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Short communication

Preliminary evaluation of exotic tick species and exotic pathogens imported on migratory birds into the British Isles

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Abstract

Field studies were carried out to determine whether ticks are being imported into the British Isles on migratory birds. During spring and autumn migration 2004, ticks were collected from ringed birds at 11 bird observatories and 3 inland *Riparia riparia* colonies. A total of 38 ticks of 4 species (*Ixodes ricinus*, *I. frontalis*, *I. lividus*, *I. arboricola*) were collected from 12 species of bird. Ticks were tested for viruses in the *Flavivirus* and *Nairovirus* genera, with no positives found. This data demonstrates that ticks are being imported into the British Isles on migratory birds with future work recommended to determine the quantity of ticks imported and to detect low prevalence pathogens.

Keywords: Tick; *Ixodes*; Migratory birds; Viral pathogens; Arbovirus

1. Introduction

With increased activity in Europe of arboviruses such as Crimean-Congo haemorrhagic fever (CCHF) virus (Karti et al., 2004) and tick borne encephalitis (TBE) virus (International Scientific Working Group on TBE, 2008), as well as recent evidence for migratory birds carrying TBEV infected ticks into Sweden (Waldenström et al., 2007), the potential exists for migratory birds to import exotic disease vectors and infectious disease into the British Isles.

Whilst there is anecdotal evidence that migratory birds import exotic non-native tick species into the British Isles; with records of *Hyalomma marginatum marginatum* ticks at land-fall sites such as Dungeness and the Calf of Man (Martyn, 1988), there is currently no information on the species and numbers of both exotic native (e.g. *Ixodes ricinus* from continental Europe) or non-native tick (e.g. *Hyalomma* sp.) species arriving each year in the British Isles on migratory birds, nor is there

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any information on whether these ticks are carrying pathogens.

Olsen et al. (1995) estimated that approximately 100 million birds migrate into/through Sweden each spring. This study found that 3% of 10,575 migratory birds surveyed in Sweden and Denmark were infested with ticks (relative intensity 0.068 ticks per bird), constituting an estimated 6.8 million ticks imported during spring each year. Waldenström et al. (2007) carried out a similar study in Sweden where 3.4% of 13,260 migratory birds were infested reporting a mean infestation rate of 0.086 ticks per bird examined. Approximately 13 million birds migrate to Britain from Africa each spring (Stone et al., 1997) and adopting a combined average of the two studies with a relative intensity of 0.078, this would represent 1.01 million ticks entering Britain each spring.

An understanding of the prevalence of exotic native and non-native ticks being imported into the UK on migratory birds, as well as the pathogens they carry, is important for assessing the risk of both human and veterinary tick-borne diseases. A pilot study was undertaken to establish the procedures needed to determine the diversity of tick species being imported into the British Isles by birds and whether such ticks may be infected with pathogens.

2. The study

As part of ongoing bird monitoring activities approximately 800,000 birds are ringed in Britain and Ireland each year. During spring and autumn migration 2004, visible ticks were collected by qualified ornithologists from a sample of birds captured for ringing at 11 bird observatories across the UK (Fig. 1) and 3 inland *Riparia riparia* (sand martin) colonies. Details of tick species, stage, tick numbers, bird host details (species/origin) and collection site and date were recorded. Ticks were identified at the Central Science Laboratory using keys by Arthur (1963), then forwarded to the Novel and Dangerous Pathogens/Virology unit at the Health Protection Agency (HPA), Porton Down and stored at −80 °C for subsequent analysis.

Tick-borne viruses are found in six different virus families (*Asfarviridae*, *Bunyaviridae*, *Flaviviridae Reoviridae*, *Rhabdoviridae*, *Orthomyxoviridae*) spread over at least nine genera. Given the limited resources available for this work, it was not possible to encompass all potential genera in a testing programme and tests were focused on the two genera known to harbour medically important tick-borne viruses. These were the Flavivirus and Nairovirus genera of which the pathogens TBE virus, Louping Ill (LI) virus and CCHF virus are respective examples.

Fig. 1. Location of participating bird observatories. Italic text indicates the sites where ticks were collected. (1) *North Ronaldsay*, (2) *Fair Isle*, (3) Walney Island, (4) *Arkholme*, (5) *Filey*, (6) Sand Hutton, (7) Holme, (8) *Bardsey Island*, (9) *Chelmarsh*, (10) *Highley*, (11) *Brecon*, (12) *Rye meads*, (13) Landguard, (14) *Flat Holm Island*, (15) *Gordano*, (16) Sandwich Bay, (17) Rye Bay, (18) *Dungeness*, (19) *Portland*.

Assays and methodology were developed in conjunction with experimental infections using LI infected (Sánchez-Seco et al., 2005) *I. ricinus* ticks (Gaunt et al., 1997) to confirm the RT-PCR and nested methods. Ticks were freeze thawed on dry ice for 1 h. 20 μl of foetal bovine serum and 80 μl of phosphate buffered saline were added and the ticks were crushed using an RNase free pestle and mortar, centrifuged for 1 min and cell debris discarded. Tick homogenate was treated with 600 μl RLT buffer/β-mercaptoethanol (1 ml/10 μl) and