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VIRGINIA VETERINARY NOTES

BLACKSBURG, VA

VIRGINIA-MARYLAND  
REGIONAL COLLEGE  
OF  
VETERINARY MEDICINE

July-August, 1988

No. 34

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Kent C. Roberts, DVM  
Extension Veterinarian

## ENTERAL NUTRITION IN SMALL ANIMAL VETERINARY PRACTICE

### Why

The value of enteral nutrition has been scientifically proven as a medical adjunct for more than 100 years. Supportive enteral nutrition can easily meet the needs of patients that cannot or will not ingest the nutrients they require for recovery. In diseased or injured animals, the metabolic rate has increased over that of the simple starvation case due to general neuroendocrine responses to stress. Patients unable or refusing to ingest enough food to meet their increased nutrient needs are actually catabolic and in an "accelerated" form of starvation. Anorexia is the loss of the desire for food before meeting caloric requirements. Anorexia is the primary cause of malnutrition in small animal patients and may well be responsible for a less than optimal response to proper medical or surgical therapy.

### When

Identifying the patient that requires nutritional support is the first step in understanding the value of enteral nutrition. The following list is a summary of the indications for nutritional support:

1. Weight loss (10% or greater) or below optimal weight (able "to feel the ribs but not see them").
2. Poor food intake or on IV fluids for greater than 3-5 days.
3. Increased losses; i.e. vomiting, diarrhea, hemorrhage, draining abscesses, burns or malabsorption.
4. Presence of edema, cachexia, hair loss, decubitus, non-healing wounds and cancer.

### How

Once a patient has been identified as requiring nutritional support above that which the animal is consuming voluntarily, the method of choice is enteral; "if the GI tract works, use it". Tube feeding should be a common practice in veterinary medicine as the procedure is simple, effective and may be accomplished via temporary orogastric tubes or long-term nasogastric tubes. Patients with disease or trauma to the face may require a pharyngostomy tube. A gastrostomy tube may be required when the pharynx or esophagus needs to be bypassed. Once the tube has been placed and the proper diet determined by the veterinarian, actual feeding and tube maintenance may be completed by a trained technician.

### What

An excellent product for tube feeding dogs and cats requiring nutritional support is the Hill's Prescription Diet Feline P/D. The diet needs to be liquified such that 1/2 can plus 3/4 cup water blenderized for 60 seconds (high speed), poured through a kitchen strainer twice will flow through an 8 French open-end tube. This blenderized product is appropriate for most patients as it is of high caloric density (0.8 Kcals/ml) and protein quality. Patients with clinical signs referable to the cardiac, renal, hepatic or GI systems should not be fed P/D but fed one of the other more appropriate Prescription Diets.

## How Much

Generally, patients with anorexia will have far less than a normal stomach capacity. Maximum normal capacity is 90 ml/kg BW for dogs and 45 ml/kg BW for cats. The caloric requirement for any dog or cat (over 2 kg) may be calculated as:  $\text{Kcals required/day} = (30 \times \text{BW kg}) + 70$ . This energy value needs to be multiplied by 2 for dogs or 1.4 for cats. For example, a 10 lb dog requires 413 Kcals per day and should receive 515 ml of Feline P/D tube feeding mixture in 24 hours. This dog's stomach capacity is 400 ml with an estimated emptying time of 3-5 hours. Therefore, three 170 ml meals/day of the blenderized diet will properly meet this patient's caloric and protein requirements. All meals should be infused slowly and the tube adequately flushed with water after each meal.

Supportive enteral nutrition is a simple, effective and valuable adjunct to other medical or surgical therapy. Tube placement and maintenance requires minimal time and expense compared with the benefit. In some cases, simply force feeding a patient may be the only treatment required to prevent further deterioration in a patient that refuses to consume the essential nutrients required for survival. --Rebecca Remillard, PhD, DVM, Research Associate, VA-MD Regional College of Veterinary Medicine, Small Animal Clinical Nutrition by L.D. Lewis, M.L. Morris and M.S. Hand. Topeka, KS. 3rd ed. Chap. 5. 1987.

