

Controlling an Evolving Menace

Mark von Keitz of the Biotechnology Institute at the University of Minnesota presented, “Controlling Lactobacillus in the Face of Antibiotic Resistance.” According to von Keitz, there is a wide range of bacterial contaminants present in all ethanol production facilities. Gram-positive lactic acid bacteria are of primary concern, he said.

Optimal growth conditions exist for lactic acid bacteria in fermentors, where a lot of sugars and very little oxygen promote not only yeast health, but that of contaminants too. When these “bad” organisms thrive, they don’t just consume nutrients required by yeast, but the production of lactic and acetic acids can inhibit yeast growth.

Lactic acid bacteria grow naturally on corn, which is one way their introduction to a production plant occurs. Von Keitz also said that contaminated yeast supplies and residual populations in the plant are two more ways these acid-producing creatures come on the scene.

There are legitimate concerns about current antibiotic treatment techniques. Among them, said von Keitz, is the cost—according to him, it costs approximately \$40,000 per year for a 125 MMgy plant to use virginiamycin (based on 2005 numbers)—and passing virginiamycin through to the distillers grains, a worry for dairy farmers in Europe particularly.

One more real concern exists, von Keitz said. “Resistance—this is the issue,” he stated. He and his team collected samples from four U.S. corn dry mills with repeated contamination. Eleven strains of lactic acid bacteria from five different species of lactobacillus were identified via fatty acid methyl ester and gram stain analysis. These strains required elevated antibiotics dosing, determined by a concentration to achieve 80 percent reduction in the overall cell number (compared to the control, using no anti-microbial agents).

“I’m not saying the antibiotics aren’t working,” von Keitz said. “However, there are some strains out there that do not respond . . .”

Many times, hops is misperceived as simply a flavor-enhancer in beer, but it also has been used for a long time as an antimicrobial agent in breweries, he said. Von Keitz tested two commercial and one experimental hops products against the strains previously mentioned. One of the three hops products, Lactostab, displayed effectiveness against some of the strains previously unaffected by recommended doses of penicillin.

Ultimately, sanitation is the best defense, von Keitz told the crowd. Rigorous cleaning is critical in combating contamination at plants. Also, he said designers ought to be cognizant of how important the “cleanability” of a plant is, and should optimize designs with this in mind. “Know thy contaminants and their weaknesses,” von Keitz instructed. He said hops products are important new defense mechanisms against bacterial contamination in ethanol plants. Alternating agents could provide additional protection, he said, finally warning everyone that antimicrobials shouldn’t be used in excess, but rather only as needed.

Von Keitz is looking for new organisms that may have gained resistance to antibiotics commonly used in today’s ethanol plants. He asked participants to contact him at the University of Minnesota’s Biotechnology Institute if a recent contamination has developed.

