



RESEARCH > REVIEW >

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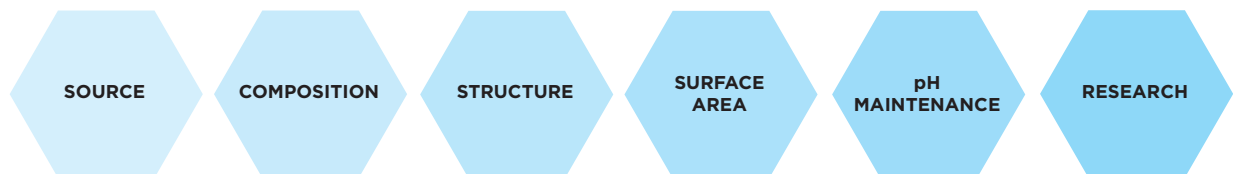
## What Makes a Good Gastric Support Supplement, and Are All Marine-Derived Calcium Sources the Same?

WHY “SEAWEED-DERIVED CALCIUM” IN EQUINE FEEDS AND SUPPLEMENTS IS DIFFERENT FROM OTHER “MARINE-DERIVED SOURCES”?

### < INTRODUCTION AND BACKGROUND >

Gastric discomfort affects up to 90% of performance horses.<sup>1</sup> As such, research is ongoing and critical in evaluating the ability of nutraceuticals to support gastric health. Recently, the use of marine-derived calcium sources to support gastric health in horses has gained popularity. However, a distinction should be made between “marine-derived” calcium sources and those that are considered “seaweed-derived” calcium sources. Not all marine-derived calcium sources are created equally, and the novel seaweed-derived calcium source, a blend of *Lithothamnion corallioides* and *Phymatolithon calcareum*, utilized in Purina® Outlast® Gastric Support Supplement has been identified as a highly useful gastric buffer for horses.<sup>2,5</sup> If there is a question on what the source is, a quick evaluation of the feed ingredient listing will indicate whether it is the specific blend of *Lithothamnion corallioides* and *Phymatolithon calcareum* (labeled as seaweed derived calcium) or another marine-derived calcium source, which will be labeled as calcite.

The development of Purina® Outlast® Gastric Support products was a rigorous process that culminated with the selection of a unique and exclusive form of seaweed-derived calcium based on its research-backed efficacy. Since the launch of Purina® Outlast®, multiple marine-derived calcium products with similar claims have emerged. The truth, however, is that there are numerous marine-derived calcium sources with varying levels of efficacy on the market, and the following characteristics should be considered as it relates to this unique ingredient:

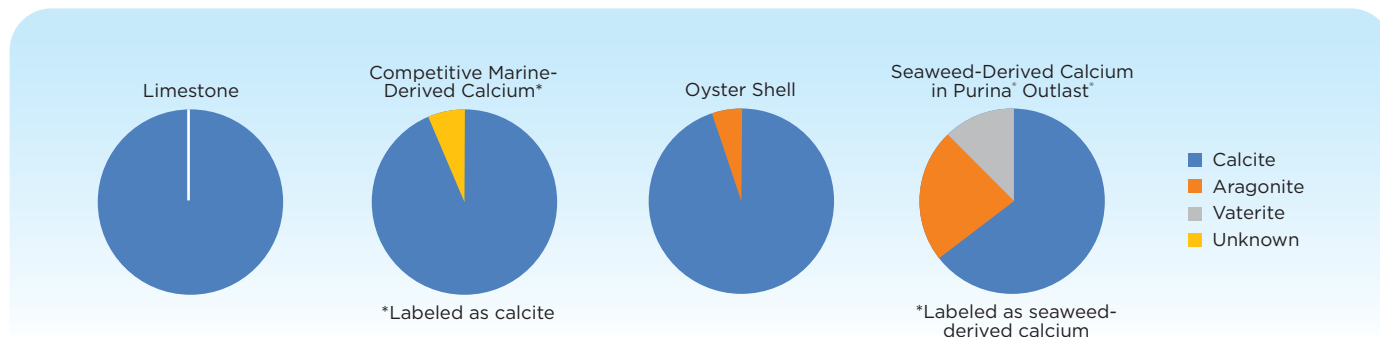


### < SOURCE >

Seaweed is a broad term encompassing thousands of species of marine growing plants. The seaweed-derived calcium utilized by Purina is a specific blend of red algae known to grow only off the coasts of Iceland and Norway. Only the calcified product, not the living material, is permitted to be harvested, and sustainability is paramount. The company that provides Purina with our calcified seaweed is the only company with permission to harvest off the coast of Iceland.<sup>6</sup> This unique source, incorporated into Purina® Outlast®, is identifiable on the ingredient listing of feeds as “seaweed-derived calcium” and is differentiated by other marine-derived calcium sources that are labeled as “calcite.”

