



HBS

Reference Guide

The Latest Research, Insights and
Management Strategies for Addressing
Hemorrhagic Bowel Syndrome





Introduction

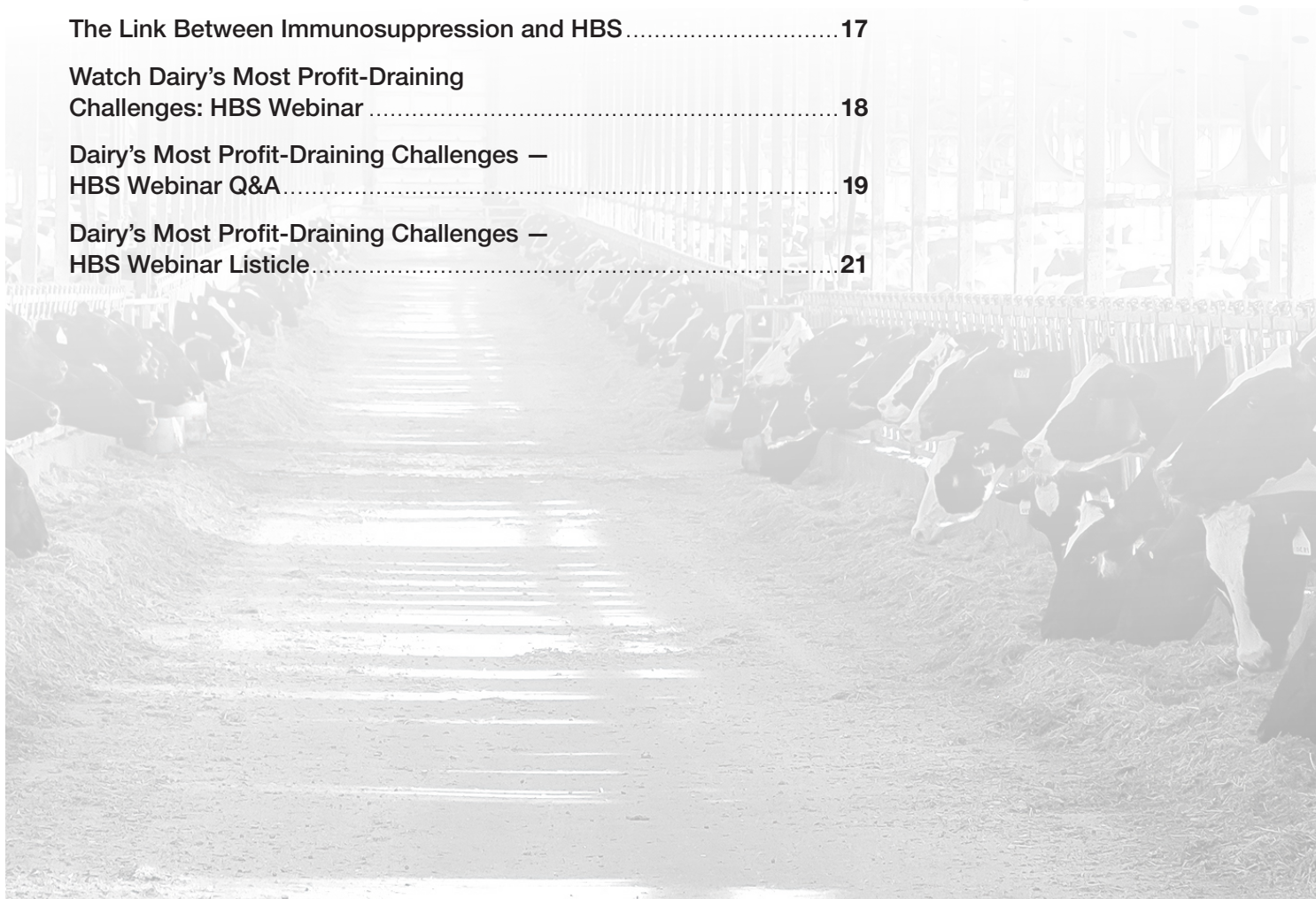
The increasing occurrence of hemorrhagic bowel syndrome (HBS) in dairy cattle is a growing concern among producers, nutritionists and veterinarians. The deadly hemorrhaging that takes place in the small intestine is swift and unexpected, with the potential to occur in any herd and in any dairy breed. Confirming that a cow's cause of death is HBS is important to properly support the health of the remaining herd.

This guide is a quick reference tool containing the latest insights and studies of HBS and its effect on dairy herds. We have collected valuable information on the subject, including the latest studies, the impact on operations, expert opinions, the relationship between HBS and *Aspergillus fumigatus*, and the benefits of supporting the immune system. While there remains no cure for HBS, we have included several management strategies that can be incorporated both proactively and reactively to boost herd health.



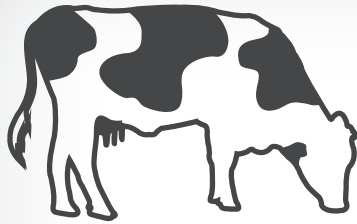
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HBS + AF FACTS

HEMORRHAGIC BOWEL SYNDROME (HBS) + *ASPERGILLUS FUMIGATUS*



ONLY 38% OF ALL OPERATIONS KNOW HOW TO PROPERLY IDENTIFY HBS¹

KNOW THE WARNING SIGNS

Common symptoms of HBS include³:



Dehydration



Dark, tarry feces (melena)



Decreased feed intake

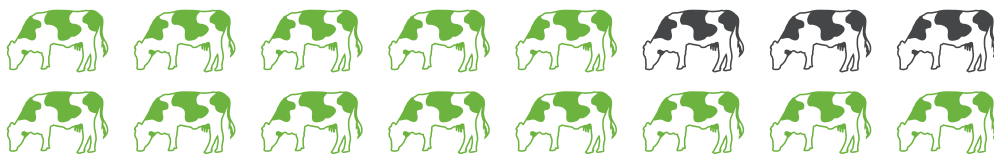
Other symptoms to watch for: decreased milk production; depression; colic; decreased rumen motility; fecal volume reduced to scant; clotted blood in feces³

