



# Research reports

A RESEARCH UPDATE FOR THE VETERINARIAN FROM AFFINITY PETCARE

## DIETARY TREATMENT OF DIARRHOEA AND/OR VOMITING IN CATS

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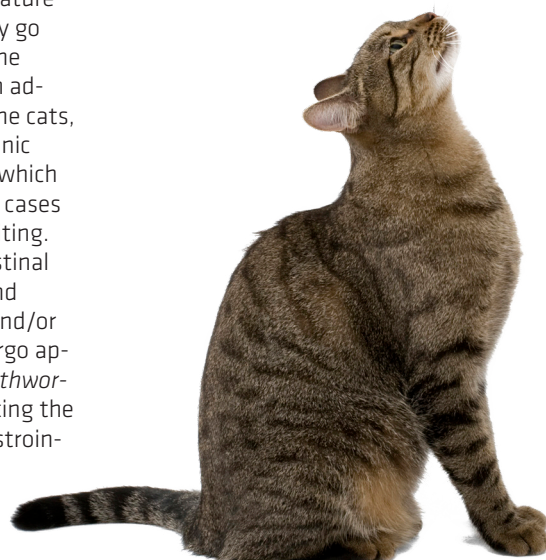
### 1. INTRODUCTION

Vomiting is considered to be one of the most common clinical signs reported in cats examined at private veterinary clinics (Lund *et al.*, 1999). In a recent study carried out in cats by a Swedish insurance company, the three leading causes of feline mortality were trauma, gastrointestinal disorders and lower urinary tract diseases (Figure 1). Similarly, in a survey carried out in cat owners in the USA and Australia, the three main diseases reported were dental-related, lower urinary tract and gastrointestinal/hepatic disorders (Freeman *et al.*, 2006). The main causes in the gastrointestinal category were similar in both Sweden and the USA, with 4% of diagnoses relating to non-specific problems such as “vomiting”

and “diarrhoea” (Egenvall *et al.*, 2010; Lund *et al.*, 1999).

Several diseases can cause vomiting and/or diarrhoea in cats. Some of the most common disorders can be found in Table 1. Given the reserved nature of cats, these clinical signs may go unnoticed by the owner until the disease process is already in an advanced stage. Moreover, in some cats, the owner may accept the chronic disease as a normal situation, which appears to be particularly so in cases of intermittent or chronic vomiting. However, cats with gastrointestinal signs, especially weight loss and chronic or recurrent vomiting and/or diarrhoea, should always undergo appropriate diagnostic tests (Northworthy *et al.*, 2013). Before evaluating the patient to detect a primary gastroin-

testinal disorder, it is essential to rule out other diseases that present with similar gastrointestinal signs (Table 1) (Bergoph and Steiner, 2011).





**Table 1.** Some of the most common disorders in cats that may induce gastrointestinal clinical signs (vomiting and/or diarrhoea)

**Secondary gastrointestinal disorders**

e.g. hepatic, pancreatic, renal, adrenal, thyroid disorders; ketoacidosis; hypercalcaemia, hyperkalaemia. etc.

**Septicaemia, enterotoxaemia. etc.**

**Foreign body**

**Fur balls**

**Infection (bacterial, viral, fungal, protozoan/parasitic diseases)**

e.g. *Campylobacter spp.*, *Clostridium spp.*, *E. coli*, Panleukopenia, FeLv, FIV, PIF, virulent calicivirus, helminths, *Giardia spp.*, *Cryptosporidium spp.*, *Tritrichomonas foetus*, Histoplasma, Toxoplasma, etc.

**Dietary indiscretion /sudden change of diet**

**Food intolerance / hypersensitivity**

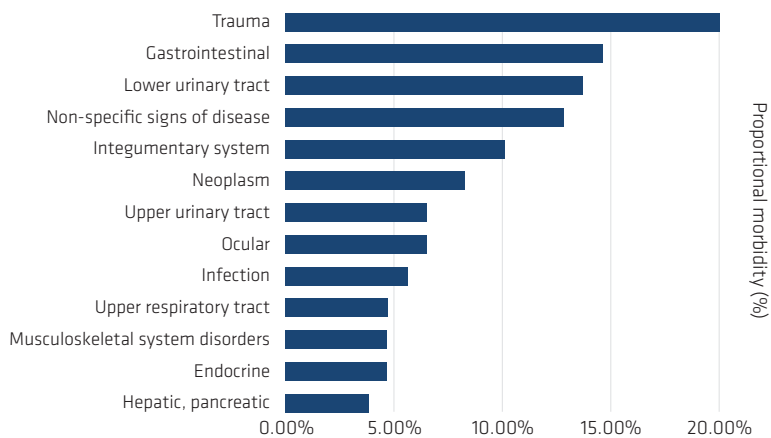
**Inflammatory bowel disease (IBD)**

**Drugs or toxins**  
e.g. xylazine, medetomidine, NSAID, etc.

**Neoplasm**  
e.g. leukaemia, lymphoma, intestinal or gastric tumours, etc.

**Neurological disorder**

**Figure 1.** Main causes of feline morbidity (%)



Proportional morbidity in cats for the diagnostic categories with at least 100 VCEs per year (annual mean of 126,627 CYAR). VCE: veterinary care event; CYAR: cat-years at risk

