New ideas for the dietary management of gastrointestinal tract disease

W. G. Guilford

Department of Veterinary Clinical Sciences, Massey University, Palmerston North, New Zealand

Journal of Small Animal Practice (1994) 35, 620-624

ABSTRACT

Drugs are often given inappropriate precedence in the treatment of gastrointestinal tract diseases. Diet has a marked influence on gastrointestinal tract function and the manipulation of dietary composition provides clinicians with a powerful therapeutic tool. During acute gastroenteritis, a short period of fasting is recommended. ‘Feeding through’ diarrhoea (without a period of fasting) is recommended in human infants but has limited applicability in dogs and cats, primarily because different types of diarrhoea are commonly treated by veterinary surgeons compared to physicians. Following the fast, a change from the animal’s regular food to a diet containing novel protein sources is advisable. This minimises the likelihood of acquired food allergies to staple proteins. Allergy avoidance may require special techniques such as rotation diets or protein hydrolysates. Dietary fat is usually kept to a minimum during gastrointestinal dysfunction as malabsorbed fatty acids and bile acids promote secretory diarrhoea in the large bowel. Recommendations to feed high fat rather than high carbohydrate diets to cats with diarrhoea need to be objectively examined. The type of fat fed may also prove to be an important consideration. Incorporation of omega-3 fatty acids into the diet has been shown to have anti-inflammatory effects on the gastrointestinal mucosa. In diseases of the small bowel, it is traditional to use low fibre diets. This recommendation needs re-examination because the binding and gelling properties of fibre are of potential benefit in the treatment of small bowel diarrhoea. High fibre diets are useful in most large bowel diseases. Soluble (fermentable) fibres (eg, psyllium, oat bran and fibrim) rather than insoluble (non-fermentable) fibres (eg, wheat bran) give better results in treating colitis. The benefits from soluble fibre probably relates to the binding of irritant bile acids and the generation of volatile fatty acids, such as butyrate, that nourish the colonic epithelium and encourage growth of normal bacterial flora.

INTRODUCTION

Drugs are often given inappropriate precedence in the treatment of gastrointestinal tract diseases — drug therapy without appropriate nutritional management is likely to result in, at best, delayed resolution of signs and, at worst, exacerbation of the disorder. Many gastrointestinal diseases can be (and should be) managed by dietary therapy only. Dietary modification provides the clinician with a powerful tool for the treatment of gastrointestinal diseases because of the numerous effects of nutrients on the bowel (Table 1).

This paper critically reviews some common nutritional practises and provides recommendations on the nutritional management of selected gastrointestinal problems of dogs and cats. By virtue of necessity, the recommendations have been based predominantly on clinical experience and pathophysiological mechanisms. Therefore, they should be regarded as speculative.

ACUTE GASTROENTERITIS

Standard dietary recommendations for dogs and cats with acute gastroenteritis include fasting for 12 to 48 hours, followed by feeding small quantities of a ‘bland’ diet three to four times a day for three to seven days. These recommendations have stood the test of time but are based more on common sense than scientific investiga-

Table 1. Influence of diet on the gastrointestinal tract

| Diet may contain          | Diet may correct          | Diet may alter                   |
|---------------------------|---------------------------|---------------------------------|
| Toxic food additives      | Nutritional deficiencies  | Cell renewal rate               |
| Allergic proteins         |                           | Motility                        |
| Antigenic proteins        |                           | Absorption                      |
|                           |                           | Secretion of mucus, acid, and enzymes |
|                           |                           | Bacterial flora                 |
|                           |                           | Luminal ammonia content         |
|                           |                           | Colonic volatile fatty acid content |

Modified with permission from Strombeck and Guilford (1990)
GASTRIC DISEASES

Little information is available on suitable diets for inflammatory or ulcerative gastric diseases. Most authorities recommend a 'bland' diet even though there is little evidence to support the recommendation (Pemberton and others 1988). Milk, which was recommended in the past as a buffering/coating agent, fell from favour because of concern about the stimulatory effects on gastric acid secretion of calcium and protein in milk (Pemberton and others 1988). However, interest in milk feeding is now undergoing a resurgence because of evidence that intragastric administration of lipid emulsions improves the hydrophobicity of the gastric mucosal barrier (Lichtenberger 1993). Frequent small feedings may provide relief of clinical signs but have not been shown to hasten healing of the mucosa (Pemberton and others 1988). Liquidising the diet will hasten gastric emptying, reducing gastric acid secretion. Minimising the protein content of the food may also reduce gastric acid secretion. The buffering action of insoluble fibre and its acceleration of gastric emptying may, one day, be proven to be valuable.