A Fatal Problem

79.3% OF COWS WITH HBS WERE REMOVED FROM THE HERD¹

\$2,104 PER HEAD IS THE COST FOR A REPLACEMENT HEIFER²

A POTENTIAL CULPRIT



13 OF 16 COWS THAT DIED OF HBS WERE *A. FUMIGATUS* POSITIVE⁴

Hypothesized as either contributing directly to the syndrome or as an agent that impaired the immune system⁵

While HBS is unpredictable and fatal, OmniGen[®] nutritional specialty products offer immune support that can serve as an important line of defense. **Learn more about the benefits of OmniGen at TheOmniGenDifference.com.**



¹USDA, 2014. Dairy 2014 Health and Management Practices on U.S. Dairy Operations. NAHMS-2014. ²<https://www.wisfarmer.com/story/news/2021/01/26/successful-heifer-management-should-they-grow-do-they-go/4269734001/#:~:text=According%20to%20a%20recent%20study,costs%20and%2012%25%20fixed%20costs.> ³McGuirk, S. M., 2014. Hemorrhagic Bowel Syndrome: Update and Observations. Madison, WI, University of WI-Madison School of Veterinary Medicine. ⁴Socket, D. C., et al. 2004. Proc. Am. Assoc. Vet. Lab. Diagnos. 36. ⁵Van Metre, D. C., R. J. Callan, 2005. Western Dairy News: Research Progress in Hemorrhagic Bowel Syndrome. Colorado State University. University of Colorado.

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Technical Bulletin: Hemorrhagic Bowel Syndrome

Summary

- 14% of herds identified hemorrhagic bowel syndrome (HBS) as a problem and 79.3% of cows with HBS were removed from the herd due to death or culling (NAHMS, 2014).
- *Aspergillus fumigatus* (AF) a pathogenic invasive mold is associated with HBS (Van Metre, 2006).
- OmniGen® nutritional specialty products may assist cows in addressing AF by supporting the immune system and through its antifungal properties in feed.

Introduction

Hemorrhagic bowel syndrome is characterized as an acute and sometimes massive hemorrhage in the small intestine (Rowson and LaFaunce, 2014, Figure 1). Symptoms include: depression, rumen stasis, a sudden decrease in milk production, colic, dehydration, dark feces and clotted blood in feces (McGuirk, 2014). This syndrome results in a fatality rate of > 85% (Kirkpatrick, 2001).

Aspergillus fumigatus (AF) is a common invasive fungus that can be found in forages and feed ingredients. The DNA from AF is frequently found in blood and tissues of cows that were diagnosed with HBS. Van Metre (2006) reports, “there are currently two hypotheses regarding its participation: 1) as a primary contributor to the intestinal lesion, or 2) as an agent that impairs the cow’s immune system.”

There has been speculation that *C. perfringens* Type A plays a role in HBS. However, research at the University of Wisconsin (Table 1) showed that *A. fumigatus* ($P < 0.001$) could be associated with HBS but the association between *C. perfringens* type A ($P = 0.466$) with HBS was not as clear (Socket, 2004).

Controlling HBS

Attempts to create HBS in a laboratory setting have failed. Field experience and case studies are useful to determine what health events are present when cows are fed OmniGen® nutritional specialty product or not fed OmniGen. In one field study conducted by Chapman (2007), in the periods where OmniGen was fed, the herd

reported fewer HBS cases, fewer dead cows and less mastitis (Table 2).

Puntenney (2003) reported the growth of AF in feed was reduced when OmniGen was mixed in the feed (Figure 2). Feeding OmniGen improved immune function in ruminants fed feed containing AF providing evidence that enhanced immune function in cows fed OmniGen may help overcome the effects of AF (Forsberg, 2006).

Media was inoculated with AF. The growth of AF was retarded for more than five hours after inoculation in the media containing OmniGen.



Figure 1. Necropsy reveals massive blood clots in intestines characteristic of a cow that died from HBS.

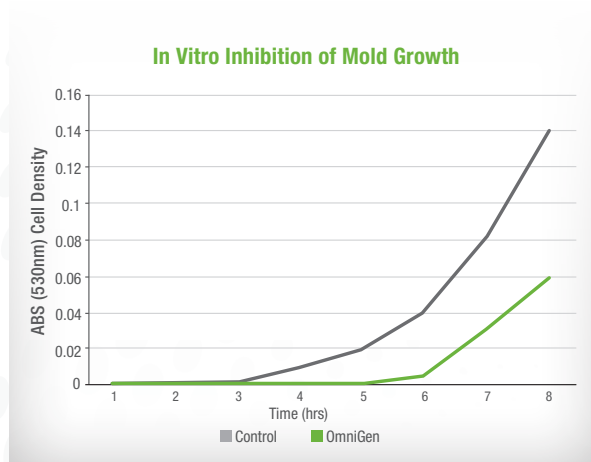


Figure 2: In vitro inhibition of mold growth.

Table 1

| Cause of Death | Number of samples | Number <i>C. perfringens</i> Type A positive | Number <i>A. fumigatus</i> positive |
|-----------------------|-------------------|--|-------------------------------------|
| HBS | 16 | 14 | 13 |
| Other GI Tract Issues | 9 | 6 | 0 |

Table 2

| Issues | Control Feeding Period (no OmniGen) | | OmniGen Feeding Period | |
|-----------|-------------------------------------|-------------|------------------------|-------------|
| | Total Cases | Cases/Month | Total Cases | Cases/Month |
| HBS | 14 | 2.5 | 2 | 0.2 |
| Mastitis | 41 | 7.3 | 18 | 2.1 |
| Dead Cows | 46 | 8.2 | 29 | 3.5 |

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Chapman, J. D. 2007. Results of an 18 Month Case Study at a Minnesota Dairy When Diets Were Supplemented with OmniGen-AF. OG1010107.

