

Nutraceutical support for dogs and cats with gastrointestinal problems



Dr Daniel Sinteoan DVM, veterinary technical support manager, Mervue Laboratories, provides an in-depth review on the symptoms, causes and treatment of gastrointestinal problems in companion animals

Diarrhoea and digestive disturbances are among the most frequent reasons that dogs and cats are presented to vets. While distressing for the pet owner to witness, diarrhoea, vomiting and digestive disturbances, can also result in impaired absorption of nutrients and in the long term, significant debilitation in animals.

COMMON CAUSES OF DIGESTIVE DISTURBANCES

The most common causes of diarrhoea and digestive disturbance are dietary indiscretion, changes in diet, and infectious causes (Hall, 2005). Less commonly, acute diarrhoea can be caused by chemotherapeutic agents and adverse drug reactions. Animals that experience diarrhoea often become depressed, anorexic and dehydrated. Malabsorption/maldigestion conditions such as inflammatory bowel disease (IBD), small intestinal bacterial overgrowth (SIBO) and exocrine pancreatic insufficiency (EPI), for example, can result in chronic diarrhoea. Acute and chronic pancreatitis are painful causes of vomiting and diarrhoea in both dogs and cats and is associated with marked pancreatic inflammation, autolysis of pancreatic tissues and in severe cases death.

Long-standing cases of chronic pancreatitis can result in EPI. Irrespective of the cause of diarrhoea, and, as a result of gastrointestinal (GI) inflammation and/or rapid transit of gastrointestinal contents, absorption of nutrients, including vitamins, can be compromised. In addition, antibiotic therapy, such as that used in SIBO, lead to profound changes in the intestinal microflora (Grønvold, 2010), which are necessary for the production of vitamin K2, the water-soluble B vitamins, biotin and folate.

In this direction, the supportive treatment including nutrition supplementation is important. The aims of nutritional supplementation are to:

- Replace fluid losses through rehydration, including where necessary intravenous fluids;

- Replace protein, carbohydrate and fat losses by encouraging return to normal appetite;
- Replace vitamin losses;
- Restore normal intestinal motility;
- Promote gastrointestinal and systemic immunity;
- Limit fluid losses and protect gastrointestinal mucosa from further damage;
- Stabilise and replace intestinal microflora.

While some nutritional supplements address some of the above aims, few address the need to deliver specific nutrients, for example supplement vitamins. The following text represents an informative review of the helpful nutrients and nutraceuticals formulated to address the needs of dogs and cats with digestive disturbance and diarrhoea, through the provision of the following supplements: probiotics, vitamin E and C and the B group vitamins.

PROBIOTICS

Commensal gut microbes, *Enterococcus faecium* being one of many, play a crucial role in host health. They act as a defending barrier against invading pathogens, aid in digestion and energy harvest from the diet, provide nutritional support for enterocytes and stimulate the development of the immune system. Alterations in the composition of the intestinal microbiota have been implicated with chronic enteropathies in dogs and cats (German et al, 2003). The presence of intestinal bacteria in early life is necessary to establish oral tolerance to commensal bacteria and food antigens, to prevent onset of an inappropriate immune response, which may lead to chronic gastrointestinal inflammation (Bauer et al, 2006). Microbes interact and stimulate the immune host system, as has been shown by administration of specific bacterial strains as probiotics in dogs and cats. Important changes in the intestinal microflora occur at weaning and

when changing diet and supplementation of food with *E faecium* (NCIMB 10415, SF68) has been demonstrated to stimulate immune function in young dogs, at the mucosal and systemic levels (Benyacoub, 2003). Administration of *E faecium* to cats in animal shelters significantly reduced the number of cats experiencing diarrhoea of two days or more duration (Bybee, 2011).

VITAMIN E AND ASCORBIC ACID

Vitamin E (α -tocopherol) is an essential vitamin and the α -form is the most active saturated form of vitamin E available. α -tocopherol has long been established as the biological antioxidant, by virtue of its ability to stabilise cell membranes and reduce the production of free radicals. Normal dogs and cats experience oxidative damage and increased dietary levels of antioxidants may decrease in vivo measures of oxidative damage (Jewell, 2000). Vitamin E is believed to be especially important in young puppies and kittens with developing immune systems (Hayek, 2000). Ascorbic acid is the vitamin typically associated with scurvy, most dogs and cats. During times of stress (eg. dietary, performance, management, temperature, disease) or high production, ascorbic acid synthesis decreases in dogs and cats. Ascorbic acid plays an important anti-oxidant role in combination with other vitamins, such as vitamin E (Heaton, 2001). Ascorbic acid plays an important role in immunity and has been demonstrated that supplementation of diets with ascorbic acid in combination with α -tocopherol in healthy and aged beagles resulted in significantly enhanced neutrophil phagocytosis (Hall, 2011). Ascorbic acid is also essential for the formation and maintenance of collagen important components of skin, connective tissue, cartilage, muscle, bone and teeth (Holmannová, 2012).