Nutritional management of delayed gastric emptying has limited effectiveness. Vagotomy accelerates the emptying of fluids but decreases the emptying of solids implying that emptying disorders resulting from neuropathies, such as dysautonomia, or diabetic neuropathy, may be ameliorated by feeding liquid diets. Emptying is delayed by the use of hyperosmolar and high fat foods. Therefore, in the first few days of therapy the liquid diet should be diluted to isoosmolarity and should contain little fat. Unfortunately, foods such as this often have insufficient caloric density to maintain animals for prolonged periods.

ACUTE 'SMALL BOWEL' DIARRHOEA

The traditional dietary therapy of acute diarrhoea is similar to that described above for acute gastroenteritis. Dogs and cats with acute diarrhoea are usually fasted for 12 to 48 hours and then offered a bland, low fat diet fed frequently and in small quantities for three to seven days. Dietary fat is kept to the minimum.

Recently, the long-held belief in the value of bowel rest for the treatment of diarrhoea has been challenged by the concepts of food-based oral rehydration therapy and 'feeding through' diarrhoea. Food-based oral rehydration therapy differs from feeding through diarrhoea primarily in the amount of nutrients provided.

Oral rehydration therapy using inorganic salts, dextrose and amino acids has been successfully practised for many years in humans, production animals and dogs. It has recently become apparent that the addition of small quantities of cereals, such as rice, to the solutions enhances salt and water absorption and provides slightly more calories than standard oral rehydration solutions (Snyder and others 1990). The glucose and peptides in rice furnish organic substrates for fluid and electrolyte pumps without markedly increasing dietary osmolality (Patra and others 1982, Armstrong 1987, Powell 1987, Carpenter and others 1988). Furthermore, at least in some studies, food-based oral rehydration solutions reduce stool volume and shorten the course of diarrhoea in comparison to glucose-based solutions (Molla and others 1989, Lebenthal 1990, Snyder and others 1990). It is possible similar solutions, fed through nasogastric tubes or by mouth, may be of value in the short-term symptomatic treatment of cats and dogs with acute diarrhoea.

Feeding through diarrhoea (with sufficient solid or semi-solid food to satisfy the approximate caloric requirements) has recently proven beneficial in infants with acute diarrhoea. Feeding through diarrhoea maintains greater mucosal barrier integrity and helps minimise malnutrition, usually without prolonging the duration of diarrhoea (Isolauri and others 1989, Snyder and others 1990). At first sight these observations might encourage veterinary clinicians to feed their diarrhoeic patients. Caution is required, however, before the tried-and-true 'no food per os' recommendation is abandoned in dogs and cats.
cats with diarrhoea. Most of the studies showing beneficial effects of feeding through diarrhoea were performed in humans affected by secretory diarrhoeas due to toxigenic organisms such as cholera (Snyder and others 1990). Feeding through was less successful in children with severe diarrhoea or those with rotavirus infection (Snyder and others 1990) which produces an osmotic diarrhoea. Osmotic diarrhoeas due to viral infections (parvovirus, coronavirus, rotavirus, etc) and dietary indiscretions are more common in dogs and cats than are secretory diarrhoeas. Furthermore, daily stooling frequency was increased in several studies of humans fed during diarrhoea (Snyder and others 1990). This may not be of major consequence to humans (provided duration of the diarrhoea is not extended) but can be disastrous to the owner of a pet that is passing diarrhoea in the house. Consequently, feeding through diarrhoea is likely to be less successful in veterinary practice than the current recommendation of ‘no food per os’.

**CHRONIC ‘SMALL BOWEL’ DIARRHOEA**

The ideal diet for chronic small bowel-type diarrhoea is highly digestible, gluten-free, low in fat and lactose, hypoallergenic, not markedly hypertonic and contains generous overages of potassium, water soluble and fat soluble vitamins. Good palatability, nutritional balance and ease of preparation are also required. Controlled diets for chronic diarrhoea are usually formulated as a compromise between the ideal and the realistic. The diet should incorporate the smallest number of ingredients possible, so that the influence of each ingredient on the patient’s bowel function can be assessed. Strict adherence to a controlled diet depends on the effectiveness of client education. Owners often incorrectly believe that minor dietary alterations are of no consequence.