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Van Metre, D. C. 2006. Hemorrhagic Bowel Syndrome: an Update. Minnesota Dairy Health Conference. Pp 81-87.

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Measuring and Managing HBS and Other Costly Issues

Minnesota Dairy Farmer Teams up with Phibro to Observe and Assess a Herd Fraught with Challenges¹

Despite careful management practices and the use of autogenous vaccines for *Clostridium perfringens* developed against two isolated strains, one Minnesota dairy farm had a history of transition cow metabolic disease and hemorrhagic bowel syndrome (HBS) — a tough challenge given the fact that 79.3% of HBS cases in dairy cows result in cows being removed from the herd through death or culling.² Not only did HBS occur with regularity on this operation, but blood tests from fresh cows indicated low to marginal levels of key macro- and microminerals. Non-esterified fatty acids (NEFAs) and glucose levels were also outside normal ranges, and problems with the dry cow program were causing cows to lose weight prior to freshening.

Dairy producers are resilient and this one was no exception. The producer reached out to his local dairy technical manager from Phibro Animal Health Corporation. Together, they created a study to evaluate changes in herd health parameters and production data and measure the results of feeding OmniGen® AF to lactating cows at the recommended feeding rates.

The cows were also studied during three distinct observation periods. In the first and third periods, OmniGen was not included in lactation diets. OmniGen AF was, however, included in the second observation period. Dairy Comp 305 records were used to provide information on dairy production and health.

Observations from the Operation

To set the stage, the dairy milked 240+ Holsteins with a rolling-herd average (RHA) of 27,000 pounds. All lactating cows were fed a 1-group total mixed ration (TMR) consisting of corn silage, alfalfa hay, high-moisture corn and commercially blended mineral vitamin supplement, while dry cows were fed a dry cow TMR of corn silage, oat or wheat straw and a commercial supplement. Silages were stored in upright silos and bags, and hay stored in a metal barn.

Random samples of the corn silage, high-moisture corn, milk cow TMR and dry cow TMR were taken throughout the 18-month observation period and were tested for the presence of *Aspergillus fumigatus* (AF) — which showed that both dry and milk cow groups were exposed to mold daily, and 77% of cows had detectable levels of AF. More than half of these had blood levels of > 1 genomic unit x 10⁴ ml, placing them in the upper 25 percentile of all cows submitted for testing in the U.S.



The Findings

Because of improved overall immunity in cows fed OmniGen AF, incidences of HBS dropped from 14 to two cases per month and cases of mastitis dropped from 41 to 18 cases per month. The reduction of mastitis and HBS weren't the only impact noted in the OmniGen group. Improvements in immunity for animals in this group were also observed to have more days in milk, more cows in milk and produce more milk per cow.

Assessing the long-term effects of a feeding program or feed additives can be difficult — dairies are dynamic places with numerous, ever-changing variables. But this

study used selected health disorders as benchmarks to best measure the differences. For this Minnesota operator, this data allowed him to see that in feeding OmniGen to improve immune function, they were better able to monitor for and manage HBS. This data will also play an important role as we continue to better understand HBS in cattle, in hopes of developing reliable strategies toward reducing HBS on dairies in the future.

SUMMARY DATA FROM MINNESOTA DAIRY CASE STUDY

| Item | Study Period ^a | | Change |
|------------------------------------|---------------------------|-------------------------|---------|
| | Control | OmniGen AF Supplemented | |
| No. cows in milk | 243.0 | 251.0 | 8.0 |
| Tank ave. lbs/cow | 73.8 | 74.4 | 0.9 |
| Days in milk | 178.5 | 180.3 | 1.8 |
| Ave. # dry cows | 31.0 | 38.0 | 7.0 |
| Ave. SCC | 322,000 | 283,000 | -39,000 |
| Ave. # cull-dead cows/mo | 15.5 | 9.8 | -5.7 |
| No. cases or treatments for: | | | |
| Abortions | 4.0 | 1.0 | -3.0 |
| HBS | 14.0 | 2.0 ^b | -12.0 |
| Mastitis | 41.0 | 18.0 | -23.0 |
| Metritis | 114.0 | 53.0 | -61.0 |
| Displaced abomasum | 6.0 | 1.0 | -5.0 |
| Fatty liver / Ketosis ^c | 15.0 | 4.0 | -11.0 |
| Milk fevers | 7.0 | 4.0 | -3.0 |
| Respiratory | 2.0 | 1.0 | -1.0 |
| Low production | 11.0 | 3.0 | -8.0 |
| Unknown illness | 29.0 | 14.0 | -15.0 |
| Cows with multiple disorders (%) | 40.0 | 23.5 | -16.5 |

^a Control periods: Jan. 1 – Apr. 27, '04 and Nov. 26, '04 – Jan.21, '05 OmniGen AF supplemented periods: Apr. 28 – Nov. 27, '05 and Jan. 23 – Mar. 1, '05.

^b Both cases occurred within 7 days after OmniGen AF feeding began.

^c Recorded as a complex

References:

¹PAHC Reference OG010107USA-R0121. Available upon request.

²USDA, 2014. Dairy 2014 Health and Management Practices on U.S. Dairy Operations. NAHMS-2014.

Connecting the Dots between Immunity and HBS Incidence

How Feeding OmniGen Can Bolster Your Dairy Cattle's Immune System to Better Defend against Challenges

Hemorrhagic bowel syndrome (HBS) was first identified in the early 1990s — and today it remains a concerning and deadly intestinal syndrome that impacts dairy cows in the U.S. and around the world.

The often-deadly syndrome is most common in high-producing, multiparous dairy cows in their first 100 days in milk, although it can also occur in late lactation, during the dry period and even in primiparous cows. HBS can affect any breed, and producers are usually unaware it's on their farm until a cow dies and there is a necropsy to confirm the diagnosis.

