THE mammalian gastrointestinal (GI) tract is home to a complex ecosystem of microorganisms (bacteria, fungi, protozoa, archaea and viruses) known as the microflora.

The total microbial load in the intestine is estimated to range between 10^12 to 10^14 organisms, about 10 times the number of cells composing the host body. In the non-diseased state, the microflora is responsible for regulating host health by:

- Aiding digestive processes
- Deamination and fermentation of amino acids
- Carbohydrate fermentation
- Deconjugation of bile acids
- Vitamin synthesis
- Competitive exclusion of non-resident bacteria
- Competition for oxygen, nutrients, mucosal adhesion sites
- Micro-environment changes – secretion of anti-microbial substances, alterations in gut pH
- Modulating the immune system
- Stimulates gut-associated lymphoid tissue (GALT)
- Increase concentrations of immunoglobulins (Ig)
- Maintaining mucosal barrier function
- Bacterial fermentation produces short-chain fatty acids (SCFAs) which promote epithelial cell growth
- Increase mucus production

Bacteria levels in the intestines are regulated by host control mechanisms which include intestinal motility and antimicrobial substances in pancreatic and biliary secretions.

Disruption of these regulatory measures can result in an imbalance in the resident intestinal microflora, known as intestinal dysbiosis, which may develop due to colonisation with transient pathogens or an overgrowth by opportunistic resident bacterial species.

Intestinal dysbiosis can lead to various mechanisms that negatively affect the functioning of the GI tract; these include dehydroxylation of fatty acids leading to impaired fat absorption, increased intestinal permeability, destruction of brush border enzymes and competition for substrates leading to nutrient and vitamin malabsorption.2

Inflammatory Bowel Disease (IBD) is thought to involve an abnormal interaction between commensal intestinal microflora and the intestinal immune system in genetically predisposed individuals.3

It is suspected that intestinal inflammation causes a dysbiosis towards Gram-negative bacteria and a depletion of commensal bacteria leading to a reduced capability of the microflora to down-regulate an aberrant immune response.4

Recent molecular studies performed in dogs and cats have revealed differences in the intestinal microflora between healthy animals and IBD patients. Animals with IBD have increased levels of Enterobacteriaceae5,6 and Proteobacteria7,8 with reduced levels of Bacteroidales and Clostridiales and an overall reduction in bacterial species richness.9

The term probiotic is used to describe a live micro-organism which, when administered in adequate amounts, confers a health benefit on the host.10 These health effects are thought to be due to a direct inhibition of pathogenic micro-organism colonisation or by immune-enhancing effects on gut-associated lymphoid tissue and increasing immune-modulating cytokines (Figure 1).

Within the European Union the only probiotic authorised for use in canine and feline species by the European Foods Standards Agency (EFSA) is Enterococcus faecium NCIMB 10415. This strain has been extensively researched to verify its safety and efficacy in dogs and cats; these studies demonstrate the following benefits from using the strain:

- Reduced faecal levels of Clostridium spp in dogs11 and cats12
- Reduced adhesion of Clostridium perfringens to intestinal mucosa by 70%13
- Increased faecal levels of beneficial Bifidobacteria spp and Lactobacillus spp13
- Maintained faecal microbial diversity in cats subject to stressful situations, while the placebo group had a reduction in the microfloral diversity14
- Reduced morbidity associated with chronic feline herpesvirus-1 infection14
- Increased faecal and plasma IgA in young dogs15
- Improved response to canine distemper virus vaccination as evidenced by higher specific IgG and IgA16

Quicker resolution

Probiotics are commonly recommended as an ancillary treatment for various GI disorders. The use of probiotic products in acute diarrhoea is well established and studies have demonstrated a quicker resolution of diarrhoea in dogs16,17 and cats when using probiotics.

A combination of Enterococcus faecium and probiotic (Symbiotic DC, Proxin Veterinary) has been investigated for its ability to prevent diarrhoea in dogs in a rehoming shelter.17

In a double-blinded, placebo-controlled, randomised study 81 dogs were randomly assigned to receive either the placebo or Symbiotic, and the incidence of diarrhoea was recorded. Dogs receiving the Symbiotic were 50% less likely to develop diarrhoea than those receiving the placebo (Figure 2).

There is limited information regarding the use of probiotics in chronic diarrhoea although work has been completed looking at a combination of probiotics, prebiotics, alpha-glucan and beta-glucan (Proxin Pro-Kolin Enterogenic) in cats naturally infected with the protozoal parasite, Trichomonas foetus.18 This prospective double-blinded, placebo-controlled trial demonstrated that the cats treated with the product had a higher resolution rate and reduced relapse rate compared to placebo. The relapse rate in the placebo group was 61.5% versus 15.4% in the treatment group (P = 0.021).

The use of probiotics in veterinary practice is well established with many clinicians opting to utilise them in acute diarrhoea cases in dogs and cats. In chronic diarrhoea, the disturbances to the intestinal microflora are well documented but further work is needed to understand these changes fully.

Future studies will need to investigate the effects probiotics can have on the disrupted microflora and any potential role they may have in the management of chronic diarrhoea patients.

One area of research showing promise in human medicine is the utilisation of faecal transplantation, and while there are reports of promising results in canine patients, controlled clinical trials are needed before this can be advocated as a viable treatment option.


James Kyffin, BVSc(Hons), MRCVS, graduated from Bristol in 2005. He spent four years working in small animal practice in the south-west and East Anglia before joining Proxin Veterinary as international technical manager in November 2009. In January 2013 he was promoted to the role of veterinary technical manager. James has a particular interest in canine and feline gastroenterology and endocrinology.

FIGURE 1. Proposed probiotic mechanisms of action.

FIGURE 2. Incidence of diarrhoea compared between active (Symbiotic DC) and placebo over six-week study period.