PATHKINEX UPDATE

United Animal Health DFMs: Comprehensive Support During Pathogen Challenges

Spotlight on Dr. Kyle Leistikow's 2025 AASV Industrial Partners Session

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Introduction to Pathogen Biofilm Formation and Quorum Sensing
Bacillus probiotics can interfere with pathogen growth and infection through various methods. Direct pathogen inhibition is the most well-known mechanism due to its clear relationship with a decrease in pathogen quantity and ease of testing in a laboratory setting. However, alternative pathways are gaining more interest, such as interference with pathogen biofilm formation and quorum sensing. The ability to control pathogen growth through multiple modes of action would provide more comprehensive support to animals during pathogen challenges.

Biofilms are complex communities of microorganisms embedded in an organism's self-produced extracellular matrix. Biofilms provide a protective environment for the pathogen, increasing its resistance or tolerance to antimicrobial agents and immune responses. This resistance often leads to chronic infections, which impact health and productivity metrics in commercial production systems. Biofilm-forming bacterial pathogens can also serve as reservoirs, posing risks of transmission of infectious diseases between animals and even to humans.[1]

Quorum sensing, or cell-to-cell communication, enables the coordinated activity of pathogens and can also play a role in bacterial pathogenicity. During this process, bacteria release signaling molecules, or autoinducers, into the environment. When there are large numbers of bacteria present, they can sense when the autoinducers have exceeded a threshold concentration and can respond by activating or repressing certain genes. For some organisms, like *E. coli*, quorum sensing is used to regulate the expression of virulence factors depending on its population density.[2]

Many pathogens that impact livestock and poultry species, such as *E. coli*, *Salmonella*, and *Clostridium*, have the ability to both form biofilms on intestinal surfaces and perform quorum sensing.[1-4] Therefore, *Bacillus* that can interfere with these complex systems *and* directly inhibit pathogens are likely to be more successful in the field. New data presented by Dr. Kyle Leistikow at the 2025 American Association of Swine Veterinarians (AASV) annual meeting suggests United Animal Health's powerful *Bacillus* strains exhibit all three of these modes of pathogen control:

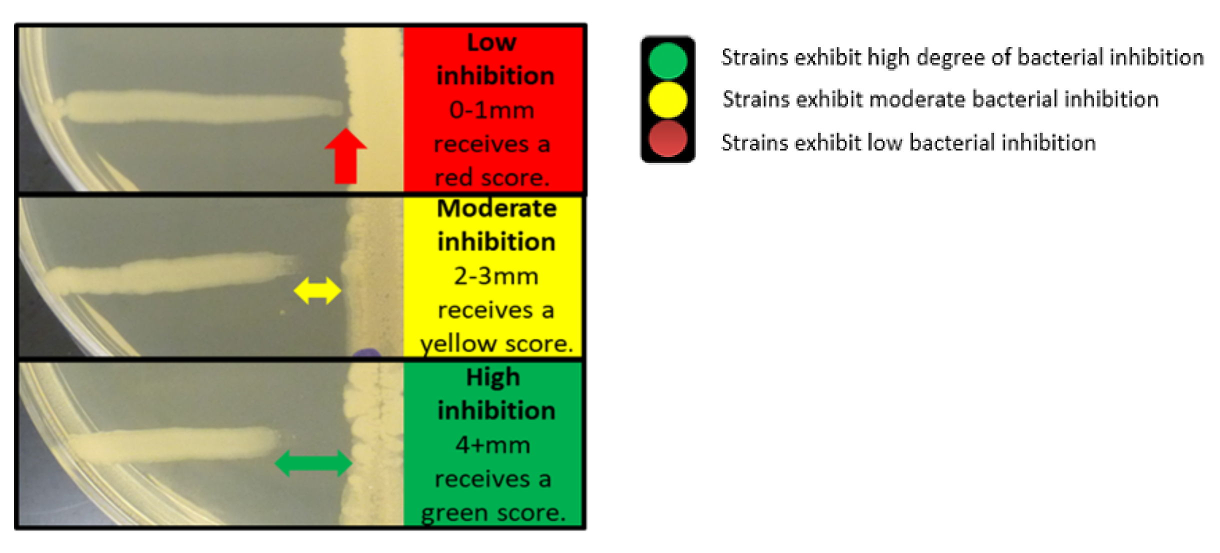
ProVent® ECL: A Comprehensive Probiotic to Support Swine Challenged with Multidrug-Resistant *E. coli*

Pathogen Inhibition · Biofilm Growth Inhibition · Quorum Sensing Disruption

ProVent® ECL Strains Inhibit the Proliferation of Multidrug-Resistant *E. coli*

ProVent® ECL strains were tested for their ability to inhibit 74 pathogenic *E. coli* isolates from swine provided by producers via veterinary diagnostic laboratories (VDL) from 2018 to 2023. These VDL *E. coli* were associated with enteric health challenges, scouring events, and/or high mortality, and many were multidrug-resistant (MDR) and *F18* positive. Specifically, out of the isolates with available antibiotic resistance data, all showed resistance to at least four antibiotics. The combination of ProVent® ECL strains were able to inhibit all of the VDL isolates tested.


