Treatment of Cobalamin Deficiency in Dogs and Cats

Cobalamin Deficiency

Cobalamin (vitamin B₁₂) is a water-soluble vitamin that is essential to energy production, DNA and RNA synthesis, and metabolism of sulfur-containing amino acids. The most common causes of cobalamin deficiency in dogs and cats are chronic and severe distal or diffuse small intestinal disease and exocrine pancreatic insufficiency. Short-bowel syndrome, hereditary cobalamin deficiency, and an exclusively vegetarian or vegan diet are less common causes of cobalamin deficiency.

Most dogs and cats with cobalamin deficiency show clinical signs of gastrointestinal disease, which could either be a cause or effect of cobalamin deficiency. Other clinical signs include weight loss, central and peripheral neuropathies, and immunodeficiencies. In a recent case study, a border collie with selective cobalamin deficiency presented with hyperammonemic encephalopathy that fully responded to cobalamin supplementation.¹ In another case report, a 4-year-old cat that presented with severe encephalopathy was found to have organic acidemia and cobalamin deficiency.²

Diagnosing Cobalamin Deficiency

Although a decreased or low-normal serum cobalamin concentration provides good evidence for cobalamin deficiency, a definitive diagnosis can be challenging. Clinical signs are ultimately caused by cobalamin deficiency on a cellular level, but the cellular cobalamin status is difficult to assess. Serum concentrations have traditionally been used to help

KEY POINTS

- Cobalamin (vitamin B₁₂) deficiency is common in both dogs and cats.
- Patients with gastrointestinal (GI) disease and cobalamin deficiency may not appropriately respond to treatment of the underlying disease process without concurrent cobalamin supplementation.
- Cobalamin deficiency can be diagnosed by measuring serum cobalamin concentration.
- Recent studies have suggested that oral supplementation of cobalamin is equally efficacious to parenteral administration.

DOSING SCHEDULE FOR ORAL COBALAMIN SUPPLEMENTATION

- Cyanocobalamin orally once a day for 3 months
  - 250 µg in cats or small dogs weighing up to 10 kg
  - 500 µg in dogs weighing 10 to 20 kg
  - 1,000 µg in dogs weighing more than 20 kg
- Re-measure serum cobalamin concentration 1 week after finishing cobalamin supplementation
Clinical Notes

April 2016

assess cobalamin status, but some patients
with cobalamin deficiency on a cellular level
do not have severely decreased serum
cobalamin concentrations.

Several assays for serum cobalamin determi-
nation are available for humans, but they
must be analytically validated for use in dogs
and cats. Reference intervals are not transferrable between labs, and each lab should establish their own reference intervals.

Serum or urine methylmalonic acid (MMA)
concentration can be used as an indicator of
cellular cobalamin status. Cobalamin
deficiency leads to accumulation of MMA, and
serum or urine concentrations of MMA are
often dramatically increased in patients with
cobalamin deficiency. However, measurement
of serum or urine MMA concentration is technically involved and expensive; therefore, these assays are not routinely used to evaluate for cobalamin deficiency. Interestingly, serum MMA concentrations have been found to be increased in some dogs and cats with low-normal serum cobalamin concentra-
tions, demonstrating that a severely de-
creased serum cobalamin concentration is not optimally sensitive for the diagnosis of cobala-
min deficiency on a cellular level.

Cobalamin Supplementation

To avoid missing patients with cobalamin
deficiency, cobalamin supplementation
should be considered even when serum
cobalamin concentration is low-normal.
Patients with severe cobalamin deficiency
often do not respond to therapy of the
underlying gastrointestinal disorder unless
or until cobalamin is being supplemented.

The most common form of cobalamin used
for supplementation is cyanocobalamin, but
hydroxocobalamin or methylcobalamin may also be used in patients that have not responded to traditional therapy or in those perceived to be experiencing side effects to
cyanocobalamin. Supplementation has traditionally been administered parenterally because cobalamin deficiency has been shown to lead to malabsorption of cobala-
min in the ileum; however, recent data have shown that oral supplementation may be just as efficacious. Dosing for oral supple-
mentation is empiric (see Dosing Schedule),
with daily supplementation administered for
3 months. Serum cobalamin concentrations
should be re-evaluated 1 week after discon-
tinuation of supplementation.

In one retrospective study of 51 client-owned
dogs with low-normal or decreased serum
cobalamin concentrations, patients received
oral cyanocobalamin (250 µg to 1000 µg
cobalamin orally once daily) for a variable
period. On follow-up, serum cobalamin
concentrations had increased in all of the dogs.

Interestingly, not all patients had the same
underlying cause of cobalamin deficiency, suggesting that the cause of cobalamin
deficiency may not play a role in determining
the success of oral supplementation. Also, more recently, a small retrospective study in 13 cats
with chronic enteropathy or intestinal lympho-
ma and low or low-normal serum cobalamin
concentrations showed dramatic increases in
serum cobalamin concentrations in all 13 cats
after oral cobalamin supplementation.

While prospective studies are needed and
ongoing, these initial data are very promising,
suggesting that oral supplementation may be
applied routinely unless there is evidence that
a particular patient may not respond.

References

1. Battersby IA, Giger U, Hall EJ. Hyperammonaemic
cencephalopathy secondary to selective cobalamin
deficiency in a juvenile Border collie. J Small Anim
2. Kelmer E, Shelton G, Williams D, Ruaux C, Kerl M,
O’Brien D. Organic acidemia in a young cat associated
3. Toresson L, Steiner JM, Suchodolski JS, Spillmann T.
Oral cobalamin supplementation in dogs with chronic
enteropathies and hypocobalaminemia. J Vet Intern
4. Toresson L, Steiner JM, Suchodolski JS, Göransson M,
Elmgren L, Spillmann T. Oral cobalamin supplementation

Additional Resource

The Gastrointestinal Laboratory at Texas A&M University
www.vetmed.tamu.edu/gilab

Sponsored by an Educational Grant from Nutramax Laboratories Veterinary Sciences, Inc.