### THIAMINE DEFICIENCY IN CATS

Thiamine or B<sub>1</sub> is one of the water soluble vitamins that is a dietary requirement in carnivores. It is destroyed by temperatures exceeding 212°F, by the preservative sulfur dioxide, and by thiaminase enzymes present in many species of fish. Anorexia and malabsorption may reduce the amount of available B<sub>1</sub>. Occasionally commercial processing of cat foods destroys B<sub>1</sub> because of the high temperatures.

Since the central nervous system relies upon thiamine as a coenzyme in metabolic reactions to produce energy, reduced levels of B<sub>1</sub> results in inadequate glucose metabolism in the brain and death of neurons.

Clinical signs develop after 2-4 weeks of deficient dietary B<sub>1</sub>. Progressive anorexia, vomiting and weight loss are followed by neurological signs of ataxia, vestibular signs, and ventroflexion of the head and neck. Finally, seizures, abnormal behavior, dilated pupils and coma herald the terminal stage of the disease.

Parental administration of 50-70 mg B<sub>1</sub> one to three times a day usually leads to full recovery if the cat is ambulatory and is treated early enough. Thiamine injections become less effective as the clinical signs progress, and may be totally ineffective if the cat is stuporous or comatose. Corticosteroids are usually administered in cases with severe neurological signs because of the edema associated with necrosis of brain tissue. Oral supplementation with foods high in thiamine, such as whole grains or brewer's yeast, may be also included in the treatment if the cat is eating.--Linda Shell, DVM, Diplomate ACVIM, (Neurology), Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA 24061.

## BULK DRUGS AND EXTRA-LABEL DRUG USE

"Veterinarians need the freedom to prescribe and compound drugs according to the needs of clients and not within the constraints which would be posed by Food and Drug Administration's (FDA) reading of the Food, Drug, and Cosmetic Act," states U.S. District Court Judge Richard Mills of the Central District of Illinois. The court decision, filed December 8, 1987, authorizes bulk drug distribution to veterinarians for use in professional practice. Judge Mills added, "The extent to which the FDA attempts to involve itself in the healing arts is clearly inconsistent and out of harmony with the statute's intent as manifested by Congress."

Judge Tom Stagg of the U.S. District Court for the Western District of Louisiana dismissed the lawsuit filed by the American Food Animal Veterinary Medical Association and 36 veterinarians. The suit sought injunctive relief from Food and Drug Administration's (FDA) compliance policy guide. The guide seeks to prohibit veterinarians from using drugs in a manner other than that determined by labeling approved by FDA.

According to Judge Stagg, the FDA's compliance guide on extra-label drug use "has no legal binding effect upon plaintiffs, thereby leaving them free to follow ethical principles."--**Extension Service Update, USDA, January-February 1988.**

## SUSTAINABLE AGRICULTURE

This term, presently in vogue with agricultural leaders, is attracting attention among America's farmers looking for workable solutions to their complex problems. While consumers want safe, low-cost food and a safe, clean environment, the nation's farmers want long term relief from high input costs, over production and increasing worldwide competition. With sustainable agriculture, producers employ a system approach to food and fiber production - they select a soil fertility package, a pest management program, a crop rotation plan, the most appropriate plant varieties and an overall management scheme. Sustainable agriculture can be practiced on small and large acreages alike.

The role of marketing must also be clearly understood. Internationalized agriculture requires a well planned approach to competitiveness and profitability involving the identification of market demand for a particular product. Producing for a market and market development are necessary components of such a system.

Important features of sustainable agriculture should include the use (and the development, if necessary) of crop varieties that are insect and disease resistant as well as stress and drought resistant. Also important is the use of reduced tillage to lower costs, conserve moisture and limit erosion. Biotechnology is an obvious component of sustainable agriculture's future and its success.

