
Hemicell[®] product profile for poultry

Key facts

- Beta-mannans (β -mannans) found in soybean meal (and other common feedstuffs) trigger an innate immune system response in animals¹⁻⁵
- This Feed-Induced Immune Response (FIIR) consumes energy responding to β -mannans⁶⁻⁹
- Hemicell breaks down β -mannans in soybean meal, preventing the wasteful Feed-Induced Immune Response (FIIR)^{12,14}
- Therefore, the animal has more energy available for growth and performance⁶⁻⁹
- Hemicell is a unique and patented enzyme
- A fermentation product produced by *Bacillus lentus*
- Key ingredient is *Endo-1,4- β -D-mannanase*
- Hemicell is approved for use in poultry diets in most major global markets

Beta-mannans

β -Mannans (β -galactomannans) are non-starch polysaccharide (NSP) fibers found in leguminous feed ingredients. The body's innate immune system recognizes β -mannans as an intruder because they have a similar molecular pattern to some pathogens.^{1,2,3,4,5} This triggers an innate immune response which consumes energy and nutrients.^{6,7,8,9} Even small amounts of β -mannans trigger the response. The presence of the β -mannan fibers can have the effect of reducing glucose absorption^{10,11}, insulin secretion^{10,11} and increasing viscosity.^{12,13}

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: A unique MOA

Some enzymes reduce fiber viscosity and improve performance via rate of passage. Others improve nutrient digestibility by "opening up" feed components 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 action¹⁻⁵: a Feed-Induced Immune Response (FIIR). This diverts energy away from growth.⁶⁻⁹ (It also reduces nutrient absorption^{12,13} and lowers secretion of insulin.^{10,11}) This response can consume about 3% of total metabolizable energy.¹⁴ Hemicell works by breaking down β -mannans in soybean meal and other common feedstuffs.^{12,14} By acting on the β -mannans in the feed, Hemicell minimizes this response. The resulting new product created does not trigger the Feed-Induced Immune Response (FIIR). Instead, the animal's body directs energy to growth and performance.⁶⁻⁹

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 an innate immune response (FIIR)¹⁻⁵ that can consume up to 3% of total metabolizable energy¹⁴, making it unavailable for growth.
- Hemicell breaks down β -mannans so they don't trigger a Feed-Induced Immune Response.^{12,14} Preventing this unneeded response enables the animal to direct more energy to growth and performance.⁶⁻⁹

Support services

- Liquid application systems designed, built and tested internally before installation.
 - Professional, start-to-finish installation with minimal mill disturbance.
 - State-of-the-art enzyme assay capability for monitoring customer feed enzyme levels.
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Hemicell product specifications for use in poultry feeds

Hemicell form	Application	Active enzyme(s)	Storage conditions	Stability	Dosage per ton of complete feed
Hemicell*					
Liquid	Pelleted feed (applied post-pellet)	Endo-1,4-β-D-mannanase	≤ 24° C (75° F)	12 mos.	100 ml enzyme with 0.90 L water
Hemicell U*†					
Liquid	Pelleted feed (applied post-pellet)	Endo-1,4-β-D-mannanase; Endo-1,4-β-D-xylanase	≤ 24° C (75° F)	12 mos.	100 ml enzyme with 0.90 L water
Hemicell HT** (heat tolerance to pelleting temperatures of 190° F or 88° C)					
Dry	Pelleted feed (applied in mixer)	Endo-1,4-β-D-mannanase	≤ 24° C (75° F)	12 mos.	0.80 lbs.
Liquid	Pelleted feed (applied in mixer)	Endo-1,4-β-D-mannanase	≤ 24° C (75° F)	9 mos.	100 ml enzyme

Safety

- Hemicell is generally recognized as safe.
- 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.

- Song, W., Wang, G., Chen, L. et al. 1995. "A Receptor Kinase-Like Protein Encoded by the Rice Disease Resistance Gene, *Xa21*." *Science*. 270: 1804-1806.
- Beutler, B., Jiang, Z., Georgel, P. et al. 2006. "Genetic Analysis of Host Resistance: Toll-Like Receptor Signaling and Immunity at Large." *Annu. Rev. Immunol.* 24: 353-389.
- Ausubel, F. 2005. "Are innate immune signaling pathways in plants and animals conserved?" *Nature Immunol.* 6(10): 973-979.
- Didierlaurent, A., Simonet, M. and Sirard, J-C. 2005. "Innate and acquired plasticity of the intestinal immune system." *Cellular and Molecular Life Sciences*. 62: 1285-1287.
- 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.
- Spurlock, M. 1997. "Regulation of metabolism and growth during immune challenge: an overview of cytokine function." *J. Anim. Sci.* 75: 1773-1783.
- Gabler, N. and Spurlock, M. 2008. "Integrating the immune system with the regulation of growth and efficiency." *J. Anim. Sci.* 86: E64-E74.
- Korver, D. 2006. "Overview of the Immune Dynamics of the Digestive System." *J. Appl. Poultry Res.* 15: 123-135.
- Klasing, K. 2007. "Nutrition and the immune system." *Br. Poult. Sci.* 48(5): 525-537.
- 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.
- 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.
- 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.
- 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.
- 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.

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Guaranteed analysis

- Hemicell* (liquid) β-mannanase (*Bacillus lentus*) not less than 720 MU/L.
- Hemicell U*† (liquid) β-mannanase (*Bacillus lentus*) not less than 720 MU/L.; xylanase (*Trichoderma longibrachiatum*), not less than 400 MU/L.
- Hemicell HT** (dry) β-mannanase (EC 3.2.1.78) (from *Bacillus lentus*), not less than 72.5 MU/lb.
- Hemicell HT** (liquid) β-mannanase (EC 3.2.1.78) (from *Bacillus lentus*), not less than 590 MU/L.

*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 7.5 and temperature of 104° F.

†One unit of xylanase activity is defined as the amount of enzyme that liberates 0.72 microgram of reducing sugars (xylose equivalents) per minute from a xylan-containing substrate (birch wood xylan) at pH 5.5 and 104° F.

**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 104° F.

Global approvals

Hemicell is approved for poultry in most major global markets.

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