**Digestibility**

High digestibility reduces the antigenicity of bowel content, by reducing both the amount of dietary protein absorbed intact by the mucosa and the number of bacteria and bacterial products in the bowel. Furthermore, less protein will enter the colon resulting in less colonic ammonia generation. High digestibility results in complete absorption in the cranial small intestine, permitting the remainder of the bowel to rest. Diets needing minimal digestion stimulate gastric, pancreatic, biliary and intestinal secretion less than do regular diets.

**Fat content**

Restriction of fat is usually necessary because fat malassimilation is common in small bowel diarrhoea. It is not necessary in all motility disorders or in many cases of chronic colitis. It has been suggested that cats with diarrhoea tolerate high fat diets better than high carbohydrate diets (Sherding 1989). This suggestion needs further investigation before widespread application. Low fat foods include vegetables, bread, cereals, low-fat milk products, most fish, and lean meats such as boiled poultry (without skin).

The addition of omega-3 fatty acids to the diet has been shown to alter the fatty acid and eicosanoid profiles of the gastrointestinal mucosa (Vilaseca and others 1990, Hillier and others 1991) and to reduce the degree of inflammation in experimental models of colitis (Vilaseca and others 1990). Furthermore, dietary supplementation with omega-3 fatty acids has a favourable impact on endotoxaemia and allergic processes (Maliakkal and others 1992).

**Osmolality**

The ideal diet has a restricted osmolality to prevent excessive extracellular fluid moving into the intestine and to minimise the damage to the mucosa that can occur with such diets. High osmolality is one stimulus for gastrointestinal inflammation, and can also disrupt tight junction structure (Madara and Trier 1987). Furthermore, if the constituents of the hyperosmolar diet are not readily absorbed, osmotic diarrhoea will develop. Hyperosmolality is most often of concern when feeding excessive amounts of hyperosmolar liquid elemental diets that can rapidly exit into the highly permeable duodenum.

**Carbohydrate source**

An ideal carbohydrate source for dogs and cats with small bowel diarrhoea is rice. White rice is highly digestible and does not induce gluten enteropathy. Furthermore, there are few reported allergies to rice proteins in dogs or cats. Boiled white rice is suitable for dogs and baby rice cereal for cats. Other carbohydrates that can be used include corn, potatoes or tapioca. These are all ‘gluten-free’. Potato and tapioca starches are less digestible than rice starch, however (Schunemann and others 1989). Corn starch is very well digested (Schunemann and others 1989) but because corn is widely used in pet foods the prevalence of allergies to corn proteins is likely to be higher than that of rice. Pasta is another alternative but it is not gluten-free.

The advisability of including carbohydrate in the diet of cats with diarrhoea has been questioned (Washabau and others 1986, Sherding...
Protein sources

Protein used in the treatment of small bowel diarrhoea should be derived from one food source and must be of high digestibility to limit potential antigenicity. A protein source not commonly included in the animal's usual diet is advantageous because it reduces the likelihood of feeding a protein to which the animal is allergic. Furthermore, acquired allergy (resulting from abnormal food antigen exposure due to gastrointestinal inflammation) to an infrequently fed protein is less significant than acquired allergy to a dietary staple. Suitable protein sources for dogs include cottage cheese, tofu, eggs, chicken, venison, lamb and rabbit but any other highly digestible meat not commonly included in the animal's diet is likely to be well tolerated. Staple protein sources vary in different geographical areas; for example, mutton is a staple protein in Australasia and is therefore not a suitable novel protein source in that part of the world. Cottage cheese is advantageous because it contains less lipid than eggs and meat. Cottage cheese is less palatable in cats than in dogs but chicken, turkey, fish and liver (provided liver is not fed continuously) are readily accepted alternatives.

Yogurt for treatment of chronic diarrhoea

Yogurt is sometimes used for therapy of chronic diarrhoea in the mistaken belief that the bacteria contained in the yogurt (*Lactobacillus acidophilus* or *Lactobacillus bulgaricus*), will colonise the bowel and displace unfavourable microorganisms (Molla and others 1989). Yogurt has bacteriocidal properties in vitro but not in vivo. Orally administered bacteria in yogurt do not displace resident or pathogenic bacterial populations in normal or diseased intestines of a variety of species (Goldin and others 1992, Gotteland and others 1992, Kotz and others 1992). The bacteria in yogurt are generally acid labile, limiting the numbers surviving passage through the stomach.

