Learning Outcomes

• Understand the nature of Lyme disease and its mode of transmission
• Describe the clinical presentation of early, early disseminated and late Lyme disease
• Identify the risk factors for contracting Lyme disease associated with tick bites and at-risk groups
• Know how to prevent tick borne infections
• Understand how Lyme disease can be diagnosed and treated
• Describe the role of the healthcare practitioner in educating the public about the balance between enjoying the outdoors and concerns about tick borne infection
• Know the existence and role of the Scottish Health Protection Network Lyme disease subgroup
What is Lyme Disease?

- Also known as Lyme borreliosis
- An infection caused by *Borrelia burgdorferi*, a gram negative spirochaete bacterium
- Transmitted through the bite of an infected tick (*Ixodes ricinus* in the UK) – a tick needs to be attached to the skin for around 24 hours to transmit Borrelia to a person.
- Recognised clinical presentations: early localized, early disseminated and late Lyme disease
- There are large gaps in our clinical understanding of Lyme disease, particularly for ‘Post-Lyme Syndrome’

Picture credit: James Gathany
Ticks – vectors of Lyme Disease

• The tick, *Ixodes ricinus*, is known as the sheep or deer tick
• Mammals and birds in affected areas are hosts for the ticks – e.g. vole, deer, rabbit, grouse, blackbird, chaffinch, grey squirrel
• Lyme disease is the most common tick borne disease in Europe
• Found over most of the UK and mainland Europe and the United States
The 3-stage life-cycle of ticks (*Ixodes ricinus*)

In Scotland the life-cycle, typical takes 2-3 years to complete

Tick scale: size of the various life stages against and adult human thumb nail
Where and when can ticks be found?

• Long grass, bracken and undergrowth
• Gardens, picnic sites and parks
• Low level vegetation rather than hill tops
• Ticks do not like desiccation
• March and October traditionally are the peak months for tick numbers
• Nymph stage is the size of a full stop with up to 10% ‘questing nymphs’ carrying Borrelia
• Scottish-field studies show seasonal variation in the number of Borrelia-infected ticks

Environmental determinants of *Ixodes ricinus* ticks and the incidence of *Borrelia burgdorferi* sensu lato, the agent of Lyme borreliosis, in Scotland Marianne C. James *et al.*, (2013) *Parasitology, 140*: 237-246
Who is at Risk?

• Anyone who is exposed to ticks!
  – Tick habitats may be near people’s homes
  – People may travel to tick habitats (e.g. picnicking, rambling, dog walking, jogging, outdoor sports, leisure activities)
  – Children, even babies, can easily get ticks

• Occupational hazard
  – Forestry
  – Scottish Natural Heritage
  – Tourism
  – Outdoor education
  – Gamekeepers
  – Farmers
Ticks on people

6 year old child’s arm

This is the likeliest stage to transmit *Borrelia* spp. to people if not removed promptly.

Nymph (8 legs)

Larva (6 legs)

Size of larva relative to tick removal device

... compared to size of engorged adult tick (from a dog)
How to remove ticks

• There are a range of specially designed tick removal ‘devices’ or ‘tools’ available
• In our experience, devices that look like a small claw hammer or a credit card are the most efficient and easy to use
• Available (relatively cheaply) from many outdoor stores, pharmacies and rural shops
• Keep one in first aid kits, back packs and car glove boxes
• DO NOT DELAY REMOVING TICKS FOR LACK OF A TICK REMOVAL DEVICE...fine-tipped tweezers held parallel to the skin can be used to lift ticks off (REMEMBER: a tick needs to be attached to the skin for around 24 hours to transmit Borrelia to a person)
Tick removal

Make sure a friend (or mirror) can check the places you can’t see!
Use a mobile phone to photograph ticks and/or rashes as their appearance can change over time

Tick Removal (YouTube video), Dr James Douglas, General Practitioner NHS Highland
https://www.youtube.com/watch?v=oCuWVqWdWUE
Clinical Diagnosis of Lyme disease
Lyme Disease

• Just because you’ve been bitten by a tick doesn’t mean to say you’re going to get Lyme disease
• Unfortunately a small number of people bitten by ticks may develop illness
Clinical Diagnosis of Lyme Disease

Laboratory tests are supportive of clinical diagnosis

- Early localized Lyme disease
  - Erythema migrans is diagnostic of Lyme disease
  - Borrelial lymphocytoma
- Early disseminated Lyme disease (up to 6 months)
  - Flu-like symptoms
  - Lyme meningitis
  - Lyme carditis
  - Neurological symptoms (including Bell’s Palsy)
- Late Lyme disease
  - Neurological symptoms
  - Lyme arthritis
  - Acrodermatitis Chronica Atropicans (ACA)
- ‘Post-Lyme Syndrome’
  - chronic fatigue, chronic neurological symptoms and arthritis in a smaller number despite appropriate antibiotic treatment
Treatment

