SENTINEL™ HORSE FEEDS

While pressure cooking is not new, this method of feeding is relatively new to the equine industry. Blue Seal Feeds has been a leader in this field, manufacturing 100% Pressure Cooked horse feeds for more than 18 years. Blue Seal offers an extensive line of pressure cooked horse feeds under the Sentinel™ brand of equine products. These Nutrient Release Formula feeds are made with all natural low starch and sugar ingredients and include soybean hulls, beet pulp, rice bran and flaxseed plus vitamins and minerals. They are pressure cooked, forming highly digestible nuggets designed to maximize nutrition and digestion. Extruded feeds are designed for maximum breakdown through enhanced enzyme activity that starts as soon as your horse takes its first bite.

Protect your horse's health at every life stage with Sentinel™ Horse Feeds, the Guardian of Equine Health™, manufactured by Blue Seal Feeds.

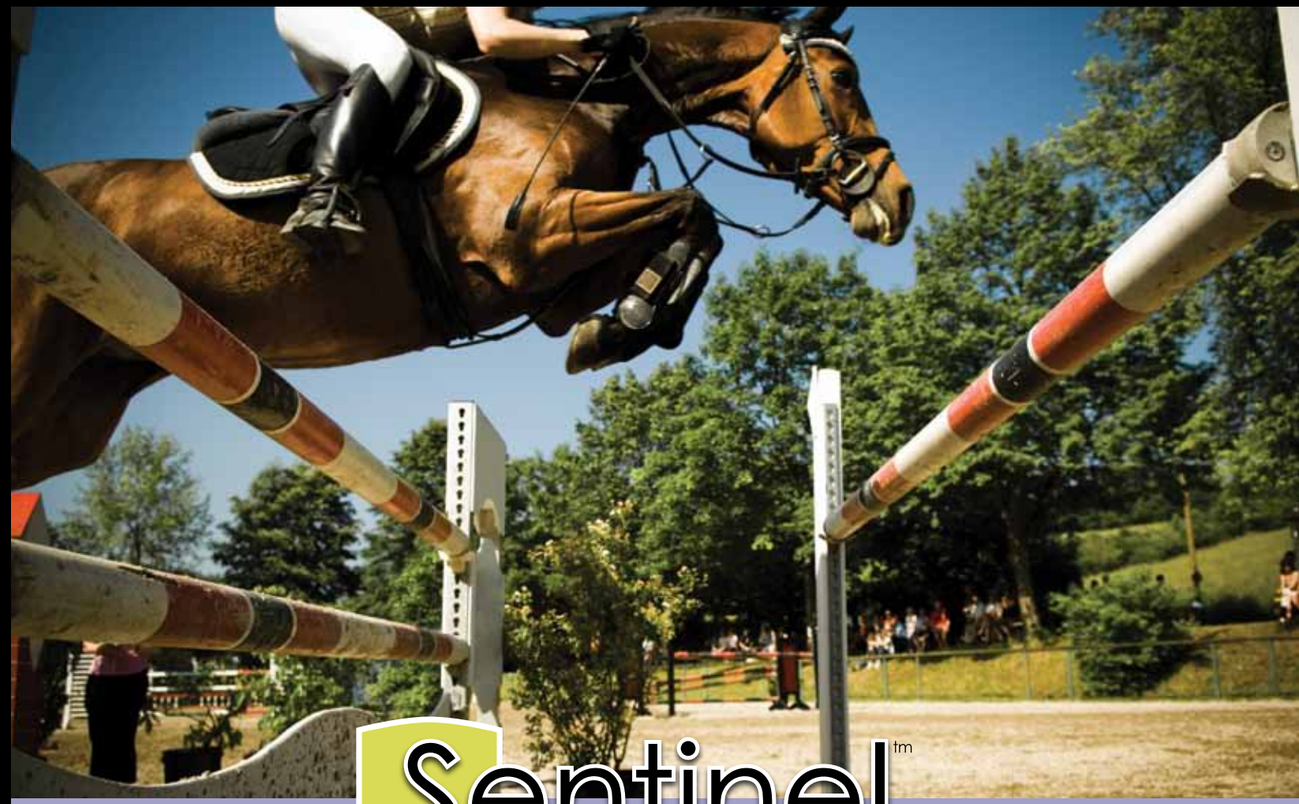
Sentinel™ Safe Start, Sentinel™ Grow & Excel, Sentinel™ Performance LS, Sentinel™ LifeTime, Sentinel™ Senior

Sentinel
GUARDIAN OF EQUINE HEALTH™

Find the best formula for your horse at www.sentinelfeed.com
Blue Seal Feeds, Londonderry, NH 800.367.2730
a division of Kent Nutrition Group, Inc.

Sentinel™ Science:

PRESSURE COOKED HORSE FEED FOR OPTIMAL NUTRITION AND DIGESTIVE HEALTH



Sentinel™
GUARDIAN OF EQUINE HEALTH™

BLUE SEAL®

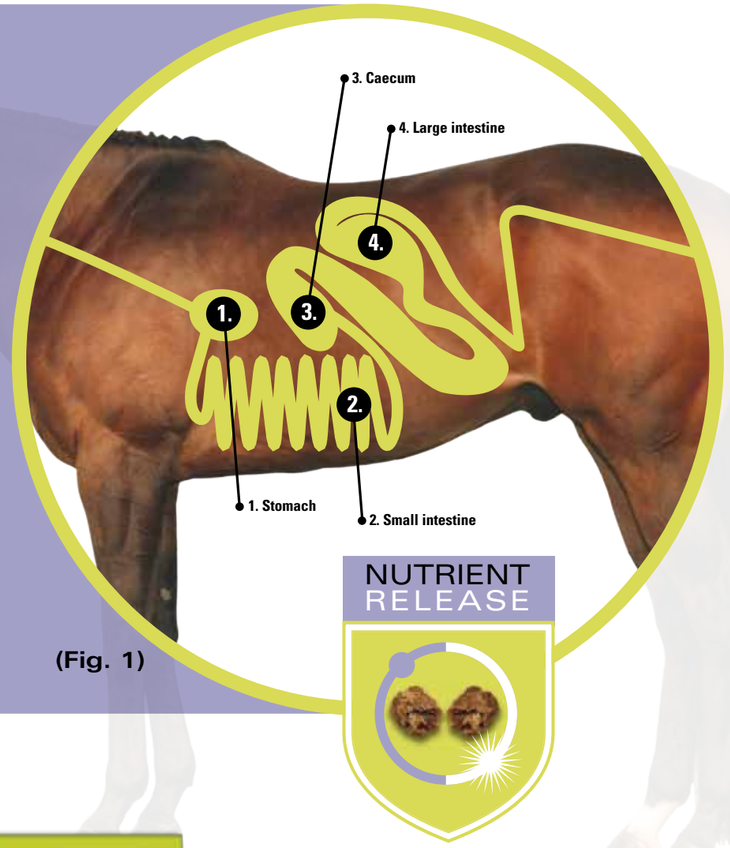
Pressure Cooking of horse feeds is the most technologically advanced method of equine feed processing, offering multiple nutritional and digestive benefits to the horse.

The process of pressure cooking involves combining moisture, heat and pressure to rapidly cook the ingredients. In the cooking process, starch and protein bonds are broken (gelatinization of starch and denaturation of protein). As the formula is forced through a die to determine size and shape, the pressure is released and the starch molecules expand, resulting in a low density food nugget. The product is then rapidly cooled to retain its high nutritional quality. This advanced cooking and cooling process results in a food that works safely and naturally with the equine digestive system.

UNDERSTANDING THE EQUINE DIGESTIVE SYSTEM

The horse has a unique digestive system designed for the continuous intake of small amounts of feed consisting primarily of forage or fiber ingredients. Enzymatic digestion of proteins, starches and fats is designed to occur in the relatively small capacity fore-gut (stomach and small intestine) while the digestion of fiber is designed to occur in the large capacity hind-gut (caecum and large intestine) by bacterial fermentation (see Figure 1).

Any factor that results in a deviation from this design can lead to digestive challenges and ultimately affect horse health. Undesirable eating behaviors, impaired digestive function, reduced nutrient absorption or feed management such as meal feeding of high grain diets can result in decreased fore-gut or pre-caecal digestion of starch and protein. Undigested starch passes to the hind-gut and undergoes rapid fermentation leading to potential digestive upsets such as colic and laminitis (founder). Undigested protein will also pass to the hindgut where absorption is significantly lower and microbial attack alters the amino acid quality. Hence a high pre-caecal digestibility of starch and protein is desirable.



