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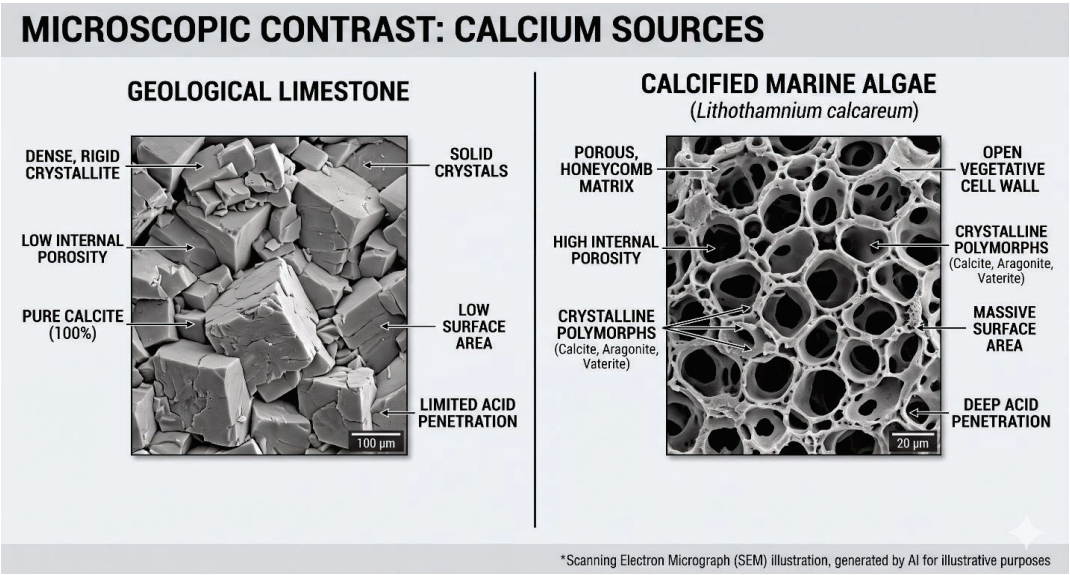
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More Than Just Rock: Calcium Sources in Poultry Nutrition

Many people view limestone as little more than inexpensive gravel for rural roads, landscaping blocks, or material lying in the ground. Yet the limestone mined and processed for animal feed is essential calcium carbonate that supports animal health, skeletal integrity, and peak performance. This article examines the geological origins of feed-grade limestone and explains why it remains a benchmark dietary calcium source compared with alternatives like oyster shells and marine algae for poultry.

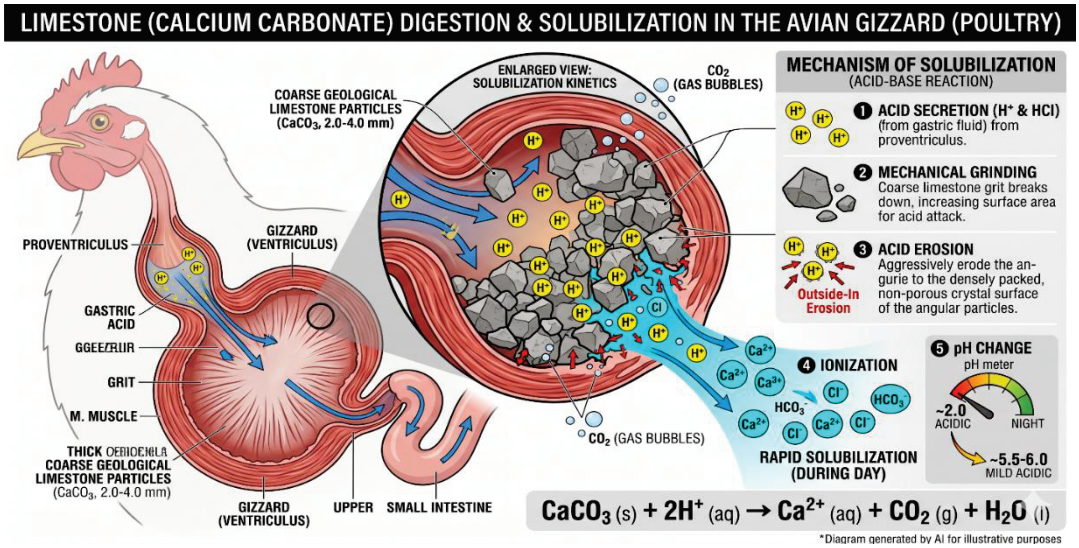
Limestone is a sedimentary rock primarily composed of calcium carbonate ($CaCO_3$), which forms over millions of years through the accumulation and compaction of marine organisms such as corals, foraminifera, and mollusks. These organisms extract calcium and carbonate ions from seawater to build their shells and skeletons. When they die, their remains settle on the ocean floor and gradually compact and cement together. Over geological time, tectonic activity uplifts these deposits, exposing them to the surface where they are mined for agricultural uses. High-calcitic limestone is harvested from rock deposits formed about 350 million years ago, when ancient crinoidal marine life thrived and deposited large amounts of calcium carbonate.

