

Title: Amendments to exemptions to TB pre-movement testing IA No: DEFRA1054 Lead department or agency: Defra Other departments or agencies:	Impact Assessment (IA)			
	Date: 27/01/2012			
	Stage: Final			
	Source of intervention: Domestic			
	Type of measure: Secondary legislation			
Contact for enquiries: Paul Davenport 020 7238 6735				
Summary: Intervention and Options			RPC Opinion: Awaiting Scrutiny	

Cost of Preferred (or more likely) Option			
Total Net Present Value	Business Net Present Value	Net cost to business per year (EANCB on 2009 prices)	In scope of One-In, Measure qualifies as One-Out?
£m1.14	£-0.94m	£m 0.19	Yes IN

What is the problem under consideration? Why is government intervention necessary?

Bovine TB is a serious infectious disease of cattle which is still getting worse. It is a significant burden for farmers and is costing the taxpayer nearly £100m a year. Disease freedom is a “public good” affecting the whole cattle industry - consumption of the “good” by one individual does not reduce the stock of that good for consumption by others and no individual can be effectively excluded from consumption. Private actions to control or eradicate disease are likely to be non-optimal because of externalities (spillover effects) and poor information, so Government policy needs to address this explicitly. A requirement to pre-movement test was introduced in 2006 because farmers had failed to act on government advice to test cattle before moving them from high TB incidence areas i.e. a non-regulatory approach is unlikely to work. A review of the policy concluded that it had been effective but that existing exemptions undermined disease control and it should be looked at again.

What are the policy objectives and the intended effects?

The Coalition Government has committed to introduce a comprehensive package of measures – including badger control – to tackle TB in cattle. This includes removing certain existing exemptions from the pre-movement testing (‘PrMT) policy on the basis of clear veterinary advice that they increase disease risk. This will be a minor change in itself, but is one of a number of measures intended to stop the disease spreading further. This is also part of a wider attempt to make farmers more aware of TB risks.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Two options have been considered: option 0 – retain the existing legal exemptions (do nothing); option 1 – amend the legislation to remove or restrict three of the existing exemptions. The preferred option is option 1: veterinary advice clearly supports this approach, and key industry stakeholders are generally supportive. We have also considered a non-regulatory approach - this is considered unacceptable, as previous experience shows that unless farmers are required to pre-movement test they will not do so voluntarily (see evidence base – page 8).

Will the policy be reviewed? It will be reviewed. If applicable, set review date: 04/2017

Does implementation go beyond minimum EU requirements?			N/A		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	Micro Yes	< 20 Yes	Small Yes	Medium Yes	Large Yes
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)			Traded: N/A		Non-traded: N/A

I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) that the benefits justify the costs.

Signed by the responsible Minister:

Jim Paice

Date: 14 May 2012

Summary: Analysis & Evidence

Policy Option 1

Description: Remove/change three of the existing exemptions from pre-movement testing requirements

FULL ECONOMIC ASSESSMENT

Price Base Year 2011	PV Base Year 2011	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: £0.59m	High: £4.25	Best Estimate: £1.14m

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Nil	£596k	£2.79m
High	Nil	£939k	£4.39m
Best Estimate	Nil	£648k	£3.03m

Description and scale of key monetised costs by 'main affected groups'

In summary, for additional pre-movement testing of cattle which are: moving to agricultural shows; moving off holdings within 30 days of a previous move and moving from higher risk to lower risk holdings within a Single Occupancy Authority. The cost of additional pre-movement testing of cattle is estimated to be £648k per annum, split £585k livestock keepers and £64k taxpayer (see Table 1 on page 8). Total cost of additional PrMT of cattle estimated to be £3.03m (in Present Value terms) over a 5-year appraisal period (see full cost/benefit analysis at Annex 1). Please note that there is also an explanation of the steps taken to calculate EANCB figures at Annex 4.

Other key non-monetised costs by 'main affected groups'

N/A

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Nil	£722k	£3.38m
High	Nil	£1.8m	£8.64m
Best Estimate	Nil	£893k	£4.17m

Description and scale of key monetised benefits by 'main affected groups'

The key benefit of this policy is the number of herd breakdowns (caused by new infections of bovine TB) avoided by changes to the cattle pre-movement testing exemptions highlighted above. The benefits arise in a number of ways: reducing the spread of bovine TB to other herds at agricultural shows; reducing the within-herd spread of bovine TB by reducing the period during which infection is undetected; reducing the spread of bovine TB to other herds (and wildlife) via the onward sale of cattle. The cost of herd breakdowns is shared between livestock keepers and the taxpayer, and the split of the benefits of herd breakdown costs avoided is therefore estimated to be as follows: £384k per annum for livestock keepers and £509k for taxpayers per annum (see Table 1 on page 8). The total benefit of herd breakdown costs avoided over a five-year appraisal period is estimated to be £4.17m (in Present Value terms) (see full cost/benefit analysis at Annex 1).

Other key non-monetised benefits by 'main affected groups'

To the extent that cattle farmers would be at less risk of new and expensive TB breakdowns, they would face reduced stress of operating businesses under restrictions and the financial and emotional impact of loss of prized cattle. TB controls were originally introduced to protect human health - this is now largely achieved by milk pasteurisation and meat inspection. The main benefits of TB controls now are meeting EU legal requirements, hence maintaining export markets, providing assurance to consumers, maintaining cattle productivity and reducing the small health risk to groups such as farmers and abattoir workers. Reduced risk of adverse physical and mental health impacts on TB affected cattle farmers.

