

# University of Salford/LAMM2014 Lyme Disease Survey

Thank you all for the massive response to the 2014 LAMM tick survey. The key findings are:

- A minimum of 8% of competitors were bitten by ticks that could potentially transmit Lyme Disease.
- About 10% of these ticks were carrying *Borrelia burgdorferi*, the bacterium that causes Lyme Disease.
- **Therefore, between 13 and 20 of the competitors who returned samples were bitten by infected ticks, suggesting that the total number of competitors bitten by infected ticks was about 60!**
- So did anyone develop Lyme disease (“bulls-eye” rash) or have flu-like symptoms after the LAMM? If so please let us know.

Read on for more details:

## *Survey of the environment*

Questing *Ixodes ricinus* ticks (commonly referred to as deer ticks or sheep ticks) were opportunistically collected by blanket dragging at three locations used by LAMM. A total of 283 nymphal ticks were collected and tested for the presence of DNA belonging to *B. burgdorferi* (the bacterial pathogen that causes Lyme Disease). The overall prevalence of infection was 10.2% (29/283) (Table 1).

Location	N <sup>o</sup> ticks collected	N <sup>o</sup> nymphs containing <i>B. burgdorferi</i> DNA (%)
Lochcarron (A)	2 larvae, 156 nymphs, 6 adults	11 (7.1)
Start of course (B)	0 larvae, 107 nymphs, 0 adults	16 (14.9)
Start/Finish Area (C)	0 larvae, 20 nymphs, 2 adults	2 (10.0)

Table 1: numbers of ticks collected, and prevalence of *B. burgdorferi* infections in ticks at the three sites surveyed.

## *Tick infestation rate among competitors*

A total of 53 competitors removed and submitted ticks on day 1 of LAMM, and 78 competitors removed and submitted ticks on day 2 (or later by post). It is not known how many competitors submitted ticks on both days, but based on the record of 624 competitors on day 1 and 566 on day 2, we can estimate that a minimum of about 8.5% of competitors on day 1 and 14% of competitors on day 2 got bitten. A total of 98 submissions contained potentially infective ticks (i.e. not larvae),

thus 7.2% of competitors on day 1 and 8.0% of competitors on day 2 were bitten by ticks with the capacity to transmit *B. burgdorferi*.

The number of larval ticks present in each submission ranged between 0 and 28, and the number of nymphal ticks ranged from 0 to 9. The vast majority of submissions contained either only 1 nymph or 1 larva (Figure 1). In total 411 larvae and 154 nymphs were collected.

