple score sheet at beginning (day 0) and thereafterwards on day 10 (finishing day). At physical examination all dogs underwent gastrointestinal interpretation (i.e. haematochezia/ melena, mucus, appetite etc.).

Statistical analytes

All statistical analytes were performed by use of R Studio (R Core Team, Vienna, Austria). In an attempt to understand data distribution prior to and thereafter treatment, descriptive and comparative statistical methodologies were deemed available. Given prior to and thereafter treatment data, mean, standart deviation, minimum and maximum values within interquartile range (IQR). For better detection of area with data dansity first quartile (Q1) and third quartile (Q3) values were found, in which aperture among those values were presented as IQR. Interquertiles aperture was used for better understanding distribution and central tendence of prior to and after treatment data.

Results

As the present author group would have the idea that this manuscript could have been used a brief atlas of fecal pool for diseased animals, in which in turn to healthy fabric settling following Gut-Cumin I liquid semi-elemental diet. Therefore, selected cases were deemed available for photographing for fecal matter prior to (day 0) and after treatment (day 10).

Fecal scoring based on individual cases

Herein at photographic records of case no 1 to 10 (Figure 1-10), were also involved at Table 1, respectively, left ones were prior to treatment and the right ones were following 10 days of Gut-cumin I treatment of selected cases (Table 2).

Table 1. Selected 12 cases, that were photographically shown below, out of 59 dogs enrolled entirely at this study. This table simply showed prior to and thereafter values for fecal scoring in relationship with Gut-cumin I semi elemental liquid diet administration.

Time	Fecal Scoring											
Prior to Gut-cumin I treatment	3	2	4	3	2	3	5	2	4	2	2	2
Following Gut-cumin I treatment	4	3	5	4	2	4	4	3	2	4	3	3

Table 2. For better detection of area with data density first quartile (Q1) and third quarttile (Q3) values were found, in which aperture among those values were presented as IQR. Interquertiles aperture was used for better understanding distribution and central tendence of prior to and after treatment data

	Prior to treatment	After treatment
Mean	2.9	3.5
Median	2.5	3.5
Q1 (25%)	2.0	3.0
Q3 (75%)	3.75	4.00
IQR (Q3 - Q1)	1.75	1.00

Discussion

All dogs enrolled at this study were born and grown in several different ecological and geographical locations. None of them were exposed to similar management, nourishment, nor microechological pathogens. Briefly this might be criticized making it impossible to differentiate influence of nutrition or breed size on the fecal score. Comparatively a prior study evaluated the efficacy of breed size on fecal scoring among puppies (Grellet et al 2012). Given large breed puppies exhibited soft and unformed feces, influence of breed size has already been detected among adult canines. Some selected large breed dogs [i.e. German shepherds/ Great Danes], moisture of fecal ingredient was elevated, soft uniformity was commonly observed and defecation frequency was increased in contrast to in smaller breeds (Hernot et al., 2006; Weber et al., 2001, 2002, 2003). The latter dissimilarity might be linked to diminished mineral absorption and/or to elevated fermentation activity associated with increased colic permeability/elevated colic transit time (Kirkwood, 1985; Herschel et al., 1981; Meyer et al., 1993, 1999; Rolfe et al., 2002a; Weber et al., 2004).

In a prior study aimed at determining feasibility of 2 previously realized (Purina and Waltham) fecal scoring systems, 126 dogs were evaluated by 3 veterinarians. In that study the uniformity of fecal scoring upgraded through veterinary surgeons experience level. Overall comparative analytes showed that there was inconsistency in fecal scoring which might have implications for veterinarians managing diarrhoeic canine patients (Cavett et al., 2021). Further studies are needed to better investigate how fecal scoring can be optimised for use in clinical and research settings.

