Rehabilitating and releasing badgers in England

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Wildlife groups and Defra have worked together to update the Badger Rehabilitation Protocol, which was first published in 2003, in response to recent interest in badger translocations from vets and farmers. The protocol provides guidelines about all aspects of how badgers should be rehabilitated and released, with a particular focus on reducing the risk of *Mycobacterium bovis* transmission. This article outlines the new protocol and how vets should handle all badger rehabilitation.

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Badger rehabilitation

Based on discussions with the major national wildlife rehabilitation organisations, we estimate that 400 badgers *(Meles meles*) are rehabilitated and released in England each year, including approximately 50 badger cubs. Reasons for admissions to veterinary surgeons and wildlife rehabilitation centres include road traffic collisions (Fig 1), conspecific wounding (Fig 2), other trauma (Mullineaux 2016a) and displaced and apparently orphaned cubs. Many badgers that come in to captivity are, for medical reasons (eg, severe trauma, evidence of chronic disease), not suitable for rehabilitation and release and are euthanased at the first opportunity. Euthanasia of badgers as an 'act of mercy' does not require a licence from Natural England, while euthanasia for other reasons (eg, disease control) does require a licence (additional information is given in the Badger Rehabilitation Protocol [Mullineaux 2018]).

The process of rehabilitation provides an opportunity for healthy badgers to be released back into the wild, with approximately 36 per cent of adult animals that are admitted to rehabilitation centres eventually being released (Mullineaux and Kidner 2011). Adult badgers are usually released where they were found, while cubs may be grouped together and released at a different release site. All aspects of the process of badger rehabilitation (Fig 3) are fully described in the Badger Rehabilitation Protocol (Mullineaux 2018).

In common with other wildlife rehabilitation, there is no formal regulation of badger rehabilitation and release in Great Britain (Mullineaux 2016b). Injured or orphaned wild badgers are instead protected under existing animal welfare legislation; the Protection of Badgers Act 1992 while in the wild or in captivity, and the Animal Welfare Act 2006 once they come into captivity (Cooper 2016).

Badgers and bovine tuberculosis

Mycobacterium bovis is able to affect a wide range of species including people, cattle and badgers. Bovine tuberculosis (bTB), the disease caused by *M bovis* infection, is a cattle disease with a global geographical range. The disease is important economically because of its effects in cattle, as well as effects on public health, wildlife and international trade. The risk of infection in people is largely removed by the pasteurisation of milk and *M bovis* infection rates in people in the UK remain extremely low, despite increased incidence in cattle. In England and Wales, where disease is endemic, infection is likely to circulate within and between cattle and badgers, and these animals can suffer from the disease. Both cattle and badgers are able to maintain and spread infection (Corner 2006).

Different strategies exist to control the disease in badgers and cattle between the devolved administrations of the UK, partly dependent upon bTB incidence in cattle (Defra 2014, DAERA 2016, Scottish Government 2017, Welsh Government 2017). Badger Bacillus Calmette–Guérin (BCG) vaccination has been used in Wales and a TVR (Test and Vaccinate or Remove) project in Northern Ireland and on a few selected farms in Wales. Scotland has Officially Tuberculosis Free status and has no reservoir of disease in the badger population. In 2014, Defra introduced a '25-year strategy for achieving Officially Bovine Tuberculosis Free status for England', which included new regulations for cattle movement and testing (Defra 2014). As part of this strategy, England has been split into three risk areas reflecting regional variations in the incidence of bTB in cattle: the High Risk Area, Edge Area and the Low Risk Area (Fig 4), with licenced badger control being carried out in some of these areas.

Those dealing with badgers in a rehabilitation situation must be aware of the possible zoonotic risk of *M bovis* infection and take suitable precautions, such as attention to hygiene when handling badgers, their urine and faeces, and the use of appropriate personal protective equipment and Defra-approved disinfectants for *M bovis* (Mullineaux 2018). Excretion of bacteria by infected badgers may occur in saliva, urine, faeces and pus from wounds and lymph node abscesses. Badgers may transmit infection via contaminated saliva during social disputes that result in wounding ('territorial' wounds [Fig 2]). The main clinical sign of bTB in badgers, as in other species, is typically weight loss leading to emaciation. Other clinical signs may be associated with lesions in the lung, liver, kidney, drainage lymph nodes and growth plates of long-bones (Mullineaux 2016b). However, in most cases, clinical signs will only emerge in later stages of disease progression, and many badgers infected with