Dr. Scott Bascom, Ph.D., Executive Technical Services Manager, Phibro Animal Health Corporation, says that even 30 years after HBS was first identified in the U.S., much remains unknown about what causes some cows to develop HBS. “We do know that cases are more frequent following periods of stress, including calving,” he says. “Such stressors impact a cow's immunity, and we know that an animal's immune system is an important defense mechanism against HBS as well as several other syndromes and diseases.”

While it's impossible to eliminate all stressors, there are actions producers can take to reduce stress — and, in turn, reduce the likelihood of their herd being impacted by HBS.

NUTRITION: Bolster your herd's immunity by feeding nutritional specialty products such as OmniGen®. Improved immune function has been shown to minimize the impact of stress, reducing health incidence and keeping cows more productive. Feed cows consistently, giving them plenty of fiber and limit spoilage.

MANAGEMENT: Minimize stressors by ensuring your cows are comfortable and have at least 24 inches of bunk space and plenty of opportunity to lay down. Handle and store feed properly and make sure feedstuffs are free of mold and mycotoxins.

AWARENESS: While diagnosing HBS can be challenging, given the fact that many of its symptoms mimic symptoms of other disorders, be on the lookout for signs of dehydration, decreased DMI, lower production, abdominal distension, dark feces or sudden depression. A combination of these symptoms could be an early indicator of HBS.

INVESTIGATION: It's important to determine why cows are dying, and to confirm or rule out HBS as the cause. Dr. Bascom advises that producers have a necropsy performed to determine cause of death.

There are still many unknowns about HBS, but when it comes to managing your dairy herd, knowledge is power. “Learn the causes behind a cow death and manage symptoms from there,” advises Dr. Bascom. “By recognizing and managing stressors, you better equip your cows to handle stress — and that's a very powerful defense against HBS.”

Markers of Immunity: Trial Measures mRNA Differences When Animals Are Fed Various Feed Additives

Study Provides Insights into Immune Function Allowing Greater Understanding of Dairy Cows' Ability to Defend against Diseases and Syndromes Like HBS

The primary function of animal models is to uncover the causal mechanisms that produce and direct the course of response to disease-causing organisms. The practice of using rodent models in lieu of dairy cattle helps researchers study certain types of feed additives and their impact on markers of immune function.

Previous work has demonstrated that ruminants and rodents fed OmniGen® nutritional specialty product exhibited similar changes in measured immune markers, including L-selectin (a protein adhesion molecule allowing neutrophils to move from the blood into tissues), interleukin 8-receptor (IL-8R, a surface receptor that recognizes chemical signals, chemokines, from other immune cells) and interleukin converting enzyme (ICE, the enzyme necessary to convert pro-interleukin 1B, a pro-inflammatory cytokine, into its active form so it can ultimately activate macrophages and monocytes to target pathogenic cells for destruction).

The commercial success of OmniGen generated a desire for Phibro Animal Health Corporation's competitors to develop similar products. But how do they stack up against the original? Using rats, Phibro researchers evaluated several feed additive products to gauge their potential to change markers of immune function — specifically, L-selectin and IL-8R.

Several feed additive products were evaluated in a study conducted with rats during November and December of 2007.¹ After several days of adapting to their surroundings, rats received one of eight treatments at comparable feeding rates of dairy cows. The eight

treatments included: OmniGen, six different competitive nutritional specialty products and a control group. The feeding programs were maintained for 13 days, after which animals were weighed and blood was drawn. Neutrophils were isolated from blood samples and mRNA was extracted; concentrations of two markers of neutrophil function, L-selection mRNA and IL-8R mRNA, were assessed.

The rats fed OmniGen exhibited statistically significant increases in L-selectin and IL-8R, markers of immunity associated with immune cell function and recruitment. The other feed additives assessed did not exhibit any statistically significant changes in neutrophil gene expression.

These findings may be applied to future research regarding cow health and the role of immune defense against syndromes like HBS as well as other issues that impact dairy cow health and productivity.

Reference:

¹PAHC Reference OG010820GLB. Available upon request.

Hemorrhagic Bowel Syndrome: Are Your Highly Productive Cows at Risk?

HBS Expert Shares Five Tips to Keep the Deadly Syndrome at Bay

Dr. Scott Bascom vividly remembers the first time he heard of hemorrhagic bowel syndrome (HBS). It was 2003, and he was listening to one of the founders of OmniGen® nutritional specialty product deliver a presentation on the relatively new bovine intestinal syndrome. Dr. Bascom was struck by the bloody gut images and the apparent randomness of incidence, and he hoped that he'd never see it firsthand in his clients' herds. But five or six years later, while doing nutrition work at a Wisconsin dairy, he witnessed several high-producing cows die, with no clue other than bloody feces. The culprit? HBS.

Now as an executive technical services manager for Phibro, Dr. Bascom believes awareness of HBS continues to increase. As producers improve their levels of management and performance, it has become a bigger crisis to have a cow die suddenly and unexpectedly. "For the most part, U.S. dairy farms are incredibly well managed," he says. "Producers keep their animals healthy and productive, so it really catches their attention when an animal dies. They are heavily invested in the well-being and care of their cows, so when one gets sick, it's a very big deal."

Sometimes referred to as "sudden death syndrome," HBS tends to affect cows in the early part of their lactation — the time when they are most productive. In fact, Dr. Bascom says that it's not uncommon for a cow to produce 150 pounds of milk right before succumbing to HBS. "That's a classic HBS symptom and shows why we don't see it coming," he says. "It's not like she was sick for weeks and we couldn't get her back on track — she was doing wonderful yesterday and today she's dead."

This element of surprise explains why 85% of cows that contract HBS are expected to die from it.¹ There's no effective way to treat it, and since it cannot be recreated in a lab setting, research is limited. As a result, prevention

is key to thwarting this deadly syndrome.

