Investigating the Epidemiology of Borrelia Spirochaetes in Dorset

Natalie Cotterell, Nicole Hope, Kensey Lycett, Louisa Spearing, Eilish Hart, Jasmin Howard, Dr J Rowe, Mr S Lewis, Mrs J Wardlaw, GENEsis Lab at The Thomas Hardye School, Dr N King University of Exeter.

Overview

More than 400 ticks have been collected from animals all over Dorset by volunteers. Using gel electrophoresis and Polymerase Chair Reaction (PCR), to amplify and fragment the extracted DNA, we are able to determine whether each tick hosts the *Borrelia* bacterium. To date, we have sampled and obtained results for 137 ticks.

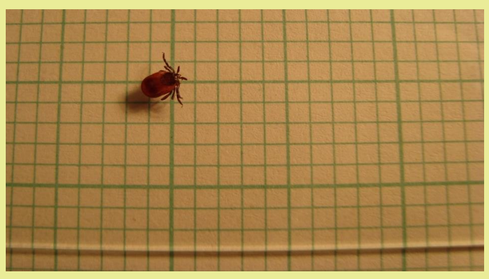
Aims

- Determine the frequency of *Borrelia* in ticks across Dorset by extracting their DNA, carrying out PCR and Gel Electrophoresis.
- Raise an awareness of Lyme Disease and the prevention of it.

Techniques and Equipment

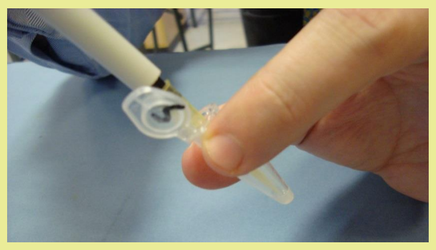
- Pipettes: allow for a more precise measurement of liquids. Different pipettes used prior to PCR and post PCR to reduce contamination.
- PCR: amplifies a specific sequence of DNA to produce a larger sample.
- Gel Electrophoresis: separates DNA fragments by size as a voltage is applied.
- Outreach: discussing the project with the public, students and staff at Dorset County Show, Family Festival of Science, Big Bang Fair South West, Fossil Festival, Meet the Scientists and Royal Society Partnership Grant celebration.

Method

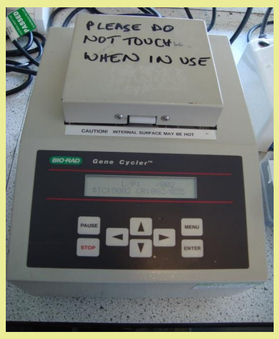


Profiled Ticks by recording size and gender

Extracted Tick DNA by adding head and Lysis buffer to a reaction tube then heating and neutralising with TRIS

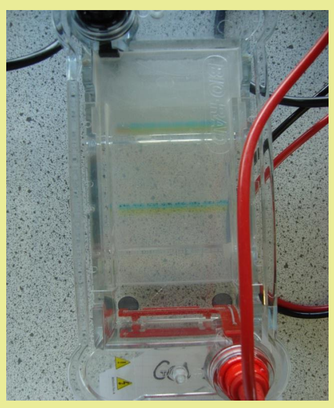


Added DNA mixture, GoTAQ, *Borrelia* Primers and distilled water to an Eppendorf tube

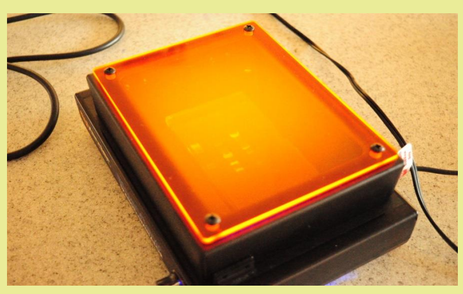


Carried out 35 cycles of PCR to amplify DNA

Pipetted DNA ladder, positive *Borrelia* controls and Tick DNA after PCR into wells of agarose gel in electrophoresis chamber



Carried out gel electrophoresis at 150V to separate DNA fragments into bands



Viewed bands under UV light and compared to positive control for the presence of *Borrelia*

Resulting image shows bands representing the DNA ladder, Positive control and a positive *Borrelia* result

Results

Of the ticks tested so far, only one has tested positive for the presence of *Borrelia* DNA. This was shown by two bands which aligned with the positive control, whereas only one band was present in those that did not contain *Borrelia.*

	Positive	Negative	Unsure
Borrelia DNA	1	135	1

Conclusions

- From our sampling, we conclude that the distribution of *Borrelia* in ticks across Dorset is low. Remaining ticks are due to be tested using the same *Borrelia* primers. Also, we isolated DNA samples to be used in the future against different primers to investigate whether other bacterial DNA is present.
- A second season of tick sampling and subsequent analysis will improve statistical validity and confidence in preliminary results. Technical expertise will be gained by biologists in 3 sixth-form cohorts.

FUNDED BY A PARTNERSHIP GRANT FROM THE ROYAL SOCIETY

Acknowledgements: