

**MEDULLARY BONE PROVIDES STRENGTH TO LONG BONES AND CALCIUM FOR EGGSHELLS**

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Medullary bone is a form of bone present within the marrow cavity of some bones, most notably the long bones of egg-laying birds. This bone exists as a randomly organized three-dimensional meshwork. Marrow occupies the spaces within the meshwork.

It has been known for many years that medullary bone serves a vital function in laying hens — namely, it is a major storage site for the calcium needed for daily eggshell formation. This supply-and-demand system is a fine example of how beautifully inte-

grated living creatures are. During the night, when most of the eggshell is formed, hens will be quiescent and will have digested food taken in during the day.

To meet the needs of eggshell formation, calcium is released from medullary bone. To achieve this, a portion of medullary bone is first destroyed and then reformed in a daily cycle. This constant turnover is the result of a collaboration of two populations of bone cells — ones that form bone and ones that take it away.

Research has shown that the latter cells adhere tightly to bone surfaces and then secrete acid and digestive enzymes onto the bone surface during the calcium release period. When sufficient calcium has been released, the digestive cells become inactive and move away. The bone forming cells then move in and replenish the thinned bones.

How this highly integrated process is controlled is only partially understood. One quest of researchers today is to identify the pieces of missing information in the control process. Acquisition of such new knowledge is expected to lead to discovering new ways to improve egg laying, for example, by selecting for hens with improved regulation of the medullary bone cycle.

The location of medullary bone within marrow cavities is also

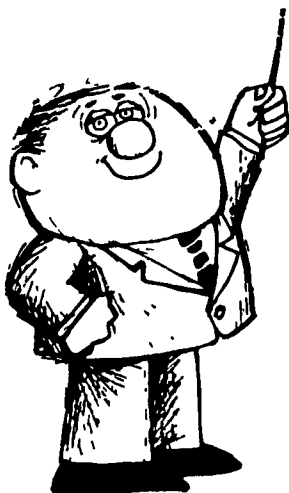
interesting in terms of origins of the bone cells. The bone forming cells are derived from cells that first appear in early stage chick embryos, as limbs develop. Division of these types of cells provides a continuous supply of bone forming cells throughout life. The bone destroying cells, however, are derived by fusion of one class of white blood cells in the bone marrow. When calcium is needed for eggshell formation, the white blood cells fuse and gain the abili-

ty to dissolve away the medullary bone.

Another recently discovered role of medullary bone relates to its structure. Because this bone exists as a three dimensional meshwork, it provides strength to bones within which it resides.

Results of a recent study show a 50 percent increase in long bone strength when the marrow cavity is half occupied with medullary bone as compared to the same

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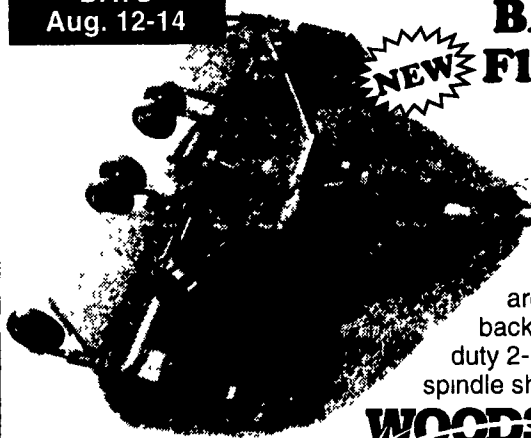
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