Inhibition Potential
6 Strains



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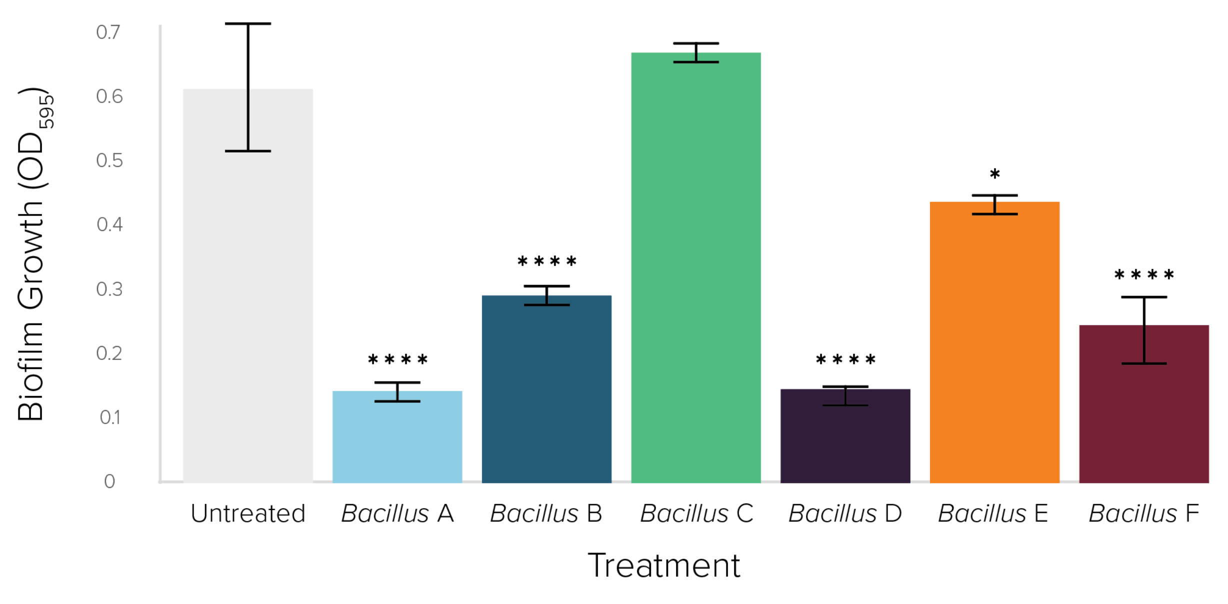
ProVent® ECL Strains Inhibit Biofilm Growth of Multidrug-Resistant *E. coli*

The inhibition of pathogen biofilms may help reduce incidence of chronic infections and reduce reservoirs of the pathogen in the environment. Therefore, the ability of ProVent® ECL strains to inhibit biofilm formation of multidrug-resistant *E. coli* was also investigated. In this assay, a multidrug-resistant VDL *E. coli* isolate was grown in a microplate and a stain was used to dye the biofilm a purple color. Most of the *Bacillus* in ProVent® ECL were able to greatly reduce biofilm growth of the multidrug-resistant *E. coli*.