While HBS remains to be a syndrome shrouded in mystery, we have a lot more information today than we did when Dr. Bascom first heard of the condition. For instance, 13 out of 18 cows that die of HBS are *Aspergillus fumigatus* (AF) positive,² which illustrates a correlation between the ubiquitous fungus and the syndrome. And while it's impossible to eliminate the presence of *A. fumigatus*, Dr. Bascom says that producers can act to reduce its occurrence — and the likelihood of HBS taking hold of their herd.

Five Ways to Protect Your Herd from HBS

1. Feed "clean" feed. Reduce exposure to fungal contamination, including *A. fumigatus*, which has shown a statistically strong relationship to HBS. Producers should pay close attention to forage and feed quality and manage these feeds to limit fungal growth. By feeding cows "clean" feed, they are subjected to a lower level of *A. fumigatus* and a lower level of mycotoxins. Purchase commodity feeds from a reliable supplier and store the feed ingredients in a dry environment, as wet conditions are conducive to the growth of fungal organisms.

2. Reduce stress. While certain stressors, like calving, are inevitable, the stacking of multiple stressors can increase the likelihood of immune suppression — and that makes cows susceptible to several issues, including *A. fumigatus* and HBS.

So, manage the stressors you can control to offset those you can't.

Use pens with plenty of room so that cows are not overcrowded. Ensure cows have plenty of opportunity to eat and sleep and keep them relatively free of dirt and manure. Minimize heat stress and make stalls comfortable places for cows to sleep and lie in.

3. Remember that knowledge is power.

If you suspect that *A. fumigatus* might be posing a threat to your animals, have your feed tested for AF. You can also test a blood sample from cows to determine the level of AF exposure. If an animal dies unexpectedly, it's a good idea to conduct a necropsy to determine the cause of death — and to rule out or confirm HBS.

4. Support a healthy immune system.

Feeding OmniGen has been shown to increase neutrophil L-selectin. Cows with higher levels of neutrophil L-selectin are more likely to have a healthy immune system. While this is important year-round, Dr. Bascom says it's imperative during the time a cow is most likely to experience stress — from dry-off through peak lactation.

5. Seek expert support. Because HBS is relatively rare, many dairies don't have a high awareness of it until it's on their operation. Phibro has the latest information on the deadly syndrome and can test tissue samples collected during a necropsy. A Phibro Stress Assessment is also a great way to evaluate for the presence of 11 different stressors, to help reduce stress and optimize herd health and performance.

After several years of studying HBS, Dr. Bascom is still struck by the disparity between proper management and HBS. "I still sometimes perceive that I will get to the dairy and spot a glaringly obvious management issue, but the opposite is often true," he says. "HBS can be found amidst incredibly well-managed situations — it's found where producers are doing most everything right."

Despite that observation, he sees reason for optimism. "Dairy producers need to be aware of HBS, but it's not something they need to worry about every day," he says. "By reducing stress, limiting exposure to *A. fumigatus*, testing feed and feeding OmniGen, this is an issue we can manage — and that should keep it from becoming too much of an ordeal on most dairy operations."

Reference:

¹USDA, 2014. Dairy 2014 Health and Management Practices on U.S. Dairy Operations.

²Van Metre, D. C. and R. J. Callan. 2005. Western Dairy News: Research Progress in Hemorrhagic Bowel Syndrome. Colorado State University; University of Colorado.

Connecting *Aspergillus fumigatus* and Hemorrhagic Bowel Syndrome

Bloody gut. Salami gut. Jejunal hemorrhage syndrome. HBS. From the descriptive to the scientific, hemorrhagic bowel syndrome (HBS) is a condition with many names. Yet while many have named it — and studied it — no one has successfully developed a treatment for it. Fortunately, as scientists continue to learn about the syndrome, they can better identify its causation and help producers take preventative measures to protect their herds.

“When HBS first came to light, it was generally thought to be caused by the toxins produced by *Clostridium perfringens* type A, which can create irritation of the gastrointestinal (GI) lining that bleeds into the lumen of the small intestine which can cause the cow to die from blood loss,” recalls Jim Chapman, Ph.D., Senior Research Leader, Phibro Animal Health Corporation. “Scientists from Oregon State University believed that hemorrhage was initiated by another agent — an invasive, pathogenic mold, *Aspergillus fumigatus*, that is known to infect humans and animals alike.”

It’s a hypothesis borne largely from human parallels. “Research has shown that *A. fumigatus* is cleared by the immune system in a healthy person,” says Chapman. “It becomes problematic when the host’s immune system is compromised, which allows the mold to become opportunistic and invade tissues. Our immune system is the primary means for clearing the mold from our blood and lungs, so it’s important to maintain good immune health.”

While humans generally become infected in the lungs, cattle become infected in the GI tract. “Once the mold gains entry into the body, it tends to locate in the highly vascular areas of the body, as it has an iron requirement for growth,” explains Chapman. “*A. fumigatus* is opportunistic, and an immunosuppressed cow may not have the ability to successfully clear it. Once it invades and colonizes in the tissue, as in the GI tract, it produces enzymes that cause capillary breakdown, and then you get bleeding, a blood clot — and death.”

The Best Defense: A Strong Immune System

HBS is a sporadic disease, which makes diagnosis challenging. It’s possible to have a group of cows consuming the same feed at the same time, but only one cow might develop HBS. This unpredictability is a result of certain factors that must align to make a cow more susceptible than its herd mates. Scientists are still working to identify all the factors, but they know that immunity is one.

Phibro designed OmniGen® nutritional specialty product to help the cow maintain a healthy immune system so it can more effectively combat and respond to all types of invasive pathogens, including mold. Chapman recommends feeding OmniGen throughout the dry period and through at least peak lactation. “By feeding OmniGen, cows maintain a healthy immune system which may not help prevent every case but may keep a cow that’s marginal from developing HBS,” he says.

