



## Ingredient Particle Size And Nutrient Availability In Free-Choice Minerals

When formulating free-choice minerals for cattle, there are different schools of thought regarding particle size. Many companies make minerals consisting of large prills or granules. In contrast, Vigortone requires sources of calcium and phosphorus with specific characteristics for size in microns, surface area (sq. cm/gram), particles per gram, and bulk density (lbs/cu. ft.). Because of these requirements, Vigortone minerals are smaller in particle size than prilled or large granule formulations. This is intentional.

One major reason Vigortone minerals are formulated for a specific particle size is for maximum nutrient availability to the animal.

*Q. How does optimum particle size affect nutrient availability?*

A. In order for a nutrient such as calcium or phosphorus to be made available to the animal, it must first be released from its source in the digestive tract. In order to do this, calcium carbonate or dicalcium phosphate needs to react or solubilize with hydrochloric acid in the stomach. Smaller particles are more soluble, resulting in a faster release of the nutrient. The following graph illustrates this point with calcium carbonate. As particle size of the calcium carbonate decreases from large to fine, solubility and release of calcium increases.

*Q. Which particle size is best?*

A. Particle size can be too large or too small. The large granule or prill, as is found in some mineral mixes, is less acid soluble (45%), releasing calcium too slowly, and a significant

amount passes through the animal before it can be utilized. Acid solubility from the fine particle size (58%) is too extensive and calcium released too quickly to be fully absorbed before passing through the animal.

Acid solubility of the medium-sized particle is intermediate (50%), more closely matching the rate of feed passage through the cow or calf's digestive tract. As a result, calcium (as well as phosphorus in the case of dicalcium phosphate) is more extensively absorbed and utilized.

After almost 100 years of experience, Vigortone has determined particle size and density requirements needed to match those demonstrated for the medium category shown in the graph. This is one of the "secrets" of Vigortone's success in mineral formulation and why producers can expect better performance on a Vigortone mineral program.

### Calcium Carbonate Acid Solubility