Adapted from Bergoph and Steiner, 2011; Batchelor *et al.*, 2013

### 1.1. GASTROINTESTINAL DISORDERS ARE COMMON IN ELDERLY CATS

A retrospective study has been carried out recently in 100 domestic cats presenting clinical signs of chronic vomiting, chronic diarrhoea of the small intestine, weight loss or a combination of these symptoms, and having undergone an ultrasound scan and laparotomy or biopsy. The median and mean age of these cats was 11 years (range: 1 to 18 years;

Weight loss and vomiting >2 times per month were the most common clinical signs. Chronic enteritis (most likely IBD) was diagnosed in 49% of cats (median age of 11 years; range: 1 to 16 years), and intestinal lymphoma was diagnosed in 46% (median age of 12 years; range: 8 to 18 years). Consequently, cats aged <8 years mainly presented enteritis, whereas those aged >8 years mainly presented enteritis or neoplasm (Figure 2) (Figure 3) (Northworthy et al., 2013). This study shows that gastrointestinal

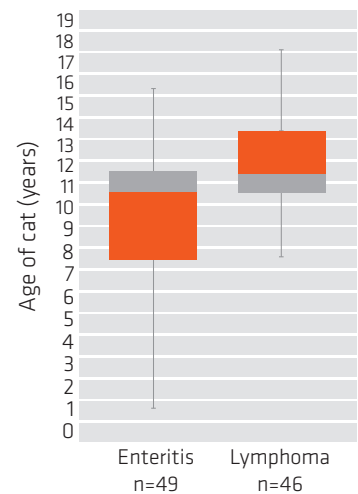
Gastrointestinal disorders are common in elderly cats

Almost half of cats with chronic signs were aged >12 years

interquartile range: 10 to 14 years). Of these 100 cats, 34% were aged between 12 and 14 years and 13% between 15 and 18 years, thus meaning that **almost half of the cats with chronic signs were aged >12 years.**

disorders are a common problem in elderly cats, thus coinciding with the findings of the Swedish study with insured cats, where the incidence rate for gastrointestinal disorders increased with age (Figure 4).

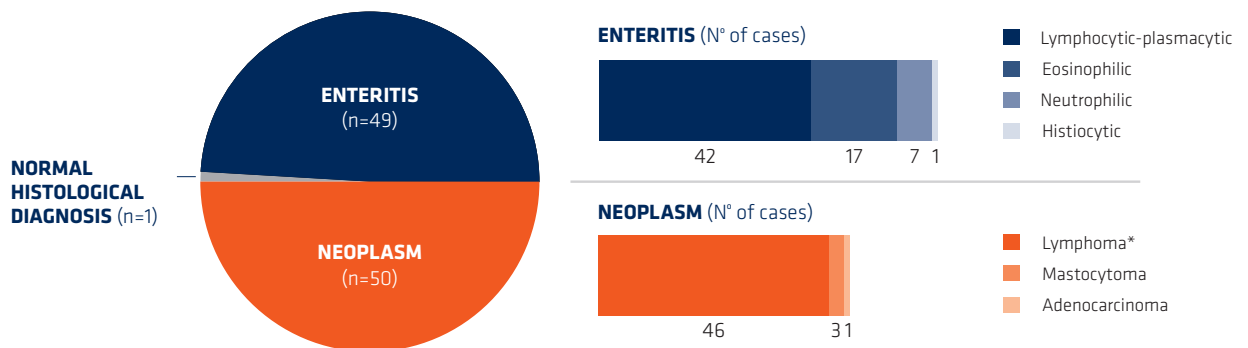
Figure 3. Box and whisker plots for age distribution at diagnosis of CSBD\* in cats with enteritis and lymphoma.



Each box represents the central quartiles (percentiles 25 to 75), the horizontal line in each box represents the median and the whiskers represent the range (Northworthy et al., 2013).

\*CSBD: chronic small bowel diarrhoea.

Figure 2. Histopathological diagnosis of cats with clinical signs of chronic enteropathy (Northworthy et al., 2013).



\*Microcytic lymphoma, n=39 (T lymphocytes, n=38; B lymphocytes, n=1)

\*Lymphoblastic lymphoma n=7 (T lymphocytes, n=6; B lymphocytes, n=1)

Diagnosis based on the results of the histological examination of samples from the small intestine obtained by biopsy in 100 cats with clinical signs of chronic enteropathy (Northworthy et al., 2013). The total number of cats is higher than 100 due to diagnostic redundancy (in other words, some cats were classified as having lymphocytic-plasmacytic enteritis and eosinophilic enteritis).

