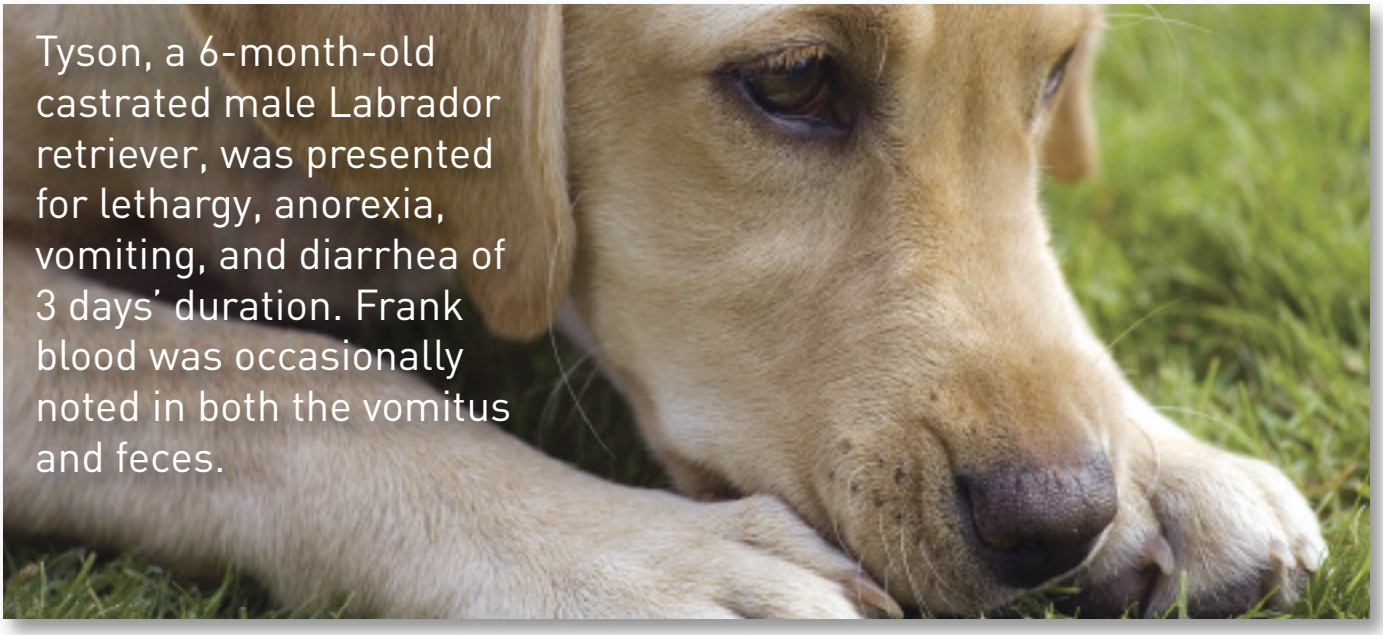
Peer Reviewed

Meredith Thoen, DVM, & Marie Kerl, DVM, MPH, Diplomate ACVIM
(Small Animal Internal Medicine) & ACVECC
University of Missouri

Feeding the Critically Ill, Anorectic Dog



Tyson, a 6-month-old castrated male Labrador retriever, was presented for lethargy, anorexia, vomiting, and diarrhea of 3 days' duration. Frank blood was occasionally noted in both the vomitus and feces.

HISTORY

The owner reported no prior illness. Vaccination status was current and Tyson received a monthly heartworm preventive. He and his owner frequently visited a dog park.

PHYSICAL EXAMINATION

Tyson weighted 18 kg and had a body condition score of 4/9. His temperature was 102.9° F; pulse rate, 150 beats/min; respiration, 24 breaths/min; and capillary refill time, 2 seconds. His mucous membranes were pink. Examination abnormalities included depressed mentation; hypersalivation upon abdominal palpation; and watery, brown feces on rectal examination.

LABORATORY RESULTS

Complete blood count revealed mild neutropenia and serum biochemical profile revealed mild hypoalbuminemia and hyperphosphatemia. A parvovirus test (SNAP Parvo Test, idexx.com) was positive. Fecal examination did not reveal any parasite ova.

INITIAL THERAPY

Tyson was admitted to the hospital. Initial treatment included Plasma-Lyte 148 (baxter.com), metoclopramide, maropitant, famotidine, sucralfate, metronidazole, and ampicillin/sulbactam. No food or water was offered.

After admission, Tyson did not vomit for 12 hours. A nasogastric (NG) feeding tube was placed and continuous feeding was initiated with a veterinary enteral liquid diet at 1/3 resting energy requirement (RER). On day 2 of NG feeding, the amount was increased to 2/3 RER but Tyson began to vomit. Nasogastric feeding was discontinued for 12 hours, then resumed. Attempts to administer 2/3 RER without causing vomiting were unsuccessful, although Tyson continued to tolerate 1/3 RER.

? ASK YOURSELF...

What nutritional plan is most appropriate for Tyson?

A. Stop all enteral feeding and initiate total parenteral nutrition
B. Allow Tyson to have free-choice food and water
C. Administer an appetite stimulant and continue NG tube feedings
D. Continue trickle feeding via NG tube and initiate partial parenteral nutrition

NG = nasogastric; RER = resting energy requirement

CONTINUES

Nasogastric vs Nasoesophageal Tubes

An NG tube allows quantification of residual gastric volume, a potential concern in feeding a patient with altered GI motility, while a nasoesophageal tube does not. However, potential disadvantages of using NG tubes include esophagitis or esophageal stricture.

