Identifying bacterial infection in Alaskan small mammals

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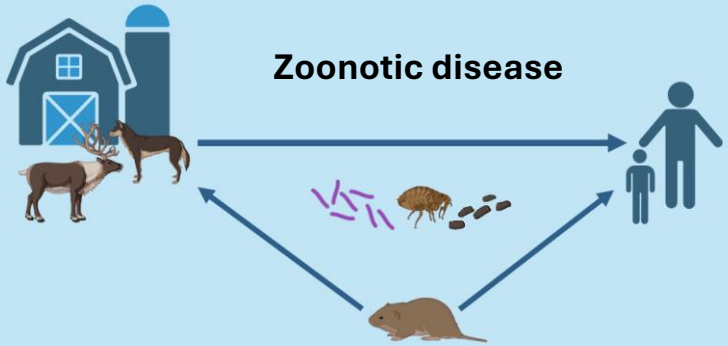
Introduction

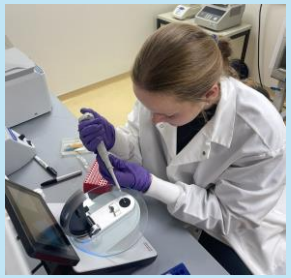
Zoonotic diseases are those that can spread from animals to people. Voles are present in many peridomestic settings and are capable of being reservoirs for zoonotic diseases. For this project we utilized Northern-Red Backed Vole (*Myodes rutilus)* tissue samples collected during the summer of 2024 from various locations to include animal facilities such as dog kennels and reindeer farms and compared them to control sites (forests and fields) across Interior Alaska. We utilized universal 16S rRNA gene PCR to identify bacterial DNA in vole liver and spleen tissue samples.

Research Question: Are small mammals at animal facility sites more likely to be carriers for bacterial zoonotic disease?

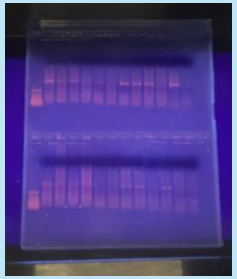
Identifying bacteria present in sterile tissues of voles could indicate infection. Determining whether small mammals living near animal facilities such as kennels or farms are more or less likely to harbor bacterial zoonotic disease could be useful for understanding what disease could spread to pets, livestock, or humans.



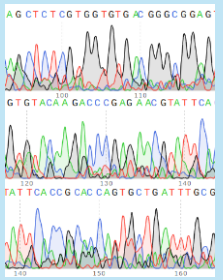
Methods



DNA quantification



Agarose gel electrophoresis



DNA sequencing

- Dissected voles to obtain liver and spleen
- Extracted DNA using Qiagen DNeasy tissue DNA extraction kit and protocol
- Quantified DNA samples using NanoDrop One
- Ran PCR assays for the 16S ribosomal RNA gene according to Hansen, 2015
- Ran agarose gel electrophoresis and analyzed the gel using a Spectroline UV transilluminator to determine positives
- Positive samples sent to Elim Biopharmaceuticals for Sanger sequencing
- Used SnapGene to clean up the chromatogram data
- Obtained bacterial species identification through NCBI Blast

Results

- Obtained 57 positive results (59% of samples)
- Species identified through Sanger sequencing:

Bacterial Species	Description	TAP +
Fusobacterium necrophum	Gastrointestinal (GI) bacteria	
Bartonella vinsonii (3)	Pathogenic bacteria	2
Mesorhizobium loti	Soil bacteria	
Lactobacillus helveticus	GI bacteria	
Enterococcus faecium	GI bacteria	
Clostridium	Pathogenic GI bacteria	

Discussion & Future Directions

- Pathogenic bacteria (*Bartonella* and *Clostridium*) could indicate presence of infection or weakened immune system
- Difficulties faced:
  - Resource and time constraints
  - Possible contamination during the procedure
  - Human error in final clean-up procedure
- Future research could isolate higher concentrations of DNA from specimen tissues and run specific bacterial gene PCR

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