Lyme Disease Action – National Conference 2013

Natural places: Lyme disease risk management and communication

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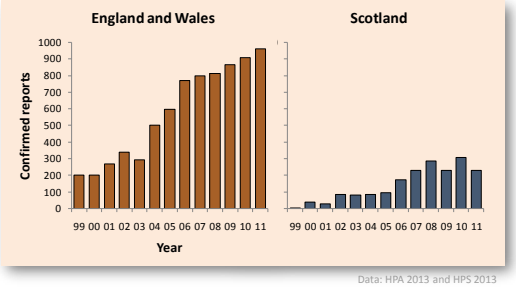
Outline

- Background
  - Epidemiology of Lyme disease
  - The changing landscape of health and forests in Britain
- Ecology of *Ixodid* ticks and Lyme disease
  - Lifecycle of Ticks and Host Interactions
  - Habitat issues and current research
- Public Education
  - Ticks and Lyme disease information
  - Minimising Risk - Case Studies
- Summary and Conclusions

Epidemiology of Lyme disease in the UK 1999-2011



Data: HPA 2013 and HPS 2013

- Approximately **10 000 confirmed cases in past 10 years**.
- Confirmed reports thought to **significantly underestimate** true incidence **(3:1?)**
- Up to **20 percent** of cases in any year are thought to be acquired abroad

Lyme disease: Factors and Trends

- Several factors thought to be responsible for the rising trend in the number of infections, such as:
  - Improved diagnostics
  - Increased awareness and reporting of infection
  - Improved habitat for host species
  - Successive mild winters enabling ticks to survive
  - Growth in recreational travel to high-risk areas (UK and overseas)

Policy Drivers in Health: Physical activity and health

Be Active, Be Healthy. Department of Health 2009.
The Scottish Health Survey. Scottish Government 2009.

Natural Environments and Health

- **Primary evidence** that **natural places are beneficial for both physical and emotional well-being.**
- Many sports and passive recreational activities are possible in forests and outdoors
- Evidence to suggest that the spiritual and "connectedness" **aspects of nature have an added impact on healing**, sense of well-being and psychological restoration (e.g., Ulrich 1984).
- **This is something we are investigating in a range of urban green spaces** in Sheffield, with a paper coming soon (Jorgensen et al).
- However, the **health benefits need to be balanced with awareness of the health risks** in natural places, especially Lyme disease.

Day-Surgery Recovery Room (2011), Sheffield

Childhood experience in woods and nature is important in determining exercise preferences in later life

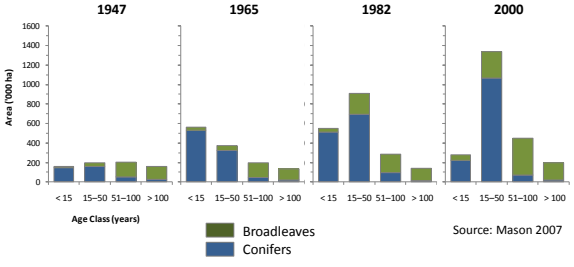
Policy Drivers in Forestry: Climate Change and Public Health

The Great Public Forest Sell-Off Debate Protest at Grizedale Forest, January 2011

Forest Policy and Ecosytem Change

- Throughout the 20th century there has been a **concerted effort to restore and enlarge the forest estate**.
- **Forests have become larger and more complex as they age**.
- Now we are moving to a **more ecological form of forest management** to promote **biodiversity and recreational values** ....
- This policy is proving successful, but this may bring **more people into habitats where there are large numbers of ticks**.

Area of High Forest by Age Class Groups 1947-2000

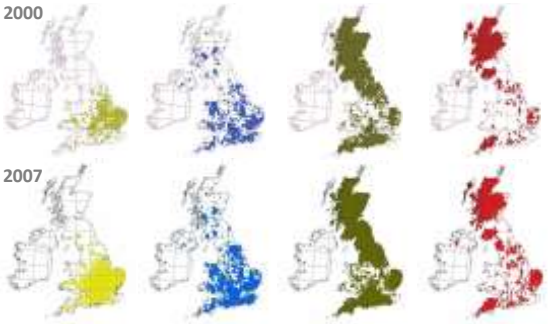


Source: Mason 2007

- **The area of woodland has increased dramatically from 1947-2000**
- **The amount and complexity of older woodland is increasing**