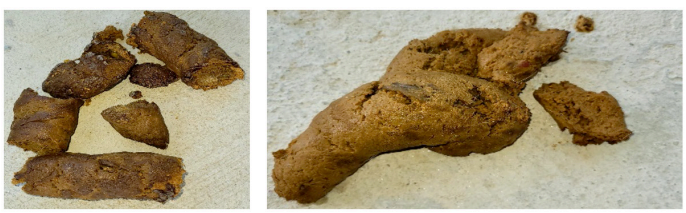
What could have been changed with semi-elental Gut-cumin I diet, regarding gastrointestinal system at this study? Amino acids modify genes expression, and the creation of molecules [i.e. polyamines and nitric oxide etc.] (Fernandes and Murakami, 2010), all required for welfare of gastrointestinal system (Li et al., 2007). Specifically threonine, arginine and glutamine entirely have been explored for their participation with mucin production (Fernandez et al., 1994), immune respond (Tan et al., 2014a,b; Chen et al., 2016), and proliferation of epithelial tissue (Scheppach et al., 1996). Glutamine as a significant fuel for epithelial cells/leukocytes residing at the small intestine, took pivotal roles in several significant metabolic issues i) protein synthesis, ii) gluconeogenesis, iii) transfer of inter-organ nitrogen, iv) biosynthesis of nucleic acid, v) immune respond, and vi) modification of tissue redox conditions (Wu et al., 2007). Moreover, glutamine added onto diet, diminished enterocytes/ lymphatic cells apoptosis (Domeneghini et al., 2006), whereas altering anti-oxidative utilization and cell proliferation through small intestine (Wang et al. 2008). Hence circulating/luminal glutamine was capable of promoting intestinal functioning and integrity of mucosae (Baskerville et al. 1980). As a matter of fact glutamine included as a significant part of semi-elemental diet component Gut-cumin I, used at this study should have helped promotion of intestinal functioning as reported above.

There has been growing body of evidence and arousing interest for participation of nitric oxide for inducing health promoting efficacy of arginine for intestinal functioning. Arginine induces secretion of gut fluids via nitric oxide pathways (Alican and Kubes 1996). On the other hand, even if

nitric oxide synthase (NOS) is inhibited, intestinal secretion diminishes, causing intestinal ischemia (Kanwar et al., 1994). As a matter of fact arginine prescription has been efficacious for modification of intestinal barrier functioning and vascular issues (Wang et al., 2009). Oral arginine deduced mucosal injury linked to lipopolysaccharide endotoxemia in animals (Sukhotnik et al., 2004), as was determined by altered mucosal morphology and elevated proliferation of cells.

Threonine has been selectively participated for mucin synthesis and preservation of intestinal barrier integrity (Bertolo et al. 1998). Regarding gut mucosal lining, significant role for threonine is consolidation into mucins, to those of foremost glycoproteins preventing the epithelial injury (Le Floc'h and Se`ve, 2005; Schaart et al., 2005). In rats dietary threonine restricted diet caused altered synthesis of mucins among small intestine, with the largest deduced rate for 40% within the duodenum (Faure et al., 2005).

In conclusion trophic amino acids (Bortoluzzi et al., 2018; O'Connell, 2017; Wang et al 2009), namely, threonine, arginine and glutamine, might be of beneficial for altering gut physiology/ immunology/microbiology (Bortoluzzi et al., 2018) of dogs, which needs to be further supported by valuable biomarkers, which were lacking in this study herein reported. broilers. Trophic amino acids threonine, arginine, and glutamine are quite crucial for intestinal mucosal lining and intestinal recovery (Bortoluzzi et al., 2018; O'Connell, 2017, Wang et al., 2009), in which Gut-cumin I have helped diminishing fecal scoring results obtained at this study indicating that the intestinal health promoting.



Case I: Fecal scoring : 3 Fecal scoring:4

Case II: Fecal scoring: 2 Fecal scoring:3

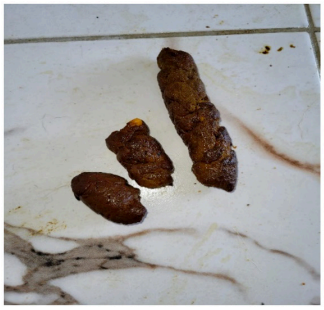
Case III: Fecal scoring: 4 Fecal scoring:5

Case IV Fecal scoring: 1 Fecal scoring:2

Case V Fecal scoring:3 Fecal scoring: 4

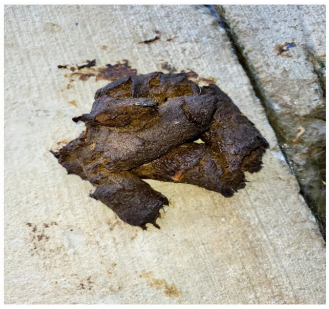
Case VI Fecal scoring:5 Fecal scoring:4

Figure 1. Fecal scoring images of cats at prior and following of Gut-cumin I semi elemental liquid diet administration.