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Fig 1: Road traffic collisions are a common cause of badger admissions to wildlife rehabilitation centres and veterinary surgeries. Picture: SWWR

Fig 2: Conspecific bite wounds ('territorial wounds') are a frequent finding in badgers presented for rehabilitation and may be a possible route of transmission of *Mycobacterium bovis*. Picture: SWWR

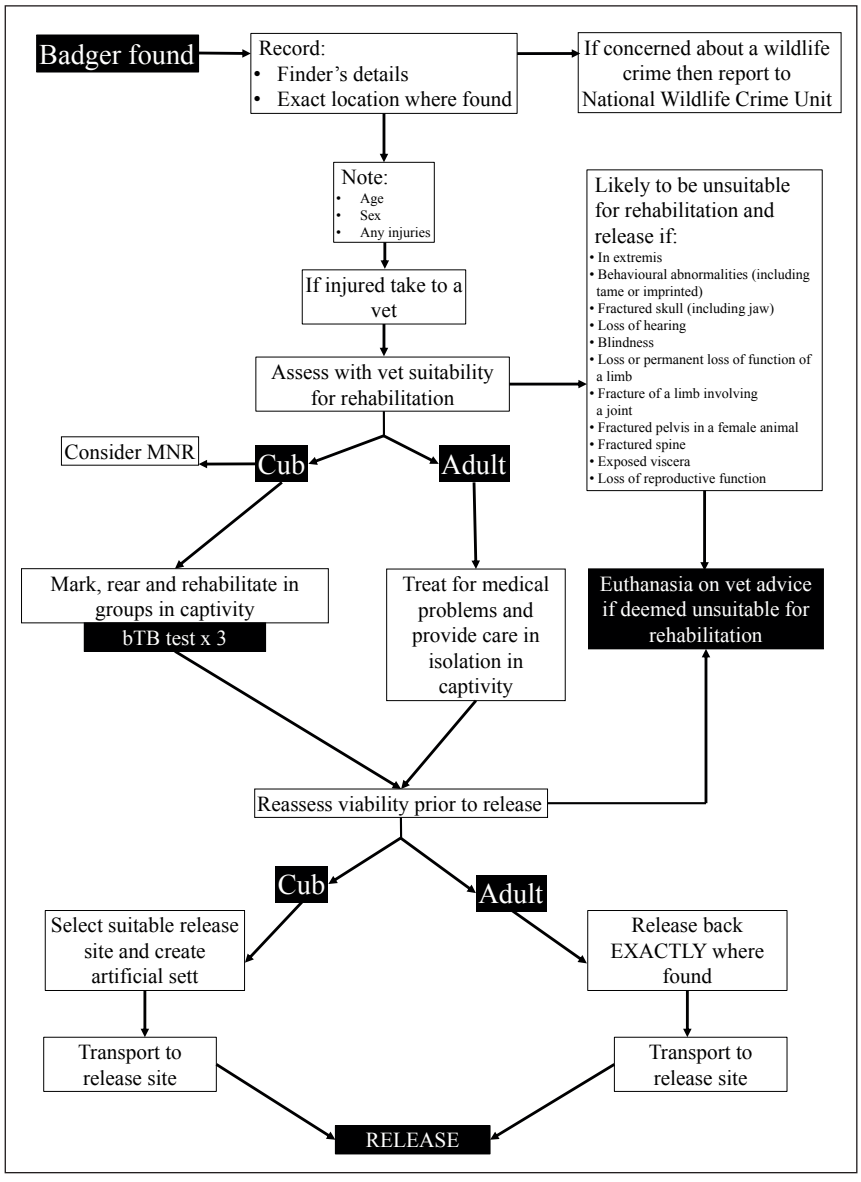

Fig 3: Overview of the badger rehabilitation process. MNR monitored natal return

M bovis may live and breed normally for many years despite active infection (Corner 2006).

Badger rehabilitation protocol

In 2000, the then Ministry for Agriculture Fisheries and Food raised concerns with wildlife groups regarding their release of badgers back into the wild, with respect to the possible transmission of *M bovis* to cattle. Wildlife groups, farmers and scientists were brought together to discuss this subject. As a consequence, wildlife organisations (the Badger Trust, RSPCA and Secret World Wildlife Rescue [SWWR]) produced a protocol for best practice, first published in 2003, with the purpose of returning healthy badgers back into the wild, while maintaining a high regard for animal welfare and the control of disease.

