Developing a Marked, Live Attenuated Johne's Disease Vaccine Strain

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Background: Johne's Disease (JD) is a chronic gastrointestinal disease caused by *Mycobacterium avium* spp *paratuberculosis* (Map) and causes significant financial burden to the dairy industry. Clinical symptoms of JD include significant weight loss, chronic diarrhea, and eventually death. Currently there are no safe, effective vaccines available for the treatment of JD. An effective vaccine would prevent infection and also stop the transmission of Map. It would be administered orally to avoid granuloma formation at the site of injection, and it would not cross react with the tuberculosis skin test generating a false positive. A more effective vaccine is needed to reduce the incidence of Map transmission and JD.

Methods and Results: A predominant strain of Map was identified to serve as a parent strain. Calves will be inoculated with a library of mutant Map bacteria to identify virulent genes that allow Map to infect the tissue. Also, the parent strain will be marked with a foreign immunogenic peptide to distinguish the mutant strain from wildtype Map and induce an immune response that differs from tuberculosis. Lastly, we will knockout genes determined to cause virulence in dairy calves to create an attenuated vaccine that survives in calves long enough to generate a protective immune response.

Implications: Investigating a potential vaccine strain will provide valuable insight regarding virulent genes of Map and enhance techniques necessary for vaccine development. Producing a strain of Map that induces a protective immune response in calves but does not allow the establishment of infection will protect calves from developing clinical symptoms. Also, a safer vaccine is financially advantageous to the dairy industry.