

This whitepaper was created to give you a better understanding of the science behind direct-fed microbials and how they can benefit the performance, profitability and overall health of beef cattle.



INVESTIGATING THE EFFECTS OF A DIRECT-FED MICROBIAL CONSORTIUM ON FEEDLOT CATTLE HEALTH AND PERFORMANCE



INTRODUCTION

Historically, livestock producers have relied on a wide variety of additives and antibiotics to help fight diseases in their herds and promote their animals' feed efficiency. But today several factors are motivating changes in those traditional practices, including consumer demands for "all natural" processes and "organic" food products, plus impending federal regulations on the use of antibiotics for disease prophylaxis and weight gain.

In July, 2017, the Pew Charitable Trusts issued a comprehensive report titled Alternatives to Antibiotics in Animal Agriculture, which addressed many of

the current concerns and discussed new treatment options. The Pew report stated, in part: “Because the use of antibiotics in any setting drives resistance expansion everywhere, it is important to minimize the use of these drugs—a goal that depends on eliminating inappropriate uses and finding other means of preventing infections . . . Alternative products play a crucial role in allowing farmers and veterinarians to reduce the use of antibiotics.”

These attitudinal changes and demands have led to greater interest throughout the livestock industry in the subject of alternative treatments, including direct-fed microbial (DFM) products. In simple terms, the concept of direct-fed microbials – or as they are often called, probiotics -- means feeding animals a supplement of viable, beneficial microorganisms for the purpose of balancing their microbial ecosystems to support their immune systems and improve digestive functions.

Among other positive effects, probiotics work in the gut to compete against undesirable organisms for nutrients and to enhance production of enzymes and natural bacteria. In the specific case of beef and dairy cattle, those activities help to stimulate immune response functions, minimize ruminal/intestinal disorders, and promote fermentation. As a result, the animals have greater potential for staying healthy and optimizing their performance.

The Pew study noted: “Probiotics have shown promise for disease prevention in cattle,¹ as well as enhancing a variety of production parameters, and probiotics are widely used commercially in cattle. According to recent data, 20 percent of U.S. dairy operations use probiotics to prevent disease in dairy cows, and to improve health and productivity in dairy calves.² Similarly, more than 1 in 4 large feedlots with more than 1,000 cattle uses probiotics to prevent disease.³ An FAO (Food and Agriculture Organization) report as well as several meta-analyses, and systematic reviews have concluded that probiotics are effective at enhancing productivity and preventing or treating disease in beef as well as dairy cattle and calves.⁴”

The benefits of probiotic products can be especially important for cattle during times of stress, such as shipping, disease exposure, environmental challenges, and nutrient deficiencies in their rations. Those kinds of events often disrupt an animal’s normal digestive processes, but by balancing gut flora, the microbial products can counteract the stress-related effects and help the animal’s systems to function properly. Logically, those animals should then tend to be healthier and less susceptible to diseases. Given the growing interest in probiotic additives for animal feed, a number of microbial products are being developed and intro-

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duced. Researchers and nutritionists hope to identify microbial supplements which can decrease morbidity as well as support good animal growth and efficiency.

One such study was conducted in the spring and summer of 2016. Bio S.I. Technology, LLC, offers a unique livestock probiotic additive known as Jackpot™. This product is a consortium of microorganisms composed of soil-derived bacteria that have been isolated from several sources in nature, including grasslands and prairies.

Those beneficial microbial organisms, which are needed to support an animal's immune system and digestive processes, traditionally have come from pasture soil when cattle grazed, but modern livestock kept in contained areas cannot typically maintain proper amounts of the microbes in their systems.

The various direct-fed microbial products carry claims that they enhance the performance of feedlot animals. Bio S.I. initiated its own proprietary research to bring scientifically objective data to the claims regarding Jackpot. To conduct the trials, Bio S. I. partnered with Palo Duro Consulting, a respected research organization with a reputation for providing valid data from independent, verifiable studies.

RESEARCH GOALS AND METHODOLOGIES

The Jackpot cattle trial was initiated with several clear goals. Bio S.I. Technology wanted to obtain and analyze relevant data which would:

- Assess the performance of Jackpot direct-fed microbials on defined metrics such as the costs of therapeutic disease treatments and cull rates, along with weight gain and feed conversion
- Correlate differences in cattle performance with the microbial flora found in the hindgut
- Determine areas where the Jackpot formula could be improved to enhance animal performance even further.

The trial began on February 4, 2016, in Canyon, Texas, using 100 head of mixed stockers with Angus predominance (98% black-hided). Upon arrival, each animal was weighed. The average weight per individual was 560.97 pounds.

The animals were randomly separated into ten groups of ten, and each was assigned a tag number and a pen number.

Five of the groups (50 total head) were chosen to be fed a normal diet, while cattle in the other five pens were fed a ration supplemented daily with Jackpot probiotic. The Jackpot was blended into the daily ration via mixing wagon at the continued rate of 1 ounce (30 ml) per head per day for the entire trial. Rumensin® was also included throughout the research period.

When the project began, one of the animals was dead on arrival and another had to be removed for lameness, so the control group not treated with Jackpot represented 48 individuals (three groups of ten and two groups of nine).