SWWR and the RSPCA have met on an informal basis since 2003, consulted with badger and bTB experts, and made revisions to the Protocol to account for changes in bTB policy and management. Scientific developments have included new *M bovis* tests for badgers and the licencing of a BCG vaccine for badgers (Brown and others 2013). However, no formal update of the Protocol had taken place.

In March 2017, in response to recent media coverage and ongoing farmer interest in the potential bTB risks posed by badger translocations, Defra asked Natural England and wildlife groups to meet for a workshop on badger rehabilitation and bTB. All attendees agreed that the Protocol would be updated to remain relevant to the current bTB situation and policy, and the new Protocol is the result of that work.

The updated Protocol details testing regimes for rehabilitated badgers to reduce zoonotic risks in those handling badgers and to reduce the risk of disease transmission to other animals, including livestock. The Protocol has a strong emphasis on testing for and minimising the risk of transmission of *M bovis* to other badgers, cattle and other animals during the rehabilitation process and in the immediate post-release period. The relatively small num-

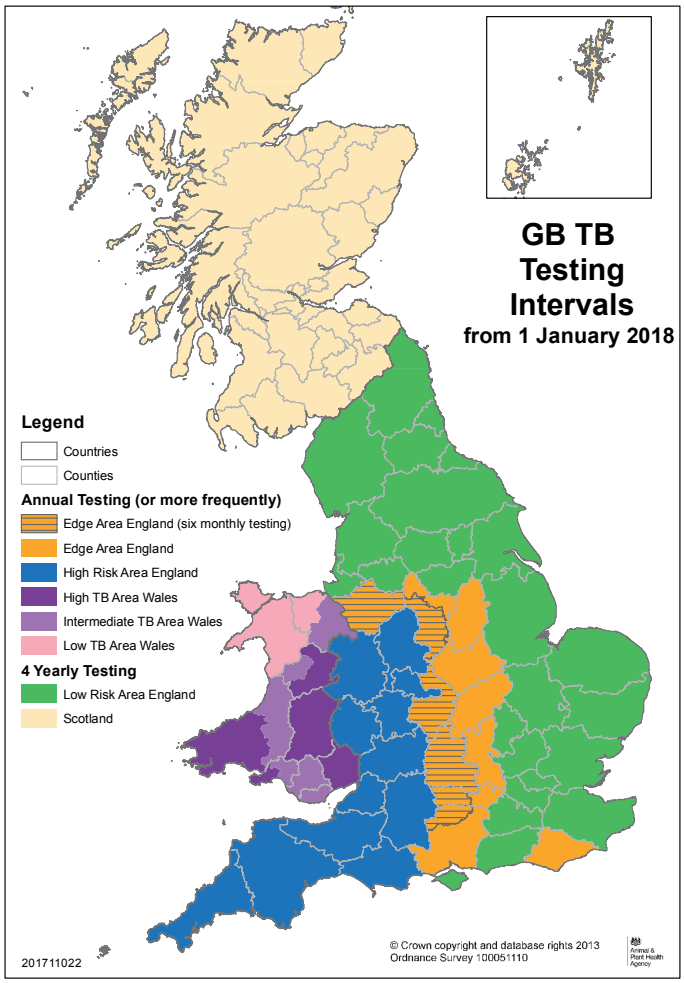

Fig 4: Tuberculosis (TB) testing interval map for Great Britain, highlighting the different bovine TB (bTB) risk areas in England (High Risk Area; Edge Area; and Low Risk Area), Wales (High TB Area, Intermediate TB Area and Low TB Area) and Scotland (Officially TB Free). Picture: APHA

bers of badgers involved, and the low incidence of disease recorded in these animals (Mullineaux and Kidner 2011), coupled with risk reduction measures taken during rehabilitation, mean that the real risk is likely to be low.

Testing badgers for *Mycobacterium bovis* infection

The diagnosis of *M bovis* infection in live animals relies upon the detection of cell-mediated immune responses (intradermal skin tests using purified protein derivatives from mycobacterial cultures to generate a delayed type hypersensitivity [type IV] reaction, and interferon-gamma [IFN-g] release assays); the detection of humoral responses (antibody tests); or the culture of the causal organism from body secretions (urine, faeces, lymph node aspirates, wound swabs). However, intradermal skin tests, as used in cattle, are ineffective in badgers (Mahmood and others 1987) and should not be used. IFN-g tests for badgers are not currently commercially available and culture of clinical samples takes considerable time (around 12 weeks), so neither option is practical in a rehabilitation situation.

