

Starvation and Re-Feeding Animals

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Introduction

The desire to generously feed a starving animal is human nature, but can have disastrous consequences if done incautiously. "Refeeding syndrome" refers to the metabolic derangements that occur with the reintroduction of food after a prolonged period of malnutrition. This syndrome was first recognized in prison camp survivors of WWII – tragically, some survived terrible ordeals only to succumb to the too-sudden reintroduction of food. [1] In shelter medicine, starvation and refeeding is most often a concern in animals subjected to cruelty and neglect, or animals which have been trapped in areas without access to food and water. It may also be a concern in patients that have undergone a prolonged period (> 5-10 days) of fasting or anorexia for any reason. [2,4]

Effects of starvation

During starvation, carbohydrate, fat and protein stores are depleted in that order, preserving vital structural proteins as long as possible. Serum electrolyte balance is maintained by a shift of intracellular ions (potassium, phosphorus and magnesium) to the extracellular space, leading to overall depletion of these electrolytes although serum values may be normal. Organ function is eventually comprised, leading to reduced cardiac, renal, immune and other functions. [5]

Refeeding complications

The major complications of refeeding are related to electrolyte imbalance, particularly hypophosphatemia, hypokalemia and hypomagnesemia. [3] The mechanism varies, but in general when a starved animal is fed glucose or carbohydrates, these electrolytes are driven into the intracellular compartment, which can lead to severe deficiency of serum levels. Ideally, serum electrolytes should be monitored at least every 24 hours for the first 5-7 days of refeeding, particularly if problems are encountered. Signs to watch for include muscle weakness, neurologic dysfunction (weakness, seizures, coma), and cardiac dysfunction. In addition to these signs, hypophosphatemia can cause hemolytic anemia, and hypomagnesemia can cause irritability or aggression. If any of these signs are observed, close monitoring and correction of electrolyte imbalances through fluid therapy is required.

Other refeeding complications can include fluid overload due to compromised cardiac and renal function, particularly as increased insulin levels lead to reduced sodium and water excretion. Thiamine deficiency may also be a problem. 2 Because thiamine is a co-factor in carbohydrate metabolism, starvation-induced deficiency is exacerbated by carbohydrate refeeding. This may result in Wernicke's syndrome (ocular disturbance, ataxia or coma). Atrophied villi can impair absorption, so parenteral thiamine supplementation should be provided.

Who is at risk?

Any animal with a body condition score of < 3.5/9 and an unknown dietary history.

Animals which have fasted for > 5-10 days regardless of body condition score. [2] 5/9 and an unknown dietary history.

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Animals which have fasted for > 5-10 days regardless of body condition score. [2,5]

Animals which have lost > 10% body weight over < 2 months. [2,3]

Animals with hepatic lipidosis, diabetic ketoacidosis and hyperadrenocorticism are at increased risk. [4]

Err on the side of caution – it is safer to re-introduce food gradually than to chance feeding too much too soon.

Developing a refeeding plan

A refeeding diet should be high-fat and low carbohydrate, with adequate potassium, phosphate, and magnesium. For horses, alfalfa hay is recommended. 6 Initially feed only $\frac{1}{4}$ of resting energy requirement (RER) divided into six small meals per day. This can be calculated by the formula $RER = (30 \times BWkgs) + 70$, or simply go by the feeding recommendations for the chosen food. Amount should be increased by $\frac{1}{8}$ to $\frac{1}{4}$ of the total requirement over several days. As noted, parenteral thiamine should be provided. Other supplementation is not generally indicated. Refeeding syndrome usually occurs within the first 3-7 days. [1,2] The number of feedings can be decreased and the amount at each meal increased gradually over the first ten days, until the animal is free fed (for non-gluttonous individuals) or placed on a plan to allow steady weight gain.

Starved animals have impaired immune systems, so shelter patients should ideally be placed in foster care or housed in an area separate from ill animals and new intakes.

References

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- Stull C. Nutrition for rehabilitating the starved horse. The Horse Report. July 2003;21(3).

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