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CLINICAL NOTES:

The role of probiotics in intestinal health

INTESTINAL MICROBIOTA

The intestinal microbiota comprises all microorganisms that inhabit the gastrointestinal (GI) tract. The canine small intestine can harbor up to 700 bacterial strains¹ and the large intestine approximately 5,000 strains. After birth, the sterile intestine quickly becomes colonized by bacteria and the microbial composition changes with growth stage. In adult animals, qualitative composition of the microbiota remains stable, but proportions of individual bacterial groups can show day-to-day variation. Because each animal possesses a unique intestinal ecosystem, with only minor overlap of bacterial species between individuals,² treatment regimens for modulating the microbiota can have varying results among animals.

INTESTINAL MICROBIOTA IN HEALTH AND DISEASE

A balanced intestinal ecosystem provides nutrients to the host, primes and stimulates the immune system, and aids the host in defense against intestinal pathogens. Studies in humans, dogs, and cats have shown a microbial dysbiosis in inflammatory bowel disease (IBD).^{3,4} Many environmental triggers such as food withdrawal, use of antibiotics, or acute GI infection will cause bacterial shifts in otherwise healthy animals. It is possible that such changes may lead to chronic GI disease in predisposed animals. Maintaining the microbial intestinal balance during such stress periods may be useful in the prevention or treatment of GI disorders.

BENEFICIAL EFFECT OF PROBIOTICS

Studies in the human literature demonstrate that probiotics have potential in the prevention and treatment of GI disease, but the mechanism(s) is not well understood. Stimulation of the immune system, competitive exclusion of pathogens, direct effect on toxins, and improved intestinal barrier function may all have a role. Strong evidence of the benefit of probiotics has been demonstrated for some disorders but results are inconclusive for others. In human medicine, the successful use of probiotics has been demonstrated in treating infectious diarrhea in children and adults and in preventing antibiotic-associated diarrhea and IBD pouchitis.⁵ Recent studies have shown promising results in the treatment of *C. difficile*-associated diarrhea and irritable bowel syndrome. While there currently are not many well-designed, large-scale studies, promising veterinary applications include prevention and treatment of antibiotic-associated or stress-related diarrhea (in boarding, traveling, working dogs) and prevention and treatment of diarrhea during periods of dietary change (weaning in puppies and kittens, new diet). The effect of each product and manufacturer claims must be demonstrated through clinical research. Furthermore, the beneficial effect of probiotics is strain specific, so strain designations are essential in comparing products.

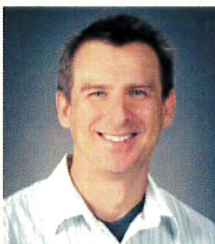
Probiotics – live microorganisms which, when administered in adequate amounts, confer a health benefit on the host

Prebiotics – nondigestible ingredients added to food to enhance growth of native lactic acid bacteria and/or help the growth of probiotics

Synbiotics – a combination of probiotics and prebiotics

KEY POINTS

- Intestinal microbiota play a crucial role in GI health and disease.
- Probiotics may be beneficial in maintaining GI health.
- Probiotic effect is strain specific.
- Product labels should contain the strain designation, not just species name.
- The administered dose is important.
- Health benefit should be demonstrated in well-conducted controlled studies.
- In vitro characteristics are not necessarily a predictor of clinical efficacy.
- Select a product from a reputable manufacturer with data showing it contains sufficient numbers of viable organisms to exert effect.



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REQUIREMENTS FOR PROBIOTICS

As a nutritional supplement, probiotics undergo little regulatory scrutiny in the U.S., but there are several requirements for probiotics to be beneficial. (See Table, left.) Studies have shown that many such products marketed for veterinary use lack proper quality standards. In one 2002 study, almost 50% of products did not list information about organisms and their numbers. Several formulations stated incorrect scientific names, and while the optimal probiotic dose for dogs and cats is unestablished, several products contained insufficient numbers of bacteria for a beneficial effect.⁶ Because of the lack of regulatory scrutiny, this is likely still the case.

