The Influence of Nutrition on Hoof Growth and Cracking

Matthew Friend
20 April 2005

Breed differences have been identified. For example, Simmental, Maine Anjou, Limousin and Charolais appear to need as much as 1.5 times as much copper as other common breeds.

Trace element relationships in cattle:

High Levels of:	**Causing reduced absorption of :**
Zn (Zinc)	Cu (Copper)
Fe (Iron)	Cu, Zn and Mn (Manganese)
Mo (Molybdemum) and/ or S (Sulfur)	Cu

Cobalt is essential for the production of Vitamin B12 by rumen microbes.

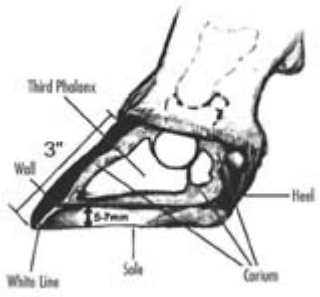
Generally, liming (increasing pH) decreases plant uptake of cobalt and copper but increases selenium uptake.

Clover plants are less efficient at taking up selenium than grasses but more efficient at taking up cobalt.

Trace element deficiency and their effects are more likely to be seen in period of very rapid pasture growth during spring. Higher levels of sulfur in green feed may reduce the availability of copper and selenium at these times.

Excessive soil levels of molybdemum will induce a secondary copper deficiency by combining with copper and sulfur in the rumen to form the insoluble product copper thiomolybdate.

Anatomy of a Bovine Claw



The claw capsule (the area of the hoof visible to the eye) includes the wall, sole and heel, and is similar in composition to a fingernail. The wall is the densest and strongest area. The weakest area is the white line, where the wall and sole attach. The heel is the least dense area, making it susceptible to injury.

Hoof health is affected by many different nutrients. Trace minerals such as zinc, copper, and manganese are important in sound hooves. Vitamins A, D and biotin play a role in hoof development. Fatty acids also play a role in maintaining a waterproof barrier in the hoof. Finally calcium and phosphorus benefit hoof and bone integrity. Since all these nutrients play a role, there isn't one 'silver bullet' that will solve hoof crack problems if all the needed nutrients aren't available.

The Bayer Cattle Lameness Guide offers the following discussion of hoof cracks.

“It seems to be most common in older cows due to a loss of the ability to keep the hoof hydrated. A deficiency of copper or zinc appears to be related to this condition. Our forages are almost always low in zinc and copper. High iron, sulfur, and molybdenum levels may accentuate copper problems”.

Copper: Copper has an important role in strengthening horn and connective tissue of the foot. Cattle suffering from a subclinical copper deficiency are more susceptible to heel cracks, foot rot and sole abscesses. Availability of copper is greatly diminished by sulfur, molybdenum, zinc and iron.

Zinc activates enzymes and is a component of metalloenzymes. Deficiency signs include skin dermatitis (parakeratosis), lesions, failure of wound healing, and reduced reproductive performance. Organic zinc can improved foot hardness, decrease sole abscesses, and reduced somatic cell counts.

It's an accepted fact that **zinc-methionine** aids in the improvement of hoof quality and the prevention and treatment of foot rot. In areas with continual foot rot problems, the use of zinc methionine is recommended.

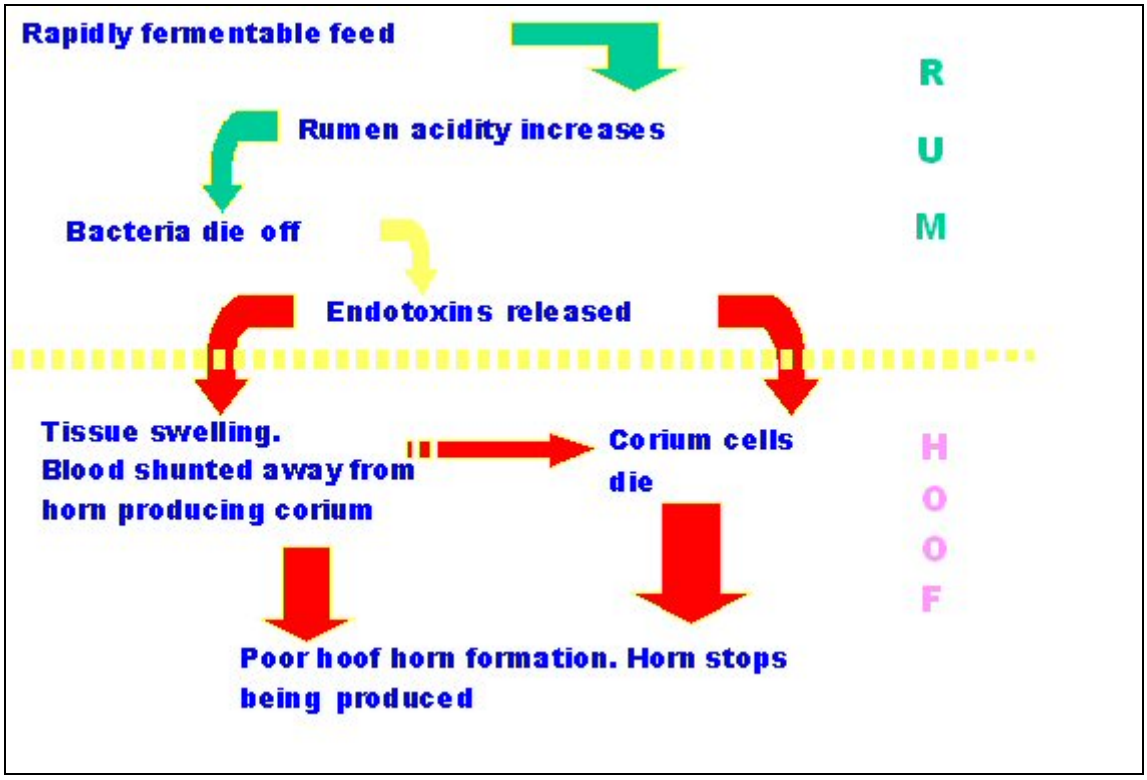
Excessive Hoof Growth

The majority of the work with regard to excessive hoof growth and trace element status is in its infancy. Work in Victoria (not published as yet) indicates that zinc deficiency on pasture based rations has promoted an excessive foot growth in beef cattle. The thinking is that there is a Mn relationship in this scenario but that has not been confirmed as yet as to the mode of action. Once the zinc imbalance was rectified the excessive foot growth was not reported in the same group of animals for the remainder of their life.

Subclinical acidosis can have the same effect on the blood vessels with the hoof corium. This can lead to hoof weakness associated with many foot problems. Subclinical by its name is not visual to the eye so is often not treated. Subclinical acidosis can have its onset during excessive feed flush periods where protein and soluble carbohydrate levels are elevated to similar to that of a feedlot ration. Early ryegrass pasture feeding is an example.

In dairy operations where most of the trace element/feet scenario work has been done it indicated that structural faults predisposed many of the foot abnormalities recorded but not all.

Laminitis


Rapidly fermentable feed
Rumen acidity increases
Bacteria die off
Endotoxins released
Tissue swelling.
Blood shunted away from
horn producing corium
Corium cells
die
Poor hoof horn formation. Horn stops
being produced
R
U
M
H
O
O
F