Chapman also advises producers to pay close attention to feed management. “The mold is most commonly found in ensiled forages, so practicing good silage management goes a long way in reducing the risk of the mold becoming a problem in dairy cows. We have also observed elevated *A. fumigatus* levels in other commodities like ground corn and cottonseed hulls,” he notes. However, unlike other molds that produce mycotoxins which are present in the feed, *A. fumigatus* produces its toxins once in the animal’s tissue.

The best method to determine if a cow died from an intestinal blood clot is by necropsy, although the mold is rarely found in the blood clot. There is a blood test for the presence of the mold available to producers that can indicate if cows are consuming the mold and assess the current level of exposure.

A. fumigatus is an ever-present health issue for cows, but Chapman says that it can be largely controlled with preventive measures. “It’s considered to be one of the dominant successional mold species in silage, so it’s always there, and we know it can be a contributing factor to HBS,” he says. “Because HBS tends to affect high-producing cows, it can pose a serious loss for a dairy. But by prioritizing cow comfort, minimizing stressors, practicing good feed management and by feeding OmniGen, producers can enhance the ability of immune cells to function as they should, and that should help reduce the incidence or occurrence of HBS.”

Help Safeguard Dairy Cows from Hemorrhagic Bowel Syndrome

Hemorrhagic bowel syndrome (HBS) may not be a common issue — but it is a deadly one. Dr. Jim Chapman, Ph.D., Senior Research Leader, Collaborative Research for Phibro Animal Health Corporation, answers common questions about HBS and shares tips to help producers safeguard their herds.

Q&A with Jim Chapman, Ph.D., Senior Research Leader, Phibro Animal Health

HBS was first identified in the U.S. in the 1990s. What do you know now about HBS that wasn't known back then?

A: The initial thought was that HBS was caused by *Clostridium perfringens* type A and the toxins it produced, which caused irritation of the gastrointestinal lining and, in turn, caused bleeding. But since then, many scientists have concluded that the *Clostridium* component might be part of a secondary response to the bleeding, meaning that the hemorrhage is initiated by another agent. The theory now is that the primary agent may be an invasive pathogenic mold, *Aspergillus fumigatus* (AF), which is known to become systemic and cause intestinal hemorrhages and respiratory issues in animals.

What takeaways have dairy researchers gleaned from looking at how HBS affects humans?

A: In healthy humans, the immune system is the primary way infectious agents are neutralized and removed from the body. This can become an issue for individuals undergoing immunosuppressive therapies, which allow the mold to become opportunistic and invade tissues. By maintaining a healthy and functional immune system, humans and animals are able to more effectively identify and clear the mold from the body.

How might OmniGen® nutritional specialty product help producers to protect their dairy herds from HBS?

A: OmniGen nutritional specialty product is an immunomodulatory feed additive designed to help maintain normal immune system function during periods of stress. Improved immune systems can more effectively respond to many types of invasive pathogens, including mold. HBS commonly affects cows in early lactation, so our general recommendation is to feed 2 ounces per day (56 g) of OmniGen beginning at dry-off and continuing through the first 60 to 90 days in milk.

What management practices should producers consider to better protect their cows against HBS?

A: Cow comfort is important. Since *Aspergillus fumigatus* is commonly found in the feeds cows consume, stressful events that can compromise immune function create opportunities for the mold to become invasive and infective. Therefore, it is important to minimize the effect of stressors on cows by improving cow comfort and management practices. In addition, paying close attention to silage and feed management will help reduce the risk of mold becoming a problem for their dairy cows.

Are there any ways to predict which cows in a dairy herd are most likely to contract HBS?

A: Occurrence of HBS is sporadic, and very difficult to predict when it may occur. There are reports where a producer has had one or two cases in a short span of time and then no cases again for a year or two.

It is unclear what makes one cow more susceptible to become an HBS case than her herd mates that are consuming the same feed with the same level of mold present. It appears that there has to be a certain combination of things, or events, to align for that one cow to develop HBS when other cows in the herd don't. It's the 'perfect storm' so to speak, a stressful event or series of events, resulting in compromised immunity, while the cow is consuming the mold which allows it to become invasive and that one cow becomes an HBS case. Feeding OmniGen has been shown to ameliorate the effects of stress on the immune system, which along with good feeding and management practices, may help keep a cow that is more susceptible than her herd mates from developing HBS.

How can producers confirm that a cow was affected by HBS and not another intestinal syndrome or disease?

A: Necropsy is the best and most conclusive method to diagnosis HBS. However, since *Aspergillus fumigatus* is a suspected primary agent that can initiate HBS, detection in feeds and blood of cows is a good starting point to determine level of exposure and potential risk of cows for developing HBS. Analytical methods are available, specific for AF, to detect levels in both feeds and the blood of cattle. Phibro sales representatives can help producers collect and submit feed and blood samples to look for the presence of mold to help determine the herd's exposure level.

The Link between Immunosuppression and HBS

Where Are the Stressors Affecting Cows on Your Dairy?

Humans aren't unique in our physiologic responses to stress. Stress takes a toll on other animals, including dairy cows. Unavoidable stressful events like dry-off and calving to management and environmental-related stressors such as limited bunk space, over-crowding, transportation and heat are common stressors experienced by dairy cows. The cumulative effects of these stressors can have a negative impact on the cow's immune system — and leave the cow more susceptible to infectious or contagious diseases or a sporadic acute condition like hemorrhagic bowel syndrome (HBS).

“When an animal experiences or perceives a stress, the event triggers a neurological response causing the pituitary gland in the brain to release adrenocorticotrophic hormone (ACTH). This stimulates the adrenal gland to secrete cortisol, the hormone associated with a stress response,” explains James Chapman, Ph.D. Senior Research Leader, Phibro Animal Health Corporation. “Although a necessary component for resolving the effects of stress, cortisol, while present, will inhibit the ability of immune cells to function normally, creating opportunities for a pathogen or an invasive mold, such as *Aspergillus fumigatus*, to gain entry and become infectious.”