One major initiative is the search to find less costly production methods for major crops and the development of alternative crops and enterprises to help diversify sources of farm income. Successful farming systems must work with the environment, minimize costs, maximize output and make better use of the resource base on America's farms.--**Extension Service Update, USDA, January-February 1988.**

## NEW TREATMENTS FOR KCS IN THE DOG

Although dry eyes comprise up to 20 percent of the canine ophthalmology referrals in the VTH, it is recognized by referring practitioners in less than one-fourth of those cases. It is likely that many chronic corneal diseases with underlying tear film defects go undiagnosed. The eyes are characterized by their dry appearance, heavy mucoid discharge that clings to the cornea, thickened, red conjunctiva and superficial keratitis. Ulcers of varying depth may or may not be present. The condition is poorly responsive to antibiotics or antibiotic-steroid combinations. Changing antibiotics rarely affects the course of the disease.

The tear film consists of three layers of secretions--a superficial lipid layer produced by the Meibomian glands of the lid margins, the fluid layer secreted by the lacrimal gland and the gland of the nictitans, and the deep mucus layer, derived primarily from the goblet cells of the conjunctiva. A disturbance in any one of these layers of the tear film may cause mild to severe conjunctival and corneal disease. However, in dogs a deficiency of the fluid portion or a mucin deficiency is the cause of the syndrome. Most therapy for tear abnormality is directed at replacement of the fluid portion of the tears (artificial tears). Other specific treatment is usually pilocarpine, orally or topically to stimulate lacrimal secretion. Adjunct topical treatment that may be indicated includes acetylcysteine to break up the mucus discharge, steroids to reduce inflammation and antibiotics for control of secondary infections.

The Schirmer tear test (STT) is the best available method to establish the diagnosis of a deficient fluid portion of the tear film. (STT strips are available from veterinary product distributors.) In the past 15 years the quality of tear substitutes (artificial tears) has improved substantially, although veterinary labeled products are generally inferior to human products. Discovery of the value of mucolytic acetylcysteine in the early 1970's became widely recognized by the 1980's. Improvement in therapeutic alternatives did not occur until recently. At least three drugs are on the horizon at this time. They are in various stages of investigation, and two are about to be released for investigational use.

All-trans retinoic acid has been shown to convert keratinized conjunctival epithelial cells into normal mucous membrane with a return of normal goblet cells and mucin layer of the tear film. A recent report in the veterinary literature about the use of sodium hyaluronate describes very favorable results in several cases that were poorly controlled with other medications. Treatments with sodium hyaluronate solution were gradually reduced from four to one or two times per day. Judging by corneal appearance, pain was relieved and discharges were reduced. The beneficial effects do not depend on increased tear production since the Schirmer readings were not significantly changed. The human product Healon® (Pharmacia) and the veterinary product Equuron® (Solvay) are used in this study. Synacid® (Schering) and Hyviso® (Norden) are other alternatives. This study was highly subjective, but patterned after similar work in human clinical trials.

In the ISU Veterinary Teaching Hospital, we now have ophthalmic cyclosporine for investigational use. This immunomodulating drug (T-cell suppressor), previously used in transplant surgery to suppress tissue rejection, has been shown by University of Georgia researchers to have a dramatic effect in increasing the aqueous tear production, resulting in regression of the proliferative chronic keratitis and reduced corneal pigmentation.

Results have been good with most cases where all-trans retinoic acid has been used. No first-hand assessments are available for the other two drugs because they have only been used for a short time.

All of these drugs are expensive (approximately \$20 for a 5 ml vial) but worth the cost because treatments can be reduced from several times a day to once or twice daily and other medications may be reduced or eliminated. **Daniel M. Betts, DVM, Iowa State University, College of Veterinary Medicine, Ames, IA.**  
--**Veterinary News, Penn State University, April 1988, Vol. 88, No. 2.**

### PARVOVIRUS VACCINATION FAILURES

Though CPV infections in dogs have greatly diminished since effective vaccines became available, "vaccination failures" are still not uncommon. Some investigators speculate that commercial vaccines might not protect dogs against recent field isolates of CPV because these vaccines were prepared from virus strains isolated before the "new" type of CPV appeared.

We addressed that concern in this study and found that the commercial vaccine prepared from a 1979 isolate protected pups against infection with a recently isolated strain of virulent CPV. Similar cross-protection results were obtained with feline panleukopenia virus and milk enteritis isolates (mink parvovirus that exhibited three antigenic forms).