## 2. COMMON GASTROINTESTINAL DISORDERS IN CATS

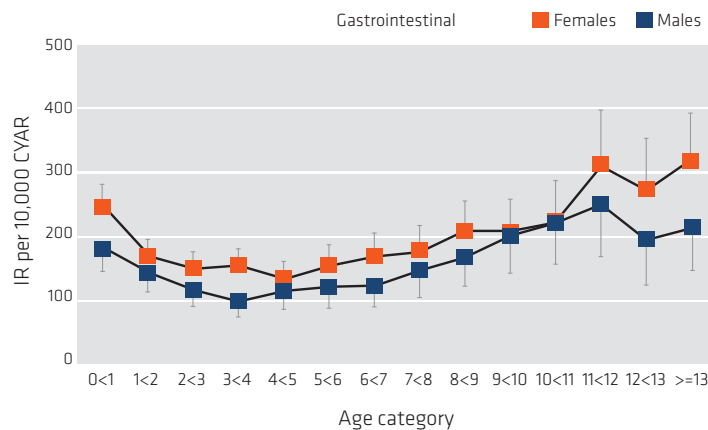
### 2.1. INFLAMMATORY BOWEL DISEASE (IBD) AND FELINE ALIMENTARY LYMPHOMA

In cats, chronic small intestine disease is associated with chronic vomiting, weight loss, chronic diarrhoea of the small intestine or a combination thereof. The signs range from mild to intense, and any sign may be the main reason for performing an evaluation (Northworthy *et al.*, 2013). Inflammatory bowel disease (IBD) and enteropathy-associated T-cell lymphoma are the most common diseases of the small intestine in middle-aged and elderly cats. As indicated above, IBD may affect cats of any age, whereas lymphoma generally affects cats older than 8 years. IBD, a chronic inflammatory disease often characterised by lymphocytic-plasmacytic inflammation, is diagnosed after having ruled out lymphoma and other known causes of chronic enteritis. Enteropathy-associated T-cell lymphoma type 2, which is characterised

The nutritional strategy is based on diets containing novel proteins (low antigenicity) or hydrolysed proteins

by small lymphocytes, is the most common infiltrating intestinal lymphoma in cats and may present a similar morphology to IBD (Northworthy *et al.*, 2013). IBD may be associated with hepatitis and/or pancreatitis. In a recent study with 38 cats with chronic enteritis, for which concurrent biopsy samples of the small intestine, liver and pancreas were obtained, 38% of cats with enteritis presented concurrent hepatitis with no pancreatitis, 10% presented concurrent pancreatitis with no hepatitis and 5% of cats with enteritis presented concurrent inflammation

**Figure 4.** Specific incidence rates (IRs) by age and sex, with upper and lower limits of the 95% confidence interval alternatively, for at least one VCE per diagnostic category and at least one VCE per 10,000 CYAR (annual mean of 126,627 CYAR) (Northworthy *et al.*, 2013).



VCE: veterinary care event; CYAR: cat-years at risk

in the liver and pancreas (Northworthy *et al.*, 2013).

Inflammatory bowel disease (IBD) and enteropathy-associated T-cell lymphoma are the most common diseases of the small intestine in middle-aged and elderly cats.

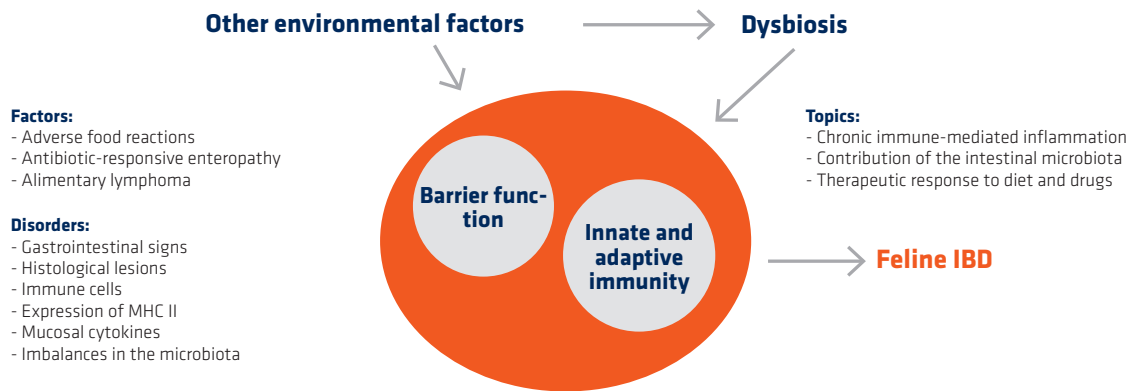
Although the exact cause of inflammatory bowel disease (IBD) is not known, current hypotheses suggest that, similar to IBD in humans and dogs, feline IBD involves complex interactions between environmental factors (e.g. intestinal microbial imbalances, dietary components) and the mucosal immune system, which leads to chronic inflammation in susceptible cats (Fig-

ure 5) (Jergens, 2012). The aim of IBD treatment has been to reduce antigen stimulation in the intestine and modulate its immune response (Trepanier, 2009). The treatment of cats with IBD includes different strategies, for example nutritional, pharmacological and the use of pre- and probiotics (Jergens, 2012). The nutritional strategy is based on diets containing novel proteins (low antigenicity) or hydrolysed proteins to reduce the risk of hypersensitivity reactions and/or supplementation with specific nutrients to compensate for the impaired absorption of nutrients (e.g. vitamin B12). The majority of cats respond favourably to this type of diet in a few days (Jergens, 2012).

