Healthy Holistic
BLUE
NATURAL
Veterinary Diet®

VOLUME NO. 9

BLUE BUFFALO CLINICAL REPORT

Clinical Evidence for: GI Low Fat for Dogs

KEY POINTS

1

Fat-restricted diets are often better tolerated by many dogs in a variety of disease states, such as:

- Acute gastroenteritis
- Obese or hypertriglyceridemic patients recovering from acute or chronic pancreatitis
- Intestinal lymphangiectasia (IL)
- Severe cases of protein-losing enteropathy (PLE) and inflammatory bowel disease (IBD)

2

BLUE Natural Veterinary Diet GI Gastrointestinal Support Low Fat for Dogs provides an ideal approach for nutritionally managing dogs with gastrointestinal conditions and difficulty digesting fats:

- Easily digestible for optimal nutrient absorption
- Low in fat while providing for energy needs of adult dogs
- Prebiotic fibers to help balance and support healthy microflora
- Great taste

3

Stool quality study results show that feeding BLUE Natural Veterinary Diet GI Gastrointestinal Support Low Fat diet produced ideal fecal consistency scores in dogs.

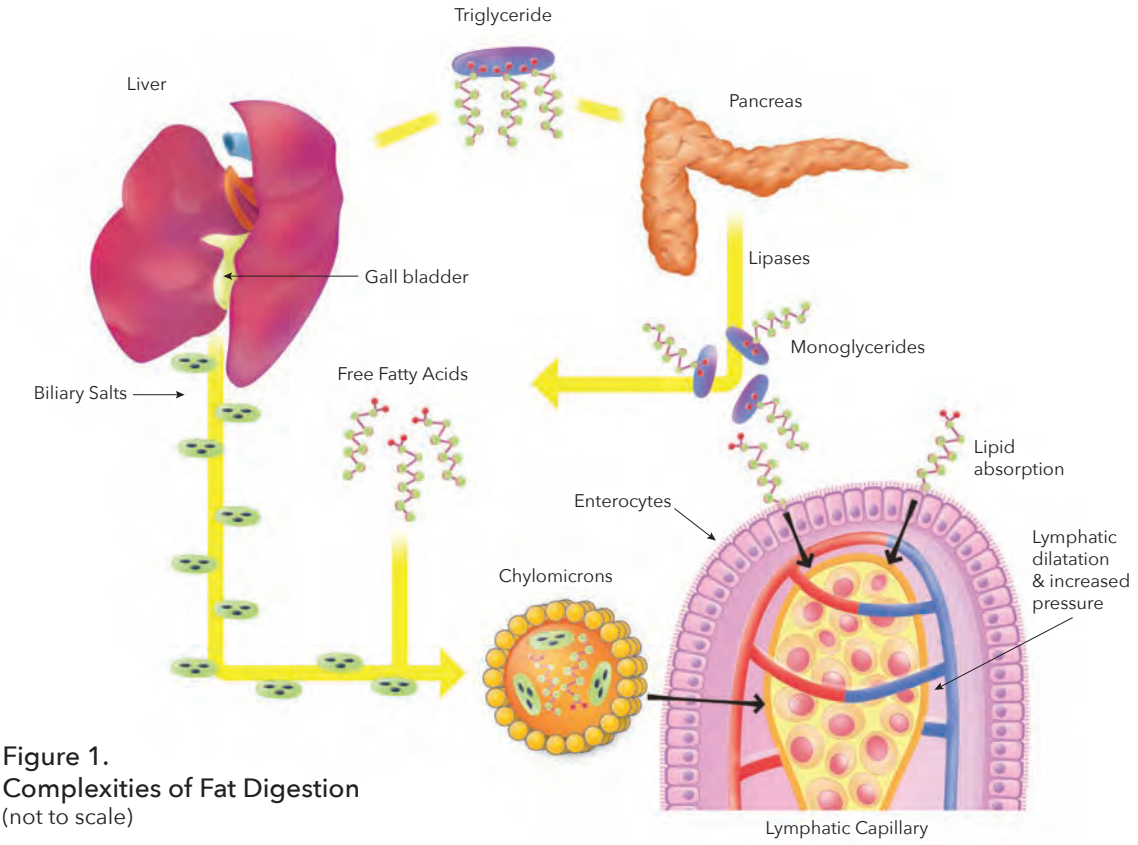


Figure 1.
Complexities of Fat Digestion
(not to scale)

BLUE Natural Veterinary Diet GI Gastrointestinal Support Low Fat for Dogs

Compared with proteins and carbohydrates, fats are the most complex nutrient to digest and absorb.[1] Complete digestion requires a variety of organ and enzymatic activity, including involvement of the pancreas, liver, gall bladder and lymphatic system. Because of its complexity, fat digestion is easily compromised and some dogs with gastrointestinal diseases have difficulty digesting fat. (See Figure 1)

Fat malabsorption can stimulate colonic water secretion and exacerbate diarrhea and fluid loss, increase mucosal permeability, alter motility, lead to secretory diarrhea and cause intestinal inflammation.[1-3]