B VITAMINS

THIAMINE

Thiamine is an essential vitamin. All animals require thiamine, and it is synthesised by bacteria, yeast and plants therefore animals must obtain thiamine from their diet.

Deficiencies in thiamine are characterised by anorexia, weakness and malaise. Any disruption to an animal's commensal flora, could alter thiamine production. Additionally, thiamine is water soluble and susceptible to destruction by heat, neutral and alkaline conditions, oxidising and reducing agents and ionizing radiation. Thiamine is a coenzyme in the conversion of carbohydrates to provide energy, it is essential for Krebs cycle within cells, plays a role in insulin biosynthesis, and is vital in nerve function (through its role in acetylcholine synthesis and thus smooth muscle function) and maintenance of the myelin sheath. Consequently, it is necessary for peristaltic activity of the stomach and intestines (Jankowska-Kulawy, 2010) and to maintain normal gut motility and appetite.

RIBOFLAVIN

Riboflavin promotes growth, food conversion, fertility and

improves skin and coat condition. Riboflavin is essential for maintaining the integrity of mucous membranes, the epithelial barrier and nerve fibre integrity. Additionally, riboflavin is required for the activation of pyridoxine (vitamin B6) for its role in the formation of niacin from tryptophan. Protein-bound riboflavin is released during digestion, and its absorption occurs in the small intestine by passive diffusion. Generally, it is not well absorbed, and it has been reported that the riboflavin requirements of adult dogs are greater than previously thought (Cline, 1996). Increased GI transit associated with diarrhoea, could reduce riboflavin absorption.

PYRIDOXINE

Pyridoxine is an essential vitamin involved in many metabolic processes; it plays a key role in energy production, central nervous system activity as well as the blood and immune systems. It is synthesised in the intestine by microorganisms and large losses occur in feed processing. Pyridoxine is essential for the synthesis, transport and breakdown of amino acids (Rosenberg, 2012). More than 60 enzymes rely on pyridoxine coenzymes. It is critical for the production and synthesis of numerous body chemicals, including insulin, neurotransmitters, enzymes, prostaglandins, histamine, dopamine, and adrenaline and it is also involved in the synthesis of niacin from tryptophan and in carbohydrate metabolism. Pyridoxine is rapidly absorbed from the small intestine.

CYANOCOBALAMIN

Cobalamin is the largest and most complex of all the vitamins. It is essential in all the basic metabolic functions including protein, carbohydrate and fat metabolism. Absorption occurs slowly in the small intestine and has low efficiency (1% absorbed). There is reduced absorption in cases of small intestine bacterial over growth (SIBO).

MENADIONE

Menadione is a pro-vitamin and precursor to vitamin K. Vitamin K is essential in the blood clotting process and depletion of vitamin K reserves can occur in cases of chronic low grade haemorrhage. Many dogs and cats with chronic intestinal disease or parasitism have pre-existing anaemia.

CALCIUM-D-PANTOTHENATE

Calcium pantothenate is an essential vitamin required for the synthesis of coenzyme A (CoA) and to synthesise and metabolise proteins, carbohydrates and fats. It is also required in the synthesis of acetylcholine. Consequently, it plays an essential role in metabolism and energy levels. As with other water-soluble B vitamins it is absorbed from the small intestine via specific carrier systems synthesised by intestinal microflora (Said, 2011). Any disruption to the microflora can impair absorption.

NICOTINIC ACID

Nicotinic acid is produced from tryptophan and is a precursor of nicotinamide adenine dinucleotide (NAD)

and nicotinamide adenine dinucleotide phosphate (NADP) which are coenzymes required by many dehydrogenases. High energy requirements (brain) or high-turnover rate (gut, skin) organs are usually the most susceptible to this coenzymes deficiency. Nicotinic acid is also important in gastrointestinal motility. Feline species, including the domestic cat, evolved as strict carnivores.

As such, their nutritional idiosyncrasies are legendary including an inability to effectively convert tryptophan to niacin, as a result of the high activity of enzymes that metabolise the precursors of this vitamin to other compounds. Consequently, while meat is well supplied with the NAD and NADP coenzymes, and while cats consume a diet of animal tissue there is no need to produce niacin from tryptophan. Anorexic cats may not receive sufficient supplies of niacin from meat sources (Morris, 2002; Baker, 2008)

CONCLUSION

There are many supplements in the veterinary market that claim to provide nutritional support to dogs and cats suffering from gastrointestinal disturbances. Most contain gastrointestinal adsorbents and/or protectants, some contain probiotics to support and replace the impaired gastrointestinal flora, but few contain also the range of vitamins, especially vitamins E, C and the B vitamins necessary to promote immunity, enhance appetite and gastrointestinal motility and support repair of the gastrointestinal system.

REFERENCES

References on request.