Early Lyme disease (erythema migrans)

– Adults:
  • 1st line doxycycline 100mg bd, po for 2-3 weeks (NB consider photodermatitis and renal function)
  or
  • Amoxicillin 500mg tds, po for 2-3 weeks

– Children:
  • refer to child prescribing guidelines

https://www.britishinfection.org/guidelines-resources/published-guidelines/
British National Formulary: https://www.bnf.org/
Testing in Scotland

• The National Lyme Borreliosis Testing Laboratory (NLBTL) tests samples from all Health Boards throughout Scotland
• Internationally recognized 2-tiered testing protocol
• Similar protocol to Public Health England, Lyme Reference Unit, Porton Down

NB. There are a range of testing services available through private laboratories for patients and near-patient kits for testing whether a tick is carrying Borrelia. It is challenging to interpret the results of these tests with confidence, as many may not be fully validated. All tests give false positive and false negative results in certain circumstances and this is better understood and accounted for in the approved tests used by the NLBTL.
Testing protocol

• Erythema migrans is diagnostic of Lyme disease – these patients not normally tested
• Screening Enzyme immunoassay on all serum samples
• Positive, equivocal and negative samples with a significant clinical history of Lyme Borelliosis (tick bite/rash, erythema migrans) tested by Borrelia IgG Immunoblot
• Interpretation of Borrelia IgG Immunoblot with clinical information

The laboratory diagnosis of Lyme disease (Webinar)
Dr Roger Evans, Director, National Lyme Borreliosis Testing Laboratory
Epidemiology from NLBTL data

The drop in cases from 2010 to 2013 is in part due to encouraging clinicians not to send a serum sample for testing if erythema migrans is diagnosed, changes to the assays used at NLBTL and other factors (e.g. tick ecology etc.). Overall, there is an under-reporting of Lyme disease in Scotland.
The Scottish Health Protection Network (SHPN)
Lyme Disease Subgroup
Membership

• Consultant Infectious Diseases Physician
• Consultant Microbiologist
• Consultant in Public Health Medicine
• GP with special interest in Lyme borreliosis
• Health Protection Nurse Specialist
• Health Protection Scotland
• Health & Safety Executive

• Local Authority Environmental Health Officer
• National Lyme Borreliosis Testing Laboratory
• NHS Education for Scotland
• NHS24
• Pharmacy
• Public Health England
• Research
• Scottish Government
3 Main Priorities

1. Raising awareness of ticks, tick-borne infection and methods of prompt and safe removal of ticks to prevent infection

2. Raising awareness among front line clinical staff to ensure correct recognition and prompt treatment with antibiotics for patients presenting with clinical syndromes suggestive of Lyme Disease

3. Improving surveillance of Lyme Disease to estimate the burden of disease and monitor changes over time
Action

• Raising awareness:
  – ticks, risks, prompt and safe removal
  – Scotland’s Outdoor Health Code

• Workforce education
  Podcast(s), Webinar(s)
  – CPD resources

• Surveillance
  – Support laboratory diagnosis
  – Explore healthcare datasets and coding for better estimates of disease burden
Very conscious that we need to avoid being overly prescriptive

Very conscious that we don’t want to discourage responsible use of the countryside

Very conscious that we want to be coherent

- Outdoor Health Code
- Lyme disease leaflet
- Lyme disease infographic
Community Engagement

- Using community engagement to co-design risk mitigation strategies for ticks and Lyme disease in Highland
  

- Resources
  
  [www.checkforticks.org.uk](http://www.checkforticks.org.uk)

- LymeAPP: risk maps and Smartphone app pilot project
Summary: Key Messages

• Ticks are very (and increasingly) common in Scotland.
• Ticks are unlikely to be infected with Borrelia spp.
• Careful checking for, and prompt appropriate removal of, attached ticks is essential to avoid Lyme disease...remember to use mobile phone/digital camera to save pictures of ticks and/or rashes around likely tick bites.

• An infected tick has to remain on a person for approximately 24 hrs to transmit Borrelia spp.
• We believe this is best done using one of the plastic tick removal devices that look like a small claw hammer or credit card and are sold by many outdoor stores, pharmacies and rural shops.

• People who develop a rash around the site of a tick bite or experience flu-like symptoms or any other health concerns after being bitten should consult their doctor.
Conclusion

• Active and responsible use of outdoor places is very important for health
• Concerns about ticks and Lyme disease should not discourage people from doing that...
  ...the risks can be managed
This resource may be made available, in full or summary form, in alternative formats and community languages. Please contact us on 0131 656 3200 or email altformats@nes.scot.nhs.uk to discuss how we can best meet your requirements.