Research has shown that fat-restricted diets tend to be better tolerated in a variety of gastrointestinal diseases.[4]

In acute gastroenteritis, a highly digestible, low-fat diet is recommended to help optimize mucosal recovery and minimize any exacerbation of diarrhea or vomiting.[4] Fat reduction is especially important for dogs at risk for or diagnosed with pancreatitis. High-fat, low protein foods have been associated with the development of pancreatic and hepatic lipidic changes in dogs, and consumption of high fat foods contributes to obesity in pets, which, like hypertriglyceridemia, is a common risk factor for pancreatitis. In one report, 43% of dogs with acute pancreatitis were considered overweight or obese. A low-fat diet, therefore, is recommended for all obese or hypertriglyceridemic patients with acute or chronic pancreatitis.[5]

In cases of intestinal lymphangiectasia (IL), characterized by dilation of the intestinal lymphatic vessels, dietary fat restriction has also been shown to be an effective treatment.[6] Lymphangiectasia may develop as a primary or congenital condition or be secondary to damage to or increased pressure in these lymphatics from chronic intestinal inflammation and inflammatory bowel disease (IBD). In either case, protein-rich lymph can leak from the abnormal lymphatic vessels, resulting in protein-losing enteropathy (PLE). Fat restriction helps to decrease lymphatic flow, thereby reducing lymphatic pressure and protein loss.[4] Restricting dietary fat can also help reduce the risk of distension and emesis associated with prolonged gastric retention and is recommended for symptomatic management of borborygmus and flatulence in such cases absent of a primary diagnosis.[4]

Therefore, highly digestible, fat-restricted diets have been advocated as appropriate and important in managing GI disease and diarrhea in many situations.[1,3]

KEY NUTRIENTS

In addition to limiting dietary fat, prebiotic fiber sources, such as fructooligosaccharides, and omega-3 fatty acids remain important nutrients for managing gastrointestinal diseases. Prebiotic fibers are fermented in the colon to produce short-chain fatty acids, which play a significant role in promoting healthy enterocyte metabolism.[7]

Prebiotic fibers additionally help balance and support a healthy intestinal microbiome, modify intestinal pH and enhance the immune system.[8-11]

Due to their anti-inflammatory properties, omega-3 fatty acids from sources such as fish and flaxseed can have a beneficial effect in controlling mucosal inflammation and aiding the recovery of the gastrointestinal mucosa. In addition to meeting criteria for fat restriction, BLUE Natural Veterinary Diet GI Low Fat for Dogs also contains omega-3 fatty acids, including DHA and EPA (eicosapentaenoic acid and docosahexaenoic acids), to help manage conditions such as pancreatitis, idiopathic hyperlipidemia (IH) and inflammatory bowel disease.

TABLE 1.
AVERAGE KEY NUTRIENT ANALYSIS VALUES FOR BLUE GI LOW FAT FOR DOGS

	Fat	EPA + DHA
As Fed %	7.60	0.16
Dry Matter %	8.26	0.17
g/100 kcal	2.33	0.05
Recommended	For obese and hypertriglyceridemic dogs with pacreatitis, ≤ 10% DM[5] For IBD, 8-12% DM with fiber enhancement[12]	For IH[13] For IBD[13]

ENHANCED DIGESTIBILITY

Feeding readily digestible proteins, carbohydrates and fats is important in diets intended to manage gastrointestinal diseases. Greater digestibility is associated with reduced osmotic diarrhea due to fat and carbohydrate malabsorption, reduced intestinal gas and lowered antigenicity of bowel contents as smaller amounts of protein are absorbed intact.[12] Adequate energy density and digestibility are also important in low-fat diets, as fat is a diet's most concentrated source of calories.

STUDY: DETERMINING DIGESTIBILITY AND ENERGY DENSITY

PURPOSE

Prove that BLUE Natural Veterinary Diet GI Gastrointestinal Support Low Fat is easily digestible in healthy dogs.

STUDY DESIGN

Six (6) clinically healthy, adult dogs, four (4) male and two (2) female, from a commercial research facility were enrolled and placed on BLUE Natural Veterinary Diet GI Low Fat food for Dogs as their sole source of nutrition for 11 days.

The dogs were housed individually in standard, species-appropriate housing and managed consistently during the study, including providing access to activity/exercise. Each dog was presented with food on an individual basis. Cages and bowls were cleaned daily and sanitized in accordance with the Animal Welfare Act.

The dogs were fed once daily at the same time each day. Body weights were recorded on Days 1 through 6, and on Day 10. The first five (5) days of the test were considered an acclimation period. Food consumption was recorded daily. Days 6 through 11 were fecal collection days.