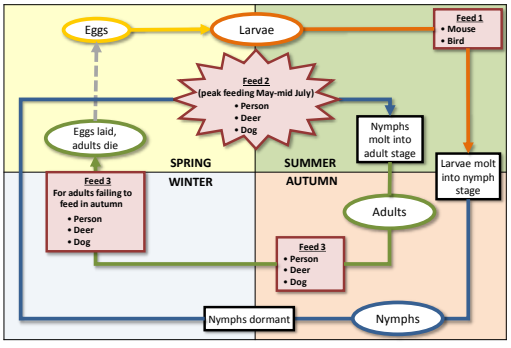
Environmental Benefits of Forests: Thirlmere Reservoir

Increase in deer populations in Britain, 2000-2007

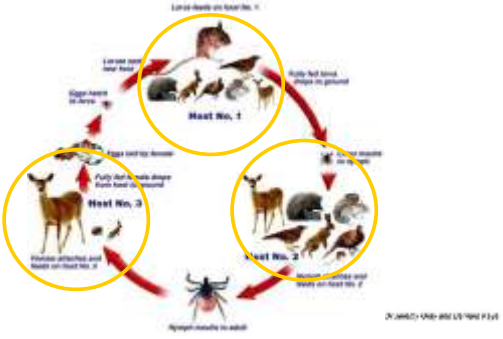


Source: British Deer Society

The 2-year life cycle of *Ixodid* ticks



Major wildlife hosts at each blood feed



- *Ixodes ricinus* is most common vector, but also an urban risk from *I hexagonus* and *I canisuga*
- Ruminants support adult tick population, but do not transmit LD – evidence they kill *Borrelia*

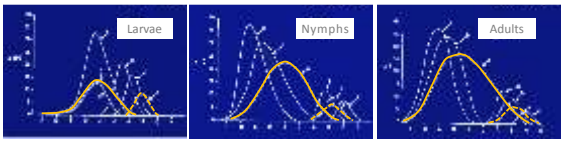
Epidemiology of Lyme disease in the UK

- Who is at risk of acquiring Lyme disease?
  - **Occupational**: Forestry workers, deer managers, gamekeepers, farmers, soldiers, outdoor educators, conservationists
  - **Recreational**: ramblers, campers, ornithologists, nature photographers, returning travellers (from focal regions in US and EU)
- Where are "hotspots" in the UK?
  - New Forest, Thetford Forest, South Downs, Exmoor, woodland/heathland in southern England, Welsh uplands, North York Moors, Lake District, Scottish Highlands
  - Other local areas → f(habitat × host species × humans)
  - Therefore, **important to note**, infected ticks can be found in both rural and urban green space – forests, parks, gardens

Forest cover in the UK

Source: Forestry Commission 2013

Ixodid ticks can be active for most of the year in woodland habitats



Seasonal activity of *Ixodes ricinus* in different habitats

a = exposed meadow
b = dense hill vegetation or secondary deciduous woodland
c = highly sheltered woodland (—)
d = spring-derived but autumn-feeding

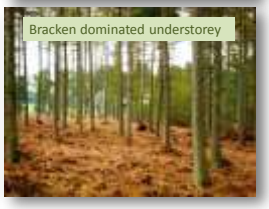
Solid line = spring population
Broken line = autumn population

Source: Prof. J. Gray/EUCALB 2010

Tick habitat

Tick "questing"

Image: BADA-UK



Urban green space and gardens can be effective tick habitats

Public parks in Sheffield

- Parks and gardens provide excellent habitat for squirrels, hedgehogs, rodents, birds
- Herbaceous vegetation especially interesting for children at play, pet dogs

Options for managing habitat

- **Vector** - Direct control of tick populations
- **Host** - Control/cull host populations
- **Environment** – Modify/spray/strim vegetation to reduce ground cover/questing potential
- **Micro-manage habitats** using knowledge of ecosystem dynamics
- **Education** to increase awareness and personal protection

Accessible public health information is key

Ixodid tick morphology and development

Nymph

- 1 to 1.5 mm in size
- difficult to detect

Adult (female)

- 3 to 3.5 mm in size
- males are smaller
- can remain attached to host for several days

