Next Generation Sequencing: An Ultrasensitive Diagnostic Tool for Lyme Borreliosis

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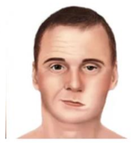
INTRODUCTION

- Lyme borreliosis is the most common tick-borne disease caused by the bacteria *Borrelia burgdorferi*.
- It is transmitted by the Ixodes ticks

Stage1: Erythema migrans



Stage 2: Neurological abnormalities or Carditis

Stage 3: Arthritis

- The CDC reports about 30,000 annual cases of Lyme disease but the true estimate is about 500,000
- Next Generation Sequencing (NGS) is a technology sequence DNA and RNA

Current Diagnostic Testing for Lyme

Clinical Constellation of signs and symptoms

Two Tier Serological Test (most common) → Detect Antibodies (IgM and IgG)

Limitations
- Insensitive during the early stages of infection
- Cannot distinguish active from resolved infection

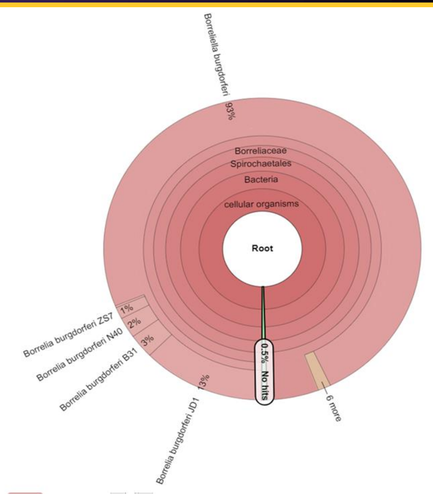
Polymerase Chain Reaction (PCR) → Detects the DNA of *B. burgdorferi*

Limitations
- Low sensitivity and unreliable due to the very low abundance of the *B. burgdorferi* in clinical samples

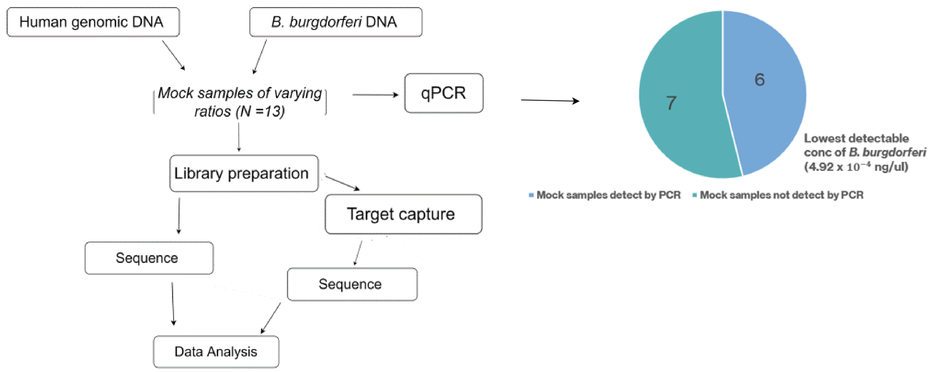
We hypothesize that next generation sequencing with target capture can be used as an ultra-sensitive diagnostic tool for lyme borreliosis

Next Generation Sequencing of *B. burgdorferi*

Skin Biopsy Culture

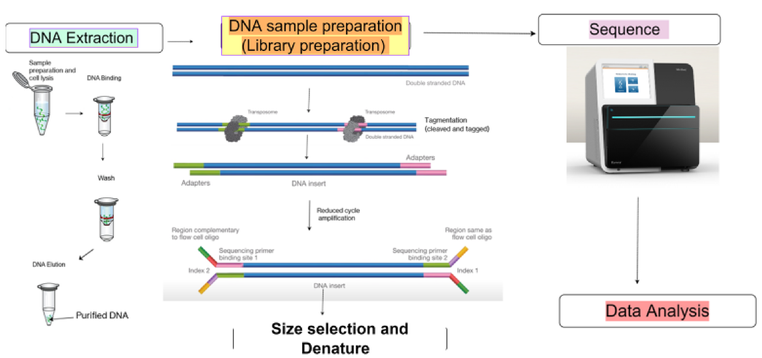


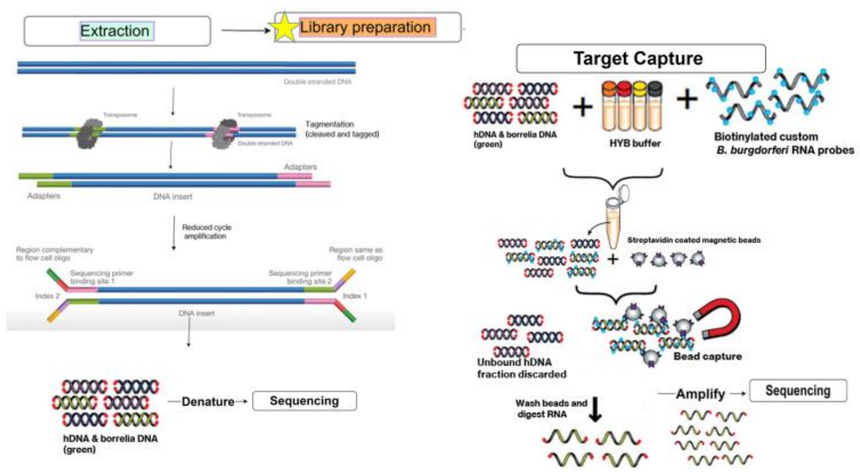
Target Capture Enrichment to Increase the Sensitivity of NGS



MATERIALS & METHODS

Next Generation Sequencing (NGS)





DISCUSSION

- Next Generation Sequencing was successfully used to sequence the genome of a cultured sample of *Borrelia burgdorferi*.
- Target capture enrichment of pathogen DNA can help overcome the low abundance of the *Borrelia burgdorferi* in blood
- We anticipate that:

NGS with Target Capture > NGS w/o target capture > PCR

REFERENCES

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