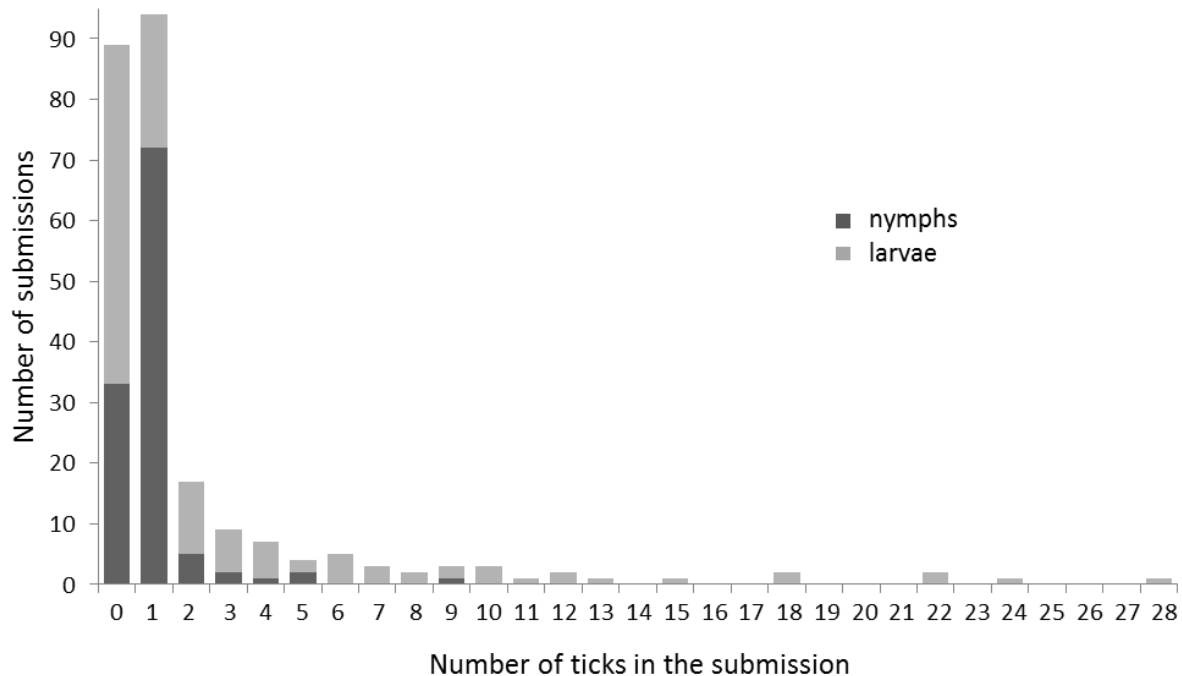


Figure 1: Distribution of number of ticks present in each of the 131 submissions from LAMM competitors.

#### *Borrelia burgdorferi* infection prevalence in nymphal ticks feeding on LAMM competitors.

DNA extracts were prepared from the 154 nymphs collected off competitors and incorporated into a PCR assay aimed at determining the presence of *B. burgdorferi* DNA. Twenty (13%) of nymphs were found to be infected with the pathogen. The 20 infected nymphs were collected off 16 competitors. In three instances, more than one nymph collected off the same competitor was found to be infected. Seven infected nymphs were collected off 7 day 1 competitors (thus 1.1% of competitors were bitten by an infected tick) whereas 13 infected nymphs were collected off 9 day 2 competitors (thus 1.6% of competitors were bitten by an infected tick). The prevalence of infection in ticks collected off humans was not significantly different from that in questing ticks (chi square prev in ticks off humans v prev in ticks off ground = 0.75,  $p = 0.39$ ).

#### LAMM discussion/comments

The presence of ticks at the site of this year's LAMM is entirely expected, as is the presence of *B. burgdorferi* infections in these ticks. In a recent survey of 25 sites across Scotland, situated primarily in the Highlands, infected ticks were found at all sites (James et al., 2012). The overall prevalence of *B. burgdorferi* infections in questing ticks and in ticks collected off competitors (49/437, 11.2%) was akin to that previously reported in Scotland and elsewhere in the UK (James et al., 2012; Bettridge et al., 2013).

Perhaps the most unexpected observation was the high proportion of competitors bitten by ticks; our estimates of 8.5% on day 1 and 14% on day 2 are likely to be underestimates due to underreporting. However, about 25% of competitors who reported being bitten by ticks only found larvae in their bodies; this life stage is not infected with *B. burgdorferi* and thus does not pose an infection threat. Nonetheless, the remaining 98 submissions, representing 75% of all those bitten by ticks and between 7.2% and 8% of all competitors, found *I. ricinus* nymphs, that do have the potential to transmit *B. burgdorferi*, attached to them. Given that all these nymphs were likely removed within 24 hours of attachment, the risk of transmission of *B. burgdorferi* is low.

However, between 13 and 20 competitors who handed in samples were bitten by infected ticks, and, if we extrapolate this to all competitors, then as many as 60 (1% of runners) were bitten by infected ticks. Therefore, it would be very helpful to hear if any competitors developed clinical signs Lyme Disease during the month following LAMM. Remember, although most cases are characterised by a “bulls-eye” rash around the site of tick bite (called erythema migrans), in some people infection may manifest in other ways – for example, flu-like symptoms.

Please email Richard Birtles ([r.j.birtles@salford.ac.uk](mailto:r.j.birtles@salford.ac.uk)) with any further information as it allows us to validate the idea that tick removal within 24hrs greatly reduces the chance of infection.

Many thanks

Stephen Martin & Richard Birtles

#### *References*

Bettridge J et al., Vector Borne Zoonotic Dis 2013;13:139-46.

James M et al., Parasitology 2013;140:237-46.

#### *Authors*

Jessica Hall, Kevin Bown, Stephen Martin, Richard Birtles, School of Environment and Life Sciences, University of Salford, M5 4WT, UK.

email: [r.j.birtles@salford.ac.uk](mailto:r.j.birtles@salford.ac.uk)