(Fig. 1)

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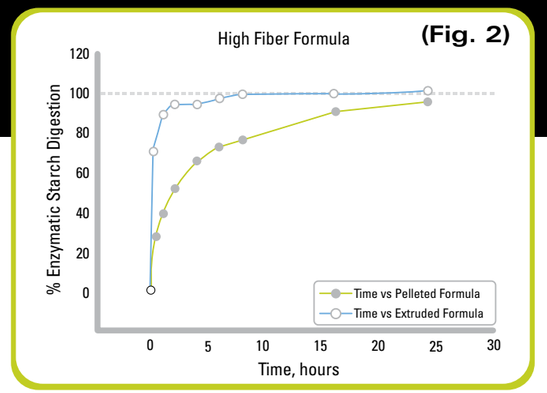

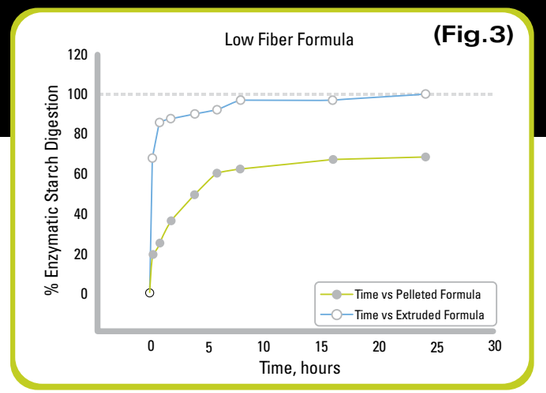

RESEARCH SUPPORTS PRESSURE COOKING

Pressure cooking, also known as extrusion, has been evaluated in numerous human and animal studies for its nutritional benefits compared to other processing techniques such as grinding and pelleting.

Improved Safety of Feed: The heat generated in the cooking process improves the safety and quality of the feed by reducing potentially harmful microorganisms or other pests that may be found in grain while eliminating anti-nutritional factors.[1] *Harmful microorganisms can lead to digestive disturbances as well as neurological disorders.*

Healthier Rate of Feed Intake: Research by Hintz et al.[2] showed a slower rate of feed intake when horses consumed an extruded form of a ration compared to the unprocessed or pelleted form of the ration. The lower density of extruded feeds is believed to be the primary factor affecting rate of consumption. *A decreased rate of intake has been advocated as being beneficial in the prevention of digestive upsets in horses.*[3]

Increased Digestibility: Research has shown that heat treatment increases the digestibility of starch and protein, and that high temperature combined with high moisture, as with pressure cooking, results in the greatest digestibility.[4] Increased digestibility optimizes nutrient availability and utilization to the horse.

Research has also shown that extrusion increases starch availability and digestion of grains in the small intestine, effectively reducing the risk of an outflow of starch to the hind-gut.[5,6] This increase in pre-caecal digestibility of starch has been attributed to the gelatinization or break down of the intermolecular starch structure through extrusion, thereby exposing the molecules to greater enzymatic digestion in the small intestine.

In a recent study conducted by Blue Seal Feeds,[7] this increased digestive potential of starch in the small intestine with an extruded feed was observed. Two low starch feeds (a high fiber and a low fiber) were either pelleted or extruded and then subjected to in-vitro enzymatic starch digestion. In both feeds a faster rate of enzymatic starch digestion was observed with the extruded form (see Figures 2 and 3).

Greater than 90% of the starch from the pressure cooked feed was digested in less than 5 hours while less than 70% of the starch was digested from the pelleted feed. A faster rate of enzymatic starch digestion, specifically at less than 5 hours, dramatically increases the potential for starch to be digested in the small intestine of the horse. This limits the amount of starch reaching the hindgut, reducing the potential for digestive disturbances that can lead to colic and laminitis (founder).

IMPLICATIONS

Improved feed safety, a more natural eating behavior and increased pre-caecal and total tract digestibility helps minimize common digestive challenges that can lead to choke, colic and laminitis (founder). Improved starch digestibility suggests that more calories are available to the horse for maintaining weight and body condition in less feed. Improved protein digestibility suggests that more essential amino acids are available for sustaining healthy growth and optimal performance. For all horses, feeding a pressure cooked horse feed means providing the best in nutrition and digestive health.

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3 Wyman, W.E.A. South Carolina Ag. Exp. Stal. Bul. 22. 1985.
4 NRC. 2007. Nutrient Requirements of Horses. 6th rev. ed. National Academy Press, Washington, DC.
5 Vervuert, I., K. Voigt, T. Hollands, D. Cuddeford, M. Coenen. Effects of Processing Barley on its digestion by Horses. The Veterinary Record, May 24, 2008. 162-21:684-688.
6 Holm, J., I. Lundquist, I. Bjorck, A. Eliasson, N. Asp. Degree of Starch Gelatinization, Digestion Rate of Starch in vitro, and Metabolic Response in Rats. American Journal of Clinical Nutrition 47, 1010-1016. 1988.
7 Rompala, unpublished data. Blue Seal Feeds. 2009

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