There are several reasons for vaccination failures. A continuing problem appears to be related to interfering levels of maternal antibody. Pups with low levels of maternal antibody might fail to respond to vaccination, but may become infected with virulent virus. This critical period appears to be of short duration, because weekly vaccinations have controlled the disease in some problem kennels.

Another reason for failure may be restricted cell replication in lymphatic tissues of adult dogs, which might increase the vaccine dosage above that required for pups. Replication of CPV (virulent or attenuated) depends on replicating cells; older dogs, with lower numbers of dividing lymphoid cells, may fail to respond to vaccination with the same dose of modified-live CPV vaccine that immunizes pups.--**M.L.G. Appel, D.V.M., Ph.D., L.E. Carmichael, D.V.M., Ph.D., James A. Baker, Inst., Cornell Univ., Ithaca, NY, Vet. Med., Oct. 1987 as reported in DVM News, Vol. 2, No. 1, Jan/Feb 1988.**

### PET FOODS AND FEEDING FOR MAXIMUM HEALTH & PERFORMANCE

Many different types and forms of commercial pet foods are available. They vary greatly in quality and efficacy. In general specific-purpose, fixed formula foods are best. Both feeding studies and nutrient content are necessary to determine diet quality and efficacy. The amount of a nutrient cannot be determined from the label. A high calorie, protein, calcium (but below 2% in dry matter) and phosphorus diet is best for growth and reproduction. A diet lower in all these nutrients is recommended for maintenance. A high calorie (fat) diet is best for exertion, and psychological or physical stress. To assist in preventing skeletal problems and obesity feed a good quality diet in restricted amounts without supplements during growth. **Lewis, LD: XXIII World Veterinary Congress Abstracts (1987) page 414.--Extension Notes, Kansas State University, April 1988.**

## A NEW RODENTICIDE HAZARD TO DOGS AND CATS

A new rodenticide, which does not include an anticoagulant, is currently available and is being used by homeowners. This product is sold under the names Quintox® (Bell Laboratories, sold in 10 gm seed packs or 30 gm pouches), Rampage® (Ceva Laboratories), and Ortho Rat-B-Gone (sold in 40 gm packs). The active ingredient in all of these products is cholecalciferol (vitamin D<sub>3</sub>) which is present at a 0.075% concentration.

Normally, cholecalciferol can be synthesized in the epidermis and transported into the blood. It can also be absorbed through the intestines from dietary sources. Cholecalciferol is enzymatically converted to 25-hydroxycholecalciferol in the liver. It is then transported to the kidneys where further metabolism to 1.25 dihydroxycholecalciferol occurs. This conversion in the kidney is rate limiting and partially explains the delay in biological activity of dietary vitamin D<sub>3</sub>. Its active metabolites act to increase absorption of calcium and phosphorous from the intestines. Vitamin D is also required for resorption and mobilization of calcium from bone, and retention of calcium by the kidneys.

Clinical signs of toxicity due to cholecalciferol are similar to hypercalcemia. Signs include anorexia, lethargy, nausea, vomiting, diarrhea, polyuria, profuse sweating, polydipsia, and neurological disturbances. Vasoconstriction and hypertension may be seen, and EKG changes such as shortened Q-T interval and prolonged P-R interval may occur. Death is thought to result from hypercalcemia, calcification of tissues, and renal and heart failure. Serum calcium levels are elevated (more than 11.5 mg/dl in adults), with an increased BUN, creatinine, and phosphorous. On necropsy, diffuse calcification throughout the body can be seen.

Current recommendations for treatment include removal of the bait by inducing vomiting and administering activated charcoal. A saline cathartic should be used in cases of recent (within 3 hours) exposure. Begin monitoring serum calcium after 24 hours to determine if further therapy is necessary. Fluid therapy should include normal saline IV and furosemide as a diuretic. Thiazide diuretics are contraindicated. Corticosteroids have several beneficial effects and should be used. Calcitonin can also be administered in microgram quantities (4 to 6 IU/kg) SQ every 2 to 3 hours initially. Treatment with diuretics and cortisone should continue until serum calcium remains normal (levels should be checked 24 hours after stopping therapy). Long term therapy, for two weeks or more, may be required.