CORRECT ANSWER:
D. Continue trickle feeding via NG tube and initiate partial parenteral nutrition

Critically ill patients are at risk for malnutrition. Caloric intake may be inadequate due to factors, such as anorexia, inability to eat, and vomiting. While healthy animals with inadequate caloric intake metabolize fat, sick animals experience a shift to a catabolic state that causes lean muscle loss. Malnourished patients have altered immune function, poor wound healing, altered energy metabolism, and increased morbidity and mortality.[1]

NUTRITION ASSESSMENT

Patients that have lost 10% of their body weight or have not consumed their RER for 3 to 5 days are likely to become malnourished.[2] Other contributing factors include serious underlying disease (eg, sepsis, pancreatitis) or significant protein loss (eg, thermal burns, proteinuria, vomiting, diarrhea, wounds).

Physical examination findings are nonspecific and not seen in early stages of malnutrition. Findings include poor body condition, loss of muscle mass, poor hair coat, and delayed wound healing. Laboratory findings are poor indicators of nutritional status.

FEEDING OPTIONS

Enteral Nutrition

- Enteral nutrition (EN) prevents villous atrophy, preserves mucosal integrity, decreases risk for GI bacterial translocation, and preserves GI immune function.[3]

Partial parenteral nutrition administration

- Contraindications include severe vomiting, GI obstruction, severe malabsorption or maldigestion, and an unprotected airway.

Parenteral Nutrition

- When enteral nutrition is contraindicated, parenteral nutrition (PN) should be initiated by 1 of 2 methods: total parenteral nutrition (TPN) or partial parenteral nutrition (PPN).
- TPN provides 100% of energy requirements. Central venous administration is necessary for TPN due to high osmolarity (> 1200 mOsm/L), which causes thrombophlebitis.
- In contrast, PPN has an osmolarity of < 800 mOsm/L and can be delivered centrally or peripherally.[4] Dilution of PPN sufficiently increases volume so that volume overload can result if patient's total caloric needs are delivered.

Table. Partial Parenteral Nutrition Components

Component	Purpose	Product Example
Amino acids	Help achieve positive nitrogen balance & delay muscle breakdown	Aminosyn II 8.5% (hospira.com)
Carbohydrates (generally dextrose)	Act as fuel substrate	50% Dextrose (hospira.com)
Electrolytes, vitamins, & minerals	Commonly included in PPN	
Lipids (calorically dense component)	Provide essential fatty acids	Intralipid (baxter.com)

BW = body weight; EN = enteral nutrition; GI = gastrointestinal; kcal = kilocalorie; NG = nasogastric; PN = parenteral nutrition; PPN = partial parenteral nutrition; RER = resting energy requirement; TPN = total parenteral nutrition

Tyson upon full recovery from parvovirus infection

- Indications for PPN include short-term nutritional support when central venous catheterization is not possible and supplementation to enteral feeding.[5]

TREATMENT

Based on Tyson's history of anorexia and vomiting, combined with an inability to provide RER via enteral feeding, PPN was chosen to supplement NG feeding. Tyson's PPN provided 70% of his RER because Tyson was only able to tolerate 1/3 RER enterally. The PPN was composed of an 8.5% amino acid solution (148 kcal), 5% dextrose (140 kcal), and 20% lipid solution (142 kcal), for a total of 430 kcal/day (see **Table**). Osmolality was 466 mOsm/L.

ADMINISTRATION & MONITORING

PPN must be delivered through a dedicated, aseptically placed IV catheter. To prevent contamination, all lines and bags should be changed daily; connections between the catheter, lines, and bag should be covered with a sterile dressing; and the PPN line should only be disconnected when the bag is changed.

Patients are closely monitored for infectious (ie, catheter-associated infections), metabolic (ie, hyperglycemia/hypertriglyceridemia), or mechanical (ie, inadvertent catheter removal) complications. Tyson did not experience any complications while receiving PPN.

OUTCOME

Forty-eight hours after PPN was initiated, Tyson began to eat small amounts of canned food without vomiting. NG feedings were discontinued, and PPN was continued for another 36 hours until he was ingesting his calculated RER voluntarily. At discharge, Tyson's body condition score was unchanged from admission and he weighed 18.1 kg.

See Aids & Resources, back page, for references & suggested reading.

TAKE-HOME MESSAGES

- Malnourished patients have altered immune function, poor wound healing, altered energy metabolism, and increased morbidity and mortality.
- Risk factors for malnutrition include anorexia of 3 to 5 days, ongoing protein loss, or severe disease, such as pancreatitis.
- Although EN is preferred, PN is indicated for patients with conditions, such as severe vomiting or an unprotected airway.
- PPN is administered through a dedicated, aseptically-placed IV catheter and handled carefully to prevent contamination.
- Patients receiving PPN require vigilant monitoring for complications.

Calculating Resting Energy Requirements

RER can be calculated using one of the following equations:

Cats & dogs of any weight:
$70 \times (BW_{kg})^{0.75} = RER$

Animals 2 to 30 kg:
$(30 \times BW_{kg}) + 70 = RER$

Conventionally, RER has been adjusted by an illness factor to account for the increased metabolism associated with various diseases. However, conservative estimates of caloric requirements should be used initially to avoid overfeeding. Excess calories can lead to a variety of metabolic complications.[1]