Key assumptions/sensitivities/risks See evidence base (pages 14 -15) and Annex 1.	Discount rate (%)	3.5
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BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:	In scope of OIOO?	Measure qualifies as
Costs: 0.58 Benefits: 0.38 Net: - 0.20	Yes	IN

Evidence Base (for summary sheets)

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1. Introduction

Bovine TB (bTB) is a serious infectious disease of cattle which is still spreading, and is one of the biggest challenges facing the cattle farming industry today. TB related controls in England in 2010/11 cost government £108 million. In that period over 25,000 cattle were compulsorily slaughtered for bovine TB control purposes with compensation for the animals totalling £28m.

The Coalition Government is committed to putting in place a comprehensive package of measures to tackle bTB, as set out in the TB Eradication Programme for England published in July 2011. There is no single solution, so we need to use every control tool in the toolbox to reduce the disease in cattle, in a proportionate and cost-effective way. We envisage that a balanced programme should include the following key elements, many of which are already in place:

- surveillance for the disease in cattle and control measures in those herds where infection is identified;
- controlling the disease in badgers;
- enhanced biosecurity and husbandry practices by cattle owners;
- advice and support to farmers;
- dealing with bTB in non-bovine kept species (including camelids (llamas, alpaca) and goats); and
- focused research and development (including development of a cattle vaccine and an oral badger vaccine).

2. Rationale for Government intervention

The original rationale for Government's involvement in the effort to tackle the disease was to protect public health. In the 1930s, most milk was drunk untreated. Milk-borne human *M. bovis* infection was a major public health risk and a significant source of TB in humans.

A cattle test and slaughter policy introduced in the 1950s alongside routine pasteurisation of cows' milk and inspection of cattle carcasses at slaughterhouses gradually removed the risk to human health.

The rationale for government intervention in bTB control is created by associate market failures. Firstly, bTB freedom is a 'public good' of which no one individual (e.g. a cattle keeper) can be excluded from consumption, and consumption by one individual does not reduce the stock of that 'good' for consumption by others. Secondly, there are positive externalities associated with bTB control: investment in control by one cattle keeper will not take into account the spillover benefits for other cattle keepers in controlling the overall prevalence of the disease. Thirdly, there are information asymmetries associated with bTB control that mean that not all cattle keepers are aware of the implications of their control actions or inaction. Taken together, these market failures – in the absence of government action – mean that investment in bTB control will occur at a sub-optimal level: at a level below that required to control the disease. Therefore, the presence of market failures creates a role for cost-beneficial government intervention.

Additionally, alongside maintaining vigilance over risks to public health, the main rationale for Government intervention is to meet EU requirements and to mitigate the economic impact of the disease on the cattle farming industry, given the damage that can be done to farm businesses and farmers' livelihoods by TB breakdowns in their herds. The proposed measures fall into the latter category. Nevertheless, as part of the TB Eradication Programme for England, the EC (who co-finance the UK's TB Eradication Programme) have made it clear that they support the changes. The benefits of Government controls of bTB in cattle – in terms of reduced disease spread and losses – outweigh the costs of those controls. By continuing with the current approach, costs are expected to increase further as the disease situation worsens and the cost of control measures increases.

The total costs of bTB are about 3% of gross output of GB cattle enterprises, rising to 7% in South West England. The total cost of a cattle herd breakdown is equivalent to about 25% of the output of an average cattle farm. This is the average of a very wide range including many small breakdowns to a few very large, costly and long-lasting incidents. Most of the cost currently falls to Government.

This proposal forms part of a TB package of measures announced by Defra in July 2011. There are two other IAs connected to this one: the first – which RPC approved – was entitled ‘Measures to address bovine TB in badgers’¹ and concerned proposals to introduce a pilot for a limited cull of badgers; the second IA, ‘Cattle Compensation: Bovine TB, Brucellosis, BSE and Enzootic Leukosis’ (IA reference DEFRA1424), relating to proposed changes to bTB compensation, including the introduction of a sliding scale of compensation for farmers who delay TB testing of their cattle without good reason, is being sent to RPC with this pre-movement testing IA.

3. Policy objective and intended effect

Compulsory pre-movement testing of cattle was first introduced in March 2006. The provisions of the policy are detailed in the Tuberculosis (England) Order 2007 which requires that owners of higher TB risk herds pay for their cattle to be tested ‘clear’ for the disease before being moved, ‘though there are exemptions for certain types of movements. The policy was reviewed during late-2009/early-2010. The review report – published in September 2010 - concluded that the policy benefitted both government and industry by preventing additional TB herd breakdowns – but recommended that some of the permitted exemptions be looked at again as they potentially allowed infected cattle to move undetected into new herds. Subsequent analysis (see attached Veterinary Risk Assessments – Annexes 2 and 3) identified particular exemptions that are clearly unhelpful from a disease control perspective because they increase disease risk.

The policy review included a comprehensive cost/benefit analysis (pages 78-97 inclusive of the review report). Some key conclusions from the review were:

- Total costs of the policy between April 2006 – March 2009 were £16.68m, over 90% of which was for farmers’ testing costs i.e. paid for by farmers. Total *benefits* (reduced costs from reduced disease spread) over the same period were calculated at £49.84m.
- Therefore the total *net* benefit was £33.16m. However, these calculations are based on estimating the benefits of PrMT per prevented movement of a future infected animal to a new herd. It does not capture the effect of PrMT on the overall progress of the bTB epidemic in GB.
- Using a mathematical model developed by the Veterinary Laboratories Agency, the total gross benefits over the period analysed could have been as high as £65m, with the total net benefits likely to be nearer £48m.