Therefore, at present, serological tests are the most appropriate for *M bovis* detection in live badgers in wildlife centres. These tests typically have low sensitivity but high specificity. Testing an individual animal with a blood test on more than one occasion increases the sensitivity of the test but reduces test specificity. An interval of at least four weeks between serological tests allows for potential development of an antibody response between tests. Table 1 details the tests that have been available for use in rehabilitated badgers since 1996.

The serological test currently used in the UK is the Dual Path Platform (DPP) VetTB test (Chembio Diagnostic Systems), which is available from the APHA's laboratory at Starcross. The test is a rapid lateral flow assay measuring specific antibody response to *M bovis*-specific antigens MPB83 and ESAT6/CFP10. The DPP VetTB has the additional advantage of being used in conjunction with an electronic reader (Fig 5), thus providing a semi-quantitative measure of the antibody response in a given sample.

Blood can be collected from the jugular vein of a badger (Fig 6); the cephalic or saphenous veins may also be used. For health and safety reasons, placing badgers under general anaesthetic or sedating them is always recommended for sample collection, even in small cubs (Fig 7). A 1 to 2 ml blood sample should be collected to give 0.5 to 1 ml of serum. Samples should be collected into 'plain' serum tubes, serum separated, labelled and sent with the appropriate laboratory submission form.

Protocol for testing adult badgers

Adult badgers are not routinely blood tested for *M bovis* for the following reasons:

- Badgers with clinical bTB, or clinical signs suggestive of bTB, are likely to be recognised by an experienced wildlife veterinary surgeon on clinical examination. All cases of emaciation in badgers should be appropriately investigated and most will require euthanasia.
- A single *M bovis* blood test has such a low sensitivity that a negative result would be inconclusive.
- It is unlikely that an adult badger will be held in captivity for medical reasons long enough to conduct three blood tests. To keep adult badgers isolated in captivity for protracted periods of time for further testing is contrary to their welfare needs. Adult badgers should be kept in captivity for the minimum required amount of time, to avoid unnecessary social disruption, although no information is available on how long is acceptable.
- Adult badgers are released as close as possible to the original location in which they were found, for social and territorial reasons, thus eliminating, as far as possible, the opportunity for the spread of disease to new areas.

However, testing of adult badgers could avoid releasing *M bovis*-positive badgers back into the wild and help

Table 1: Blood tests for *Mycobacterium bovis* infection in badgers

Test	Years available	Testing on one occasion		Testing on three occasions	
		Sensitivity	Specificity	Sensitivity	Sensitivity
'Brock' ELISA	1996 to 2009	40.7 %[1]	94.3%[1]	79.5%[2]	83.1%[2]
Brock TB Stat-Pak (Chembio Diagnostic Systems)	2009 to 2016	56.4%[3]	96.2%[3]	91.7%[4]	89.0%[4]
Dual Path Platform (DPP) VetTB test (Chembio Diagnostic Systems)	2015 to present	55.3%[5]	97.5%[5]	91.1%	92.7%

Point estimates have been used to calculate the sensitivity and specificity of triple testing. The uncertainty associated with each estimate is not captured here. The Stat-Pak estimate is specific to cubs. Sensitivity is likely to be greater in animals with more severe pathology and this variation is not captured by these estimates. [1]Clifton-Hadley and others (1995), [2]Forrester and others (2001), [3]Chambers and others (2009), [4]Tomlinson and Wilson (2009), [5]APHA, unpublished data

Fig 5: Dual Path Platform (DPP) VetTB test electronic reader provides a semi-quantitative measure of the antibody response in a given serum sample. Picture: Sandrine Lesellier, APHA

reduce zoonotic risks in captivity. In general, the sensitivity of serological tests for *M bovis* increases as disease progresses; therefore, using a single antibody test may be of benefit where disease is suspected.

Protocol for testing badger cubs

If a badger cub cannot be returned to its natal sett, it needs to be tested for *M bovis*. Badgers are social animals and so cubs need to be mixed with other badgers when in captivity for extended periods of time, and when released. Therefore, cubs should be put into 'release groups'. This means that not all cubs are likely to be released back to the location where they were found and, instead, the group is released at a new site.

Badger cubs being reared and rehabilitated for release have been 'triple tested' using a serological test by the RSPCA and SWWR since 1996. The three tests are performed at approximately equal intervals during the four to six months of the badger rearing process in an attempt to ensure that badger cubs are free of *M bovis* infection before release.