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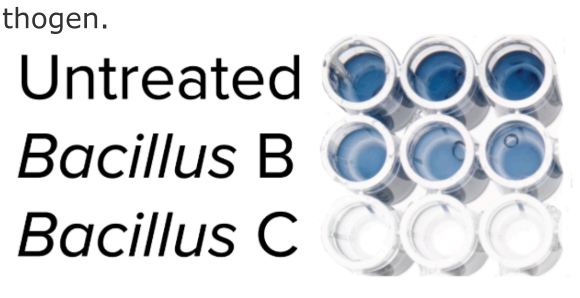
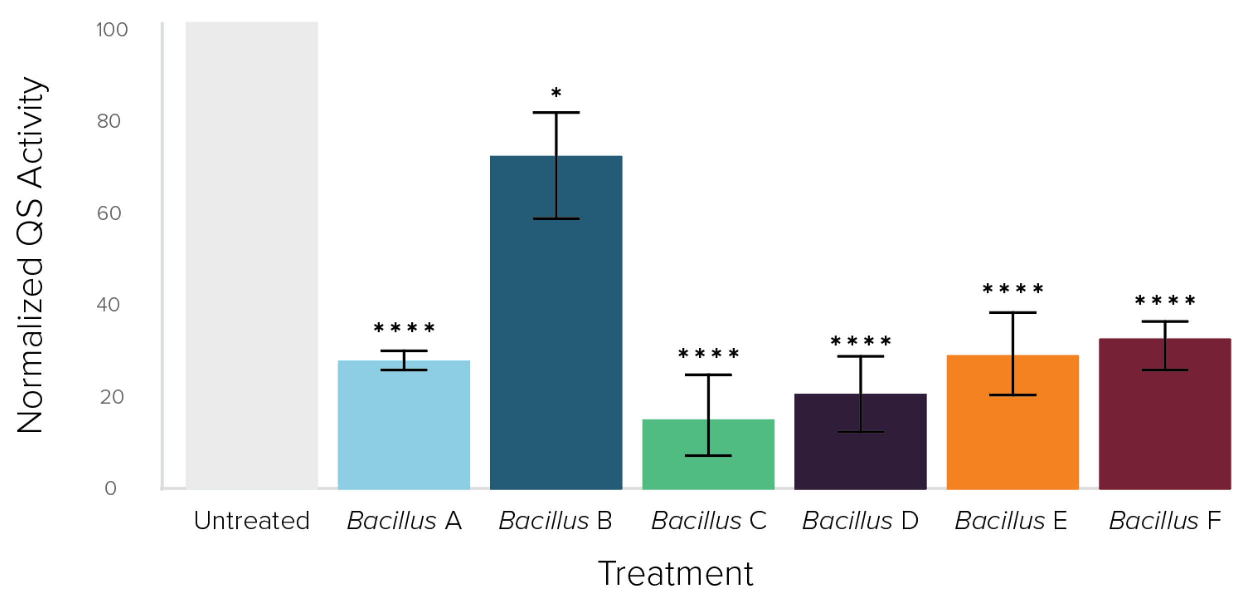
ProVent® ECL Strains Disrupt Pathogen Quorum Sensing Systems

The disruption of quorum sensing (QS) in pathogens may help reduce pathogenicity due to the role of QS in virulence factor production. *Chromobacterium violaceum* is an opportunistic pathogen commonly found in soil and water that can cause fatal human infections. *C. violaceum* is used as an indicator of QS activity because it produces a QS-regulated pigment called violacein that is easily measured. In this assay, the strains in ProVent®ECL were tested for their QS interference capability against *C. violaceum.* The darker blue color in the untreated wells compared to the *Bacillus* wells indicates QS inhibition. The strains in ProVent® ECL showed effective disruption of quorum sensing by this opportunistic pathogen.





These exciting findings demonstrate that the powerful strains in ProVent® ECL have the ability to disrupt pathogens through multiple mechanisms, making this unique formulation a great choice for comprehensive support to animals during pathogen challenges.

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Want to discuss these additional modes of pathogen control? Other questions on the topic?

EMAIL MDG

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For more information about pathogen inhibition, check out our previous PathKinex™ update:

ProVent® ECL IS UP TO THE CHALLENGE

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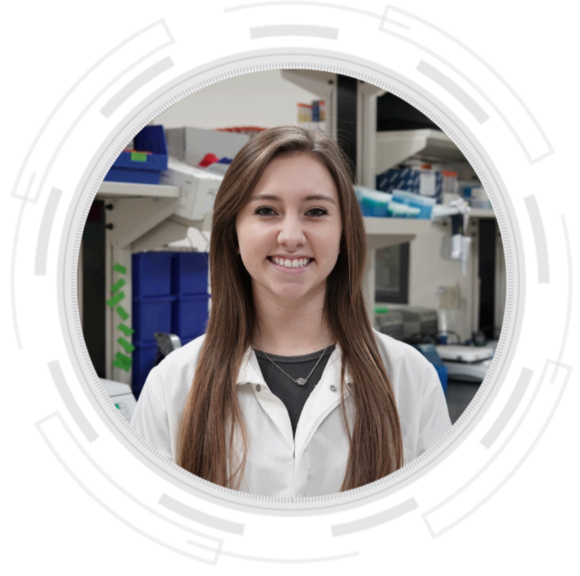
About the Author:



Kaley Pederson is a Microbiologist III at Microbial Discovery Group. She is focused in further understanding swine host-microbe interactions through the application of large-scale microbial surveillance platforms, as well as characterization of novel microbial strains.

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References

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