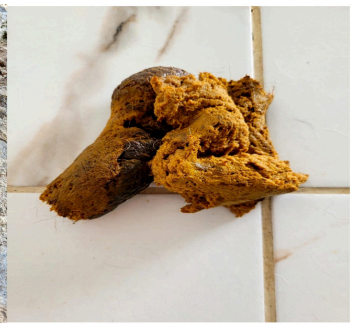



Case VII Fecal scoring: 2 Fecal scoring:3


Case IIX Fecal scoring: 2 Fecal scoring:3

Case IX Fecal scoring: 1 Fecal scoring: 3

Case X Fecal scoring:1 Fecal scoring:4

References

1. Allenspach K., Wieland B., Grone A., Gaschen F. (2007). Chronic enteropathies in dogs: evaluation of risk factors for negative outcome. Journal of Veterinary Internal Medicine, 21(4), 700–708. https://doi.org/10.1892/0891-6640(2007)21[700:CEIDEO]2.0.CO;2
2. Baskerville, A., Hambleton, P., & Benbough, J. E. (1980). Pathologic features of glutaminase toxicity. British Journal of Experimental Pathology, 61(2), 132–138.
3. Bertolo, R. F. P., Chen, C. Z. L., Law, G., Pencharz, P. B., & Ball, R. O. (1998). Threonine requirement of neonatal piglets receiving total parenteral nutrition is considerably lower than that of piglets receiving an identical diet intragastrically. Journal of Nutrition, 128(10), 1752–1759.
4. Bortoluzzi, C., Rochell, S. J., & Applegate, T. J. (2018). Threonine, arginine, and glutamine: Influences on intestinal physiology, immunology, and microbiology in broilers. Poultry Science, 97(3), 937–945. https://doi.org/10.xxxx (ISSN: 0032-5791).
5. Cavett, C., Tonero, M., Marks, S., Winston, J., Gilor, C., & Rudinsky, A. (2021). Consistency of faecal scoring using two canine faecal scoring systems. Journal of Small Animal Practice, 62, 10.1111/jsap.13283.
6. Domeneghini, C., Giancamillo, A. D., Bosi, G., & Arrighi, S. (2006). Can nutraceuticals affect the structure of intestinal mucosa? Qualitative and quantitative microanatomy in L-glutamine diet-supplemented weaning piglets. Veterinary Research Communications, 30(4), 331–342.
7. Faure, M., Moënnoz, D., Montigon, F., Mettraux, C., Breuillé, D., & Ballèvre, O. (2005). Dietary threonine restriction specifically reduces intestinal mucin synthesis in rats. Journal of Nutrition, 135(3), 486–491.
8. Grellet, A., Feugier, A., Chastant-Maillard, S., Carrez, B., Boucraut-Baralon, C., Casseleux, G., & Grandjean, D. (2012). Validation of a fecal scoring scale in puppies during the weaning period. Preventive Veterinary Medicine, 106(3-4), 315–323. https://doi.org/10.1016/j.prevetmed.2012.03.012
9. Hernot, D. C., Biourge, V. C., Martin, L. J., Dumon, H. J., & Nguyen, P. G. (2005). Relationship between total transit time and faecal quality in adult dogs differing in body size. Journal of Animal Physiology and Animal Nutrition (Berl.), 89(5-6), 189–193. https://doi.org/10.1111/j.1439-0396.2005.00544.x
10. Hernot, D. C., Dumon, H. J., Biourge, V. C., Martin, L. J., & Nguyen, P. G. (2006). Evaluation of association between body size and large intestinal transit time in healthy dogs. American Journal of Veterinary Research, 67(2), 342–347. https://doi.org/10.2460/ajvr.67.2.342
11. Herschel, D. A., Argenzio, R. A., Southworth, M., & Stevens, C. E. (1981). Absorption of volatile fatty acid Na, and H2O by the colon of the dog. American Journal of Veterinary Research, 42(7), 1118–1124.
12. Tan, J., Liu, S., Guo, Y., & Applegate, T. J., Eicher, S. D. (2014b). Dietary L-arginine supplementation attenuates lipopolysaccharide-induced inflammatory response in broiler chickens. British Journal of Nutrition, 111(8), 1394–1404.

