IOWA
LIMESTONE
COMPANY

MINERAL
WRITES

FIRST QUARTER 2000

CAGE LAYER FATIGUE

Cage layer fatigue (CLF) is a syndrome in which demineralization of the bone (osteoporosis) occurs, typically in highly productive caged birds. The loss of calcium and phosphorus from the bone cortex is the result of a dietary deficiency in the calcium and/or phosphorus availability compared to the nutrient needs of the bird.

It is not uncommon to see CLF around peak egg production due to the combination of high demand for nutrients and low feed intake. Birds in cages use bone calcium to generate eggshell without having the ability to regenerate the bone. Affected birds show difficulties and a reluctance to move. The full affects of CLF are difficult to reverse, so it is critical to prevent the syndrome.

Skeletal Development in Pre-Layers

Even before onset of lay, proper skeletal development is essential when growing birds tend to consume less feed due to selection practices and management practices to improved feed conversion. Any management practice that affects the size of the bone reserve, the calcium and phosphorus availability, or excessively depletes the bone will generate CLF.

The lack of proper development of the medullary bone by lack of adequate calcium and phosphorus in the diets before the onset of lay will magnify the occurrence of CLF. The medullary bone is a very special, highly mineralized bone that develops only during the last two weeks before first eggs and is a very mobile source of calcium. This bone acts like a sponge that can release calcium easily and it quickly replenishes reserves in a similar fashion. Medullary bone develops mostly in the narrow cavity of the tibia, femur, ribs and sternum. It prevents calcium being withdrawn from more valuable bone structure and bone cortex, and creating osteoporosis. The

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CALCIUM
Feed-grade calcium products are available in a wide variety of particle sizes, from liquid suspendable products to large particle products for laying hen diets.

DICALCIUM PHOSPHATE
Both 18.5% and 21% phosphorus products are available.

SODIUM BENTONITE
Bentonite products are available in a wide variety of particle sizes suitable for any purpose.

POTASSIUM
Iowa Limestone Company has both potassium chloride (KCl) and potassium magnesium sulfate (K/Mg/S) available.

All products are available in both bag and bulk.

ILC

medullary bone only develops during the prelay period (usually 15-18 weeks of age) and only when higher levels of calcium (2 to 3.5%) are available in the feed. Failure to use a higher calcium level during the prelay period is a major predisposing factor to CLF in highly productive layers.

To ensure proper development of the skeleton, calcium and phosphorus levels should be adjusted to meet the daily needed intake. Start by knowing what level is desired and use laboratory tests to insure proper mixing provides the established amount.

Feeding Layers

During the egg production cycle, 100% of calcium needs come from feed sources. However, during shell formation at night, the calcium required is so significant that the bone acts as a temporary reserve, releasing calcium when needed. This loss is replaced during the day when the shell formation is complete.

Since the shell formation occurs during the night, it is important the last feeding be done as close as possible to light extinction (one to two hours before). This will allow the birds to carry more feed and calcium to help supply the calcium requirement for shell formation through the night. Producers that give their last feeding in the early afternoon will definitely contribute to CLF.

Particularly during the early stage of egg production (18-40 weeks), layers need to have a proper level of calcium and phosphorus in the correct form in their diets. Form considers such criteria as particle size, solubility and availability. Pure presence of the mineral is not adequate. Make sure the bird can use it to help restore the depleted bone if needed.

Calcium-related deficiency is the major factor contributing to the generation of CLF, long before phosphorus gets involved. But every time the bone is depleted of calcium it also loses phosphorus; anytime the bone is reloaded it requires phosphorus to be associated with calcium to regenerate the mineral structure. If CLF appears, the treatment is higher levels of dicalcium phosphate in the feed, not simply limestone.

Additional Factors

Other contributing factors to CLF include: (1) Deficiency of available phosphorus in feed, mainly early in production. (2) Deficiency in Vitamin D3 in the feed. (3) Poor feeding system, generating separation of fine particle limestone in the feeders. (4) High density cages, poor feeder space and fewer feeding periods can generate competition for calcium intake and contribute to CLF in dominated birds.

Birds that are raised on the floor, where they are exposed to their own manure, seldom exhibit symptoms of CLA because the bacterial enzymatic activity from the intestinal tract and caeca will compensate for a mild deficiency of calcium and available phosphorus.

Cage layer fatigue is easy to prevent through proper management practices. As industry moves to practices that will allow higher performance, more management skills will be required.

LIMESTONE COLOR: WHAT DOES IT MEAN?

