RESEARCH

Alternatives to antimicrobials: immunomodulation by mycobacterial cell surface biomolecules to protect against infections in beef and dairy calves

TRAINING IMMUNITY AS AN ALTERNATIVE TO ANTIBIOTICS

PROJECT NO.: 2023F190R
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Background: Antimicrobial use and resistance remains a topic of concern for beef producers. Not only are there fears that current products used to treat bacterial infections in cattle will become less effective over time, compromising animal health and welfare, but it is possible that any new antimicrobial products developed may be restricted for use in human medicine alone.

Several different approaches are being investigated to develop effective alternatives to antimicrobial products. One potential avenue is to stimulate or "train" immune cells to react to pathogens by exposing them to related bacteria that don't cause disease. In this case, previous work has shown that monocytes (immune cells) were trained by exposure to portions of mycobacteria cells and were able to mount a strong immune response against other bacterial and viral antigens. This concept is similar to training the immune system to recognize different pathogens via vaccination but does not have to be as specific to the target organism as a vaccine.

Objectives:

1. Prepare and test various mycobacterial cell surface extract fractions for their ability to induce trained immunity
2. Test the most promising formulations for their ability to reduce or prevent Mycoplasma bovis infection in calves
3. Isolate, characterize and validate the activity of biomolecules within the cell surface extract fractions
4. Determine if other immune cells beyond monocytes exhibit the ability to be trained in a similar fashion

Implications of the Research: While this is relatively early-stage research, if these biomolecules are successful in inducing broad spectrum trained immunity against other bacteria or viruses, they may be a new tool we can add to our animal health toolbox that will not contribute to antimicrobial resistance.

Additional note: If mycobacteria sounded familiar to you, it might be because both bovine tuberculosis and Johne's disease are caused by different kinds of mycobacteria – these are the not the same mycobacteria being used in this project, and steps will be taken to ensure that no cross reaction occurs with standard tuberculosis testing methods.

This project is also supported by Results Driven Agricultural Research.