Calcium is an essential mineral for biological processes, particularly in egg-laying poultry, where it is a critical component of eggshells. The most common sources of dietary calcium for commercial layers are calcitic limestone and oyster shell meal. Calcitic limestone is widely used due to its high calcium content (approximately 38%) and consistent availability. Both calcitic limestone and oyster shells are valued for their solubility and slow release of calcium, which supports overnight eggshell formation. Alternative sources of calcium are also explored to meet high demands, including marine calcium derived from calcareous marine algae (*Lithothamnium sp.*). Research evaluating the replacement of calcitic limestone with marine calcium in commercial layer diets (utilizing birds from 40 to 84 weeks of age) demonstrates that marine calcium can replace up to 45% of calcitic limestone without negatively affecting layer performance, egg production, egg mass, feed intake, feed conversion ratios, or eggshell thickness. However, inclusions reaching 60% have been shown to negatively impact specific gravity, confirming that substitution thresholds must be carefully managed.

The physical structure of a calcium source heavily influences its solubilization dynamics within the avian gizzard. Geological limestone consists of dense, tightly packed crystalline blocks with limited internal porosity, so acid erosion must occur from the outside inward to provide a predictable, steady release of calcium ions. In contrast, calcified marine algae feature an intricate, three-dimensional porous honeycomb matrix derived from their biological origin, which provides a much higher surface-area-to-volume ratio and drives rapid dissolution.



Laying hens form eggshells primarily during the dark cycle, requiring approximately 200 to 300 mg of ionized calcium per hour during this time. Diets formulated strictly with fine calcium deplete rapidly during daylight feeding hours, forcing the hen to draw excessively from medullary bone reserves overnight, predisposing the bird to skeletal degradation By utilizing a multi-particle strategy, balancing a moderately soluble fine fraction for immediate daytime needs with a coarse particle (2.0 to 4.0 mm). Coarse limestone particles remain in the gizzard as mechanical grit, eroding at a steady rate to ensure a sustained stream of bioavailable calcium ions to the shell gland throughout the dark period.



Shell & Bone Builder, ILC Resources, coarse limestone, oyster shell, and marine algae-derived calcium all function as dietary calcium sources for laying hens, but they differ significantly in physical attributes, structure, and handling properties:

Parameter	Shell & Bone Builder (Coarse Limestone)	Oyster Shell	Marine Algae (Lithothamnium sp.)
Average Particle Size (D_{50})	2,800 – 3,600 μm (~2.8 – 3.6 mm)	3,000 – 6,000 μm (~3.0 – 6.0 mm) highly variable	Finely ground powder (~0.4 mm / 400 μm)
Typical U.S. Mesh Target	Primarily centered on 6 to 8 Mesh	Screen fractions span 3.5 to 10 Mesh	99% passing 0.4 mm mesh
Distribution Uniformity	Narrow, tightly controlled: >95% passing 4 mesh, bulk retained on 6–10 mesh	Broad/wide coefficient of variation: wide spread from large flakes down to fine dust	Homogeneous fine particulate
Particle Morphology	Granular, sub-angular to cubic (aspect ratio ~1:1 to 2:1)	Plate-like, flat, irregular flakes (high aspect ratio)	Porous, three-dimensional honeycomb vegetative cell wall matrix
Bulk Density (Loose)	~84 – 88 lb/ft^3 (consistent flow)	~45 – 55 lb/ft^3 (low bulk density, prone to bridging)	Variable fine powder

Finally, concerning handling and feeder uniformity, the larger particle size in this case, Shell & Bone Builder, tends to flow more easily. With a lower bulk density, such as oyster shell, it increases the risk of feed segregation in augers and chain feeders. Coarse limestone has a narrow distribution and higher density that minimize separation and selective bird sorting, while marine algae blends smoothly into mash diets, provided inclusion levels are controlled below the 45% threshold to prevent drops in egg specific gravity.

Beyond physical and biological properties, practical feed formulation requires a close evaluation of commercial availability and cost-effectiveness. Feed-grade calcitic limestone remains the most economically advantageous and widely available dietary calcium source. Oyster shell typically commands a higher market price, with availability subject to regional harvesting fluctuations and shipping distances from coastal processing facilities. Meanwhile, marine algae derived from *Lithothamnium sp.* is positioned as a specialty, premium alternative. Although commercial availability is sufficient to supply the market and support livestock integration, specialized harvesting from specific marine environments and complex drying and milling procedures result in a significantly higher cost per ton than calcitic limestone.

Selecting the appropriate dietary calcium source is a critical management decision that directly impacts commercial layer performance, skeletal integrity, and eggshell quality. While traditional options like coarse calcitic limestone and commercial oyster shells remain foundational for providing the mechanical gizzard retention and slow release solubilization dynamics necessary for nighttime shell calcification, alternative mineral sources such as marine algae (*Lithothamnium sp.*) offer viable supplementary benefits. Research shows that marine calcium can replace up to 45% of calcitic limestone in layer diets without compromising egg production, feed conversion, or shell thickness, provided inclusion thresholds and cost parameters are carefully managed. By balancing economic availability with the unique physical attributes and solubilization dynamics of each calcium source—from the high density and low cost limestone to the specialized benefits of marine-derived alternative nutritionists can optimize feed formulations to support bird health and maximize profitability.

Reference for the article:

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