### 2.2. FELINE PANCREATITIS AND MULTIORGAN INFLAMMATORY DISEASE (TRIADITIS)

Pancreatitis is the most common disorder of the exocrine pancreas in cats (Xenopulis *et al.*, 2008). A recent study has shown the existence of pancreatitis in 67% of cases presented for autopsy, 45% of which were apparently healthy, thus increasing the uncertainty regarding the clinical relevance of histopathological findings of inflammation of the

**Figure 5.** Pathogenesis proposed for feline IBD



Chronic intestinal disease in feline IBD involves a complex interaction between the mucosal immune system and the enteric microbiota in a genetically susceptible host. The possible genetic factors affecting the function of the barrier or the innate and adaptive immunity may predispose susceptible cats to the onset of gastrointestinal (GI) signs, aberrant host responses and microbial imbalances (dysbiosis). It is likely that environmental factors (dietary factors, ingredients, exposure to enteropathogens, NSAIDs or administration of antibiotics, etc.) control or trigger reactivation of the inflammation (exacerbation of the disease).

pancreas in cats, especially when mild (DeCock *et al.*, 2007). The clinical data indicate that the majority of cases of feline pancreatitis remain undiagnosed, possibly due to a low level of clinical suspicion of the disease and the limitations of diagnostic tests. In cats, chronic pancreatitis has traditionally been considered to be a more common condition than acute pancreatitis and has been reported in 65–89% of all cases of pancreatitis. Concurrent cases of both acute and chronic pancreatitis have been reported in the same pancreas (chronic active pancreatitis) in 9.6–44% of all cases. An underlying cause cannot be determined in the vast majority of cats with pancreatitis, and in this case the pancreatitis is considered to be idiopathic (Xenoulis and

**Triaditis has been reported in 50–56% of cats diagnosed with pancreatitis and 32–50% of cats with cholangitis/inflammatory liver disease.**

Steiner, 2008).

Pancreatitis in cats is often accompanied by concurrent disease in other organs and systems. Concomitant diseases include hepatic lipidosis, inflammatory liver disease, bile duct obstruction, diabetes mellitus, inflammatory bowel disease, vitamin deficiencies (B12/cobalamin, folate or vitamin K), intestinal lymphoma, nephritis, pulmonary thromboembolism and pleural and peritoneal effusion. Pancreatitis in cats often coexists with inflammatory bowel disease (IBD), less commonly with bile duct disease (known as cholangitis) and occasionally with both. Multiorgan inflammatory disease (also known as triaditis) is the term used to describe concurrent inflammation of the pancreas, liver and small intestine. Triaditis has been reported in 50–56% of cats diagnosed with pancreatitis and 32–50% of cats with cholangitis/inflammatory liver disease.

A definitive diagnosis of triaditis is based on a histopathological evaluation of each organ. However, the specific conditions of each organ representing a diagnosis of triaditis are yet to be defined. It is currently unknown which disease occurs first and what role it plays in the onset of the pathogenesis

of the other two disorders. Bacterial infection and idiopathic and immune system-mediated mechanisms are considered to be possible causes of the inflammation in each organ that may affect the onset of

**Pancreatitis in cats is often accompanied by concurrent disease in other organs or systems.**

triaditis. Given the common coexistence of these three diseases, **cats with IBD and/or bile disease should be considered to be at risk of developing pancreatitis.**

Pancreatitis may cause hepatic lipodosis, while complications may occur with other conditions, such as diabetes mellitus (*Xenoulis et al., 2008; Armstrong and Williams, 2012; Simpson, 2015*).

### 2.3. ADVERSE FOOD REACTIONS

Adverse food reactions are defined as any aberrant reaction after eating a food or food additive. Adverse reactions to ingredients in the diet are classified into two categories: food allergy or food intolerance. A food allergy is an immunological reaction to the ingredients of a food, whereas food intolerance is an adverse food reaction with no immunological basis. Hypersensitivity reactions type I, III and IV have been associated with food allergies. **The majority of animals with food sensitivity develop skin signs,** although gastrointestinal, respiratory and neurological signs may also occur, as well as some signs of abnormal behaviour, epileptic seizures and general malaise (depression). The gastrointestinal signs include vomiting, abdominal pain, liquid stools and inflammatory bowel disease, including lymphocytic-plasmacytic colitis.

A change of diet remains the method of reference for diagnosing food sensitivity. Intradermal skin tests, *in vitro* serological analyses and gastroscopic food sensitivity tests (endoscopic chal-

A dietary intervention remains the method of reference for diagnosing food sensitivity

lenge test) are not reliable for detecting adverse food reactions in animals. Serum IgE is of limited interest: 25% of cats with no food sensitivity present positive tests (false positive) and only 58% of cats with food sensitivity have a positive finding (42% false negatives). Moreover, only 25% of cats with food sensitivity showed concordance between IgE and the oral challenge test

(*Guilford et al., 2001; Leistra and Willemse, 2002*).

### 2.4. FUR BALLS

The regurgitation of fur balls is a common problem in domestic cats, to such an extent that many owners consider it to be normal feline behaviour that does not require veterinary care. However, it should also be recognised that the frequent elimination of fur balls is often indicative of the ingestion of excessive fur (flea infestation, pruritus, excessive licking due to pain or anxiety) or an underlying gastrointestinal disease (abnormal gastrointestinal motility). Chronic gastrointestinal disease (IBD, food intolerance) or increased stimulation of the sympathetic nerve, secondary to other factors such as chronic pain and/or stress, may affect upper gastrointestinal motility (*Cannon, 2013*). The regurgitation of fur balls more than twice per month justifies an ultrasound examination to detect thickening of the small intestine (*Northworthy et al., 2013*).

