

Jersey Johnes Research

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Foundation Priorities

- Nutrition of high-producing Jerseys, particularly practical feeding methods to maximize production of valuable milk components
- Factors affecting management of Jersey calves
- Factors affecting yield and/or quality of products manufactured from Jersey milk
- **Factors affecting economic impact of Jerseys: efficiencies, net income, longevity, and lifetime profit**
- Optimizing the genetic basis for improving animal health and/or enhancing product quality
- Enhancing environmental impact associated with Jerseys
- **New technologies for safe and sustainable food production from Jersey cattle**
- Feasibility of adding value and increasing consumer acceptance of Jersey-derived products through enhanced product quality and branding.

Projects funded in 2009 & 2010

- Two distinctly different Johnes projects
- Represented one-third of the financial awards made by the Research Foundation in 2009 & 2010
- \$10,378 for UW-Madison project
- \$6,000 for WA State/USDA-ARS

Genetic Markers Associated with Susceptibility to Paratuberculosis in Jersey Cattle

Sponsored by

AJCA Research Foundation

at

University of Wisconsin-Madison

College of Agricultural and Life Sciences

School of Veterinary Medicine

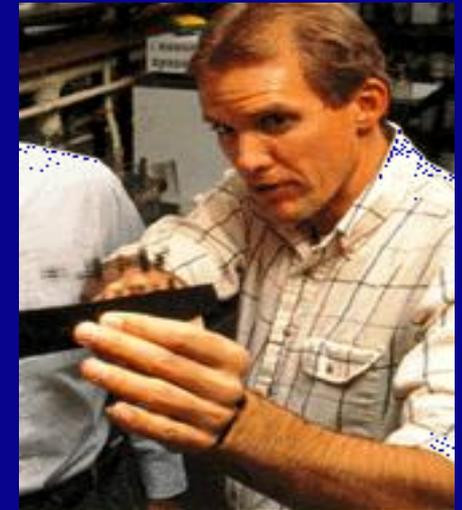


Project Team



George Shook
Dairy cattle genetics
Health traits

Brian Kirkpatrick
Molecular genetics &
DNA analysis



Mike Collins
Veterinary microbiology
Johne's diagnosis and control





Jersey Project

- OBJECTIVE: Examine in Jerseys the 40 most significant DNA markers in Holsteins
- EXPECTED RESULTS: Many, but not all, Holstein markers will be significant in Jerseys
 - Some unique susceptibility mutations in each breed
 - Breeds may differ in linkage of DNA markers with genes that cause susceptibility



Jersey Data



- Current AJCA project
 - Two herds, 1100 cows, sampling in 2009
 - Expect about 90 infected; 180 matching negative cows
- "Healthy Cows for a Healthy Industry" project
 - Two herds, 360 cows, sampled in 2007-08
 - 50 disease positive; 100 matching negative cows
- Total: Genotype 140 infected and 280 matching negative Jerseys



Sampling and Testing

- Blood samples for DNA extraction and JD antibody test (ELISA)
- Fecal samples for culture of JD pathogen
- Susceptible group:
 - Cows positive to both JD tests
- Non-susceptible group:
 - Cows negative to both tests
 - Two cows matched to each positive cow by herd, sire & birth date



Jersey Genotyping

- Genotype 40 DNA markers that were most significant in Holsteins
- Calculate genotype frequencies for each marker in each JD group
- For a given marker, different genotype frequency between JD groups indicates linkage of that marker with a gene that causes susceptibility



Benefits to Jersey Breeders

- Which Holstein DNA markers can be used in Jerseys?
- Select Jersey cows and bulls with genotypes that have lower susceptibility to JD



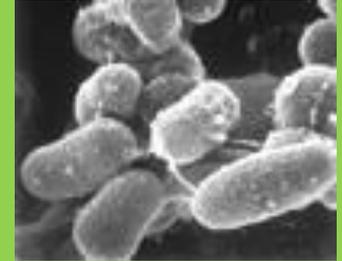
Identification of Gene Mutations Responsible for
Susceptibility to Tissue Infection of
Mycobacterium avium spp *paratuberculosis* in
Jersey Cattle



Holly Neibergs, PhD (Washington State University)
Curt Van Tassell, PhD (USDA, ARS, Beltsville, MD)

Long-Term Goal

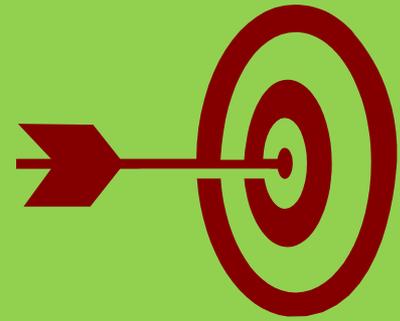
- Our long-term goal is to reduce the prevalence or severity of Johne's disease in cattle through genetic selection



Objective

- The objective of this proposal is to identify if mutations in *HIVEP3* or *EDN2* genes are associated with susceptibility to *Mycobacterium avium subsp. paratuberculosis* (*Map*) tissue infection in Jersey cattle thus gaining critical information to select for animals that are less susceptible to Johne's disease.

