Badger Vaccination

Badgers can act as a wildlife reservoir for *Mycobacterium bovis*, the bacterium which causes tuberculosis (TB) in cattle. Badger vaccination aims to reduce the transmission and spread of the disease in the badger population with the intention of reducing the risk of cattle contracting TB.

How are badgers vaccinated?

- Traps are deployed near signs of badger activity (setts, runs or latrines).
- Traps are usually locked open and pre-baited with peanuts (typically for 7-10 days).
- Traps are set to capture for two consecutive nights.
- Traps are checked in the early morning and captured badgers are vaccinated with BCG (the same vaccine used in humans), temporarily marked and released.

How often does vaccination take place?

Trapping for vaccination (as described above) takes place once per year at each sett or target area, typically for four years. It is unclear how long the vaccine is effective in individual badgers. Annual vaccination will result in some animals being vaccinated several times, but also aims to maintain and increase vaccine coverage by vaccinating new cubs or immigrants into the population.

What effect does the vaccine have on badgers?

The effects of badger vaccination by injection have been evaluated in several captive experimental studies [1,2] and during a four year field study in Gloucestershire [2,3]. Although vaccination with BCG will not guarantee protection from infection, meaning some badgers may still become infected, these studies provide good evidence for the following beneficial effects:

- **Vaccination reduces the likelihood of badgers developing lesions or excreting TB bacteria [1,2].**
- **Vaccination reduces the rate of new infections (measured using diagnostic tests) in badgers by 76% [3].**
- **Vaccinating more than 1/3 of adults in a badger social group reduces new infections (measured using diagnostic tests) in unvaccinated badger cubs by 79% [3].**

Will the vaccine work on badgers already infected with TB?

There is no evidence that vaccination will have either a positive or negative effect on badgers that are already infected with TB. Even if vaccination has no effect on infected badgers this does not mean that it cannot reduce TB in badger populations. Badgers typically live for 3-5 years. Over a four year programme, vaccination should reduce new cases of TB in badgers (as in the Gloucestershire field trial) and infected animals will gradually die off. The combination of these processes should lead to a reduction in the number of infected badgers in an area.

What do recent studies from Ireland tell us?

Badger vaccination research is being conducted in Ireland and a recent study reported the results of a large field trial [4]. In this study badgers were anaesthetised and **BCG in an oily (lipid) mixture was delivered into the mouth** (compared to delivery by injection - the licensed route for badger vaccination in the UK). This study found that vaccinated badgers were less likely to become infected with TB (**reduced susceptibility**), but that those that did become infected were still capable of transmitting the disease (**no change in infectivity**). This study also suggested that even with no change in infectivity, moderate levels of vaccine coverage (>30% badgers vaccinated annually) may lead to a decline in TB in the badger population.

Is the vaccine safe?

BCG is a live vaccine, but studies have shown that the risk of vaccinated badgers shedding BCG into the environment is minimal [5]. Vaccination does not lead to changes in badger ranging behaviour or 'perturbation' [6], and there is no evidence of negative effects on badger health or welfare [5].

Does badger vaccination reduce TB in cattle?

We don't know for sure what effect badger vaccination has on cattle TB incidence, but if it leads to reduced TB in the badger population then it is to be expected that this would eventually have a beneficial effect on TB in cattle. As badger vaccination is carried out in more areas this will provide an opportunity for the effects on TB in cattle to be better understood.

Who can vaccinate badgers?

In England vaccination requires a licence from Natural England and the vaccine has to be delivered by either a vet or a certified lay-vaccinator. In order to be certified, lay-vaccinators have to be deemed competent after attending an APHA training course, which is approved by LANTRA and the Secretary of State (after consultation with the Royal College of Veterinary Surgeons).

Is there an oral vaccine for badgers?

Oral vaccination may offer a cheaper and more effective way to deliver BCG to badgers. An oral vaccine is in development involving research in the UK [7], Ireland and parts of Europe, but it may be some time before it is licensed for use in wild badgers.

Where can I find out more information?

More information on bovine TB and a range of related topics can be found on www.tbhub.co.uk. Information on the 'Badger Edge Vaccination Scheme' can be found on www.gov.uk. For general questions about badger vaccination email badgervaccine@apha.gsi.gov.uk. This sheet was produced as part of a Knowledge Exchange project funded by NERC.

Studies referenced

1. **Lesellier et al. (2011)** Protection of Eurasian badgers (Meles meles) from tuberculosis after intra-muscular vaccination with different doses of BCG. Vaccine
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3. **Carter et al. (2012)** BCG Vaccination Reduces Risk of Tuberculosis Infection in Vaccinated Badgers and Unvaccinated Badger Cubs. PloS one
4. **Aznar et al. (2018)** Quantification of Mycobacterium bovis transmission in a badger vaccine field trial. Preventive Veterinary Medicine
5. **Lesellier et al. (2006)** The safety and immunogenicity of Bacillus Calmette-Guérin (BCG) vaccine in European badgers (Meles meles). Veterinary Immunology and Immunopathology
6. **Woodroffe et al. (2017)** Ranging behaviour of badgers Meles meles vaccinated with Bacillus Calmette Guerin. Journal of Applied Ecology.
7. **Chambers et al. (2017)** The effect of oral vaccination with Mycobacterium bovis BCG on the development of tuberculosis in captive European badgers (Meles meles). Frontiers in cellular and infection microbiology.

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