Badger cubs should be microchipped under licence from Natural England. The microchip number can, with good record keeping, then be used to identify the animal, any samples taken from it and previous *M bovis* test results. The first blood test should be carried out when the cub is six- to eight-weeks-old; tests taken before this time may be influenced by the presence of maternal antibodies. Badger cubs can be aged by consideration of tooth eruption, size and weight (Mullineaux 2016b). For cubs that are at least eight-weeks-old, blood tests should be carried out as soon as the animal is taken into care and before mixing with other cubs.

For cubs younger than eight-weeks-old, mixing with another young cub (or cubs) will need to occur before testing. Badgers are sociable and cubs need to be kept together in order to prevent the development of irreversible behaviours towards people (eg, imprinting and habituation). Cubs younger than eight-weeks-old should ideally only be put into 'mini groups', consisting of two or three animals, to limit any possible transmission of infection before testing. On receiving the first negative *M bovis* test results, older cubs that were not already in a mini group should now be mixed together, and allowed time for social interaction to take place (Fig 8). Each mini group of cubs should then be blood tested for a second time, at least four weeks after the last cub in the group was first tested. On receiving the second negative *M bovis* test results, two or more mini groups may be mixed together to form a suitable 'release group'. The sex-ratio of a release group should be taken into account in an attempt to ensure that the group is still viable if, for example, an individual dies; we suggest a ratio of one male to every two or three females, with at least two males in each group. All cubs in a release group should be tested for a third time as near as possible to the time of release and at least four weeks after the second test. Anaesthesia for the third blood test allows for a final full health examination of the animal before release.

Badger cubs should only be released following three consecutive negative blood test results (Fig 9). Cubs testing positive to any of the three *M bovis* blood tests must be immediately euthanased. A licence from Natural England

Fig 6: Blood can easily be collected from the jugular vein in a sedated or anaesthetised badger

Fig 7: General anaesthetic or sedation, together with use of a Baskerville-type muzzle, is always recommended for blood sample collection from badgers. Picture: SWWR

Fig 8: Cubs are mixed in mini groups while in captivity to allow time for social interaction. Picture: SWWR