## < COMPOSITION >

While several companies claim that all marine-derived calcium sources are the same, this is in fact untrue. In nature, calcium takes on many forms, or polymorphs that all have different compositions and structures. The active ingredient in Purina® Outlast® has a unique chemical composition that differentiates it from other calcium sources. The figure below depicts the chemical compositions of limestone, a common calcium source in equine rations, a competitive marine-derived calcium source, labeled as calcite, oyster shell, a unique source of calcium, and the unique blend of *Lithothamnion corallioides* and *Phymatolithon calcareum*, the active ingredient in Purina® Outlast®, which is labeled as seaweed-derived calcium.



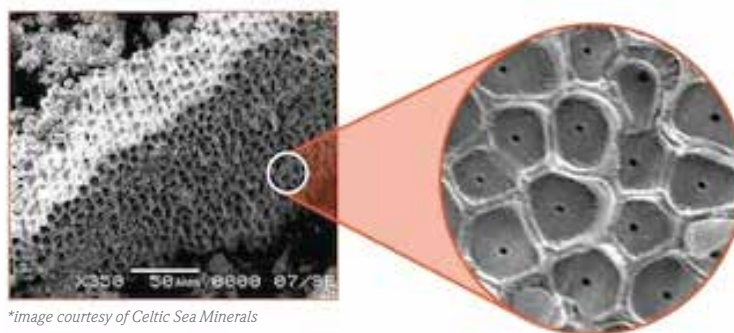
## < STRUCTURE AND SURFACE AREA >

Structure and surface area also vary between calcium sources, which are key factors in their ability to buffer the gastric environment. Limestone, a common source of calcium, has a predominantly crystalline structure, while marine-derived calcium sources have a more porous structure. The degree of porosity (or number of pores) is a differentiating variable between marine-derived calcium sources leading to distinct differences in their efficacies as gastric buffers. The Purina® gastric health products contain a form of seaweed-derived calcium with a very high surface area that is up to fifteen times higher than other calcium sources, which in turn can result in the maintenance of optimal gastric pH.

PRODUCT	BET SURFACE AREA (M <sup>2</sup> G) M2/GRAM
SEAWEED-DERIVED CALCIUM SOURCE IN PURINA® OUTLAST®	10.67
LIMESTONE	1.23
OYSTER SHELL	0.63
COMPETITIVE MARINE-DERIVED CALCIUM 1 (CALCITE)	1.83
COMPETITIVE MARINE-DERIVED CALCIUM 2 (CALCITE)	2.24
COMPETITIVE MARINE-DERIVED CALCIUM 3 (CALCITE)	2.94
COMPETITIVE MARINE-DERIVED CALCIUM 4 (CALCITE)	3.19

A HIGHER SURFACE AREA RESULTS IN AN INCREASED ABILITY TO OPTIMIZE GASTRIC pH

The increased surface area is due to the unique honeycomb structure of the *Lithothamnion corallioides* and *Phymatolithon calcareum* species harvested specifically off the coast of Iceland which is seen in the microscopic evaluation below\*:

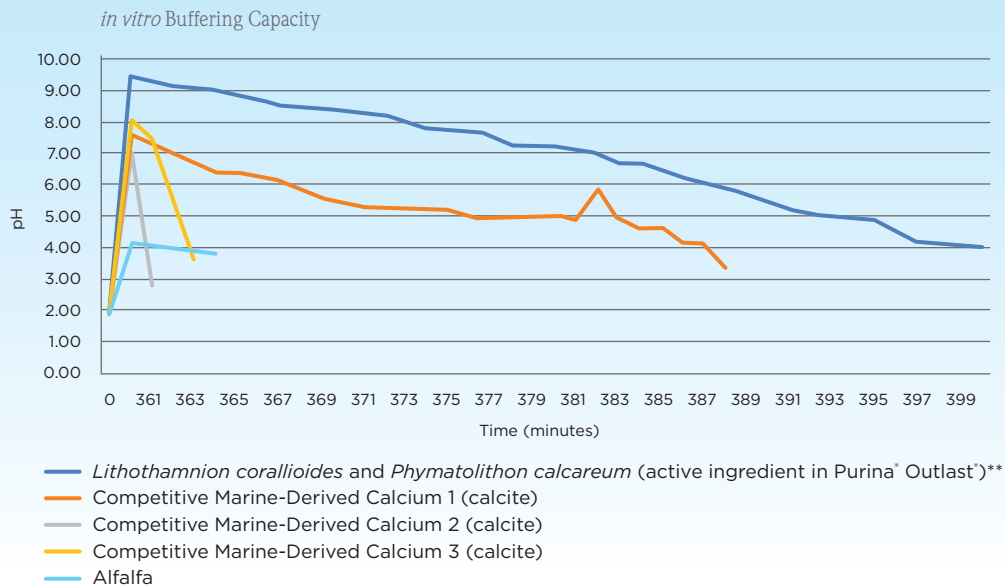


Taken together, the significantly greater surface area and the unique molecular structure of *Lithothamnion corallioides* and *Phymatolithon calcareum* contribute to the performance of Outlast® in supporting equine gastric health and proper pH.

## < pH MAINTENANCE >

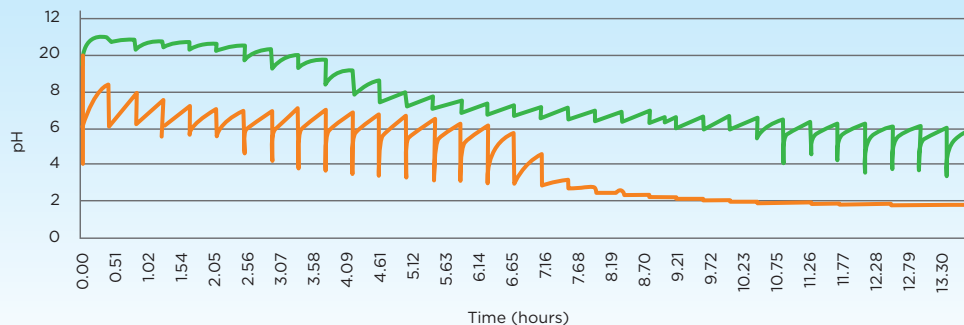
Equine gastric health is best supported when gastric acid is effectively buffered for a sustained period of time. *In vitro* research conducted at the Purina Animal Nutrition Center and by the supplier of our unique seaweed-derived calcium, has determined that the active ingredient in Purina® Outlast® has more buffering capacity than other marine-derived and non marine-derived calcium sources.

In an *in vitro* trial conducted at the Purina Animal Nutrition Center<sup>6</sup>, a simulated equine gastric environment was developed to assess the buffering capacity of gastric support ingredients. For each, a ratio was determined based on the manufacturers recommended dosages and the size of the equine stomach in relation to the reaction vessel. All supplements were ground to simulate chewing and placed in a continually stirring (mimicking gastric motility) and heated (37°C; internal body temperature) beaker containing 1 L of a pH=2.0 hydrochloric acid solution. The ingredients were left in the reaction vessel for 6 hours to allow them to reach the maximum buffering capability of the slowest ingredient as determined in a previous experiment. At 6 hours, 5 mL of a pH=1.0 hydrochloric acid solution was added every minute and pH measurements recorded until the pH in the vessel no longer remained above 4.0. For all time points, pH was measured via a digital pH analyzer (Hach, Loveland CO) and an average of two pH measurements was utilized. The chart below shows that the active ingredient in Purina® Outlast® was able to most successfully buffer the simulated gastric environment compared to any of the competitive marine-derived and non-marine derived gastric support products.



\*\**Lithothamnion corallioides* and *Phymatolithon calcareum* (active ingredient in Outlast) required longer to fall below pH=4 ( $P<0.05$ ) and required more acid to fall below pH=4.0 ( $P<0.05$ ). Statistical differences based on a dummy regression ( $R^2=0.92$ )

Utilizing a unique *in vitro* scientific methodology, it was found that the seaweed-derived active ingredient in Purina® Outlast® (green line), displayed a higher overall ability to neutralize acid than the marine-derived calcite (orange line).