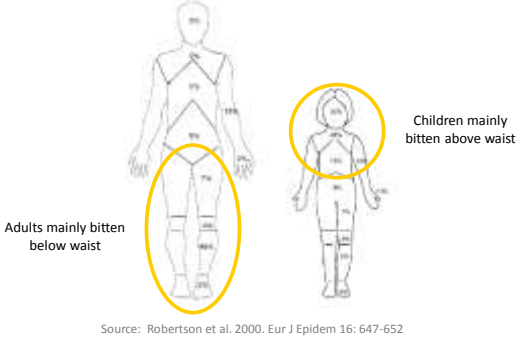
Start and completion of a blood feed

Image: LDA

- Ticks are skilled at evading early detection - bites are painless
- They naturally focus on moist, warm areas of the body, often in skin folds
- Undisturbed, feeding will continue for several days
- A fully engorged tick will measure up to 10 mm in size, and appear like a small bean
- **It usually takes several hours before a tick transfers the *Borrelia* bacteria to the host**

Anatomical distribution of nymphal tick bites

% of total nymphal bites, recreational forest site, England



Source: Robertson et al. 2000. Eur J Epidem 16: 647-652

Erythema migrans (EM) – the target rash

Image: LDA

Image: 2007 J Gathany PHIL/CDC

- The rash expands from the site of the bite and gradually clears in the centre
- The rash appears over 3-30 days and may persist for several weeks
- The rash present in 74 % of cases (LBU, HPA Study) (Marcu et al 2013)
- The rash can be a wide variety of shapes depending on the location of the bite

Symptoms and signs

Early:

- red, expanding target rash
- feeling unwell or 'flu-like'
- headache, stiff neck
- swollen lymph nodes
- sound or light sensitivity

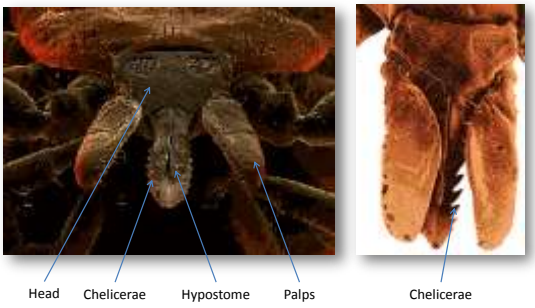
Acute:

- facial palsy
- heart problems
- breathing problems

Weeks, months, years:

- arthritis, typically of the knee
- sleep disorders
- extreme fatigue
- upset digestive system
- loss of weight
- muscle pain and/or weakness
- tendon pain
- tingling and numbness
- cognitive and psychological problems

Ixodid tick head and mouthparts



Images: D. Scharf/Brown Univ. USA

Removal of ticks – the dos and don'ts!

Best practice

- **Don't panic**
- Aim to remove the tick promptly
- Grip the tick by its mouthparts
- Use a dedicated **tick tool**, follow instructions
- Use **fine tweezers** – pull firmly, steadily, no twisting
- Disinfect site of bite after removing the tick

Image: BADA-UK

Image: LDA

Unsafe practice

- **Don't squeeze** the body of the tick
- **Don't twist** (unless using a tick tool)
- **Don't use fingernails**
- **Don't burn** the tick
- **Don't use** oils, alcohol, nail varnish

Managing Risk in Relation to Lyme disease

- **Risk** – *"the probability of a particular adverse event occurring in a stated period of time"*
  - Probability
  - Consequence
- Risks in woodlands include: activity undertaken, management +/-, anti-social behaviour, animals/stock, climate, biological conditions.
- Communicating risks?
  - Recent papers – e.g., O'Brien et al 2012; Marcu et al 2013

Case Studies: Positive Action in Practice

- **Case Study 1**: **Forestry Commission**
  - Staff induction and Health and Safety (mirrored at NSF)
  - Information (intranet) and training, tick tools
  - Risk assessments (mirrored at NSF)
- **Case Study 2: National Outdoor Centre, Glenmore Lodge, Cairngorms**
  - Staff induction
  - Awareness and training, tick tools
  - Annual testing (ELISA)
- **Case Study 3: Whinfell Forest, Center Parcs Holiday Village, Penrith, Cumbria**
  - Education and awareness - ground staff and visitors
  - Medical Centre – trained staff and information leaflets
  - Bracken spraying/habitat modification (esp. By footpaths)

