

PRODUCT PROFILE

Key facts

- Beta-mannans (β -mannans) found in soybean meal (and other common feedstuffs) trigger an innate immune system response in animals¹⁻²
- This Feed-Induced Immune Response (FIIR) consumes energy responding to β -mannans³⁻⁶
- Hemicell breaks down β -mannans in soybean meal, preventing the wasteful FIIR^{9,11}
- Therefore, the animal has more energy available for growth and performance³⁻⁶
- Hemicell is a unique and patented enzyme
- A fermentation product produced by *Bacillus lentus* (Hemicell) or *Paenibacillus lentus* (Hemicell HT)*
- Key ingredient is *Endo-1,4- β -mannanase*
- Hemicell is approved for use in broilers, turkeys and swine diets

*Production microorganism registered under new name of *Paenibacillus lentus* in several regions.

Beta-mannans

β -Mannans (β -galactomannans) are non-starch polysaccharide (NSP) fibers found in leguminous feed ingredients. The animals innate immune system recognizes β -mannans as an intruder because they have a similar molecular pattern to some pathogens¹⁻². This triggers an innate immune response which consumes energy and nutrients³⁻⁶. Even small amounts of β -mannans trigger the response. The presence of the β -mannan fibers can have the effect of reducing glucose absorption⁷⁻⁸, insulin secretion⁷⁻⁸ and increasing viscosity⁹⁻¹⁰.

Enzyme mechanism

Enzymes are proteins produced by living organisms. They act as catalysts for many biochemical processes in the body. All animals use enzymes to digest feed. Each enzyme has a specific structural arrangement that binds with a specific substrate. Once bound, an enzyme breaks down certain substrates into component parts. Then, the enzyme moves on to repeat this action. A variety of factors affect enzymes, including pH and temperature.

Hemicell: Mode of action

Some enzymes reduce fiber viscosity and improve performance via rate of passage. Others improve nutrient digestibility by "opening" feed components that the animal is unable to access on its own. These are considered **energy-releasing enzymes**. Hemicell is different. Hemicell is an **energy-sparing enzyme**.

The animal's innate immune system perceives β -mannans as a Pathogen Associated Molecular Pattern (PAMP) and initiates a protective action¹⁻² or a Feed-Induced Immune Response (FIIR). This diverts energy away from growth³⁻⁶. It also reduces nutrient absorption^{9,10}, and lowers secretion of insulin⁷⁻⁸. This response can consume about 3% of total metabolizable energy¹¹. Hemicell works by breaking down β -mannans in soybean meal and other common feedstuffs^{9,11}. By acting on the β -mannans in the feed, Hemicell minimizes this response. The resulting breakdown product created does not trigger the FIIR. Instead, the animal's body directs energy to growth and performance³⁻⁶.

Implications for the food industry

- Global demand for animal nutrition and protein is growing, partly as emerging markets shift to higher-protein diets.
- Feed is the No. 1 input cost for food animal production, and energy is the most expensive component of feed.
- β -Mannans in feed trigger a FIIR¹⁻² that can consume up to 3% of total metabolizable energy¹¹, making it unavailable for growth.
- Hemicell prevents this unneeded FIIR enabling the animal to direct more energy to growth and performance³⁻⁶.

Support services

- Nutrition and technical consulting.
- Global analysis of β -mannan levels in common feed ingredients.
- Local analysis and calculation of β -mannan levels in specific feed.

Hemicell product specifications for use in animal feeds

Application	Active enzyme(s)	Storage conditions	Stability	Recommended Inclusion per Tonne of Complete Feed			
Hemicell HT (heat tolerance to pelleting temperatures of 88° C)				Broilers	Turkeys	Weaned Pigs	Pigs for Fattening
Pelleted feed (applied in mixer)	<i>Endo-1,4-β-D-mannanase</i>	≤ 24° C	24 mos.	330 g	330 g	300 g	300 g

Guaranteed analysis

Hemicell HT β-Mannanase (EC 3.2.1.78) (from *Paenibacillus lentus*), not less than 160 million units per kg product.

One unit of β-mannanase activity is defined as the amount of enzyme which generates 0.72 microgram of reducing sugars per minute from a mannose-containing substrate at pH 7.0 and temperature of 40° C.

Approvals and safety

- Hemicell is approved for broiler, turkey and swine diets.
- Hemicell has no restrictions when used in combination with other feed ingredients.
- Hemicell does not require a withdrawal period.
- The label contains complete use information, including cautions and warnings. Always read, understand and follow the label and use directions.

References

- ¹ Ausubel, F. 2005. "Are innate immune signaling pathways in plants and animals conserved?" *Nature Immunol.* 6(10): 973-979.
- ² Stahl, P. and Ezekowitz, R. 1998. "The mannose receptor is a pattern recognition receptor involved in host defense." *Curr. Opin. Immunol.* 10(1): 50-55.
- ³ Spurlock, M. 1997. "Regulation of metabolism and growth during immune challenge: an overview of cytokine function." *J. Anim. Sci.* 75: 1773-1783.
- ⁴ Gabler, N. and Spurlock, M. 2008. "Integrating the immune system with the regulation of growth and efficiency." *J. Anim. Sci.* 86: E64-E74.
- ⁵ Korver, D. 2006. "Overview of the Immune Dynamics of the Digestive System." *J. Appl. Poultry Res.* 15: 123-135.
- ⁶ Klasing, K. 2007. "Nutrition and the immune system." *Br. Poult. Sci.* 48(5): 525-537.
- ⁷ Leeds, A. and Kang, S. 1980. "The pig as a model for studies on the mode of action of guar gum in normal and diabetic man." *Proc. Nutrition Society* 44A.
- ⁸ Sambrook, I. and Rainbird, A. 1985. "The effect of guar gum and level and source of dietary fat on glucose tolerance in growing pigs." *Brit. J. Nutr.* 54(01): 27-35.
- ⁹ Lee, J., Bailey, C. and Cartwright, A. 2003. "β-Mannanase Ameliorates Viscosity-Associated Depression of Growth in Broiler Chickens Fed Guar Germ and Hull Fractions." *Poultry Sci.* 82:1925-1931.
- ¹⁰ Couch, J., Bakshi, Y., Ferguson, T. et al. 1967. "The effect of processing on the nutritional value of guar meal for broiler chicks." *Brit. Poultry Sci.* 8(4): 243-250.
- ¹¹ Daskiran, M., Teeter, R., Fodge, D. and Hsiao, H. 2004. "An Evaluation of Endo-β-D-mannanase (Hemicell) Effects on Broiler Performance and Energy Use in Diets Varying in β-mannan Content." *Poultry Sci.* 83: 662-668.

For further information please contact

Elanco Denmark ApS
E-mail: nordic@elanco.com

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