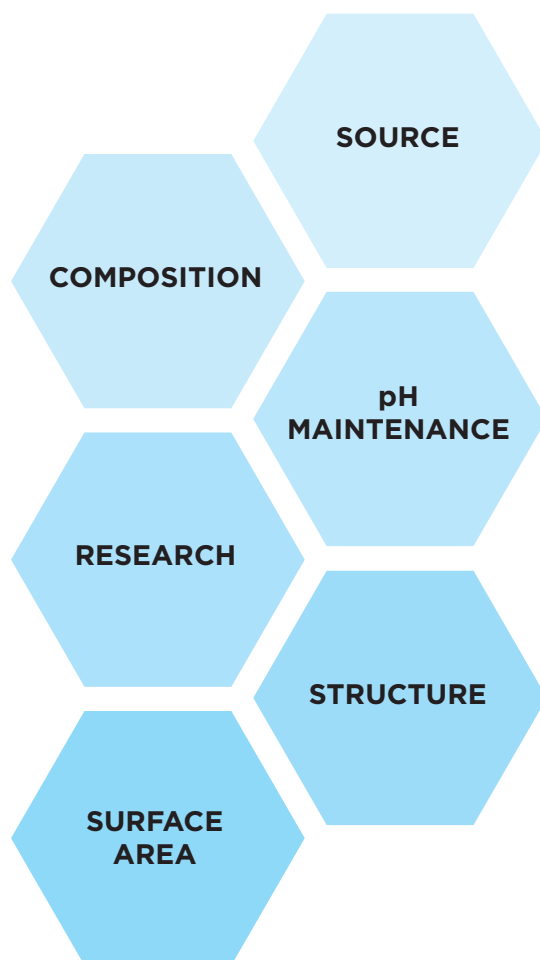


## < RESEARCH >

When determining whether a gastric supplement should be incorporated into an equine ration, certain criteria should be met. Namely, the supplement should be researched in horses to make sure it is compatible with equine physiology, provides the active ingredients at the proper amounts and produces the desired effect. Purina has conducted multiple studies related to the development of Outlast® and to date has four peer-reviewed publications.<sup>2,4</sup> Our supplier of *Lithothamnion corallioides* and *Phymatolithon calcareum* has also conducted their own independent research and to date has published over 50 peer reviewed scientific articles comprising research in a variety of species.

## < CONCLUSION AND IMPLICATIONS >

In conclusion, we hope it is evident that not all gastric support products are created equal, and not all seaweed-derived calcium sources are the same. The differences in source, composition, structure, surface area, and buffering capacity, combined with the research into these differences, all show that the exclusive form of seaweed-derived calcium in select Purina® equine feeds and supplements, is a unique ingredient with an advanced ability to optimize gastric pH.



<sup>1</sup>Sykes, B.W., Hewetson, M., Hepburn, R.J., Luthersson, N. and Tamzali, Y. (2015) European college of equine internal medicine consensus statement—equine gastric ulcer syndrome in adult horses. *Journ. Vet. Int. Med.* 29 (5) 1288-1299.

<sup>2</sup>Jacobs, R.D., Gordon, M.E., and Jerina, M.L. (2019) Feeding a seaweed-derived calcium source vs. calcium carbonate on physiological parameters of horses. *Journal of Equine Veterinary Science.* June 2019.

<sup>3</sup>Gordon, M.E., Jerina, M.L., Young, J.K., Andrews, F.M. (2019) The effect of a natural-source mineral supplement on gastric ulceration in horses. *Journal of Equine Veterinary Science.* June 2019.

<sup>4</sup>Gordon, M.E., Jacobs, R.D., Jerina, M.L. (2019) Feeding natural-source minerals or calcium carbonate to horses: Is there a relationship with TCO<sub>2</sub>? *Journal of Equine Veterinary Science.* June 2019.

<sup>5</sup>Gordon, M.E., Vineyard, K.R., Andrews, F.M. (2019) The effect of a natural-source mineral supplement on gastric juice pH in horses. June 2019.

<sup>6</sup>Jacobs, R.D and Gordon, M.E. HR 246. 2016. Purina Outlast pH comparison.

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< FOR MORE INFORMATION > Contact your local Purina representative if you would like more information about this study.

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