The regurgitation of fur balls more than twice per month justifies an ultrasound examination to detect thickening of the small intestine

### 3. DIETARY TREATMENT OF DIARRHOEA AND/OR VOMITING IN CATS

Various key concepts need to be highlighted when considering the dietary treatment of gastrointestinal diseases in cats.

Diets with novel and/or hydrolysed proteins are also of interest in the case of chronic pancreatitis

### 3.1. PROTEIN AND CARBOHYDRATE SOURCES SELECTED

**A change of diet with the selection of new sources of whole protein (low antigen) or hydrolysed proteins is a first, critical step in the treatment of chronic gastrointestinal signs.**

Almost 50% of cats with idiopathic gastrointestinal signs, including serious inflammatory changes, will respond to an elimination diet (based on new or hydrolysed proteins) with high efficacy; however, only 29% of these cats are diagnosed with an actual food sensitivity based on the response upon reintroduction of the previous diet (*Guilford et al., 2001*).



Generally speaking, administration of the elimination diet for 4–8 weeks is recommended. However, cats that respond generally improve more quickly (sometimes in 2–3 days) (Trepanier, 2009; Northworthy et al., 2013).

Diets with new and/or hydrolysed proteins are also of interest in the case of chronic pancreatitis. Indeed, chronic pancreatitis may be associated with IBD and/or cholangitis and these cats normally respond well to these sources of protein (Zoran, 2006). New sources of protein are selected to minimise exposure to possible allergens. The common allergens in cats include dairy products, beef and fish (90% of cases) and to a lesser extent chicken egg, chicken, pork, corn, lamb, rabbit, whale meat and wheat (Reedy, 1994; White and Sequoia, 1989; Verlinden et al., 2006; Roudebush, 2013).

**Advance Veterinary Diets Gastroenteric Sensitive Feline Formula** contains turkey protein and peas as the new protein source. These new proteins have been selected based on their low allergenicity, high digestibility, high palatability and good amino acid profile. Hydrolysed proteins are also an alternative to new proteins. Hydrolysed proteins are small peptides that do not trigger an immunological reaction compared with the whole protein. Hydrolysed proteins are also added given their high digestibility. **Advance Veterinary Diets Gastroenteric Sensitive Feline Formula** does not contain ingredients that may produce adverse food reactions or intolerances in cats, such as corn, wheat, beef, lamb, chicken, egg, lactose or gluten.



### 3.2. MODERATE LEVEL OF FATS

A reduction in the quantity of dietary fats to treat poor digestion in cats has mainly been proposed in feline pancreatic diseases to reduce pancreatic secretions. However, this approach normally entails an increase in dietary carbohydrates, which is inconsistent with the normal feline diet (Zoran, 2006).

As mentioned above, chronic pancreatitis in cats may be associated with IBD and/or cholangitis, and these cats normally respond well to diets containing new and/or hydrolysed proteins, meaning that severe restriction is of little use (Zoran, 2006).

Cats with pancreatitis fed with high levels of carbohydrates become hyperglycaemic and develop diarrhoea, whereas diets with a higher fat level are well tolerated (Michel, 2002).

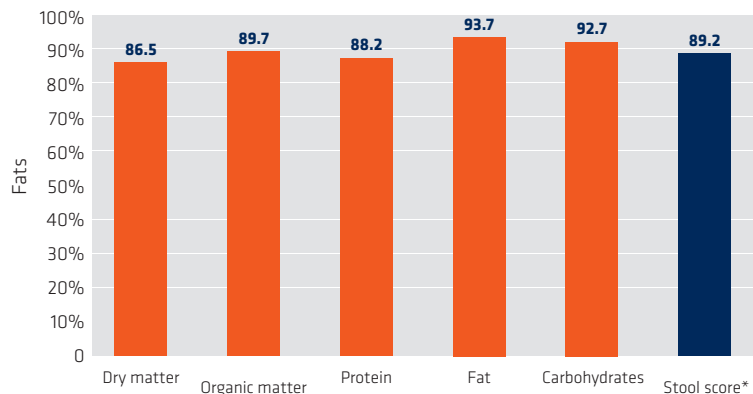
Fats are a source of concentrated calories, which allows the ingestion of smaller amounts of food to maintain the energy supply, thereby minimising GI work and helping to control clinical signs and re-establish physical condition. Fats may also help to improve palatability, which is important in patients with digestive disorders: **the lack of palatability of a low-fat diet may be counter-productive if the sick animals refuse to eat** (Zoran, 2008). A fat content of up to 23% (dry matter) is tolerated well in cats with chronic large or small bowel diarrhoea of unknown origin or with IBD (Laflamme 2011, Zoran, 2008).

**Advance Veterinary Diets Gastroenteric Sensitive Feline Formula** contains 14% fat, a balanced level that provides energy to compensate for the reduced food intake while being suitable for cats with pancreatic diseases.

### 3.3. HIGH DIGESTIBILITY AND STOOL CONTROL

High digestibility remains a key aspect in the treatment of the feline gastrointestinal disorders responsible for poor digestion and malabsorption. Easily digestible nutrients are absorbed more easily in the intestinal tract and reduce osmotic diarrhoea and gas production. Clinical signs, such as low stool score and weight loss, improve when animals

**Figure 6.** Mean digestibility and stool score for **Advance Veterinary Diets Gastroenteric Sensitive Feline Formula**.