Also at the time of the initial processing, two cattle from each pen were randomly selected to be tracked for fecal samples. That total of 20 (ten from the treatment group, ten from the control group) formed a reliable representative population for effective further analysis. Fecal samples were subsequently taken from those exact designated individuals throughout the duration of the trial, which lasted 221 days. The fecal samples were collected at Day 0 (Intake), Day 45, Day 60, Day 120, Day 180, and Day 221, just prior to slaughter. Information derived from these samples is not included in this whitepaper and will be analyzed in another phase of the trial.

The feeding trial was set up as two segments. The timeframe of the first segment was to measure the cattle from 0 to 60 days, at which point the animals' performance would be carefully measured and recorded. The second phase was to last until Day 221, with performance metrics also measured and evaluated at Day 120 and Day 180. Additional data was collected at slaughter and in post-mortem analysis.

All of the cattle were observed daily for any individual animals exhibiting signs of Bovine Respiratory Disease (BRD). Steers identified to be ill were processed through the squeeze chute for collection of temperature, body weight, and administration of therapy.

RESULTS ON MORBIDITY

One of the most exciting aspects of the trial was the data that researchers found regarding the costs of treating cattle for disease. Believing that probiotic supplements can enhance an animal's immune functions and promote better overall health, it was important to verify if Jackpot could be a positive influencing factor.

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The expense of medicinal treatment can have a significant impact on a livestock operation's profitability, so any financial benefit resulting from a DFM program would be a definite bonus.

The trial data clearly showed that there was a lower incidence of disease in the Jackpot-fed group vs. the control group.

13 of the cattle (26% of the herd) from the group with no probiotic in their ration had to be pulled for disease treatment, compared to only eight animals (16% of the group) from the cattle fed with Jackpot. That 10% difference is a considerable advantage.

Even more impressively, eight of the cattle from the non-DFM control group required a second medicinal treatment (a 61.54% incidence) for their illnesses, and three of them needed to be pulled for a third and/or fourth treatment. Only two of the animals from the Jackpot-fed group (25%) needed follow-up therapy.

Overall for the trial, the cost of treatment for the cattle in the control group totaled \$450.19, which worked out to a cost-per-head average of \$9.38. For the group of animals that were fed Jackpot, the entire treatment cost was \$191.59, resulting in a much more economical per-head average of just \$3.83.

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POST-MORTEM RESULTS

The day after the conclusion of the trial – Day 222, September 13, 2016 -- the processed carcasses of the cattle involved in the research project were all carefully evaluated for signs of disease, plus hot weights, meat quality grades, and other categories.

Specimens were also harvested at slaughter of flank subcutaneous and/or lymph nodes to be examined for the presence of salmonella. The testing was performed by the Texas A & M Veterinary Medical Diagnostic Laboratory in Amarillo. In every case, the cattle which had been fed the Jackpot-supplemented ration produced a negative culture for salmonella.

RESULTS ON FEED PERFORMANCE

In addition to finding improvements in animal health and the potential for reducing treatments, the researchers monitored the trial data for weight gains and feed efficiency. Evaluations throughout the study – including benchmark assessments at Day 120 (June 3, 2016) and Day 180 (August 2, 2016) -- showed that the cattle treated with Jackpot microbials were consistently performing well on feed intake, feed conversion rates, and gains.

FECAL ANALYSIS

The fecal samples taken during the course of the research trial will be evaluated and correlated to the respective individual animals. That phase of the study is currently ongoing.

In addition to determining DFM performance in terms of disease resistance and other criteria, the efficacy of probiotic supplements can be measured in fecal content. That analysis will indicate the products' impact on lower gut response, and can help to show how the added microbials have succeeded in competing with specific pathogenic organisms (such as *E. coli*) for nutrients in the digestive tract.

That information can also be applied to the further improvement of Jackpot and the development of other potential new DFM products, by suggesting which ruminal bacteria can support optimal performance in the cattle's digestive systems.

CONCLUSION

Ongoing concerns about the use of antibiotics in livestock production will give added motivation to manufacturers and cattle producers to emphasize the development and implementation of effective natural, non-GMO, probiotic supplements. Additional research and experimentation will continue as nutritionists look for the best combinations of microbes to achieve the greatest results.

Although direct-fed microbial products in beef cattle are still relatively new concepts, they are generating a noteworthy amount of positive effects and increased attention. Numerous university and independent studies have demonstrated measurable improvements in animal performance with probiotic products.

As the Pew report noted in its summary, "Alternative products should be considered as one part of a comprehensive herd or flock health management program aimed primarily at the prevention of diseases, rather than curing of infections. An alternative product's efficacy and cost-effectiveness will be central to farmers' decisions about whether to use it, and the sharing of experiences and lessons learned is likely to be as important as formal economic analyses."

In other words, when a probiotic product works for your friends, it should be worth considering. Experienced cattle operators know how to feed and manage for cost-effective gains, but as the old saying goes, you can't put weight on a dead animal.

Morbidity and mortality are always threats to receiving cattle when they are subjected to a wide range of stresses and diseases. If direct-fed microbial treatments can minimize animals' digestive/intestinal disorders and support

their immune functions, morbidity should be reduced, which lowers the cost of therapeutic treatments and helps to limit the number of animals lost to disease.

The results of this Bio S. I. feeding trial suggest that Jackpot probiotics can be a valuable strategy and smart investment for a cattle operation.

For more information, visit Bio S.I. Technology's website, biositechnology.com or call (866) 393-4786 to speak with a microbial specialist.

Cited references:

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