It is important to understand that ‘Gold standard test’ does not mean ‘perfect test’. It means that a test is commonly used as reference or benchmark for other tests.

Isolation of *Mycobacterium bovis* by laboratory culture does provide the ultimate way of confirming TB infection. This is because culture is a very specific tool, as it looks for the bacterium itself rather than a marker of the host’s immune response to it. So, if you find the TB bacterium in an clinical or post-mortem specimen it is unlikely to be mistaken for something else.

However, the converse is not true, i.e. a negative laboratory culture for *M. bovis* (for instance in a TB test reactor slaughtered in a known infected herd) does not rule out TB infection. This is because the traditional culture techniques are not very sensitive and a positive result largely depends on sufficient numbers of viable bacteria being present in the piece of tissue or the clinical sample selected for culture from the suspect animal. As TB is normally a chronic, slowly-progressing infection, the bacterial load in the sample is in turn affected by the thoroughness of the post-mortem examination and the stage of infection in the animal being sampled. If no visible lesions of TB are found during post-mortem examination, then it is very unlikely that culture will identify the organism. For instance, when a standard postmortem technique was used in a TB survey of badgers found dead in the southwest of GB and Wales, about 15% of those proved positive on culture, but this prevalence of culture-positive badgers nearly doubled in a subgroup of badgers that was subjected to a more comprehensive post-mortem.

Therefore, post-mortem examination and mycobacterial culture only constitute a partial ‘gold-standard’ for TB infection in animals. This does not mean that it is not possible to estimate the performance characteristics of serological (or other ante-mortem) tests for TB infection. Classically, the sensitivity of a diagnostic test is estimated as the proportion of animals in an infected population (or herd) with pathological or microbiological evidence of disease that reacted to that test. Conversely, the specificity of a test has to be estimated in a non-infected population and this can be done without the need for PM and culture results, as long as one can be reasonably satisfied (based on the herd history, husbandry and regional disease status) that the study population is free from the disease of interest.

Additionally, there are statistical techniques that allow for estimation of the operating characteristics of two or more diagnostic tests where the true disease status is not known and none of the tests can be considered a ‘gold standard’ (latent class analysis).

It is not possible to assess the specificity or the percentage of false positive results of a test for TB in infected populations or groups of animals, i.e. by simply calculating the proportion of seropositive animals that are negative on culture.

**Ian Greenwood**
TB Programme