What causes the color and tint differences in limestone? Generally these variations result from very low levels of inert mineral impurities, the conditions around the time of formation and the type of sediment that was deposited during that time period. Color variations are a reflection of the environment during formation rather than quality.

What do theses differences in coloration mean?

White to light gray:
Such coloration generally indicates that a particular deposit maintained it's original color. Impurities may be present, but environmental conditions have not allowed the impurities to elicit a color change. This color may indicate extraction from an underground mine instead of a quarry. Gray limestone deposits also indicate the presence of carbonaceous impurities (decomposed plant material), with colors ranging from dark gray to nearly black as carbonaceous impurities increase.

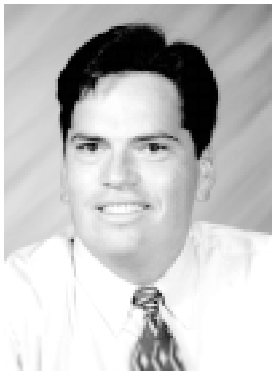
Buff to Tan:
Coloration results from water percolating through the deposit and oxidizing. The iron content of the limestone has not been increased; the chemical form of the iron has simply changed. The stone can change from buff to tan and, in cases of high iron concentrations, to a red to brown color.

Multicolored:
Multicolored stone can come from the same deposit, especially in cases of quarried limestone where the whole deposit is being used. Generally, with quarried limestone the top layer has been weathered, and the lower level has not been effected. A limestone deposit can contain two or more different colorations. While a color may be inconsistent it does not have any effect on the quality of the limestone.

The feed industry uses limestone coloration as a tool to differentiate it from other mineral sources or to enhance the color of premixes or mineral formulations. The use of limestone as an efficacious carrier or visually enhancing product via its color is very important. But the feed, poultry and livestock industries should never use limestone color as selection criteria for animal feeds. The calcium content, purity, and solubility are the traits utilized when choosing a source of calcium carbonate.

American Association of Feed Control Officials (AAFCO) label limestone products as follows: 38-40% calcium is referred to as calcium carbonate; 33-37% calcium is called ground limestone; and a 20-23% calcium product that is at least 10% Mg is called dolomitic limestone. Feed grade limestone falls in the 33-40% calcium range.

YOUNG JOINS ILC STAFF



Iowa Limestone Company is pleased to introduce Dr. Mark Young as Director of Nutrition and Technical Services. He comes to us from Golden Sun/Purina where he was a beef specialist. Mark received his Masters degree and Doctorate from Kansas State University in the field of animal nutrition. His diverse background provides Iowa Limestone and its customers with a broad experience base to utilize

If you have any questions or just want to call to get acquainted, don't hesitate to contact Mark.

ILC will publish *Mineral Writes* periodically (quarterly is our intention) and short updates may be published in-between to keep you apprised of important nutrition information. We will do our best to keep these technical reports easy to read, yet fairly detailed in nature.

If you are not currently receiving *Mineral Writes* and would like to be placed on our mailing list, just email or call us.

Phosphorus Fundamentals - Part 1 Function and Body Composition

As a major component of the skeleton, phosphorus (P) plays an intricate role in bone development and continued structural integrity. It's vital for teeth and eggshells, and low levels can have deleterious effects on reproductive efficiency, especially in grazing cattle. Phosphorus is also a major component of phospholipids, which are important in lipid transport, metabolism, and cell membrane structure. Therefore, P is present in virtually every cell in the animal's body.

Energy metabolism is another profoundly important function of phosphorus, where it is involved as a component of adenosine monophosphate (AMP), ADP, ATP and creatine phosphate. These high-energy phosphate bonds are needed to sustain proper metabolic function and to fuel muscle contraction. Phosphorus is a constituent of several vitally important enzyme systems (Cocarboxylase, flavoproteins, NAD), as well as a component (phosphate) of RNA and DNA, the vital cellular constituents for protein synthesis.

Body Composition: Phosphorus content of the human body is roughly 1.1%, with 80% of that being present in the hard tissues (i.e. bones and teeth), with bone ash containing approximately 18% P. The balance of the body's phosphorus content is present as mentioned above in the soft tissues. The percentage of phorphorus in the body and the proportion of it in the skeleton increases throughout prenatal and postnatal life as ossification of the skeleton progresses to physiological maturity (Pond, Church, and Pond 1995). Total body phosphorus would be expected to increase fastest during the early growth period when rapid muscle accretion and skeletal growth is happening. The same trend is evident in domesticated livestock we raise in today's intensive production systems.

For additional information contact

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