Yogurt and milk have approximately twice the lactose of cottage cheese (per calorie). Thus, cottage cheese is the preferred milk-based substrate for the treatment of diarrhoea. Interestingly, however, lactose in yogurt has greater digestibility than lactose in milk, perhaps because of the presence of bacterial-derived β-galactosidase (lactase) that assists digestion.

DIETS FOR INFLAMMATORY BOWEL DISEASE

The dietary therapy of inflammatory bowel disease is similar to that recommended for chronic small bowel diarrhoea. Immunosuppressive drugs (e.g., prednisone) are also usually required in the therapy of inflammatory bowel disease. In the author's experience, acquired food allergies are particularly important in this disorder. To avoid recurrence of clinical signs due to acquired allergy the dietary protein source can be changed after the first six weeks of therapy. This diet change is made just before the lowering of the prednisone dose from the immunosuppressive to the anti-inflammatory range.

DIETS FOR LARGE BOWEL DISEASE

Faecal incontinence is best treated with low fibre diets whereas constipation can be prevented (but not treated) by high fibre diets. Dietary recommendations for the management of colitis are controversial. Low residue diets (Nelson and others 1988), lamb and rice, and cottage cheese and rice have been successfully used as the sole management in many dogs. Other authors have recommended the use of fibre, with some finding success with fermentable fibres such as psyllium (hemicalcellulose) and others preferring non-fermentable fibres such as bran (Simpson 1992). I prefer a diet containing moderate amounts of a highly digestible protein that is not included in the animal's usual diet, in order to reduce colonic ammonia generation and lower dietary antigenicity, in combination with a soluble fibre such as psyllium or soy fibre. The beneficial effect of the soluble fibres probably relates to the generation of volatile fatty acids that nourish the colonic epithelium and discourage growth of pathogens.
REFERENCES

ARMSTRONG, W. M. (1987) Cellular mechanisms of ion transport in the small intestine. In: Physiology of the Gastrointestinal Tract, 2nd edn. Ed L. R. Johnson. Raven Press, New York. pp 1251-1265

CARPENTER, C. C. J., GREENOUGH, W. B. & PIERCE, N. F. (1988) Oral-rehydration therapy – the role of polymeric substrates. New England Journal of Medicine 319, 1346-1348

Deren, J. J., Brotman, S. A. & ZAMCHECK, N. (1967) Effect of diet upon intestinal disaccharidases and disaccharide absorption. Journal of Clinical Investigation 46, 186-195

Goldin, B. R., Gorbach, S. L., Saksin, M., Barakat, S., Guinther, L. & Salminen, S. (1982) Survival of Lactobacillus species (strain GG) in human gastrointestinal tract. Digestive Disease Sciences 37, 121-128

Gottland, M., Pochart, P., Dabbech, M., Bisetti, N. & Desirieux, J. F. (1992) In vivo effect of yogurt on excretion of enteropathogen Escherichia coli RDEC-1 during acute diarrhea in the just-weaned rabbit. Journal of Pediatric Gastroenterology and Nutrition 14, 264-267

Grossman, M. L., Greenhaw, H. & Ivy, A. C. (1942) The effect of dietary composition on parotid enzymes. American Journal of Physiology 138, 676-682

Gryboski, J. D. (1991) Gastrointestinal aspects of cow’s milk protein intolerance and allergy. Immunology and Allergy Clinics of North America 11, 773-797

Hullier, K., Jewell, R., Dobrell, L. & Smith, C. L. (1991) Incorporation of fatty acids from fish oil and olive oil into colonic mucosal lipids and effects upon eicosanoid synthesis in inflammatory bowel disease. Gut 32, 1151-1155

Isolauri, E., Juntunen, M. & Wiren, S. (1989) Intestinal permeability changes in acute gastroenteritis: effects of clinical factors and nutritional management. Journal of Pediatric Gastroenterology and Nutrition 8, 466-473

Jyngklar, N., Robinson, M. I., Sundararam, E., Lam, S. K., Puthucheary, S. D. & Yadav, M. (1978) Cow’s milk protein-sensitive enteropathy: An important factor prolonging diarrhoea of acute infectious enteritis in early infancy. Archives of Diseases in Childhood 53, 150-153

Kotz, C. M., Peterson, L. R., Moody, J. A., Savajano, D. A. & Levitt, M. D. (1992) Effect of yogurt on clindamycin-induced Clostridium difficile colitis in hamsters. Digestive Diseases Science 37, 129-132