(for further information see the review report at:

<http://archive.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/tb/documents/pre-movement-testing-review.pdf>)

Not revising the exemptions as we propose would, of course, mean no additional direct costs for industry. This would, however, leave the current TB spread risks accruing from these exemptions (with the consequential costs for industry and Government) unchecked.

Tightening up the pre-movement testing policy – alongside other measures to tackle TB, including badger control - will benefit cattle farmers and the taxpayer by helping to stop the further spread of the disease, particularly *within* herds, by increasing the prospects for earliest detection of TB, thereby avoiding the deleterious effects on farming businesses that an undetected TB reactor animal can cause (i.e. by ‘seeding’ the disease in new herds) with the resultant pressure on the public purse from compensation payments and the costs of further follow-up work. The benefits of early, effective detection of TB that the changes are designed to bring, specifically in terms of the numbers of TB reactors that would have been detected had the exemptions not been in place, is set out in more detail in the attached veterinary risk assessments (at Annexes 2 and 3). More importantly, the economic analysis sets out the projected long-term substantive and substantial benefits of the proposed changes.

Our proposals have been considered and endorsed by Defra’s key stakeholder advisory group – the TB Eradication Group for England (TBEG) – which includes representatives from both the farming industry and the veterinary profession.

¹ <http://archive.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/tb/documents/bovine-tb-impact-assessment.pdf>

The European Commission's Food and Veterinary Office (FVO) in their September 2011 review of TB controls in England and Wales, were critical of various perceived 'loopholes' in our TB controls which allow TB to spread, and therefore welcomed our intention to further tighten the pre-movement testing policy.

4. Application and scope

TB control is a devolved matter. These proposed changes will apply to England only. The changes we are proposing have already been introduced by the Welsh Government

5. Analysis of Options

Options considered

We have considered two policy options. **Option 0** would be to continue with the current policy. **Option 1** would be to amend the TB Order to make three specific changes:

(i) Remove the "30-day residence" exemption. Currently, animals can be moved without a pre-movement test if they have been on a farm for less than 30 days². The exemption was permitted because clear tested animals that spend only a short time on premises are at a reduced risk of becoming infected and, even if they were to become infected whilst on the premises, detection within one month is highly unlikely despite the best available tests for detecting TB in cattle.

However there is some evidence that some cattle owners have mis-used the exemption by repeatedly moving animals from premises to premises (i.e. using the 30 day exemption for multiple movements). This effectively allows them to bypass the requirement to pay for TB tests, it also increases disease risks.

(ii) Revise the current exemption for movements to agricultural shows - by removing the testing exemption for cattle moved to shows where animals are 'housed' overnight i.e. where animals share airspace in an enclosed environment. The advice from veterinary experts is that whilst the risk of spreading TB at shows is generally low, *it is not insignificant*, and that risk will increase where cattle from annually and biennially tested herds are kept confined in the same air space and/or where an overnight stay at the show premises is necessary. We do not propose removing the exemption for cattle moved to other agricultural shows i.e. those where cattle are not housed together overnight.

(iii) Remove the current exemption for Sole Occupancy Authority (SOA) – Farmers that own different parcels of land (regardless of geographical distance between the different premises) can register their operation as a SOA³. Once the SOA has been approved livestock movements between the premises no longer incur 'standstills' (see footnote 2). Movements between SOA premises are also exempt from PrMT. Because there is no geographical limit between SOA premises some farmers can currently (and legally) move untested cattle over long distances, including between different TB risk areas. This potentially increases the TB risks for other cattle farmers, including those in parts of the country where currently there is very little TB. We therefore propose **removing the SOA exemption** for owners of SOAs that include premises in different TB risk areas - NB we will use a herd's routine TB testing

² A 'standstill' period of 6 days applies to all stock (including pigs) whenever cattle, sheep, or goats are moved onto a holding. When pigs are moved onto the holding a 20 day 'standstill' applies to all pigs on the farm and a 6 day standstill is triggered for cattle, sheep and goats. This means that until the 'standstill' period expires, no stock can be moved off of the premises other than to slaughter or direct to a 'slaughter only' market. The 30 day exemption overrides the 'standstills'.

³ Single Occupancy authorities (also known as a sole occupancy authorities or groups) were created in 2003 and allow livestock keepers to link different premises which fall under their sole management and control. Once the SOA has been approved (essentially the only check is to verify that the premises are under the control of a single entity) livestock movements between the premises no longer incur standstills (see above). Establishing SOAs therefore reduces burdens associated with standstills. Movements between SOA premises are also exempt from PrMT. A farmer is required to notify the British Cattle Movement Service (BCMS) of movements between SOA premises, although we have evidence that often this does not happen.

frequency as a proxy for TB risk (all cattle herds are routinely tested for TB, with the frequency of testing determined by the prevalence of disease in the area and other risk factors⁴).