Requirements for probiotics

- Must be safe
 - no virulence genes
 - no translocation from gut
 - no transfer of antibiotic resistance
- Must survive passage through the GI tract
- Must be able to colonize the GI tract
- Must be stable during storage
- Should confer a health benefit

A substantial percentage of administered probiotic bacteria will be lost through competitive exclusion by resident microbiota, and some organisms will lose viability during passage through the GI tract. Probiotics therefore need to be administered at very high doses to reach a useful concentration. For the above reasons, it is recommended to use products from reputable manufacturers with a proven track record for quality, including numbers of viable organisms during and at the end of shelf-life.

Multispecies vs Single-Species Probiotics

Multispecies probiotics (eg, Provable®-DC; Nutramax Laboratories, Inc.; Edgewood, MD) contain strains from one or preferentially more genera and tend to be the most effective preparations.⁷ Their advantage over products with only one strain is the potentially higher chance that at least one species will colonize the gut. Mixed formulations may also contain bacteria that have synergistic properties, and each species can have different probiotic properties. There may be an increased risk of mutual antagonism, potentially decreasing effectiveness, but because each animal has its own intestinal microbiota, a multistrain probiotic could benefit a larger population of animals. There is currently no conclusive evidence that a probiotic needs to be host-species specific. Several in vivo and in vitro studies have shown that some probiotics are effective across animal species.⁸ Ultimately, each product needs to be judged based on its own clinical effectiveness. Research has demonstrated both an increase in lactic acid bacteria in the gut of dogs and cats and abatement of diarrhea with Provable-DC.

Provable®-DC study

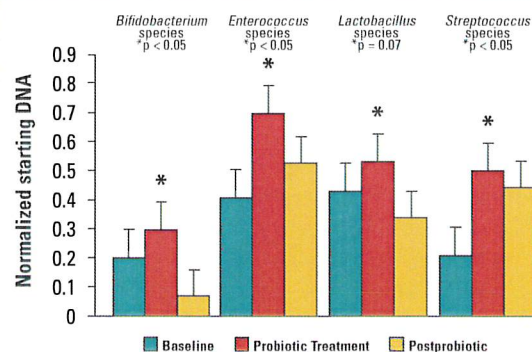
- 12 dogs/12 cats, client owned
- Collection of baseline fecal sample, day 0
- Probiotic administered orally for 21 days
- Collection of fecal samples during study and 21 days after cessation

Results

- No adverse GI effects
- Significant qualitative changes
 - Rapid appearance/disappearance of probiotic bacteria after initiation and cessation of probiotic administration, respectively
- Significant quantitative changes
 - Increase in organisms from probiotic bacterial groups during probiotic administration

Strains of Provable-DC were capable of colonizing the GI tract and increasing the lactic acid bacteria in the gut of both cats and dogs.

Levels of Probiotic Bacteria Before and After Treatment with Provable®-DC



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Provable®-DC in cats with diarrhea

- 8 cats with diarrhea of unknown cause
 - Cats underwent various dietary trials
 - Had normal serum cobalamin/folate concentrations
 - 1 cat had abnormal fecal flotation
- All cats received Provable-DC for 10 days (capsule opened and mixed into food)

Results

- 8/8 owners reported improvement of median fecal score

Data courtesy of Dr. Craig Webb, Colorado State University

Provable®-DC

Intestinal health supplement containing live (viable) naturally occurring microorganisms plus prebiotics. Supports the immune system, digests nutrients, and supports overall intestinal health. Contains billions (5×10^8 cfu) of beneficial multispecies microorganisms per daily administration, including

- *Enterococcus faecium*
- *Bifidobacterium bifidum*
- *Lactobacillus acidophilus*
- *Lactobacillus casei* (rhamnosus)
- *Lactobacillus plantarum*
- *Lactobacillus delbrueckii* subsp *bulgaricus*
- *Streptococcus salivarius* subsp *thermophilus*

Provable® is also available as Provable®-KP paste, with kaolin and pectin for acute-phase diarrhea.

Based on a presentation at the 2010 Western Veterinary Conference. The opinions expressed in this summary do not necessarily reflect the point of view of the publisher or sponsor.

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