13. Tan, J., Applegate, T. J., Liu, S., Guo, Y., & Eicher, S. D. (2014a). Supplemental dietary L-arginine attenuates intestinal mucosal disruption during a coccidial vaccine challenge in broiler chickens. British Journal of Nutrition, 112(7), 1098–1109.
14. Fernandes, J. I. M., & Murakami, A. E. (2010). Arginine metabolism in uricotelic species. Acta Scientiarum, 32(4), 357–366.
15. Kanwar, S., Wallace, J. L., Befus, D., & Kubes, P. (1994). Nitric oxide synthesis inhibition increases epithelial permeability via mast cells. American Journal of Physiology, 266(2), G222–G229.
16. Kirkwood, J. (1985). The influence of size on the biology of the dog. Journal of Small Animal Practice, 26(3), 97–110.
17. Lappin, M. R., Zug, A., Hovenga, C., Gagne, J., & Cross, E. (2022). Efficacy of feeding a diet containing a high concentration of mixed fiber sources for management of acute large bowel diarrhea in dogs in shelters. Journal of Veterinary Internal Medicine, 36(2), 488–492. https://doi.org/10.1111/jvim.16360
18. Le Floc'h, N., & Sève, B. (2005). Catabolism through the threonine dehydrogenase pathway does not account for the high first-pass extraction rate of dietary threonine by the portal drained viscera in pigs. British Journal of Nutrition, 93(4), 447–456.
19. Meyer, H., Kienzle, E., & Zentek, J. (1993). Body size and relative weights of gastrointestinal tract and liver in dogs. Journal of Veterinary Nutrition, 2(1), 31–35.
20. Meyer, H., Zentek, J., Habernoll, H., & Maskell, I. (1999). Digestibility and compatibility of mixed diets and faecal consistency in different breeds of dog. Zentralblatt für Veterinärmedizin A, 46(3), 155–165. https://doi.org/10.1046/j.1439-0442.1999.00201.x
21. O'Connell, T. C. (2017). 'Trophic' and 'source' amino acids in trophic estimation: A likely metabolic explanation. Oecologia, 184(2), 317–326. https://doi.org/10.1007/s00442-017-3881-9
22. Li, P., Yin, Y. L., Li, D. F., Kim, S. W., & Wu, G. (2007). Amino acids and immune function. Journal of Nutrition, 98(2), 237–252.
23. Rolfe, V. E., Adams, C. A., Butterwick, R. E., & Batt, R. M. (2002). Relationships between fecal consistency and colonic microstructure and absorptive function in dogs with and without nonspecific dietary sensitivity. American Journal of Veterinary Research, 63(5), 617–622. https://doi.org/10.2460/ajvr.2002.63.617
24. Rolfe, V. E., Adams, C. A., Butterwick, R. E., & Batt, R. M. (2002). Relationships between fecal consistency and colonic microstructure and absorptive function in dogs with and without nonspecific dietary sensitivity. American Journal of Veterinary Research, 63(5), 617–622. https://doi.org/10.2460/ajvr.2002.63.617
25. Rolfe, V. E., Adams, C. A., Butterwick, R. F., & Batt, R. M. (2002). Relationship between faecal character and intestinal transit time in normal dogs and diet-sensitive dogs. Journal of Small Animal Practice, 43(7), 290–294. https://doi.org/10.1111/j.1748-5827.2002.tb00075.x
26. Fernandez, S. R., Aoyagi, S., Han, Y., Parsons, C. M., & Baker, H. (1994). Limiting order of amino acid in corn and soybean meal cereal for growth of the chick. Poultry Science, 73(12), 1887–1896.
27. Schaart, M. W., Schierbeek, H., van der Schoor, S. R. D., Stoll, B., Burrin, D. G., Reeds, P. J., & van Goudoever, J. B. (2005). Threonine utilization is high in the intestine of piglets. Journal of Nutrition, 135(4), 765–770.
28. Sokolow, S. H., Rand, C., Marks, S. L., Drazenovich, N. L., Kather, E. J., & Foley, J. E. (2005). Epidemiologic evaluation of diarrhea in dogs in an animal shelter. American Journal of Veterinary Research, 66(6), 1018–1024. https://doi.org/10.2460/ajvr.2005.66.1018
29. Stavisky, J., Radford, A. D., Gaskell, R., Dawson, S., German, A., Parsons, B., Clegg, S., Newman, J., & Pinchbeck, G. (2011). A case-control study of pathogen and lifestyle risk factors for diarrhoea in dogs. Preventive Veterinary Medicine, 99(2–4), 185–192. https://doi.org/10.1016/j.prevetmed.2011.02.009
30. Sukhotnik, I., Mogilner, J., Krausz, M. M., Lurie, M., Hirsh, M., Coran, A. G., & Shiloni, E. (2004). Oral arginine reduces gut mucosal injury caused by lipopolysaccharide endotoxemia in rats. Journal of Surgical Research, 122(2), 256–262.
31. Ural, K., Erdoğan, H., Erdoğan, S., Paşa, S., Gültekin, M., & Balıkçı, C. (2024). Anti-leaky Gut Recipe 'Gut-cumin I' could have helped hasten clinical signs and disease remission among dogs with inflammatory bowel disease. Turkish Journal of Veterinary Internal Medicine, 3(1), 10–17.
32. Wang, W. W., Qiao, S. Y., & Li, D. F. (2009). Amino acids and gut function. Amino Acids, 37(1), 105–110.
33. Scheppach, W., Dusel, G., Kuhn, T., Loges, C., Karch, H., & Bartram, H. P. (1996). Effect of L-glutamine and n-butyrate on the restitution of rat colonic mucosa after acid-induced injury. Gut, 38(6), 878–885.
34. Wang, J. J., Chen, L. X., Li, P., Li, X. L., Zhou, H. J., Wang, F. L., Li, D. F., Yin, Y. L., & Wu, G. (2008). Gene expression is altered in piglet small intestine by weaning and dietary glutamine supplementation. Journal of Nutrition, 138(6), 1025–1032.
35. Wang, W. W., Qiao, S. Y., & Li, D. F. (2009). Amino acids and gut function. Amino Acids, 37(1), 105–110. https://doi.org/10.1007/s00726-008-0152-4

