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Entomology



Food Science

# Poultry Pointers

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**THE IMPORTANCE OF VITAMIN D**

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of cod liver oil or sunlight, provided clues for the biochemical sleuthing that led to the purification of vitamin D.

The roles of vitamin D in tissues are now fairly well known. These are similar in both mammals and non-laying birds. Vitamin D, once ingested or converted in the skin from a precursor, is modified in the liver by one simple reaction to a new form, now called 25-hydroxy vitamin D. After this, the kidney adds on another hydroxyl group to form 1,25-(dihydroxy) vitamin D.

This latter compound is the

active form of the vitamin and it has several precise roles. In the intestine, 1,25-vitamin D stimulates the production of a protein in intestinal cells. This special protein binds calcium in digested food and moves the calcium across the intestinal wall into the bloodstream. Without vitamin D, very little calcium can enter the body — thus rickets and other problems with mineralization occur.

Vitamin D acts on bone cells to enhance both bone resorption and formation. The resulting bone remodeling allows for maintenance of strong bones while providing calcium for body functions.

It's much like using and maintaining a bank account. In the kidney, 1,25-vitamin D is linked with retention of calcium. Overall, vitamin D assists the body in acquiring calcium (intestinal effect), storing calcium (bone effect), and retaining calcium (kidney effect).

Above and beyond these effects, many types of cells are being found to bind vitamin D, including cells in bone marrow. The possibility that 1,25-vitamin D may be

useful in treating certain leukemias has stirred some excitement.

One might wonder why the body goes to the trouble of using two steps at two different sites (liver and kidney) to make the final form of the vitamin, 1,25-vitamin D. Apparently, the reason is that 25-hydroxy vitamin D is a storage form of the vitamin. Small amounts of this are converted to 1,25-vitamin D in a way that is very tightly controlled. This allows the body to retain a supply of this fat-soluble vitamin for many days and avoids the need for daily ingestion.

Laying birds have an especially high demand for calcium, obviously, since each eggshell contains about 2 grams (the weight of a dime) of calcium. A dietary deficiency of vitamin D in egg-laying hens results in osteomalacia (the adult form of rickets), dwindling egg production, and a deterioration in eggshell quality.

In birds in the wild, vitamin D is obtained by preening — the process of spreading oil from the preen gland at the base of the tail onto feathers so that the precursor of vitamin D is exposed to sunlight. In the commercial setting, vitamin D is added to feed.

It is interesting that laying hens are capable of producing substantially more 1,25-vitamin D than non-laying birds (or mammals). The most important consequence of this is that calcium absorption by the intestine is boosted by more than twofold when an eggshell is being formed. A few hours later, when the egg has been laid, amounts of 1,25-D return to lower levels.

The discovery of 1,25-vitamin D has led to new possibilities in treating diseases of calcium metabolism, such as osteoporosis in humans, milk fever in dairy cows, and eggshell breakage in poultry.

The history of vitamin D goes back a long way. Rickets, a result of vitamin D deficiency, was described in 1645.

However, it wasn't until the 1920s that cures for rickets, a dose

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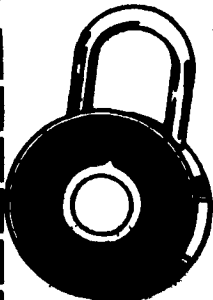
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