

Calf Notes.com

Calf Note #55 – Blood BHBA in calves

Introduction

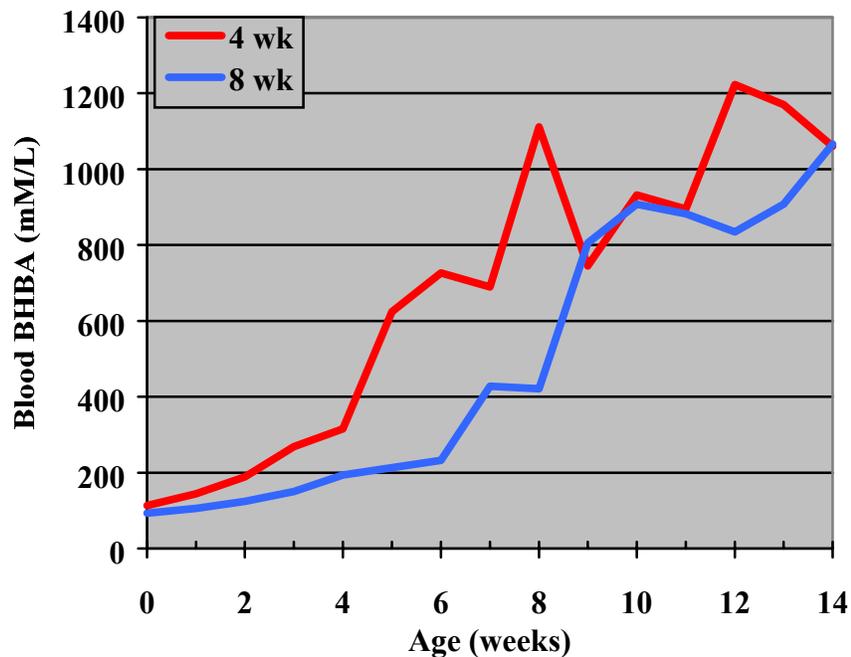
As the calf begins to consume calf starter and other dry feed, there are some very interesting changes that occur in the animal. In addition to the physical development of the stomach, there are very interesting changes that result as a consequence of the changes that occur in the rumen.

An example of the changes associated with rumen development is the change that occurs in blood β -hydroxybutyrate (**BHBA**). This is a compound known as a ketone, which describes its chemical composition. An important metabolite, BHBA is used by the body as a source of energy. In adult ruminants, BHBA is often produced when energy is limited and the body mobilizes fat. This condition is called ketosis and may lead to clinical problems.

However, in the young animal, BHBA has been used as an indicator of the development of the rumen. BHBA is produced when rumen bacteria ferment carbohydrate in the rumen to the volatile fatty acid butyrate. Butyrate is then absorbed by the rumen epithelial cells, where it is converted to BHBA. An example of the increase in BHBA concentration in the blood of young calves is shown in the figure.

When calves were offered calf starter from 4 days of age, the amount of BHBA increased to about 350 mM (millimoles per liter). However, in the two weeks after weaning, the amount of BHBA in the blood increased to nearly 800 mM. This increase is closely related to the increase in calf starter intake.

When calves were weaned at 8 weeks of age, the increase in BHBA occurred more slowly, but by the week after weaning, the increase in BHBA doubled. Note that by 12 weeks of age, total BHBA in the calf's blood reached >1,000 mM. This level is sometimes used by veterinarians to



indicate subclinical ketosis in mature animals. Apparently, the fermentation that occurs in young calves produces large amounts of BHBA as calf starter intake increases.

The increase in blood BHBA has important implications to the animal. Prior to rumen development, the calf utilizes primarily glucose for energy. However, as calf starter intake increases, the amount of BHBA in the blood increases also. Consequently, the calf has to adapt to this new nutrient source. Fortunately, this adaptation occurs quickly, so that the calf is able to utilize BHBA as a source of energy.

Reference

Quigley, J. D., III, L. A. Caldwell, G. D. Sinks, and R. N. Heitmann. 1991. Changes in blood glucose, non-esterified fatty acids, and ketones in response to weaning and feed intake in young calves. *J. Dairy Sci.* 74:250-257.

**Written by Dr. Jim Quigley (18 May 1999).
©2001 by Dr. Jim Quigley
Calf Notes.com (<http://www.calfnotes.com>)**