Lemons, L. A. (1990) Rice as a carbohydrate substrate in oral rehydration solutions (ORS). Journal of Pediatric Gastroenterology and Nutrition 11, 293-296

Lichtenberger, L. M. (1993) Mechanisms of gastric mucosal protection. Proceedings of the American College of Veterinary Internal Medicine, pp 74-79

Madiara, J. L. & Thier, J. S. (1987) Functional morphology of the mucosa of the small intestine. In: Physiology of the Gastrointestinal Tract, 2nd edn. Ed L. R. Johnson. Raven Press, New York. pp 1209-1249

Malakkaal, R. J., Hendra, K. P. & Mascoll, E. A. (1992) Recent advances in medium-chain triglycerides and fish oil. Current Opinion in Gastroenterology 8, 314-325

Molla, A. M., Molla, A., Rhude, J. & Greenough, W. B. (1989) Turning off the diarrhea, the role of food and ORS. Journal of Pediatric Gastroenterology and Nutrition 8, 81-84

Nelson, R. W., Stookey, L. J. & Kazacos, E. (1988) Nutritional management of idiopathic chronic colitis in the dog. Journal of Veterinary Internal Medicine 2, 133-137

Patra, F. C., Mahalanabis, D., Jalan, K. N., Sen, A. & Banerjee, P. (1982) Is oral rice electrolyte solution superior to glucose electrolyte solution in the infantile diarrhoea? Archives of Diseases in Childhood 57, 910-912

Pennington, C. M., Moyness, K. E., Girman, M. J., Nelson, J. K. & Gaskin, C. F. (1988) Mayo Clinic Diet Manual. BC Decker, Toronto, pp 168-170

POWELL, D. W. (1987) Intestinal water and electrolyte transport. In: Physiology of the Gastrointestinal Tract, 2nd edn. Ed L. R. Johnson. Raven Press, New York. pp 1267-1305

Schunemann, C., Muhlum, A., Junker, S. et al. (1989) Proctal and postprandial digestibility of various starches, and pH values and organic acid content of digests and faeces. Advances in Animal Physiology and Animal Nutrition 19, 44-58

Sheeding, R. G. (Ed) (1989) Diseases of the intestines. In: The Cat Diseases and Clinical Management. Churchill Livingstone, New York. pp 955-1006

Simpson, J. W. (1992) Role of nutrition in aetiology and treatment of diarrhoea. Journal of Small Animal Practice 33, 167-171

Snyder, J. D., Molla, A. M. & Cash, R. A. (1990) Home-based therapy for diarrhoea. Journal of Pediatric Gastroenterology and Nutrition 11, 438-447

Strumbeck, D. R. & Guilford, W. G. (1990) In: Small Animal Gastroenterology. 2nd edn. Stonegate Publishing, Davis, California

Vilaseca, J., Salas, A., Guarnier, F., Rodriguez, R., Martinez, M. & Malagelada, J. R. (1990) Dietary fish oil reduces progression of chronic inflammatory lesions in a rat model of granulomatous colitis. Gut 31, 539-544

Washabau, R. J., Buffington, C. A. & Strumbeck, D. R. (1986) Evaluation and management of carbohydrate malabsorption. In: Current Veterinary Therapy IX. Ed R. W. Kirk. W. B. Saunders, Philadelphia. pp 889-892

ABSTRACT

Management of a dog with acute traumatic subdural haematoma

A THREE-month-old retriever cross was struck by a car, 30 minutes before presentation. There was a V-shaped laceration on the top of the head, dorsal to the left eye. The dog was in hypotensive shock, for which treatment was given. Response was favourable. Thereafter, it began to struggle and make loud noises. Four hours later there was rapid deterioration in neurological status – depression, bilateral loss of menace reflex, and conscious proprioceptive deficits in all four limbs. The dog responded to noise and noxious stimuli but otherwise was unaware of its surroundings. Skull radiographs demonstrated left-sided frontal bone depression fractures. After unsuccessful medical treatment to counteract the cerebral oedema, and continuing deterioration, surgery was attempted. A 4 × 2.5 cm depressed skull fragment was removed from the left frontal area. The underlying brain was diffusely swollen and there was a large subdural haematoma under the intact dura. This was removed, the dura was closed and the skull fragment was not replaced. On recovery from anaesthesia, neurological status was much improved and a complete recovery was made in the two weeks after surgery.

Dewey, C. W., Downs, M. O. & Crowe, D. T. (1993) Journal of the American Animal Hospital Association 29, 551-554