

TB – AVAILABLE TESTS

What diagnostic tests are used at present?

The main TB test being used at present is skin testing, commonly called the tuberculin skin test. It is an accepted standard test internationally and detects the animal's immune response to the bacterium. The gamma-interferon (IFNG) test is used as a supplementary test for TB in addition to the skin test.

The aim of the test is to detect infected animals so that they can be removed before the bacterium spreads to other animals.

Skin testing

The skin test for TB is the Single Intradermal Comparative Cervical Tuberculin (SICCT) test. It is used to actively check animals for TB during routine testing and also during enhanced surveillance when the disease has been identified. A routine herd testing programme is in place with the frequency of testing being determined by the disease situation.

The skin test assesses the current TB status of an animal on the day of the test. The tuberculin comprises a mixture of proteins from the bacteria that have been cultured in a laboratory and killed by heat. The test is 'comparative' because it compares the response to bovine and avian tuberculin, which allows current exposure and exposure to other types of mycobacteria to be distinguished.

The injection of tuberculin will generate an inflammatory response if the animal has been infected with *M bovis* and so a lump will develop at the injection site, with a greater reaction to the bovine tuberculin than the avian tuberculin.

After testing, cattle can subsequently become infected (eg through purchases, from neighbouring cattle or contact with infected badgers).

Gamma-interferon testing

The gamma-interferon (IFNG) test is useful because it is more **sensitive** than the skin test (90% compared with 81% respectively). This means that it can detect infected animals before they react positively to the skin test, and it can also detect infected animals that do not react to the skin test. The test is not as **specific** as the comparative skin test (3.5% false positives (IFNG) compared to 0.02% with the skin test).

The test challenges T cells (important cells in the immune system) in a whole blood sample. If the animal has previously been infected with *M bovis*, its T cells will respond to the *M bovis* specific antigens in the test and produce gamma interferon accordingly. GIFN testing can be very useful when it is used in parallel with the skin test, and when positives to both tests are removed.

Other tests

The **Idexx antibody** test has been validated by the World Organisation for Animal Health (WOAH) but is not yet EU-approved and not approved for routine use in NI. It measures antibody specific to *M bovis*. The antibody test is less sensitive than the gamma-interferon

test. It could potentially be useful in chronic breakdowns to identify some skin-negative and gamma-interferon-negative infected cattle.

Other tests are the **Enferplex** and non-validated **Actiphage** test for TB. These tests have not been approved for use in NI.

What tests are done in the laboratory following suspected infection?

Laboratory testing of samples from TB reactors and of samples from slaughtered cattle that have signs of TB on inspection of their lymph nodes during routine meat inspection are examined by histopathology (microscopic examination) and bacteriology (where an attempt is made to grow the bacteria on special growth medium).

What is molecular strain typing?

Molecular strain typing is a tool related to the TB genome to investigate TB epidemiology and outbreaks. It may demonstrate local micro-epidemics, and can be useful for tracing. In NI, cattle and badger strains have been associated at regional level through molecular strain typing.

What is Whole Genome Sequencing?

Bacteria contain unique genetic material. Whole Genome Sequencing (WGS) is a way of characterising the DNA sequence data of the whole *M bovis* genome and has largely replaced genotyping. The outcome of the sequencing is that different *M bovis* strains can be identified, and that relatedness between the bacteria found in different animals can be analysed.

WGS has provided evidence of ongoing TB transmission between cattle and badgers at the individual farm level, and also signals of cattle to cattle spread.

What does the current TB Programme do?

The current Programme is delivered by DAERA and has several key components:

Disease Surveillance

- Abattoir surveillance
 - Follow up testing of herds where visible lesions have been found in the abattoir
- Testing of live animals using the Single Intradermal Comparative Cervical Test (SICCT) and gamma interferon blood test (IFNG test)

Removal of reactor animals

- Compulsory slaughter with full market valuation; no compensation for consequential losses

Veterinary Risk Assessment

- Disease control measures in affected herds including movement controls
- Identification of at-risk animals and herds; additional testing and movement controls.

Research is being supported by DAERA, including work being done by AFBI. Recent projects include investigation of the role of passive immunity in wildlife bTB vaccination, development of the use of Whole Genome Sequencing of the TB bacterium as an epidemiological tool, and the relevance of genetic variability in the host/ pathogen relationship.