We carefully considered whether we could deal with the identified risks through *non-regulatory means*, for example through a communication effort to make farmers with higher TB risk herds aware of the risks (based on best veterinary advice) of using the exemptions discussed in this document to move untested cattle from their herds. However, our experience shows that would be ineffective: before the introduction of PrMT legislation in 2006, farmers (with cattle in higher TB risk areas) had been strongly urged by government to pre-movement test, but very few followed this advice. It is precisely because the best practice guidance was being ignored that it was felt necessary to make pre-movement testing a legal requirement.

6. Costs and benefits

The analysis below sets out the headline costs and benefits of the different options. **A detailed explanation of the approach taken to calculate costs and benefits is provided in Annex 1 below.**

Costs

Table 1: Summary of costs

<u>Provision</u>	<u>Costs (distribution of costs)</u>
Shows – costs of additional pre-movement testing ⁵	£66k per annum (£61k farmers; £5k taxpayers)
<30 days – costs of additional pre-movement testing ⁶	£500k per annum (£450k farmers; £50k taxpayers)
SOAs ^{7,8} – costs of additional pre-movement testing	£82k per annum (Low: £30k; High: £372k) (£74k farmers; £8k taxpayers)
<u>Total per annum cost of Option 1</u>	<u>£648k per annum</u> (£585k farmers; £64k taxpayers)
<u>Total cost of Option 1 over 5 years (PV terms)</u>	<u>£3.03m</u> (£2.73m farmers; £0.3m taxpayers)

Additional pre-movement tests for shows

There are approximately 6,500 annual cattle movements to shows from areas with annual and 2-yearly TB testing⁹. Under option 0, movements would continue unchecked and the potential for TB spread would remain. However, farmers (and taxpayers) would be saved the costs of additional testing. The average cost of a test for *shows* is estimated at £12, based on information about PrMT fees under the existing regulations, farmer time to gather and handle animals for the test and the cost of tuberculin used in the test itself. This is slightly higher than for the 30 days and SOAs exemptions, as, generally, batches of animals moving to shows are smaller, so there are less economies of scale. However, the £66,000

⁴ TB risk areas are classified according to the default frequency that cattle herds are required to be routinely tested for TB. The frequency is determined by historical incidences of TB in the parish in which the herd resides. For example, Devon is a county where TB is endemic. Therefore, herds are required to undergo annual testing. At the other end of the spectrum, herds in Yorkshire are tested every four years (and there are other herds which are tested either biennially or every three years). **For the purposes of this Impact Assessment, high risk movements are from those herds which are situated in 1- and-2-yearly testing areas.**

⁵ A full explanation of the costs and benefits calculation for the Shows provision can be found at pages 17-20.

⁶ A full explanation of the costs and benefits calculation for the <30 Days provision can be found at pages 18, 20 and 21.

⁷ A full explanation of the costs and benefits calculation for the SOAs provision can be found at page 18, 21 and 22.

⁸ Cost/benefit calculations in relation to SOAs are based on SOAs continuing in their present form for the whole of the 5-year analysis period, although SOAs may be abolished by 2014 as the result of a recommendation from the Farming Regulation Task Force.

⁹ An explanation of this assumption is available in the AHVLA (Animal Health and Veterinary Laboratory Agency, a Defra agency) veterinary risk assessment (VRA) for moves to agricultural shows (below at Annex 2).

benefit figure mentioned in Table 1 is based on 5,525 annual movements. This is because a small proportion of animals would have been tested in a clear routine herd test within the 60 days prior to the move and so would be eligible to move without a specific pre-movement test¹⁰. This is assumed to account for 10% of the 6,500 movements (taking account of the fact that routine tests are more often in winter, while most shows are in summer). Some animals are shown at more than one show in a 60 day period, so perhaps a further 5% of moves would be covered by a previous PrMT (see pages 17-18).

Additional pre-movement tests for animals on site <30days

50,000 moves annually of eligible cattle within 30 days of their arrival onto a holding. This figure excludes moves of animals that have tested clear within the previous 60 days. It has been assumed the 50,000 movements are not covered by a previous routine herd test (RHT) or whole herd test (WHT). The average cost of PrMT for these cattle would be about £10 per animal. As discussed in the previous paragraph this is slightly lower than for the shows exemption but assumes the batch size for 30 day moves is similar to the existing PrMT average. Therefore, total costs of £500,000 (see page 18).

Additional intra-SOA pre-movement tests

There are 3,000 recorded moves of cattle between holdings within SOAs per annum¹¹. However, it is widely recognised that there is very likely to be a significant under-reporting of such moves. To correct for this, the number of reported intra-SOAs moves was divided by the number of keepers (188) reporting those moves, producing an average of 16 intra-SOAs moves per reporting keeper per annum. To give a more realistic estimate of the number of intra-SOAs moves per annum, this average per annum figure was then multiplied by the number of SOAs straddling different TB risk areas (1369), to give an assumed number of intra-SOAs moves (10,923 per annum) between PTI 1/2 and PTI 3/4-based holdings. Further, we assume that only 50% of these will be moves from PTI1/2 to PTI 3/4 risk areas (rather than vice versa), and so will trigger a PrMT in the Option 1 scenario. Additionally, a number of these cattle moves will be covered by a recent routine herd test, and so will not require a PrMT. Given that the majority of routine herd tests are undertaken in winter – as opposed to intra-SOAs movements, which occur throughout the year - we estimate that 25% of cattle moved between SOA holdings will be covered by a routine herd test. This generates an estimate of the number of intra-SOAs movements requiring a pre-movement test, of 8192. Again, average cost of PrMT for these cattle would be about £10 per animal, as discussed above for the Shows and 30 Days exemptions, but, as with the 30 days exemption, assumes the batch size is similar to the existing average for pre-movement testing. Hence, total annual costs of £82,000 (see page 18).