Aspergillus fumigatus (AF) is an invasive pathogenic mold suspected as being the primary agent associated with HBS. Once AF enters the circulatory system and becomes resident in the animal's tissue, such as in the intestine, the toxins secreted by the mold inhibit the immune system's ability to recognize, kill and remove the mold.

Immune competency is affected by stress. Temporary immune dysfunction may be experienced in cows under stress, further limiting the ability of the immune system to eliminate the mold before it can become active and infect tissues.

Ensiled forages and some feed ingredients typically used in dairy cow diets can be potential sources of AF. Assays for detecting AF in feeds and the blood of dairy cows are available to help the producer assess herd-level exposure to the mold and the risk for HBS.

Currently there is not a solution on the market to cure or treat HBS, however, feeding OmniGen® nutritional specialty products helps to improve the cow's immune system, which can lead to ameliorating the effects of cortisol, the stress hormone, on the immune system. This action helps to keep the immune system healthy and more able to respond to infectious agents like AF during times of stress.

In addition to feeding OmniGen, Dr. Chapman recommends that producers identify areas or practices on their dairy operation that can be potential stressors to cows and work to limit them.

The Phibro Dairy Stress Assessment tool was designed to help producers do just that. Using this program, Phibro dairy experts work with producers to survey and identify potential stress points on the dairy that could not only affect immunity and leave cows more susceptible to HBS, but might also predispose them to mastitis, increased days open and heat stress.

Watch Dairy's Most Profit-Draining Challenges: Hemorrhagic Bowel Syndrome Webinar



DR. JIM CHAPMAN
Senior Research Leader,
Phibro Animal Health Corporation

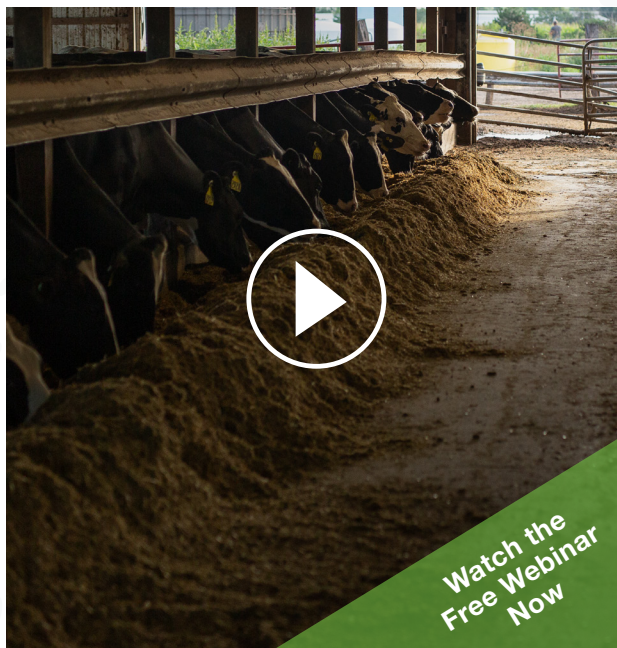


DR. SCOTT BASCOM
Executive Technical Services Manager,
Phibro Animal Health Corporation

This informative overview of hemorrhagic bowel syndrome (HBS) provides a thorough understanding of the prevalence, characteristics, outcomes and management of HBS in dairy cows. This webinar covers the history of HBS, the symptoms of the syndrome, the impact to dairy cows and the role that *Aspergillus fumigatus* (AF) may play in its occurrence. You will also gain insight into the development and performance of OmniGen® nutritional specialty products and their ability to enhance the immune system when fed to cows, which may help protect the herd from issues related to AF and HBS.

Registration for the webinar series is free on the Phibro Academy website at:
<https://academy.pahc.com/catalog/info/id:447>

For more information on OmniGen, contact your local Phibro representative or visit <https://www.theOmniGenDifference.com>



Dairy's Most Profit-Draining Challenges — Hemorrhagic Bowel Syndrome Webinar Q&A

Dairy Technical Expert Dr. Scott Bascom Answers Common Questions about Hemorrhagic Bowel Syndrome

Imagine having a healthy, high-producing dairy herd one day and then finding one or more cows dead in the barn the next day. This deadly and profit-draining scenario can occur if hemorrhagic bowel syndrome (HBS) impacts your operation.

Fortunately, there are actions producers can take to fortify their dairy cows' immune systems to better withstand exposure to the mold believed to cause HBS. Two dairy technical experts, Dr. Scott Bascom and Dr. Jim Chapman, both of Phibro Animal Health Corporation, hosted a free webinar titled "Dairy's Most Profit-Draining Challenges — HBS," which is available on demand from Phibro Academy. They answer some of your biggest questions about HBS. Dr. Bascom shared a sampling of the questions he receives most often about HBS.

Q&A with Dairy Cattle HBS Expert Dr. Scott Bascom

What is hemorrhagic bowel syndrome, and why do I need to know about it?

A: HBS, also known as jejunal hemorrhage syndrome, is an intestinal syndrome that can cause sudden death in dairy cattle. It's all the more shocking because it is sporadic and tends to affect high-producing dairy cows. A producer might observe that a cow is healthy and high-producing one day and then find the cow dead in the barn the next day. While there are measures that producers can take to try to prevent HBS, there is no treatment — nearly 80% of cows that have HBS die.¹

What symptoms should I look for?

A: Common HBS symptoms include depression, colic, rumen stasis, dehydration and a sudden, sharp drop in milk production. It's not unusual for a cow with HBS to make over 100 pounds of milk one day and then not produce any milk at all the next day. Dark feces with blood clots is another potential sign of HBS. However, it's a difficult syndrome to diagnose, because many of its signs are similar to those of common intestinal diseases. A postmortem exam is the only way to diagnose HBS with certainty, but of course then it's too late.