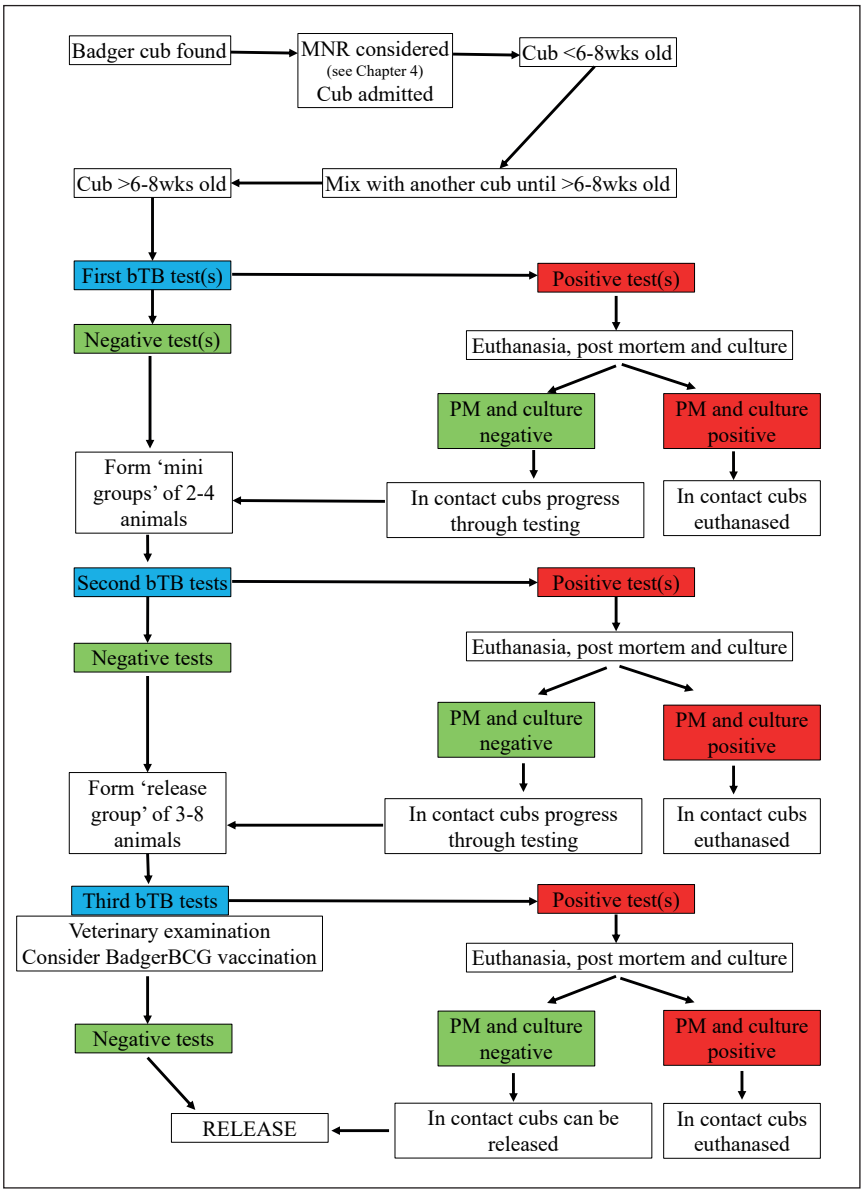

Fig 9: Flow chart illustrating the protocol for testing badger cubs for bovine tuberculosis. MNR monitored natal return

is required for euthanasia of badger cubs in these circumstances. Test-positive cubs are examined postmortem, and culture of tissue samples is carried out for *M bovis* as this remains the 'gold standard' test for diagnosis. Culture of *M bovis* takes around 12 weeks. Postmortem examinations should only be carried out at laboratories where the appropriate biosafety facilities are available.

There are two possible outcomes of the postmortem examination and culture result:

- If the euthanased animal is negative on postmortem examination and culture, the remaining group can continue the release protocol.
- If the euthanased badger is positive on postmortem examination and/or culture, the remaining animals in the group must also be euthanased.

Suspected or confirmed *M bovis* in a carcase of any animal is notifiable under the Tuberculosis (England) Order 2014.

BCG vaccination

Since 2010, a BCG vaccine for badgers (BadgerBCG; Statens Serum Institut [under contract to APHA]) has been licenced and available to individuals for vaccination of badgers against bTB. The legal requirements of administering the vaccine and the available evidence for its effectiveness are discussed in Brown and others (2013). The vaccine has been shown to reduce the severity and progression of bTB in badgers (Chambers and others 2011) and is therefore of some potential benefit to individual animals in endemic areas of England. However, as a disease control tool, the benefits of BCG are likely to be best seen when used at a population level, when large numbers of badgers are vaccinated. There is some evidence of such a 'herd effect' in social groups with high levels of vaccine cover (Carter and others 2012).

Recent international shortages of BCG vaccine have resulted in a lack of availability of BadgerBCG. BCG Sofia vaccine is currently available, with a special treatment certificate from the Veterinary Medicines Directorate, for veterinary prescription and use under the cascade.

In badger cub release groups there is a clear argument for vaccination, both to protect the group and to enhance landowner confidence in the release process. BadgerBCG is licenced for use in cubs from 12 weeks of age. Badger cubs are usually BCG vaccinated before release, usually at the time of the third bTB blood test and final health check. The case for vaccinating single adults is less strong, especially where they have not been tested for bTB. However, where vaccination of adults before release is possible, no disadvantages are expected.

Release of badgers

Badgers should not be released unless they are able to survive and the disease risks have been considered and managed. Adult badgers should always be released as close as possible to the location in which they were found (with the landowner's permission as necessary) as they are social and territorial animals. It may be possible to return independent cubs back to their natal sett in a process of monitored natal return (MNR) (Parr 2016), and thus avoid the need to bring them into captivity. Professional help should be sought before carrying out such returns by contacting a specialist centre such as SWWR or the RSPCA. Dependent badger cubs will require rearing in captivity and eventual release into artificial setts in new sites.

If a badger cub cannot be released using MNR, the suitability of the release site needs to be considered with regard to bTB risk. Maintaining the confidence of landowners providing release sites for badger cubs is key to the rehabilitation of these animals. Once cubs have successfully passed through the triple testing regime, they should be released into artificial setts at sites as close as possible to where they were found, ideally in an area of equal or higher risk (ie, Edge Area cubs should be released into areas of similar risk in the Edge Area or the High Risk Area) (Fig 4). Where possible, cubs should be mixed with other cubs from the same risk area. Where this is not possible, the release group takes on the risk score of the most 'risky' badger in the group.

Summary

The updated Badger Rehabilitation Protocol aims to describe best practice for badger care, rehabilitation and release. As a result of the role of badgers in the epidemiology of bTB in England, the protocol has a strong emphasis on testing for and preventing transmission of *M bovis* within and between badgers, cattle and people during the rehabilitation process. In reality, the small numbers of badgers involved and the low incidence of disease recorded in these animals, mean that the real risk is low. Since our wish is that all interested parties have confidence in the process we will continue to review and update the policy as new scientific information and new diagnostic tests become available.