Benefits

Table 2: Summary of benefits

<u>Provision</u>	<u>Benefits (distribution of benefits)</u>
Shows	£80k per annum (£24k farmers; £56k taxpayers)
<30 days	£544k per annum (£181k farmers; £363k taxpayers)
SOAs	£269k per annum (Low: £99k; High: £1.2m) (£159k farmers; £79k taxpayers)
<u>Total per annum benefit of Option 1</u>	<u>£893k per annum</u> (£384k farmers; £509k taxpayers)
<u>Total benefit of Option 1 over 5 years (PV terms)</u>	<u>£4.17m</u> (£1.8m farmers; £2.08m taxpayers)

¹⁰ Assumptions around moves eligible for pre-movement testing in this section have been agreed by AHVLA vets.

¹¹ Reported intra-SOAs moves data are taken from Defra's Rapid Analysis and Detection of Animal-Related Risks (RADAR) database.

The calculation of the benefits presented in Table 2 above is based upon internal Defra analysis, and, as mentioned above, the methodology used is presented in Annex 1. The following section summarises the approach taken to quantifying the benefits of Option 1.

Shows

The benefits calculations presented above for the Shows provision include the following avoided costs of new incidents (NIs) caused by:

- a) **Transmission of bTB at shows** - pre-movement testing of cattle moving to shows is expected to identify approximately nine reactors per annum. The identification of these nine reactors by PrMT avoids the transmission of infection to approximately 0.5 herds per year. The cost of the associate herd breakdowns is approximately £25,000 per herd breakdown, and so £12,000 in total (see **Table 4** below for a disaggregation of herd breakdown costs).
- b) **Spread of bTB within the herd of origin of the infection** - pre-movement testing of cattle trigger approximately 5 NIs in the herd of origin. We expect that approximately 20% of these incidents would be reduced to save approximately £4000 per annum in the cost of slaughters, testing and restriction.
- c) **Onward spread to other herds (from subsequent cattle sales)** – an additional (approximately) 2.5 new incidents per annum caused by reactors otherwise moving to other herds. The avoided herd breakdown cost of these new incidents is £63,000 per annum (2.5 x £25,000).

<30 days

The benefits calculations presented above for the <30 days provision include the following avoided costs of NIs caused by:

- a) **Transmission of bTB to destination holdings** - the lifting of the exemption on the pre-movement testing of cattle moving within 30 days of their arrival on a holding is expected to prevent approximately 22 new incidents per annum. The avoided herd breakdown cost of these new incidents is £441,000 per annum (22 x £20,000).
- b) **Spread of bTB within the herd of origin of the infection** - pre-movement testing of cattle trigger approximately 17 NIs in the herd of origin. We expect that approximately 20% of these incidents would be reduced to save approximately £10,000 per annum in the cost of slaughters, testing and restriction.
- c) **Onward spread of bTB to other herds (from subsequent cattle sales)** - the lifting of the exemption of testing on movements within 30 days of arrival is expected to prevent approximately five new incidents per annum. The avoided herd breakdown costs of these new incidents is £94,000 per annum (4.68 x £20,000).

SOAs

The benefits calculations presented above for the SOAs provision include the following avoided costs of NIs caused by:

- a) **Spread of bTB to within-SOA PTI 3/4-based holdings and onward spread of bTB to other herds (from subsequent cattle sales)** - pre-movement testing of cattle moving from PTI 1/2- to PTI 3/4-based SOAs is expected to prevent approximately 12 new incidents per annum. The avoided herd breakdown cost of these new incidents is £236,000 per annum (11.82 x £20,000).
- b) **Further spread to neighbouring herds and wildlife** - the lifting of the exemption on PTI 1/2 to PTI 3/4 intra-SOAs cattle moves is expected to prevent approximately 0.5 herd breakdowns per annum as a result of the development of 'controlled hotspots' (small clusters of bTB herd breakdowns) and <1 'uncontrolled hotspots (larger, persistent clusters of bTB herd breakdowns,

which affect an average of 100 herds and take 10 years to bring under control). The avoided herd breakdown costs of the related new incidents are £33,000 per annum.

Table 3 – Net benefits of the individual provisions in Option 1

Provision	Net benefit (best estimate per annum)
Shows¹²	£13k
<30 days¹³	£44k
SOAs¹⁴	£187k
Overall net benefit of Option 1	£244k

In summary:

- **The net present value of the policy, over a 5-year appraisal period, is £1.14m.**
- **The overall benefit to cost ratio of the policy is 1.4.**

Unit cost of a herd breakdown (which takes account of the costs of both confirmed incidents and unconfirmed incidents)

The cost/benefit calculations in this section take account of both confirmed and unconfirmed incidents of TB in herds. Until 31st December 2010, incidents where TB was confirmed through post-mortem evaluation were known as ‘confirmed incidents’ (or CIs). However, since 1st January 2011 the term ‘OTFW’¹⁵ has replaced CI. Likewise, ‘OTFS’¹⁶ is now used in place of ‘unconfirmed incidents’.

¹² A full explanation of the costs and benefits calculation for the Shows provision can be found at pages 16 and 18.

¹³ A full explanation of the costs and benefits calculation for the <30 Days provision can be found at pages 17 and 19.