What causes HBS?

A: Scientists who have investigated the causes of HBS, believe that it may be a mycosis or fungal infection related syndrome, caused by an invasive pathogenic mold (*Aspergillus fumigatus*). It's not specific to dairy cows. In humans, mycosis can also impact internal organs. For healthy people, this is not much of a concern, but for immunosuppressed people, like those who have had organ transplants and may be taking drugs to suppress their immune system, mold can take up residence and grow in their respiratory systems. Similarly, when dairy cows are stressed and immunosuppressed, they are more susceptible to a mycosis — leading to a higher risk of developing HBS. The creators of OmniGen® nutritional specialty product formulated a hypothesis that a stressor can cause immune suppression with an indirect effect, meaning that a cow is less able to deal with the effects of *Aspergillus fumigatus* (AF), and therefore may develop HBS. This is the model we work with at Phibro.

Is mycosis the same thing as mycotoxicosis?

A: No. Mycotoxicosis is a condition caused by mycotoxins, which are produced and secreted by molds that commonly are found on grains or forages. Mycosis, on the other hand, is caused by fungus that grows in animal tissue. Also, mycotoxicosis can occur even if the molds that produce its toxic compounds have died, whereas the fungus must live and grow to cause mycosis. They are easy to confuse, but they are two different issues.

How does feeding OmniGen help prepare cows to combat a mycosis to reduce the risk for HBS?

A: I want to be very clear that OmniGen does not treat HBS. Nothing does. OmniGen supports a cow's immune system. Again, stressors like calving and heat stress are inevitable, but OmniGen boosts immunity to help dairy cows better withstand stress. This puts them in a better position to fend off molds that cause mycosis like AF, making them less susceptible to syndromes like HBS. Registration for the webinar series is free on the Phibro Academy website at: <https://academy.pahc.com/catalog/info/id:447>. For more information on OmniGen, contact your local Phibro representative or visit www.theOmniGenDifference.com.

Reference:

¹USDA, 2014. Dairy 2014 Health and Management Practices on U.S. Dairy Operations. NAHMS-2014.

Dairy's Most Profit-Draining Challenges — Hemorrhagic Bowel Syndrome Webinar Listicle

Dairy Health Experts Demystify a Syndrome That Can Impact Highly Productive Dairy Cows with Little Warning

From heat stress to mastitis, dairy producers have a number of common, profit-draining challenges to worry about daily. So, given its low incidence rate, they may not spend a lot of time thinking about hemorrhagic bowel syndrome (HBS)—until it hits their dairy operations. Once a cow shows signs of HBS, it's typically too late to save the cow. In fact, nearly 80% of cows that contract HBS die from it.¹

To provide producers with information on this deadly disease, two dairy research experts with Phibro Animal Health Corporation, Dr. Jim Chapman and Dr. Scott Bascom, led a webinar titled, “Dairy’s Most Profit-Draining Challenges — Hemorrhagic Bowel Syndrome.” The free webinar is available for download on Phibro Academy.

irritation of the GI lining (enteritis) with bleeding into the lumen of the small intestine creating symptoms similar to those observed in cases of HBS,” states Dr. Chapman. “However, most researchers now believe that *Aspergillus fumigatus* (AF), a pathogenic, invasive mold, is more likely the root cause of HBS.”

Five Things You Might Not Have Known about HBS

1. Your most productive cows are prone to HBS.

This syndrome hits without warning and often impacts highly productive dairy cows in the early part of lactation. “It’s not unusual for a cow affected by HBS to make well over 100 pounds of milk one day, then the next day not produce any milk at all,” says Dr. Bascom. “HBS is associated with sudden death for good reason. Producers may observe a healthy cow one day, then find it dead in the barn the next.”

2. Scientists have made great strides in understanding HBS. For years, researchers suspected that *Clostridium perfringens* type A was the causative agent of HBS. “Type A strains are normal inhabitants of the GI tract and are prevalent in the environment. It is true that toxins caused by type A strains can create



3. The more stressed a cow is, the more susceptible she is to HBS. Like most molds, AF is found in the environment and produces toxins that inhibit immune function. A healthy, low-stressed cow is more likely to withstand the presence of AF without issue; however, stress and immunosuppression are primary predisposing factors in AF infection. HBS is often initiated by a stressful event or by stress in combination with ingestion of the mold. While unavoidable, calving is a significant stressor that possibly serves to explain why high-producing, early-lactation cows are often the ones affected by HBS.

4. HBS is caused by mycosis, which is not the same as mycotoxicosis. Those who work with ruminants are all too familiar with the problems that mycotoxins can cause. Mycotoxins are produced by mold that grows in grain or forage ingredients and is consumed by the animal. As the mold grows, it produces toxic compounds that cause mycotoxicosis. By contrast, mycosis is a fungal infection where the fungus grows on or in tissue.

5. There are actions producers can take to reduce the likelihood of HBS affecting their herds. Moldy feed and immunosuppression are the two biggest contributing factors of HBS. Fortunately, producers have some control over both. “Like most molds, AF grows when exposed to air and is most prevalent in corn silage — particularly if it’s put up poorly,” cautions Dr. Bascom. And while it’s impossible to eliminate all stressors, producers can boost their herd’s immune system through nutritional specialty products like OmniGen® that provides immune support in cows which helps them to respond better to the mold once it takes residence in their bloodstreams.”

Registration for the “Dairy’s Most Profit-Draining Challenges — Hemorrhagic Bowel Syndrome” webinar is free on the Phibro Academy website at: <https://academy.pahc.com/catalog/info/id:444>. For more information on OmniGen, contact your local Phibro representative or visit www.theOmniGenDifference.com

Reference:

¹USDA, 2014. Dairy 2014 Health and Management Practices on U.S. Dairy Operations. NAHMS-2014.



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