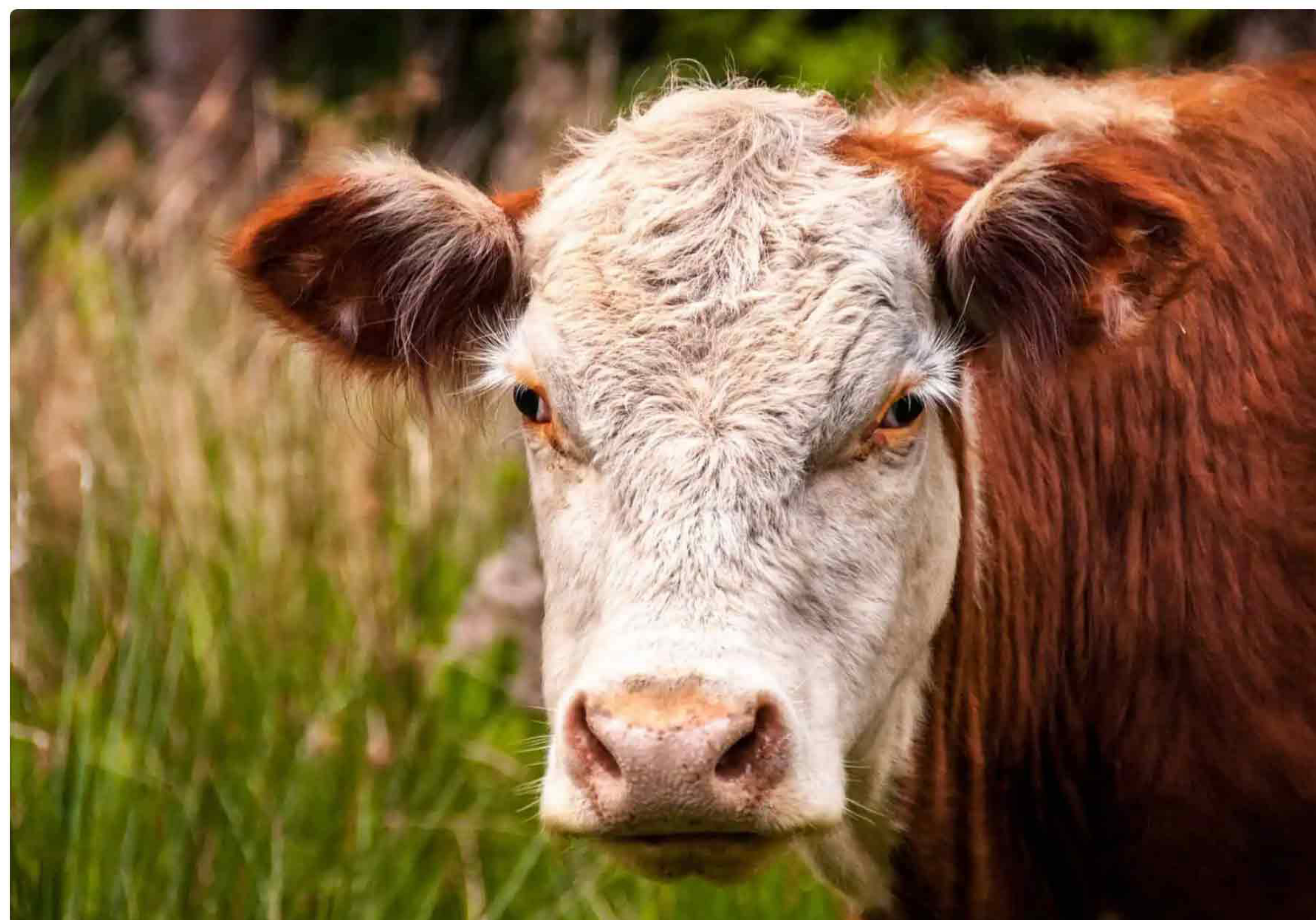


Was Clarkson's cow killed for nothing?

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Insight

 Life Sciences, Earth & Environmental

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Did you watch Clarkson's Farm the other evening? That poor cow Pepper was culled after routine tuberculosis tests. Clarkson was furious, and the nation was up in arms, writes professor **Brian J Ford**. Surely the test was inconclusive?

I can guess what you're likely thinking: without a positive culture of the organism, what's the justification to kill the cow?

The bacterium that causes bovine tuberculosis (bTB) is *Mycobacterium bovis*. We used to culture it when I was on the junior staff of the Medical Research Council. It's closely related to *M. tuberculosis* which infects humans, indeed it is so closely related that it's used to vaccinate people against TB.

At the Institut Pasteur in Lille back in 1908, Albert Calmette and Camille Guérin began sub-culturing *M. bovis* 235 times until it became highly attenuated ... and by 1921 they showed it could be used to protect people against TB. If you are 40 or older you probably still have the visible mark on your arm from being injected with the original bacille Calmette-Guérin – BCG.

The test for TB in cows is to challenge their immune status by injecting bovine tuberculin, with avian tuberculin as a control. If antibodies are present, the site will swell. Perhaps it's just reacting to the injection? Possibly – in which case both sites will enlarge. However, if the cow has circulating antibodies from bTB then the bovine site will be the one that swells most, and it is the difference in size that the vet measures.