The cholecalciferol rodenticides are considered to be fairly safe, with a LD<sub>50</sub> in dogs of over 100,000 mg/kg. However toxicities have been seen in puppies eating as little as 15 grams of the bait, and deaths have been reported. Consequently, it is important to recognize these compounds and to be prepared to treat animals that have consumed one of these products. **Dr. Sheila M. Tuler, Georgia Animal Poison Center, Athens (404) 542-6751, Georgia Veterinary Diagnostic Laboratories, Spring 1988.--Animal Health Beat, University of Nevada-Reno, April 1988, Vol. 4, No. 4.**

### FELINE DIABETES MELLITUS

Affected cats are usually over five years of age with a higher incidence in males than females.

Diagnosis should be based on persistent fasting hyperglycemia with polydipsia, polyuria and glucosuria.

Careful individual dose calculation and monitoring is necessary as cats have marked variations in insulin activity and tolerance.

Protamine zinc insulin is the treatment of choice but NPH insulin may be used with equal effectiveness.

The effect of insulin peaks in 4-10 hours in most cats, suggesting that many diabetic cats may require insulin bid.

Diluting insulin 1 to 9 makes dosing easier in cats. A commercial insulin diluent is available from Eli Lilly.

Controlled feeding at regular intervals with no "snacks" is critical in treating and regulating diabetic cats.

Insulin resistance and the loss of insulin requirement occur occasionally in cats. Insulin is absorbed better following intramuscular injection as opposed to subcutaneous injection.

A blood glucose level of 100-300 is acceptable in most diabetic cats undergoing treatment.

Monitoring the diabetic cat is best done using a drop of blood and a Chemstrip BG (Mannheim-Boehinger).

Monitoring the cat's urine for glucosuria is somewhat unreliable and may lead to overdosing.

Diabetic cats seldom develop cataracts but they do have lowered resistance to disease.

--Dr. Alice Wolf, Texas A&M University. Presented at AAHA Convention, Washington, D.C., April 1988 and reported by K.C. Roberts.

### IMMUNE-MEDIATED HEMOLYTIC ANEMIA INDUCED BY PENICILLIN IN HORSES

Three horses developed immune-mediated hemolytic anemia after treatment with penicillin. The horses had positive results on direct antiglobulin tests and high titers of IgG antibody that agglutinated penicillin-coated equine RBC. Two of the horses were tested for antibodies to autologous RBC antigens, but autoantibodies were not present. Titers of antipenicillin antibody decreased after penicillin was discontinued, but IgG antibody was detectable months after recovery. One horse was challenge exposed with penicillin; antibody titer increased slightly, but anemia did not develop. Antipenicillin antibody of the IgM class was present in low titer in 23 (77%) of 30 nonanemic horses tested. Apparently, horses are similar to human beings in that penicillin-induced anemia is rare, but the percentage of individuals with antipenicillin antibody is high. J. T. Blue, R. P. Dinsmore, and K. L. Anderson in Cornell Vet., July 1987.-- Extension Notes, Kansas State University, April 1988.

### THOUGHT FOR THE MONTH

One of the great tragedies in life is people who have sight but no vision.

## LESIONS ASSOCIATED WITH INTESTINAL FOREIGN BODIES

Intestinal foreign bodies cause clinical problems in practically all domestic animal species. The clinical problem and the lesions that occur depend to a great extent upon the characteristics of the material ingested.

Firm foreign bodies are among the most frequently found. Common foreign bodies of this type include children's toys, small household items, or corn cobs in dogs and cats. Occasionally apples or potatoes swallowed whole cause problems in horses or dogs. These materials are associated with overt luminal blockage, causing more acute and more severe signs the further cranial they are lodged in the intestine. In some cases, the continual pressure of intestinal contraction against the foreign body due to peristalsis may result in localized pressure necrosis. These regions appear dull red to grey, tan and have hyperemic zones at the periphery. Intestinal rupture in these areas with focal or diffuse peritonitis is a possible, but infrequent, sequella.