36. Weber, M., Martin, L., Biourge, V., Nguyen, P., & Dumon, H. (2003). Influence of age and body size on the digestibility of a dry expanded diet in dogs. Journal of Animal Physiology and Animal Nutrition (Berl.), 87(1–2), 21–31. https://doi.org/10.1046/j.1439-0396.2003.00410.x
37. Weber, M., Stambouli, F., Martin, L., Dumon, H., Biourge, V., & Nguyen, P. (2001). Gastrointestinal transit of solid radiopaque markers in large and giant breed growing dogs. Journal of Animal Physiology and Animal Nutrition (Berl.), 85(5), 242–250. https://doi.org/10.1046/j.1439-0396.2001.00325.x
38. Weber, M. P., Hernot, D., Nguyen, P. G., Biourge, V. C., & Dumon, H. J. (2004). Effect of size on electrolyte apparent absorption rates and fermentative activity in dogs. Journal of Animal Physiology and Animal Nutrition (Berl.), 88(6), 356–365. https://doi.org/10.1111/j.1439-0396.2004.00494.x
39. Weber, M. P., Stambouli, F., Martin, L. J., Dumon, H. J., Biourge, V. C., & Nguyen, P. G. (2002). Influence of age and body size on gastrointestinal transit time of radiopaque markers in healthy dogs. American Journal of Veterinary Research, 63(5), 677–682. https://doi.org/10.2460/ajvr.2002.63.677