A positive test suggests there must be circulating antibodies – and that points to infection with tubercle. A positive result means the cow is categorised as an Inconclusive Reactor (IR) so the test is performed a second time three months later. If it is positive a second time it's concluded that the cow must be infected, so has to be sent for slaughter.

Right: why not culture for the organism? It will grow on Löwenstein-Jensen Egg Medium, which has been routinely used for almost a century, though there are alternative modern broth media. The problem is that *Mycobacterium* is fastidious, and *M. bovis* often takes more than 20 weeks to appear. The organisms are elusive, often present in small, discrete spots, and are easily missed.

Culturing would take far too long, and false positives with the standard skin test are virtually non-existent. That's why it's regarded as the gold standard.

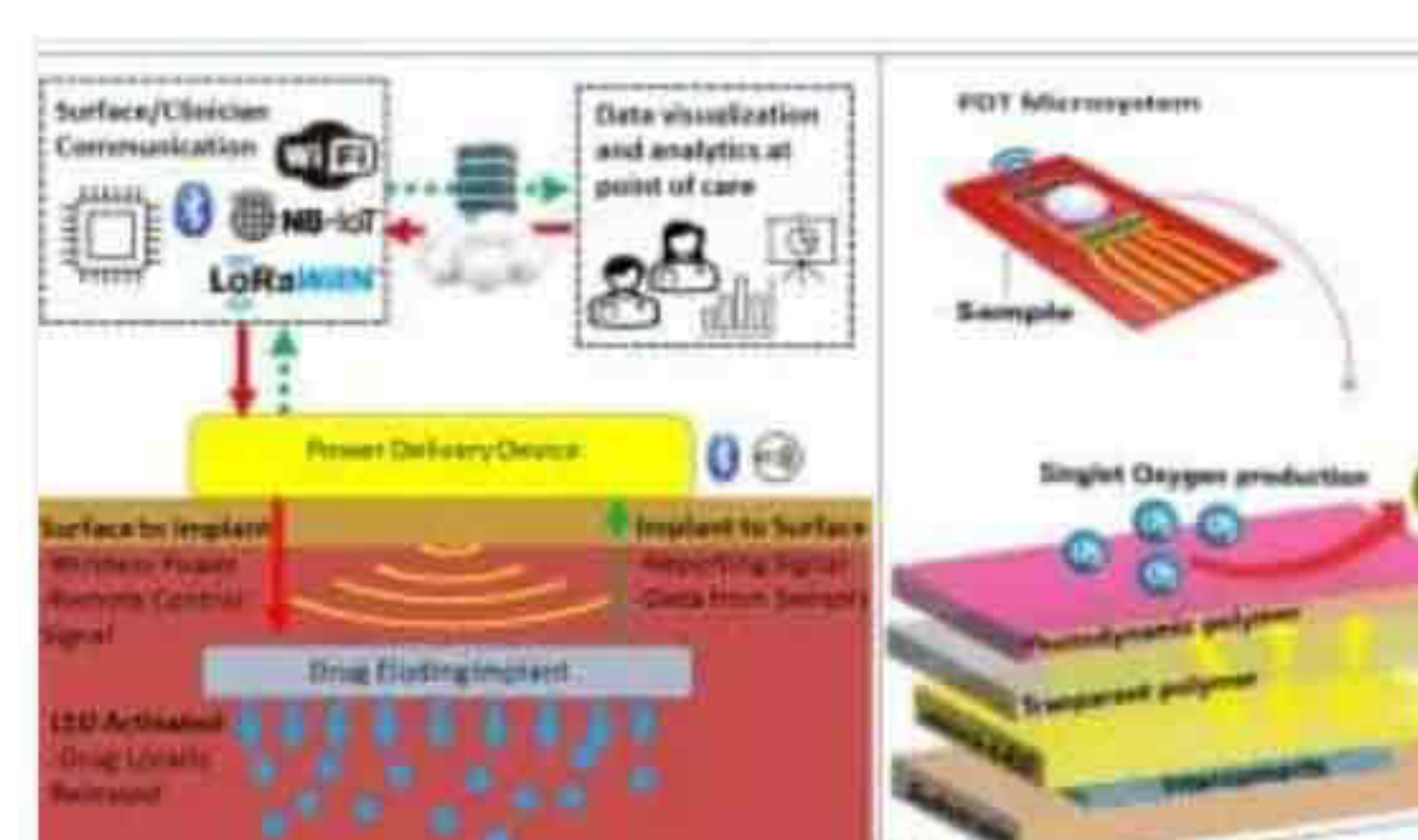
There are other tests. White blood cells from a suspect cow can be tested for gamma-interferon; if they release IFN- γ when challenged that's an indicator of infection. The Polymerase Chain Reaction (PCR) is another. It has very high specificity, it provides reliable results within three weeks, and for the past two years it has been tried out on post-mortem tissue samples.

Its advocates insist that you can't rely on collecting an infected tissue specimen from a given cow, so you might miss a positive case. But PCR is extremely sensitive and could offer an alternative.

So no, culturing tubercle from cows is an unreliable procedure, and takes many months for anything to appear. The standard skin test is extremely reliable; and that's going to be the standard for decades to come.

And was Pepper justifiably slaughtered? There is no reason to doubt it. All Clarkson was told was whether the answer was good or bad ... not how the test works, what it reveals, or why. He was left in the dark. But now, you know.

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