Soft foreign bodies, such as modeling clay, socks or packing material cause intestinal obstruction in cats and dogs. These materials rarely obstruct the lumen completely and are frequently removed via enterotomy. However, a serious and potentially fatal lesion is often overlooked. Because the intestinal lumen is partially patent these materials may remain in the intestine for days before removal. This type of foreign material is pliable and it is difficult for the intestine to move the material down the gastrointestinal tract. As a result, the intestine proximal to the foreign material may undergo exhaustion atrophy. The intestine may appear normal or slightly pale during surgery for foreign body removal. Following surgery, however, the animal may not recover as expected since several centimeters of bowel are unable to participate in normal peristaltic contractions. If the animal is necropsied, the affected bowel usually is pale and slightly dilated. Histologically, the lesion is most pronounced in the inner muscle layer of the intestine and consists of atrophied muscle fibers with occasional foci of mineralization.

A third type of foreign body is the linear foreign body. The cases most frequently seen involve cats that have ingested thread or string. Other materials, such as rags or socks, may produce similar lesions in dogs. The intestine "bunches up" along the foreign body and in some cases a linear perforation occurs along the mesenteric attachment of the intestine. Similar lesions occur in horses, where ascarids (Parascaris equorum) act in mass to form a linear foreign body.--Lois Roth, DVM, PhD, Diplomate ACVP, VA-MD Regional College of Veterinary Medicine, Blacksburg, VA.

## COLONIC TORSION

In one study it was found that complete colonic torsion had its highest seasonal incidence from April to August, and that large framed pregnant mares were predisposed to the condition. Hematocrit and heart rate are the most valuable clinical values in determining prognosis. Horses with PCV of 50, 60 and 70% were considered, poor, very poor or hopeless, respectively.--(J.W.) H. Bonfig, Dr Med Vet, Dissertation, Hannover, 1987, as reported in Capsules, Oklahoma State University, May 1988, No. 59.

### SUMMER SOJOURN

#### Virginia Veterinary Medical Association - Summer Meeting

WHERE? Harbour Inn, St. Michaels, Maryland  
WHEN? June 23-25, 1988  
WHY? Six hours of continuing education on ophthalmology and dermatology plus good food, recreation and relaxation on beautiful Chesapeake Bay.

#### CONTINUING EDUCATION OPPORTUNITIES FALL 1988

<u>Date</u>	<u>Program</u>	<u>Location</u>	<u>Contact Hours</u>
Sept. 14-15	Small Animal Medicine Update	Chesapeake	4
	Chesapeake (14) Holiday Inn	Charlottesville	4
	Charlottesville (15) Days Inn		
*Sept. 23-24	Small Animal Diagnostic Endoscopy	Blacksburg	8
	Lecture/Wet lab		
*Oct. 14-15	Mare Infertility Workshop	Leesburg	10
	Lecture/Wet Lab		
Oct. 20	Local Associations Meeting	Blacksburg	2
*Oct. 21-22	Bovine Abdominal Surgery	Blacksburg	10
	Lecture/Wet lab		
Nov. 3-4	Bovine Practitioners Fall	Frederick, MD	10
	Conference, Sheraton Inn		
*Nov. 11-12	Small Animal Urogenital Surgery	Blacksburg	10
	Lecture/Wet Lab		
*Dec. 2-3	Critical Care Nutrition	Blacksburg	10
	Lecture/Wet Lab		
*Dec. 9-10	Practical Eye/Ear Surgery	Blacksburg	10
	Lecture/Wet Lab		

\*Limited Enrollment

Note: Program brochures are mailed approximately six weeks prior to the course date.

For CE information or assistance, please contact:

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**MAILING LIST UPDATE**

We need your help in our continuing efforts to update our mailing list of veterinarians in Maryland, Virginia, West Virginia and North Carolina. This list provides the labels for mailing Virginia Veterinary Notes and our continuing education program brochures.

Please assist us by making any of the following additions or corrections:

- \_\_\_\_\_ 1. New addition-not receiving mailings at present
- \_\_\_\_\_ 2. Change of address
- \_\_\_\_\_ 3. Delete from mailing list

New Address

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Old Address

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Questions/Comments on newsletter or CE programs

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Thank you,

Kent C. Roberts, D.V.M.

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