¹⁴ A full explanation of the costs and benefits calculation for the SOAs provision can be found at page 17 and 20.

¹⁵ **Officially TB Free Withdrawn (OTFW) status**

Since 1 January 2011, herds throughout Great Britain have had their OTF status withdrawn (and designated OTFW) where:

- Lesions typical of TB are detected at post-mortem examination, or;
- Mycobacterium bovis (bovine TB) is identified in tissue samples from any animal in the herd, or;
- An additional epidemiological risk is identified by Animal Health.

¹⁶ **Officially TB Free Suspended (OTFS) status**

Herds will have their OTF status suspended (and they will be designated OTFS) when:

- Skin test reactors are identified, but none have lesions typical of bovine TB and they are culture negative, or;
- Inconclusive reactors are identified, and the herd has had its OTF status withdrawn within the previous three years, or;
- Suspected TB lesions are identified at post mortem examination in one or more animals at routine slaughter, or;
- There is a suspicion of clinical disease in an animal in the herd, or;
- The TB status of the herd is unknown due to a tuberculin skin test becoming overdue, or;
- Any combination of the above scenarios.

All herds that have their status suspended due to identification of reactors at a TB test carried out after 1 January 2011 will require **ONE** clear short interval test with negative results before OTF status is regained. However, if either of the following circumstances applies, their status will remain suspended until they have passed **TWO** consecutive, short interval tests with negative results:

- The herd has had OTFW status in the three years prior to the current breakdown, or;
- The herd is contiguous to another which currently has OTFW status. Herd status will not however be changed retrospectively, i.e. if contiguous herds subsequently have their OTF status withdrawn and will only apply to herds newly meeting the above criteria from 1 January 2011

We estimate the average cost of an OTFW incident using a standard approach described previously in Defra but we have updated the financial values (e.g. the loss to the farm business from having a reactor slaughtered) in line with appropriate price indices and the physical values (e.g. number of cattle slaughtered and number of extra herd tests per incident) with averages from recent AHVLA analysis of actual OTFW incidents.

The largest item of OTFW costs is the impact of slaughtered reactor cattle and dangerous contacts. Reading University developed a method to estimate the true economic cost of these slaughters to take account of all relevant costs, e.g. disruption of the milk output of a dairy herd, so this is not simply the same as the value of the cattle taken¹⁷. The average number of slaughters per OTFW is 12.8. The average cost (net of the salvage value of the animals) is estimated to be £1,205, carried partly by Government (through the compensation arrangements) but leaving a residual cost to the farmer of £320 per animal. The total cost of slaughter per OTFW is about £15,000.

The second largest cost item is the cost of extra tests on the OTFS/restricted herd. Cattle testing is costly both to the farmer, who has to collect cattle for testing and may lose output as a result, and to government, which pays for the vet, administrative support and tuberculin. This item also includes the cost of official veterinary input extending beyond the tests themselves. The total extra testing cost of a restricted herd per breakdown is about £9,500.

Other OTFW/OTFS costs are to the farmer, of movement restrictions and isolation of animals, and the costs of consequent testing in other herds (contiguous herds and traced animals). These are estimated to total around £1,500.

Table 3 shows the estimated total costs of a Tb breakdown. The average cost is *about* £25,000, split roughly one third to the farmer and two thirds to Government. Analysis of data from the Farm Business Survey for farms experiencing major TB incidents tends to confirm that this estimate of total financial cost of an average TB herd breakdown is realistic. Our impact assessment calculations use the rounded figure of £25,000 cost per OTFW/OTFS incident¹⁸.

Table 4: Average cost of a bovine TB-related cattle herd breakdown

	Cost to Farmer	Cost to Taxpayer	Total herd breakdown costs
Slaughter	£2500	£7000	£9500
Restriction	£800	N/A	£800
Isolation	£250	N/A	£250
Testing	£3000	£6500	£9500
Other tests	£400	£900	£1300
Spread	£1100	£2500	£3600
Total	£8050	£16900	£24950

For the purposes of calculating the cost/benefits of our proposed changes, we have used average breakdown costs of all breakdowns, including those where no post-mortem evidence was found (which would suggest that the breakdown had been detected at an earlier stage).

Unquantified costs of herd breakdowns

Qualitative evidence suggests that bTB can cause significant stress and ill health among the farming population. However, the impact of such stress is difficult to quantify or value. Studies looking at the social impacts of bTB have found self-reported stress among farmers. For example, from a sample of 50 farmers interviewed in the south-west, 30 said their farm's bTB breakdown had affected their own daily life, 20 that of their family or household, 10 their employees. Evidence suggests that a long period of time under movement restrictions is a significant contributor to stress across all farming groups. A standard questionnaire designed to identify psychiatric ill health found that farmers that have been under

¹⁷ Bennett, R. M. and Cooke, R. J. (2006) *Costs to farmers of a tuberculosis breakdown*. Veterinary Record, 158 (13). pp. 429-432. ISSN 0042-4900

¹⁸ Herd breakdowns involving pedigree herds are assumed to cost an average of £25,000. The £25,000 estimate is therefore applied in the analysis of impacts of the Shows provision. A lower estimate - £20,000 - is used in the analysis of the impacts of the <30 Days and SOAs provisions, where pedigree herds are less likely to be relevant.

bTB movement restrictions for a long period of time showed significantly higher levels of stress than farmers who had not experienced a bTB herd breakdown.