Acknowledgements

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References

BROWN, E., COONEY, R. & ROGERS, F. (2013) Veterinary guidance on the practical use of the BadgerBCG tuberculosis vaccine. *In Practice* **35,** 143-146

CARTER, S. P., CHAMBERS, M. A., RUSHTON, S. P., SHIRLEY, M .D. F., SCHUCHERT, P., PIETRAVALLE,S. & OTHERS (2012) BCG Vaccination Reduces Risk of Tuberculosis Infection in Vaccinated Badgers and Unvaccinated Badger Cubs. PLoS ONE **7,** e49833

CHAMBERS, M. A., ROGERS, F., DELAHAY, R. J., LESELLIER, S., ASHFORD, R., DALLEY, D. & OTHERS (2011) Bacillus Calmette-Guérin vaccination reduces the severity and progression of tuberculosis in badgers. *Proceedings. Biological Sciences* **278,** 1913-1920

CHAMBERS, M. A., WATERHOUSE, S., LYASCHENKO, K., DELAHAY, R., SAYERS, R. & HEWINSON, R. G. (2009) Performance of TB immunodiagnostic tests in Eurasian badgers (*Meles meles*) of different ages and the influence of duration of infection on serological sensitivity. *BMC Veterinary Research* **5,** 42

CLIFTON-HADLEY, R. S., SAYERS, A.R. & STOCK, M.P. (1995) Evaluation of an ELISA for *Mycobacterium bovis* infection in badgers (*Meles meles*). *Veterinary Record* **137,** 555-558

COOPER, M. (2016) Law affecting British wildlife casualties. In BSAVA Manual of Wildlife Casualties. 2nd edn. Eds E. Mullineaux and E. Keeble. BSAVA, Gloucester. pp 7-16

CORNER, L. A. L. (2006) The role of wild animal populations in the epidemiology of tuberculosis in domestic animals: how to assess the risk. *Veterinary Microbiology* **112,** 303-312

DAERA (2016) TBSPG Bovine TB Eradication Strategy NI. www.daera-ni.gov.uk/publications/tbspg-bovine-tb-eradication-strategy-ni. Accessed May 1, 2019

DEFRA (2014) The strategy for achieving officially bovine tuberculosis free status for England. www.gov.uk/government/uploads/system/uploads/attachment_data/file/300447/pb14088-bovine-tb-strategy-140328.pdf. Accessed May 1, 2019

FORRESTER, G. J., DELAHAY, R. J. & CLIFTON-HADLEY, R. S. (2001) Screening badgers (*Meles meles*) for *Mycobacterium bovis* infection by using multiple applications of an ELISA. *Veterinary Record* **149,** 169-172

MAHMOOD, K. H., ROOK, G. A., STANFORD, J. L., STUART, F. A. & PRITCHARD, D. G. (1987) The immunological consequences of challenge with bovine tubercle bacilli in badgers (*Meles meles*). *Epidemiology and Infection* **98,** 155-163

MULLINEAUX, E. (2016a) Badgers. In BSAVA Manual of Wildlife Casualties. 2nd edn. Eds E. Mullineaux and E. Keeble. BSAVA, Gloucester. pp 7-16, pp 210-227

MULLINEAUX, E. (2016b) Legal responsibilities of veterinary professionals when working with wildlife centres. *Companion Animal* **21,** 592-597

MULLINEAUX, E. (2018) Badger Rehabilitation Protocol. www.secretworld.org/wp-content/uploads/2018/04/Badger-Rehabilitation-Protocol-Final-Liz-07032018.pdf. Accessed May 1, 2019

MULLINEAUX, E. & KIDNER, P. (2011) Managing public demand for badger rehabilitation in an area of England with endemic tuberculosis. *Veterinary Microbiology* **151,** 205-208

PARR, A. (2016) The Rehabilitator's & Badger Enthusiast's Handbook: Returning Badger Cubs (*Meles Meles*) to the Natal Sett Following Short Term Rehabilitation. Lancashire Badger Group

SCOTTISH GOVERNMENT (2017) Bovine TB update. www.gov.scot/Resource/0052/00523479.pdf. Accessed May 1, 2019

TB HUB (2017) Working towards bovine TB free status in England. www.tbhub.co.uk/wp-content/uploads/2017/09/infographic-TB-measures.pdf. Accessed May 1, 2019

TOMLINSON, A. & WILSON, G. (2009) Badger Rehabilitation Protocol Review Final Report to RSPCA. RCPCA, Horsham.

