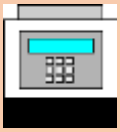
Polymerase Chain Reaction (PCR) testing for *M. bovis*

The Animal & Plant Health Agency (APHA) has validated a PCR test which can detect the bacterium primarily responsible for TB in cattle and other mammals, *Mycobacterium bovis (M. bovis)* directly from tissue samples collected at post-mortem inspection.

The major advantage of this method is that a final result is typically available **within three weeks**, whereas the traditional microbiological culture method takes 6-22 weeks.

PCR test ≤3 weeks



Culture 6-22 weeks

The *M. bovis* PCR test has advantages for the management of TB slaughterhouse cases by APHA

Slaughterhouse case (lesions typical of TB found in the carcase of an animal sent for private commercial slaughter)

→ Movement restrictions applied to the herd/flock of origin

→ *M. bovis* PCR test carried out on the tissue samples from the carcase

↓

PCR test result within **3 weeks**

Previously 6-22 weeks to obtain a result using culture

← **Negative** (+ check testing where required)

← Lifting of movement restrictions, in non TB breakdown premises, sooner than if culture used to confirm or negate disease

← **Positive**

← APHA can inform the keeper and their private vet quicker, so that further action can be taken as soon as possible to control TB in the affected herd/flock

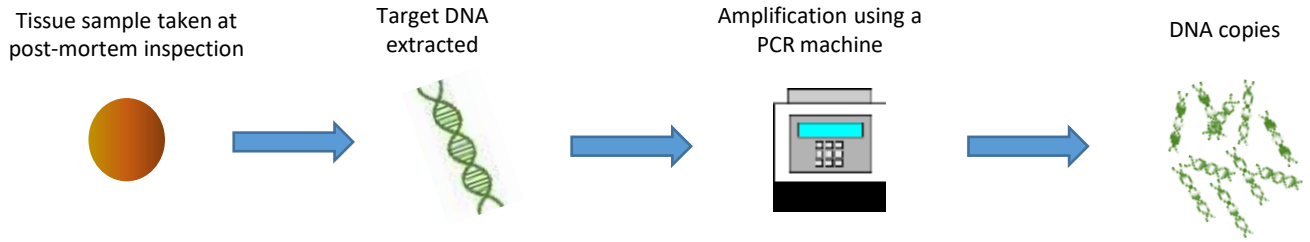
How is APHA's *M. bovis* PCR test used?

The *M. bovis* PCR test is used in Great Britain (GB) for direct detection of *M. bovis* in tissue samples from carcases of:

- TB slaughterhouse cases in cattle and non-bovines i.e. animals routinely sent for private commercial slaughter that have suspected lesions of TB at routine meat inspection;
- Bovine and non-bovine animals (such as camelids, goats, pigs, sheep and farmed deer) that are removed as TB skin test reactors or blood test-positive animals, direct contacts, inconclusive reactors (IR) or clinical TB suspects, and cases where TB lesions are identified on diagnostic post-mortem examination in a veterinary laboratory; and
- Domestic pets (cats and dogs) and exotic species of animals (e.g. in zoological collections) submitted to APHA for laboratory investigation. The test can also be used on biopsy samples from live domestic pet mammals

What is PCR?

Polymerase chain reaction (PCR) is a molecular-based laboratory technique. It involves detecting small amounts of the genetic material (DNA) contained within all living organisms that may be present in a sample, by making millions of copies of a specific sequence of the target DNA, a process called amplification.



Each *M. bovis* bacterium contains unique DNA which carries the genetic instructions for its development, function, growth and reproduction. PCR can identify tiny amounts of the bacterial DNA that may be present within a sample taken from the suspect animal and **amplify** it to produce a quantity which is then detectable.

How accurate is the PCR test?

In a validation study carried out by APHA, the *M. bovis* PCR test has been shown to produce equivalent results to the traditional microbiological culture method, for both bovine and non-bovine tissue samples.

Benefits of the PCR test	Limitations of the PCR test
For many years the "gold standard" for bTB diagnostic testing from tissue samples was traditional microbiological culture, which takes 6-22 weeks to obtain a result. PCR test results are typically reported to the keeper within three weeks.	Whole genome sequencing (WGS) can't be used directly on the PCR product as it requires DNA obtained from a pure microbial culture. This means that APHA can't rely exclusively on the PCR test for case management and epidemiological analyses of TB breakdowns. To allow full investigation of the breakdown and identify the probable source of infection, subsequent culture is carried out on PCR test-positive samples to allow WGS to be performed.
Instead of relying on culture results for confirmation or negation of *M. bovis* infection, PCR testing is now carried out on tissue samples taken from bovine and non-bovine carcasses. If negative, herd movement restrictions can be lifted sooner in non-TB breakdown premises (e.g. slaughterhouse cases) without having to wait for culture results. In Wales and in breakdown herds in England, a clear herd test may be required before restrictions can be revoked following a negative PCR test.	
The PCR test is cheaper to run per sample than microbiological culture. The process is semi-automated and exploits laboratory robotics to facilitate high throughput, whilst also minimising contamination and maximising traceability of samples.	

Find out more about the *M. bovis* PCR test on the TB hub https://www.tbhub.co.uk/ **Updated October 2023**

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