Bovine TB incidents are also likely to have consequences for other businesses. The available evidence in this area suggests that these effects are minor compared to those for farmers themselves and that they are a mixture of positive and negative impacts. They are not considered further in this assessment.

Sensitivity analysis undertaken

The probability of disease transmission at agricultural shows, from cattle moving within 30 days of arrival on a holding and between holdings within a SOA – based upon rigorous epidemiological risk evidence – is unknown. Therefore, a significant number of assumptions have been employed to arrive at the costs and benefits estimates presented above. **The key assumptions used are detailed in section 7 below, as well as in Annex 1.** The range of uncertainty around each of these assumptions is small and well established. The only assumption where the range of uncertainty is large is around the number of intra-SOAs cattle movements per annum. Given the scope for the undetected (and so unrecorded) movement of cattle between SOA-based holdings, as well as the implausibly low number of such movements recorded in RADAR, we believe there to be significant under-reporting of moves between SOA-based holdings (only 3000 were reported, and so recorded, in 2010/11). Therefore, we decided to conduct sensitivity analysis based upon the number of intra-SOA cattle movements alone.

We have considered three intra-SOAs moves-based scenarios in this sensitivity analysis, and these are:

- **Scenario 1 (which generates our BEST ESTIMATE of BOTH costs and benefits)** – the assumed number of intra-SOAs moves is based upon the average number of recorded moves per recording SOA (per annum) (16) multiplied by the number of SOAs straddling PTI 1/2 and 3/4 areas (approximately 1400). The assumed total number of moves is therefore approximately 22,000 per annum¹⁹.
- **Scenario 2 (which generates our LOW ESTIMATE of BOTH costs and benefits)** – The assumed number of intra-SOAs moves is equal to the number of moves recorded in RADAR in 2010/11 (3000).
- **Scenario 3 (which generates our HIGH ESTIMATE of BOTH costs and benefits)** – The assumed number of intra-SOAs moves is based upon the average number of moves between an adjusted average number of moves between holdings of all types (per annum) (72) multiplied by the number of SOAs straddling PTI 1/2 and 3/4 areas (approximately 1400)²⁰. The assumed total number of moves is therefore approximately 101,000 per annum.

¹⁹ We assume further, in all intra –SOAs moves-based scenarios considered, that 25% of intra-SOAs moves are covered by a previous routine herd test, and so do not require an additional pre-movement test. Additionally, we assume that only 50% of intra-SOAs moves are from PTI 1/2 risk to PTI 3/4 risk areas, and so require a PrMT.

²⁰ The average number of moves between holdings is adjusted (multiplied by two) to account for the greater number of moves between within-SOA holdings and holdings of all types.

7. Risks and assumptions

Key risks and assumptions are set out below. These have been extracted from the cost/benefit analysis in Annex 1.

General

- a) No change to the existing PrMT policy would mean the continued and increased risk of TB breakdowns, higher numbers of animals slaughtered as reactors or direct contacts, with consequential testing and compensation costs for government, and trading impacts for owners.

Shows

- b) In removing/revising the *shows* exemption, it is assumed that the *costs* arising from the slaughter of cattle detected by PrMT would have occurred anyway as they would have been detected at the next routine test and triggered a TB incident in the herd at that stage.
- c) The *benefits* of revising/removing the shows exemption come mainly from stopping the movement of infected cattle from a herd. The scale of the benefits depend on two assumptions:
 - i. Herds that 'show' move 50% more cattle to farms than other herds and
 - ii. PrMT would miss 30% of these moves because they are mostly individual moves or small groups; therefore, test sensitivity is low
- d) Of the 6,500 movements to shows annually from PTI 1 and 2 areas, a small proportion would have tested clear in a routine herd test within the 60 days prior to the movement and therefore would not require an additional pre-movement test. This is assumed to account for 10% of movements (given that routine tests tend to take place in winter whilst most shows are in summer).
- e) An assumption that the proportion of TB reactor cattle detected in all previous pre-movement tests would be maintained. Therefore the extra tests required by Option 1 would result in 9 extra cattle detected as reactors (or converted inconclusive reactors²¹)
- f) It is assumed that these cattle would have transmitted infection to 0.5 herds per year.
- g) The average cost of a test for *shows* is taken to be £12 for the purposes of the cost/benefit analysis - this is slightly higher than for the 30 days and SOAs exemptions (£10), as, generally, batches of animals moving to shows are smaller.
- h) (Also for SOAs) When calculating the probability of TB spread from an infected herd to other, 'clean' (TB-free), herds, need to account for the so-called 'batch factor', the small chance that two or more individual TB reactor animals may be destined for the same herd so would not each create a separate new herd incident/breakdown.

30 days

- i) In the case of the 30 day exemption, it has been assumed that the 50,000 movements mentioned in this IA are not covered by a previous routine herd test (RHT) or whole herd test (WHT).
- j) In calculating the probability of an animal becoming a TB reactor or inconclusive reactor, the period between its routine herd test and the pre-movement test needs to be factored in. For an animal in a PTI1 area, this is likely to average about 6 months, assuming cattle movements are randomly distributed during the year in relation to the routine herd test.