(\*) Scale from 0 (liquid stool) to 100 (very hard and dry stools).

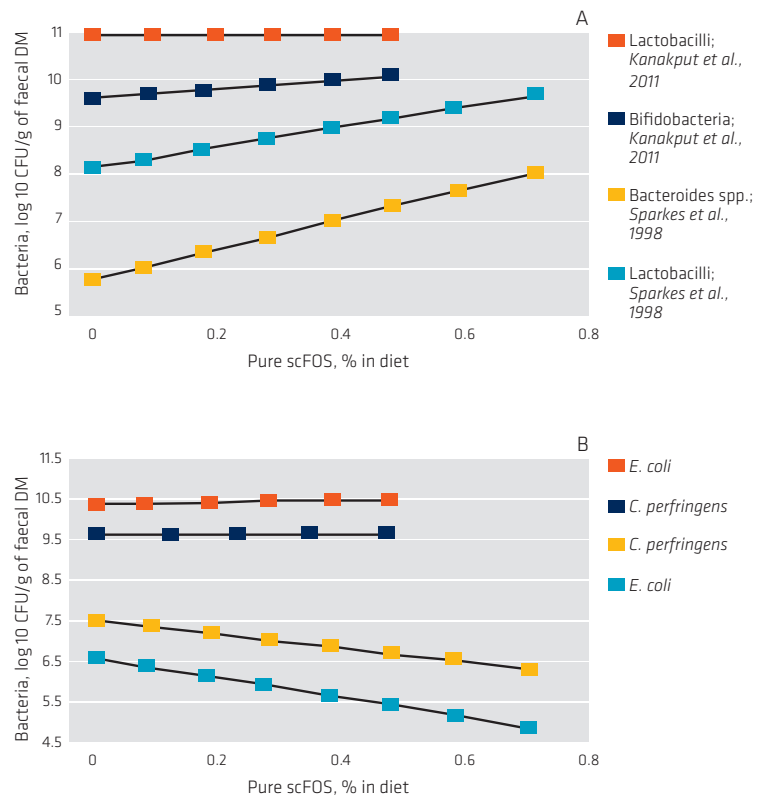
are fed with easily digestible diets. **Advance Veterinary Diets Gastroenteric Sensitive Feline Formula** is an easily digestible diet (Figure 6) that includes selected ingredients which are easy to digest, such as rice, hydrolysed proteins, medium-chain triglycerides (MCTs), to compensate for the poor digestion of foods and to facilitate the absorption of nutrients, making them accessible for immediate use. The inclusion of sepiolite, a clay mineral with absorbent properties, together with the easily digestible ingredients, helps to reduce stool volume.

High digestibility remains a key aspect in the treatment of the feline gastrointestinal disorders responsible for poor digestion and malabsorption.

### 3.4. PROTECTION OF THE INTESTINAL BARRIER

Studies in cats and dogs have shown that acute and chronic gastrointestinal diseases, including inflammatory bowel disease (IBD), are associated with problems in the small intestine and faecal microbial communities. These studies have also revealed possible underlying susceptibilities in the innate immune system of cats and dogs with IBD, thereby also demonstrating the complex relationship between the intestinal microflora and the host's health. The microbial changes commonly identified in IBD are reductions in the bacterial groups from the phyla *Firmicutes* and *Bacteroidetes*, and increases in *Proteobacteria*. In addition, a reduction in the diversity of the groups

**Figure 7.** Effects of sc-FOS supplementation on stool composition of microflora in cats (representation in the study)



Adapted from Apper E, 2005.

*Clostridium* XIVa and IV (e.g. subgroups *Lachnospiraceae* and *Clostridium coccooides*) associated with IBD suggests that these bacterial groups may play a key role in maintaining gastrointestinal health (Honneffer et al., 2014).

Acute and chronic gastrointestinal diseases, including inflammatory bowel disease (IBD), are associated with problems with the small intestine and faecal microbial communities.

It has been shown that supplementation with prebiotics, for example short-chain fructooligosaccharides (**sc-FOS**), modulates the intestinal flora in cats, increasing the mean value for *Lactobacilli*, *bacteroides spp* and *bifidobacterium spp* while reducing *E. coli* and *C. perfringens* (Sparkes *et al.*, 1998; Kanakput *et al.*, 2011), thereby potentially improving intestinal health (Figure 7).

