Assessing Mother-Cub *Mycobacterium bovis* Transmission in Badgers

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Background

- Bovine Tuberculosis (TB) is a disease found in cattle, caused by *Mycobacterium bovis*
- Nearly 25,000 cattle were slaughtered in 2010, and over the last decade the disease has cost the taxpayer around £500m (DEFRA, 2011)
- Badgers are a significant wildlife host of *M. bovis* and can transmit the infection to cattle (Krebs *et al.*, 1997)
- Vaccination of badgers may reduce *M. bovis* prevalence in badger populations
- It's hypothesised regularly that there is a pseudo-vertical (from mother to cub after birth) route of transmission that increases the persistence of infection in badger populations (Anderson and Trewhella 1985, Smith *et al.* 2001) , but there is no evidence of this to date
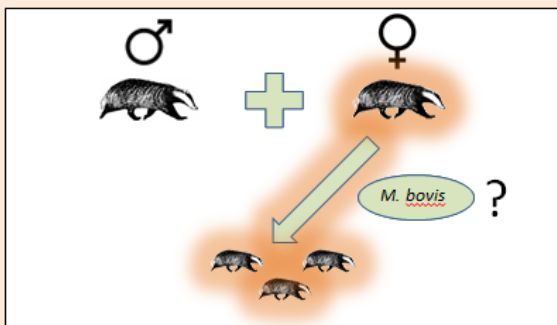
- If true, then cubs may be more likely to become infected when they are dependent on their mothers i.e. their first 6-8 weeks of life, during which they remain underground in their sett
- This may therefore impact on vaccination strategies that can only reach cub once they have left the sett

Methods

- Genetic data on 5774 badgers from 27 culls across 10 areas of the UK
- Genotyping error rates (allelic dropout = 0.01; false allele = 0.002) were generated using Pedant (Johnson & Haydon, 2007)
- Phenotypic data on each badger's age, sex, binary infection status and capture location.
- The first round of culls ("initial" culls) in 8 of the 10 areas had data on social group residency
- Parents were assigned to cubs using the R package MasterBayes (Hadfield *et al.*, 2006)
- For the 8 initial culls, we therefore ran the analyses under two sets of assumptions:

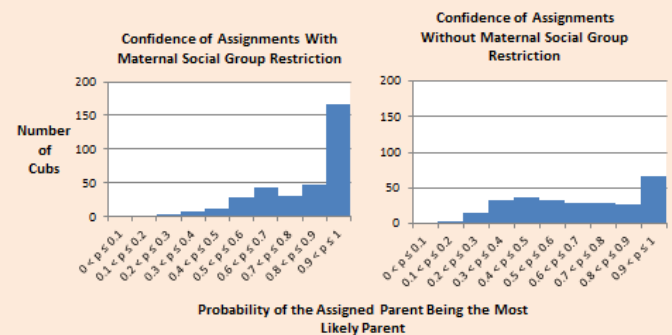1. *Restrict maternity to candidate mothers from the same social group:*
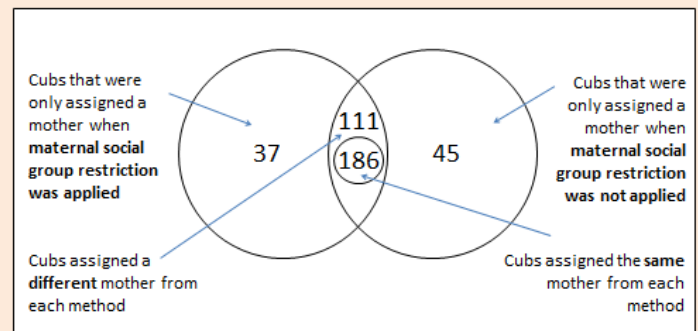
2. *No restriction on maternity:*
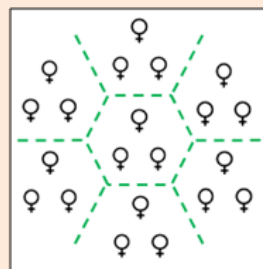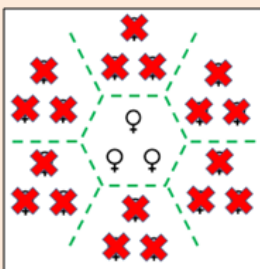
Results

- **There is a positive association between the number of infected cubs and infected mothers** (Mantel-Haenszel Odds Ratio: 2.18, 95% CI 1.21 - 3.92; over all culls)
- The social group data from the initial culls show:

1. **The inclusion of a maternal social group restriction improves the confidence of assignments:**

Confidence of Assignments With Maternal Social Group Restriction

Confidence of Assignments Without Maternal Social Group Restriction

Number of Cubs

Probability of the Assigned Parent Being the Most Likely Parent

2. **Whether the inclusion of a maternal social group restriction gives the same mother:**

Cubs that were only assigned a mother when **maternal social group restriction was applied** — 37

111

186

Cubs that were only assigned a mother when **maternal social group restriction was not applied** — 45

Cubs assigned a **different** mother from each method

Cubs assigned the **same** mother from each method

Conclusions

1. **Pseudo-vertical transmission could affect vaccination strategies that involve vaccinating cubs after they've left the sett for the first time**

2. **Knowing the social group structures of badger populations can improve the confidence of maternity assignments**

References

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