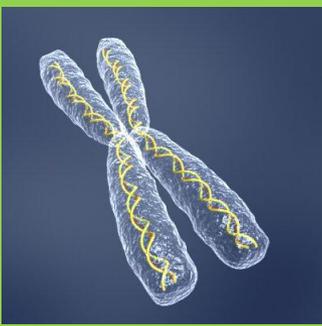
Hypothesis



- Our hypothesis is that mutations in *EDN2* or *HIVEP3* genes are responsible for the association of bovine chromosome 3 with susceptibility to tissue infection of *Map* (the bacteria that leads to Johne's disease).

Project Summary

- The proposed research seeks to determine if a chromosomal region identified in Holsteins is equally important in susceptibility to *Map* tissue infection in Jerseys.
- This information will be very important to determine if the same genetic mutations are resulting in disease susceptibility in both breeds.
- The identification of this region as associated with *Map* tissue infection in Jerseys and the identification of the mutation(s) responsible will provide much needed knowledge on the initiation of Johne's disease through *Map* tissue infection and provide tools to select animals that are less susceptible to Johne's disease.



Research Design

- The DNA variants in and around these genes on chromosome 3 have been further evaluated in Jerseys and Holsteins by DNA sequencing
- The DNA variants will be screened for in Jersey cattle with known exposure to *Map*
 - DNA differences in animals that became infected will be compared with animals that were resistant to identify if *EDN2* or *HIVEP3* are the genes associated with susceptibility to *Map* tissue infection, the first step towards Johne's disease

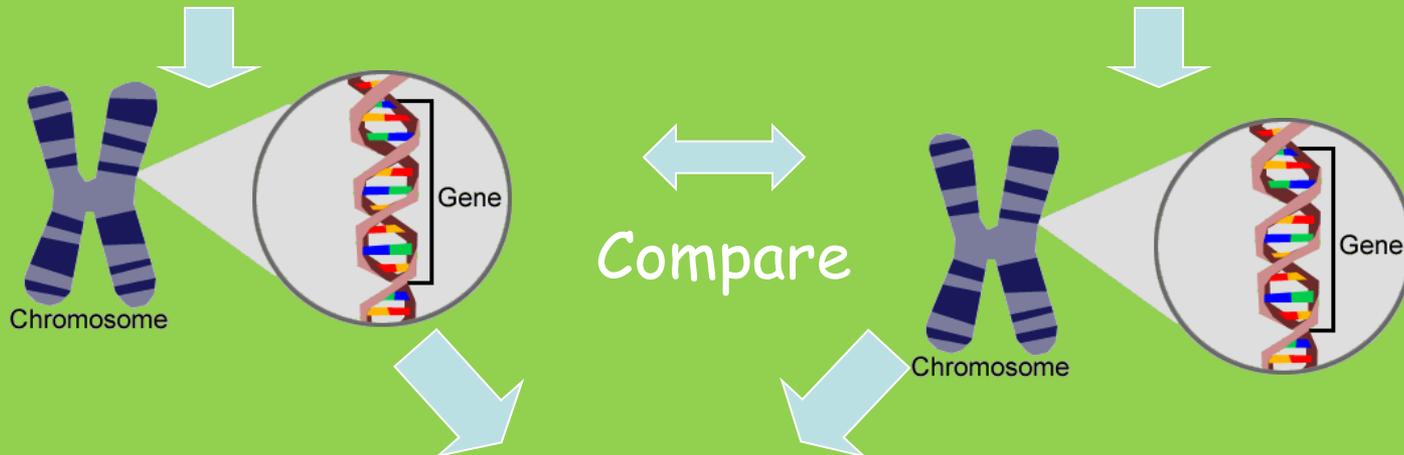
Research Design Summary



Johne's-causing bacterium

Tissue Infected

Resistant



Identify if *HIVEP3* or *EDN2* genes are associated with susceptibility to Johne's disease

Value to Jersey Milk Producers



- Identifying gene mutations responsible for susceptibility to *Map* tissue infection in Jersey Cattle will:
 - Provide tools for selection for animals resistant to Johne's disease
- Reducing the prevalence of Johne's disease through genetic selection will:
 - Reduce morbidity
 - Reduce mortality
 - Improve animal welfare
 - Improve production
 - Improve profitability

Jersey Marketing Service

- Subsidiary of the American Jersey Cattle Association
- Public auctions and private treaty sales
- Leader in animal health testing
 - Negative Johnes test required for all animals over 24 months old at national sales

Summary

- We view Johnes disease as an important area of research
- We expect the results of these projects will have an impact on the profitability of Jersey dairy businesses