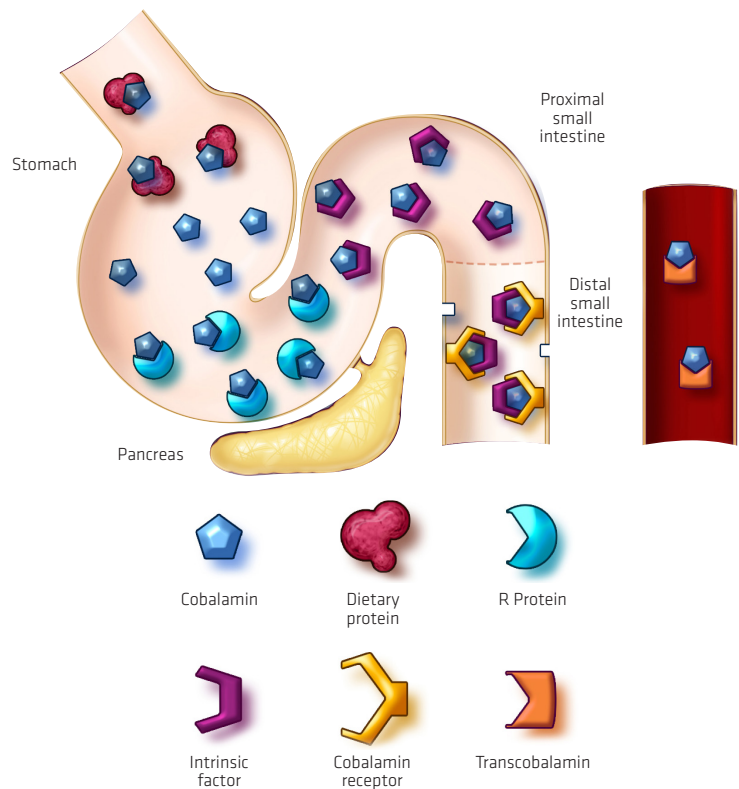
Omega-3 fatty acids from fish oil may have a beneficial effect as regards modulation of the inflammation associated with IBD.

**Advance Veterinary Diets Gastroenteric Sensitive Feline Formula contains prebiotics (sc-FOS) and omega-3 fatty acids to stimulate growth of beneficial intestinal flora and reduce inflammation**, thereby helping to preserve the health of the intestinal tract.

**3.5. SUPPLEMENTATION WITH VITAMIN B12 (COBALAMIN)**

Cobalamin is a water-soluble B vitamin with an important role in many biochemical reactions (including DNA synthesis and the synthesis of methionine from homocysteine), as well as in important enzymatic reactions in the citric acid cycle, where it acts as a co-factor. A cobalamin deficiency causes important metabolic and clinical disorders. In cats, the absorption of

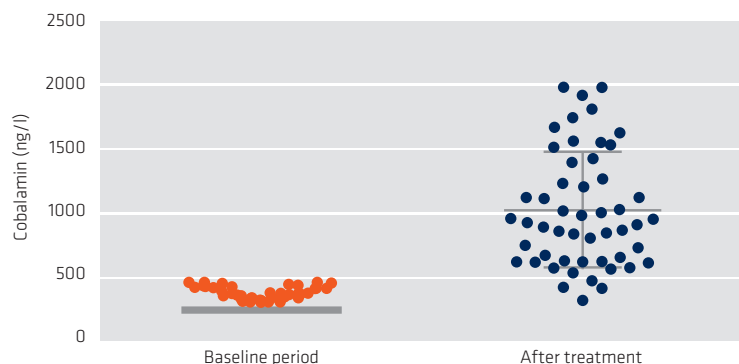
**Figure 8.** Mechanism of cobalamin absorption by cobalamin carriers in the intestine of carnivores.



Adapted from Suchodolski and Steiner, 2003.

**A cobalamin deficiency causes significant metabolic and clinical disorders. In cats, the absorption of cobalamin is particularly complex and mainly depends on pancreatic function and the health of the mucosa in the small intestine.**

**Figure 9.** Serum cobalamin concentrations in 51 dogs with hypocobalaminemia treated with oral cobalamin supplementation in the baseline period and after treatment (Toresson *et al.*, 2015).



cobalamin is particularly complex and mainly depends on pancreatic function and the health of the mucosa in the small intestine. For absorption, cobalamin needs a carrier protein of pancreatic origin (intrinsic factor) and

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**Cobalamin deficiency is a common anomaly in cats with clinical signs of gastrointestinal tract disease.**

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a receptor mediated process in the ileum. However, studies in humans have shown that approximately 1% of free cobalamin is absorbed by passive diffusion in the intestine, irrespective of the intrinsic factor (Figure 8) (Berlin *et al.*, 1968).

The half-life of cobalamin depends on intestinal absorption and enterohepatic circulation, and gastrointestinal disease leads to a reduction in this half-life from 13 to 5 days, thus indicating a very rapid exchange of cobalamin compared with other species (Simpson *et al.*, 2001). This rapid reduction in circulating cobalamin in cats may explain why these animals are so susceptible to cobalamin deficiency.

The clinical department of the gastrointestinal laboratory at Texas A&M University suggested that cobalamin deficiency is a common abnormality in cats with clinical signs of gastrointestinal disease.

These authors reported a high prevalence (60%) of abnormally low cobalamin (< 900 pg/ml) in 80 cats with signs of gastrointestinal disease (weight loss, diarrhoea, vomiting, anorexia and intestinal thickening), as well as a high prevalence (27.4%) of serum cobalamin concentrations below the lower limit for the reference range (< 290 ng/ml) in 2377 serum samples from cats (Ruauux *et al.*, 2001). Cats with subnormal cobalaminaemia were diagnosed with gastrointestinal diseases, including inflammatory bowel disease, intestinal lymphoma, cholangiohepatitis or cholangitis and pancreatic inflammation (Simpson *et al.*, 2001). Using the serum cobalamin concentration as a marker for sub-clinical gastrointestinal disease and including its analysis in the routine evaluation of elderly cats has been suggested (Salas *et al.*, 2014).