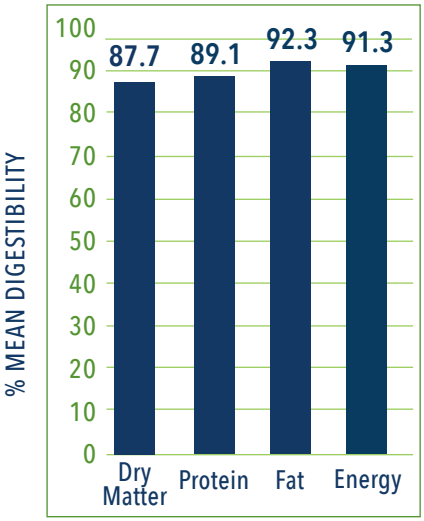
After the final fecal collection, each of six (6) individual fecal samples, as well as a sample of the BLUE Natural Veterinary Diet GI Low Fat food for Dogs, was sent to a commercial laboratory for analytical determination.[14]

The results of the analyses on the feces and the diet were used to calculate dry matter, protein, caloric digestibility and metabolizable energy according to the recommended protocol as defined by Method 1 of the Association of American Feed Control Officials (AAFCO).[15]

RESULTS

Results from the study showed that BLUE Natural Veterinary Diet GI Low Fat food for Dogs is highly digestible (See Chart 1), with a mean calculated metabolizable energy (ME) of 3266 kcals/kg.[16]

CHART 1: DIGESTIBILITY RESULTS



STUDY: DETERMINING STOOL QUALITY

PURPOSE

Prove that BLUE Natural Veterinary Diet GI Low Fat for Dogs results in ideal stool quality.

STUDY DESIGN

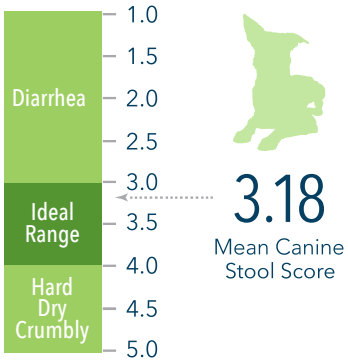
Two (2) groups of adult dogs (n=10 each for Canine Stool Quality Studies 1 and 2) from a commercial research facility were enrolled in the studies. All animals were clinically healthy. Dogs were individually fed BLUE Natural Veterinary Diet GI Low Fat food for Dogs once daily as their sole source of nutrition for 7 days.

Stool consistency observations were made a minimum of three (3) times daily during the collection period for each dog, and stools were collected a minimum of three (3) times daily or as often as needed during the collection period to ensure a clean sample for each individual dog. Stools were weighed and recorded daily during the collection period for each individual dog. The scoring scale ranged from 1 for diarrhea to 5 for hard, dry crumbly feces and was aided by photographs of examples. In this study, a stool score between 3 and 4 is considered to represent ideal fecal consistency for dogs.

RESULTS

Overall, feeding BLUE Natural Veterinary Diet GI Low Fat food for Dogs was clinically proven to result in ideal stool consistency. Importantly, most stools were moist, formed (score of 3) or well-formed, sticky (score of 3.5) stools, with a mean score of 3.18.[16]
(See Figure 2)

FIGURE 2: STOOL QUALITY SCORING



STUDY: URINE RELATIVE SUPERSATURATION EVALUTION

PURPOSE

Show that feeding BLUE Natural Veterinary Diet GI Low Fat for Dogs results in urine relative supersaturation (RSS) values less than 5 for calcium oxalate, which have been shown to limit the formation of calcium oxalate uroliths.

STUDY DESIGN

Ten (10) adult dogs, ages 3-8 years old, were enrolled in the RSS study. All dogs selected were clinically healthy and were maintained in standard, species-appropriate housing, managed consistently during the study and provided access to activity/exercise. The study protocols were reviewed and approved by the research facility's institutional animal care and use committee.

The dogs were fed BLUE Natural Veterinary Diet GI Low Fat diet for 23 days. An amount of food calculated to maintain body weight was offered each day. On the last day of the study, a 24-hour urine sample was collected. From the sample, urine pH was measured via pH meter and specific gravity was measured with a refractometer. Two (2) aliquots were frozen and shipped to University of Tennessee for RSS analysis.[17]

RESULTS

Feeding BLUE Natural Veterinary Diet GI Low Fat for Dogs resulted in a clinically significant urine RSS value of 1.36 for calcium oxalate, indicating a stable solution where crystals do not precipitate, aggregate or grow and will dissolve and uroliths do not form.

Note that this diet is not intended to prevent or resolve struvite uroliths.

HIGHLY PALATABLE

Consuming an appropriate gastrointestinal diet is important to aid mucosal healing. Because of its impact on compliance and acceptability, high palatability is an important component of the nutritional approach to gastrointestinal conditions. Palatability and intake studies show that BLUE Natural Veterinary Diet GI Low Fat is highly palatable and well accepted by dogs.[16]

CLINICAL IMPACT

The results discussed in this Clinical Report, along with existing literature, provide evidence supporting the clinical efficacy, digestibility, stool quality and palatability for BLUE Natural Veterinary GI Low Fat food for Dogs. These findings support that BLUE Natural Veterinary GI Low Fat food for Dogs provides an ideal approach to nutritionally manage dogs with a gastrointestinal condition and difficulty digesting fat, while satisfying pet owners' preferences for wholesome, natural diets.

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