

# Critical Care Nutrition – Canine

Daniel L. Chan, DVM, MRCVS, DACVECC, DACVN

## Definition

*Critical illnesses* have a significant impact on nutritional status of dogs and often lead to overt malnutrition. Nutritional support of critically ill dogs is an important part of medical therapy and may play a role in improving outcome. Dogs with critical illnesses often have reduced nutritional intake, vomiting, diarrhea, and possibly altered nutritional requirements, all of which can impact their nutritional status.

## Key Diagnostic Tools and Measures

Designing a nutritional plan entails performing a nutritional assessment to establish the specific needs and considerations for the patient. Body Condition Scoring (BCS) is an important part of nutritional assessment. Biochemistry profiles are also helpful in identifying important considerations for the nutritional plan. For the majority of critically ill dogs, nutritional support should be aimed at meeting resting energy requirements (RER) initially and adjusting the calories provided based on frequent re-assessment.

## Pathophysiology

Critical illness imparts various changes in metabolism that impact the nutritional state of the patient. In a response to inflammation and injury, there are alterations in carbohydrate, protein, and lipid metabolism. The various changes in metabolism, combined with the effects of reduced dietary intake, result in a negative energy balance or a catabolic state. Dogs in a catabolic state may experience more complications and may have poorer rates of recovery. Reversal of the catabolic condition requires addressing the primary cause of disease and provision of adequate nutritional support.

## Signalment

Patients that may be at greater risk for malnutrition include very young and geriatric patients. This may reflect the relative greater difficulty in providing nutritional support for patients in these age categories.

## Key Nutrient Modifications

- Critically ill patients with a negative energy balance may have a greater need for protein to maintain lean body mass.
- Protein should be of good quality and highly digestible.
- Special considerations may include patients with comorbidities such as renal or hepatic failure, where increased protein may be contraindicated.
- More specific nutrient requirements will depend on the nature of the underlying disease.
- Antioxidants may be an important component of therapies intended for critically ill animals, however, specific dosages have not been determined.
- Other nutrients such as glutamine, arginine, omega-3 fatty acids may also be helpful in certain conditions, but specific or optimal dosages have not been established.

## Recommended Ranges of Key Nutrients

Nutrient	% DM	g/100 kcal	% DM	g/100 kcal
	Recommended dietary level		Minimum dietary requirement*	
Protein	20–45	6–9	18	5.1
Fat	25–35	5–7	5	1.4

Modified intake of these nutrients may help address metabolic alterations induced by disease states. The recommended dietary composition is shown as percent of dietary dry matter (DM) and as g or mg per 100 kcal metabolizable energy. All other essential nutrients should meet normal requirements adjusted for life stage, lifestyle, and energy intake.

\*Nutrient requirement for adult animals as determined by the Association of American Feed Control Officials

Correction of negative energy balance is critical.

## Therapeutic Feeding Principles

An important part of the nutritional plan is establishing the most appropriate route of nutritional support. In the absence of a contraindication, it is preferable to feed the dog via the enteral route. Contraindications for enteral nutrition include protracted vomiting, regurgitation or diarrhea, inability to guard the airway, and intolerance for feedings (e.g., gastric atony). In patients that could tolerate enteral feedings but there is no adequate voluntary intake (approximately 75% of energy requirements), a feeding tube should be placed. For short-term assisted feeding (<3 days) a nasoesophageal feeding tube may be appropriate but this requires a liquid diet. Should nutritional support be required for longer than 3 days, use of an esophagostomy or gastrostomy feeding tube is usually indicated.

Once a feeding tube is in place, feedings should aim to provide 50% of calculated calories in the first day, and gradually increasing to 100% of calculated calories over next 2 days. In severely affected patients, initial nutritional support should start at 33% of calculated calories. Diets typically recommended for tube feeding are high in calories, protein, and fat. It is very important to ensure that the diet chosen is appropriate for the feeding tube being used (i.e., the consistency of the diet must not occlude the tube). In patients in which the enteral route cannot be used, parenteral nutrition is necessary. Formulation of parenteral nutrition is tailored to the patient and requires special formulation and handling.

■ **Treats** – For critically ill animals, the use of treats is usually ineffective at meeting energy and nutrient requirements and only delays more appropriate nutritional support. Animals receiving tube feedings may be offered treats to assess return of appetite. Provision of enteral and/or parenteral nutrition does not interfere with the assessment of appetite.

■ **Tips for Increasing Palatability** – The use of appetite stimulants in critically ill animals is not recommended as they are ineffective at restoring adequate nutritional intake. Techniques such as hand feeding or warming the food may be attempted but are also typically ineffective at achieving adequate nutritional support.

■ **Diet Recommendations** – Diets typically used in nutritional support of critically ill dogs are usually energy dense, high in protein and fat

content, and have high digestibility. Many prescription diets recommended for tube feeding are also very high in water content and are amenable for tube feeding with minimal modification. Most diets, however, will need to be modified in order to be used effectively with feeding tubes. With small-gauge tubes, typically used for nasoesophageal access, complete liquid diets are the only acceptable diets.

### Client Education Points

- As many recovering patients can be discharged from the hospital with the feeding tube in place (e.g., esophagostomy, gastrostomy tubes), clients need to be instructed how to use and care for the feeding tubes.
- Clients need to be made aware of possible complications and how to detect them.
- Clients should be provided with detailed and specific instructions for how to use feeding tubes. This should include instructions of how to prepare the diet and how to administer the feedings.

### Common Comorbidities

Patients with critical illness often have several affected organ systems which may impact the nutritional plan. More serious comorbidities include

concurrent congestive heart failure, renal failure, hepatic failure, respiratory failure, gastrointestinal dysfunction, neurologic dysfunction, and systemic infection.

### Interacting Medical Management Strategies

Various antibiotics may cause nausea, vomiting, or diarrhea. Chemotherapeutic agents may cause severe gastrointestinal complications. Diuretics and angiotensin-converting enzyme (ACE) inhibitors may also decrease appetite.

### Monitoring

All critically ill patients receiving nutritional support should be closely monitored for possible complications related to nutritional support. Patients with feeding tubes should be inspected for infection/inflammation at the surgical exit site. Biochemical and hematologic tests may also be helpful in identifying metabolic complications. Although body weight and body condition scores are essential in patients receiving nutritional support, weight gain per se is not necessary.

## Algorithm – Nutritional Support of Critically Ill Canine Patients