Cobalamin supplementation is recommended for all cats with gastrointestinal disease and serum cobalamin concentrations of less than 300 ng/ml (Ruauux *et al.*, 2005). The recommended protocol is currently parenteral supplementation for 4 weeks, which restores the biochemical findings to normal, with an improvement in body weight and a reduction in the frequency of diarrhoea and vomiting (Ruauux *et al.*, 2005). The empirical evidence found in the literature suggests that cobalamin supplementation in animals presenting gastrointestinal disease and low cobalamin concentrations often improves the response to treatment of the disease (Ruauux *et al.*, 2005).

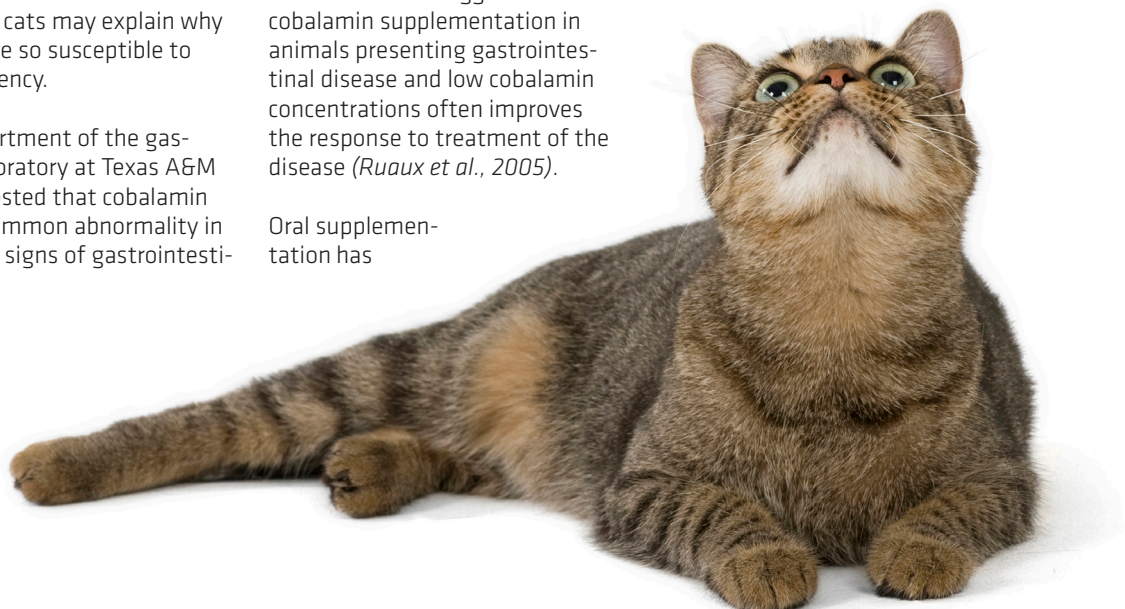
Oral supplementation has

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**Clinical studies carried out by Affinity Petcare in cats with a diagnosis of gastrointestinal disease have shown that oral supplementation with cobalamin for 1 week is sufficient to restore cobalamin concentrations in hypocobalaminemic animals (internal data).**

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been widely studied in humans and, more recently, in dogs with hypocobalaminaemia (Figure 9), suggesting that it may be just as effective as parenteral administration as regards restoring cobalamin concentrations in several diseases (Kuzminski *et al.*, 1998; Castelli *et al.*, 2011; Baloman *et al.*, 2003; Kim *et al.*, 2011; Toreson *et al.*, 2015).



The clinical studies carried out by Affinity Petcare in cats with a diagnosis of gastrointestinal disease have shown that oral supplementation with 100 µg cobalamin/day for 1 week is sufficient to restore cobalamin concentrations (> 900 ng/L) in hypcobalaminemic animals (< 290 ng/L) (Figure 10) (internal data).

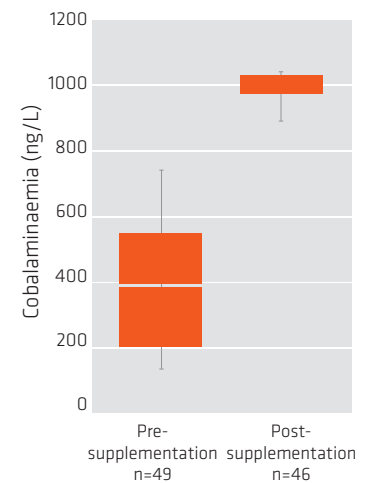
As a result of Affinity's clinical studies, **Advance Veterinary Diets Gastroenteric Sensitive Feline Formula** contains cobalamin supplementation that helps to restore cobalamin levels in cats with pancreatic and small intestine disease, thus leading to a general improvement in gastrointestinal signs.

### 3.6. PALATABILITY

Loss of appetite and weight loss are common signs in cats with gastrointestinal disorders. The nutritional strategies in these animals include the use of a nutritionally balanced and easily digestible diet in order to encourage the ingestion of food. This will ensure the supply of nutrients known to be essential to promote the growth and replacement of intestinal epithelial cells, which will help to restore intestinal function and flora (Zoran, 2008).

**Advance Veterinary Diets Gastroenteric Sensitive Feline Formula** has been formulated with selected ingredients to provide a high level of palatability.

**Figure 10.** Cobalamin concentration in cats before and after oral supplementation.



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## A CLINICAL REPORT FOR THE VETERINARIAN FROM AFFINITY PETCARE

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