

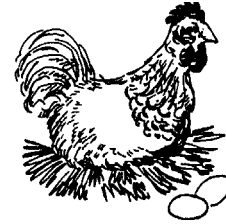


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COMMERCIAL EGG TIP . . .

BONE QUALITY MUST BE PROTECTED WHILE LAYING HENS ARE STILL YOUNG.

Sustained high rates of egg production create a tremendous metabolic demand for calcium to support eggshell formation, especially during peak production. Ideally, all of the calcium in an eggshell should be supplied in the hen's diet. Since eggshell formation takes place typically during evening and night, and the hen eats during the day, the dietary calcium that is absorbed when shell formation is not taking place must be stored until needed. The hen uses a specialized bone component called medullary bone for this purpose.

The maturation of a pullet into a laying hen, which typically occurs in commercial flocks shortly after pullets are photostimulated, triggers a change in bone metabolism. The medullary bone matrix develops in the marrow spaces of some skeletal structural bones, for instance the leg bones. At the same time, the bird's ability to remodel structural bone is curtailed (remodeling is the dynamic, ongoing reconstruction of existing bone that normally occurs in the structural bone of non-egg-laying birds, i.e., pullets, molting hens, and roosters). Medullary bone, on the other hand, is remodeled daily, being remineralized to store calcium at one time, only to be resorbed later to release calcium for deposition into the eggshell. If available calcium is limited, medullary bone will be mineralized using calcium resorbed from structural bone. The loss of mass from structural bone is called osteoporosis and causes reduced bone strength.

It appears that osteoporosis cannot be totally avoided in modern, cage-housed laying hens (Rennie et al., 1997). Although this is unfortunate enough, things can happen to increase the severity of the problem. Medullary bone formation requires both calcium and phosphorus, so dietary deficiencies of either element from the time of medullary bone formation and the beginning of lay can quickly cause osteoporosis, leading to reduced production performance, weaker bones, and increased mortality (Roland and Rao, 1992; Rao et al., 1995, Roland et al., 1996). Although osteoporosis develops progressively throughout the laying cycle, the greatest loss of structural bone

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tends to occur early in lay, when the rate of production is highest (Whitehead and Fleming, 2000).

The most critical time to preserve bone quality, therefore, is early in lay when the greatest demand is placed on skeletal calcium reserves. Aside from good general husbandry, can anything be done to reduce the loss of structural bone at this time? The inclusion of a particulate source of calcium, such as large-particle limestone or oystershell, in the diet from before the start of egg production can reduce loss of structural bone early in lay and increase accumulation of medullary bone (Rennie et al., 1997; Fleming et al., 1998). Dietary calcium in particulate form appears to promote better sustained mineralization of medullary bone so that less resorption of structural bone occurs. This effect, while not eliminating osteoporosis, can benefit bone quality to the end of the laying cycle.

It is not uncommon for egg producers to include particulate calcium sources in the diets of older flocks to alleviate specific shell quality problems or to prepare flocks for molting. However, protection of bone integrity early in lay may benefit shell quality late in lay, because poor bone mineralization can negatively affect shell quality. Egg producers should consider including at least 1/3 of dietary calcium in large particle form starting at photostimulation to ensure that medullary bone is well mineralized at all times with minimal loss of structural bone. Since severe osteoporosis is associated with palpable bone deformity at the dorsal/ventral rib junctions and at the keel, flock supervisors should inspect hens on a weekly basis to be aware of when osteoporosis problems start to occur. A developing bone quality problem will not necessarily be reflected immediately in flock egg records because the hen will sacrifice bone quality to preserve eggshell quality. Hen inspection information can be used to identify and rectify feed or management-related problems in a timely fashion, or, if common symptoms occur across flocks, may guide re-evaluation of a company-wide feeding program.

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A. Bruce Webster

Extension Poultry Scientist

County Extension Coordinator/Agent