WELSH GOVERNMENT (2017) Wales TB eradication programme. https://gov.wales/docs/drah/publications/170616-tb-eradication-programme-en.pdf. Accessed May 1, 2019

Useful information

- **DPP VetTB blood tests**: APHA Starcross, Staplake Mount, Starcross, Exeter, Devon EX6 8PE. Tel: 01626 891121, email: starcross@vla.defra.gsi.gov.uk
- **Licences for marking of badgers and euthanasia of *M bovis* test positive badger cubs**: Natural England, County Hall, Spetchley Road, Worcester WR5 2NP. Tel: 0300 060 3900, email: enquiries@naturalengland.org.uk, website: www.gov.uk/government/organisations/natural-england
- **Badger licences**: www.gov.uk/government/collections/badger-licences

Self assessment on p 204 →

Self-assessment quizzes

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Self assessment: Rehabilitating and releasing badgers in England

1. Approximately what percentage of adult badger casualties admitted to veterinary practices and wildlife centres would be expected to be released back to the wild?
   a. 12 per cent
   b. 25 per cent
   c. 36 per cent
   d. 54 per cent
   e. 90 per cent

2. Which pieces of legislation in England protect badgers once they are in captivity?
   a. Wildlife and Countryside Act 1981 and The Conservation of Habitats and Species Regulations 2010
   b. Wildlife and Countryside Act 1981 and Protection of Badgers Act 1992
   c. Animal Welfare Act 2006 and Protection of Badgers Act 1992
   d. Animal Welfare Act 2006 and The Conservation of Habitats and Species Regulations 2010
   e. Protection of Badgers Act 1992 and The Conservation of Habitats and Species Regulations 2010

3. What is the main sign of clinical tuberculosis in badgers?
   a. Coughing
   b. Lameness
   c. Open wounds
   d. Lymphadenopathy
   e. Weight loss/emaciation

4. The sensitivity and specificity of the commercially available serological test for bovine tuberculosis in badgers, the Dual Path Platform (DPP) VetTB, when used on one occasion, are approximately what?
   a. Sensitivity 23% Specificity 97%
   b. Sensitivity 55% Specificity 97%
   c. Sensitivity 23% Specificity 55%
   d. Sensitivity 97% Specificity 55%
   e. Sensitivity 97% Specificity 80%

5. Which of the following statements about adult badger casualties is true following the Protocol?
   a. They should be tested for bovine tuberculosis on admission
   b. They should be kept in isolation during captivity and released back exactly where they were found
   c. They should be mixed with other badgers on admission as they are social animals
   d. They should be moved to new territories after treatment
   e. They should only be released if they test negative for bovine tuberculosis on three occasions

6. A licence from Natural England is required for which of the following things related to testing badger cubs and tuberculosis testing?
   a. Microchipping and blood sampling
   b. Blood sampling and anaesthesia
   c. Anaesthesia and euthanasia of test-positive cubs
   d. Microchipping and euthanasia of test-positive cubs
   e. Euthanasia of test-positive cubs and release of test-negative cubs back to the wild

Answers: (1) c, (2) c, (3) e, (4) b, (5) b, (6) d

Research recently published in *Vet Record Case Reports*

Permanent cessation of nail growth using multiple nail plate avulsions and phenolisation in a dog

This is a case of a two-year-old Yorkshire terrier that was referred for treatment of abnormal growth of all nails of both thoracic limbs, where permanent cessation of nail growth was achieved by nail plate avulsion and phenolisation in all thoracic limb digits.

Management of an outbreak of multiple equine herpesvirus type 1 abortions among vaccinated mares on a large UK Thoroughbred stud farm

This is a case of an outbreak of equine herpesvirus type 1 (EHV-1) abortions on a UK Thoroughbred stud farm between February 23 and April 2, 2016, which resulted in a loss of 10 Thoroughbred foals that were confirmed to be in infected with EHV-1 at postmortem examination.

Synchronous bilateral testicular neoplasms in a black-capped capuchin (*Sapajus apella*)

This is a case of a 31-year-old, 5.01 kg, intact male black-capped capuchin (*Sapajus apella*) which was presented for examination after zookeepers noted an enlarged right testicle. Fine-needle aspiration with cytological evaluation identified a seminoma of the right testis.

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