Awareness raising at Whinfell Forest Village, Cumbria (Center Parcs)

Case study 4: Understanding risk during a woodland visit in SE England (O'Brien et al 2012)

- **Objectives:**
  1. what sort of risk people expect to encounter and their response
  2. Awareness of Lyme disease, response to information and actions they might take
  3. How these influence people's values of woodland
- **Methods:**
  1. Photo elicitation task
  2. Semi-structured group discussion
  3. Evaluation of two posters, perception of risk, preferences for information

Case study: Understanding risk during a woodland visit in SE England (O'Brien et al 2012)

- **Results:**
  1. **Values** – restorative, inherently peaceful, **mainly risk-free**, only apparent risks are man-made or due to poor maintenance of site
  2. **Risks** - many (large mammals, domestic stock, timber production, algae in ponds, etc)
     - **ticks not mentioned spontaneously**
     - not all risk can or should be eliminated (esp. in relation to play and child development)
     - ***"health and safety culture"*** v ***"common sense"***
     - risk can be categorised - e.g., visible/not visible; need to be made aware/no need to be informed

Case study: Understanding risk during a woodland visit in SE England (O'Brien et al 2012)

- Results: Awareness and response to communication on Lyme disease
  - **Limited familiarity and communication**
    - 50% familiar before participating
    - <25% familiar with precautions
    - 1 person previously treated.
    - **Key features in posters:**
      - **Less is more**
      - Key elements – **picture of tick, tick removal, rash**

Example Lyme Disease Poster
Royal Parks, London

Case study: Understanding risk during a woodland visit in SE England (O'Brien et al 2012)

- **Results: Taking action or not?**
  - **Preference for taking action after a visit**
    - Checking skin for bites, rash
    - Visiting doctor in event of symptoms
  - **Precautionary actions**
    - Covering bare skin, insect repellent
    - Viewed as impinging on participants' normal practice (esp. In younger age group) and reduced value of experience
  - **Relative risk?**
    - Issues with signage – too many signs about "health and safety" reduce visitor experience , perception of naturalness

Case study: Understanding risk during a woodland visit in SE England (O'Brien et al 2012)

- **Outcomes**
  - Many personal benefits from contact with nature
    - Physical exercise, Psychological restoration, Social contact
  - Focusing too much on risk can detract from the experience
    - *"distancing from risk"* (Marcu et al 2011)
  - Advice at odds with behaviour preference was unlikely to be adopted

Case study: Understanding risk during a woodland visit in SE England (O'Brien et al 2012)

- **Managing woodland visits:**
  - Providing information that does not seem to impede or reduce recreational use of woodlands
  - Short, clear, concise warning messages most appropriate and effective
  - Focus on post-visit action (see also Marcu et al 2013)
  - *"Naturalness of setting"* is important, sensitive placement of signs is essential
  - Responsible management does not equate with a lot of visible warnings

Health Information for Outdoor Users: Key Points

1. **Enjoy the outdoors**
   - it's great for physical and emotional well-being!
2. **Before going outdoors**
   - be aware of ticks and tick ecology
3. **While outdoors**
   - minimise risk of being bitten: dress appropriately; apply acaricide; avoid dense vegetation (questing)
4. **After being outdoors**
   - check for ticks on skin and clothes; check children; check the dog too!
5. **If bitten by a tick**
   - remove promptly using a **safe technique**
6. **Medical treatment**
   - seek early diagnosis and treatment if symptoms of infection develop after being bitten or after visiting tick habitat
   - early diagnosis is easier to treat with ABx
7. **If in any doubt, speak with your GP**

Images: Forestry Commission

Conclusions

1. The potential **risk of Lyme disease is increasing** for many social, environmental and ecological reasons.
2. The risk of being bitten by an infected tick is **modifiable** through application of **ecological knowledge**, often at the local scale, and also an understanding of **how people interact with natural environments**.
3. Public Health Information needs to be **targeted**, **normalised** and **empowering** so that more people can safely engage with the natural world for their physical and emotional well-being.


Adopt the pace of nature: her secret is patience. Emerson