²¹ An inconclusive reactor (IR) is an animal which has given readings to the tuberculin skin test between the 'clear' (pass) and 'reactor' (fail) ranges. These IRs are important because there is some uncertainty as to the disease status of IRs and therefore they must be re-tested; occasionally, the presence of other diseases, or exposure to bacteria similar to *M. bovis*, can cause a positive test reaction, IRs will be re-tested after 60 days. Unless they test clear of TB at that point, they will be slaughtered. A 'converted' IR in this context means an IR that becomes a reactor at the second test.

SOAs

- k) Due to previous under-reporting of intra-SOA movements, an assumed annual number of movements *between* PTI 1/2 and PTI 3/4 was calculated (10,293) (see page 2 of cost/benefit analysis). In addition, it was assumed that 50% of these moves would be *from* PTI1/2 to PTI 3/4 so will trigger PrMT under the proposed Option 1.
- l) Given that the majority of routine herd tests are undertaken during the winter months and that intra-SOA movements take place year-round, it is assumed that 25% of cattle moved between SOA holdings will be covered by a routine herd test.
- m) Based on historic PrMT data, calculation of probability indicates an expectation that 8.6 TB reactor animals will move from PTI 1/2 SOA holdings to those in PTI 3/4 areas, as well as the prevention of each of these infecting an average of 3.38 further animals. There is a further assumption of a 50% chance of these reactor cattle moving off the SOA from a PTI 3/4 area of a SOA via an onward sale and so being subject to PrMT once the exemption has been lifted.

8. Administrative burden and policy savings calculations

We are conscious of the need to minimise red-tape burdens. We will ensure that the administration of the policy, for farmers and for Government, is fit for purpose and proportionate.

9. Wider impacts

Economic impacts

Competition Assessment

Although some farm businesses would face cost increases, the numbers are such that the proposed policy is not expected to have a significant impact on competition.

Small Firms Impact Test

The proposals do not discriminate between large and small firms. The policy options have been developed with regard to farming businesses who are most impacted by bTB. Approximately 99% of farming enterprises in England have less than 10 employees and are therefore classed as 'micro-businesses'. We will therefore be seeking a waiver from the moratorium on new legislation for micro-businesses legislation.

Environmental impacts

Greenhouse Gas

The proposed policy is not expected to impact greenhouse gas emissions as the number of cattle kept by farmers (and hence methane emissions) is assumed to remain steady.

Wider Environmental Impact Test

The proposed policy is not expected to impact on the wider environment.

Social impacts

Health impact assessment

Human health: No significant effect on human health. TB controls were originally introduced to protect human health - this is now largely achieved by milk pasteurisation and meat inspection.

Lifestyle: No significant effect on lifestyle related variables is expected. Any effect is likely to be positive by reducing the stress associated with bTB cattle breakdowns.

Impact on health and social care services: No effect is expected as options would not have any direct impact on demand.

Race/Gender/Disability Equality

The options are not expected to have any effect on race, gender or disability equality.

Human Rights

The options are not expected to have any effect on human rights.

Justice Impact Test

The proposed policy would not be expected to increase normal court business.

Rural Proofing

The options considered by this policy apply principally to rural areas.

Sustainable Development

The policy options are in line with the shared UK principles of sustainable development.

10. Summary and preferred option

The Government's long term goal is to eradicate bTB in cattle but this is likely to take several decades. We need a progressive approach which first aims to stop the disease getting worse and then to reduce the spread and prevalence of the disease to a point where eradication becomes an achievable goal.

The Impact Assessment demonstrates that there is an economic case for PrMT of some currently exempted cattle movements. However, none of the options result in a large cost saving and, because the Government bears much of the cost of dealing with TB breakdowns, most of the benefits accrue to the taxpayer.

11. References

1. Impact Assessment - 'Measures to address bovine TB in badgers'
2. PrMT Phase 1 Review (including cost benefit analysis)
<http://archive.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/tb/documents/pre-movement-testing-review.pdf>
3. Report of farming Regulation Task Force
<http://www.defra.gov.uk/publications/2011/05/17/pb13527farming-reg-report/>
4. Bennett, R. M. and Cooke, R. J. (2006) *Costs to farmers of a tuberculosis breakdown*. Veterinary Record, 158 (13). pp. 429-432. ISSN 0042-490

Proposed revisions to TB pre-movement testing exemptions – estimates of costs and benefits

Estimates of costs and benefits are based on the methodology used in the review of Phase 2 of the existing pre-movement testing ('PrMT') regulations:

<http://archive.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/tb/documents/pre-movement-testing-review.pdf>

In extending this methodology to apply to the exempted movements considered in this IA, it is necessary to make a number of assumptions where data are not available and where quantitative epidemiological information about TB transmission does not exist. This means that the estimates – of benefits in particular – are uncertain and are at best an indication of the scale of the impacts.

Historic data on cattle movements and costs is from Defra sources.

Costs

Costs arise mainly from the resources to carry out extra PrMT. This involves farmers' time, fees for vets' time, and tuberculin used for testing.

Shows

There are about 6,500 cattle movements a year from 1 and 2 yearly testing parishes in England to shows²². A small proportion of these would have been tested in a clear routine herd test within the 60 days prior to the move and so would be eligible to move without a specific pre-movement test²³. This is assumed to account for 10% of the 6,500 movements (taking account of the fact that routine tests are more often in winter, while most shows are in summer). Some animals are shown at more than one show in a 60 day period, so perhaps a further 5% of moves would be covered by a previous PrMT. This leaves 85% of moves (5,525) incurring the cost of a PrMT.

The cattle farmer would have to pay the veterinary fee for testing. Fees typically include a fixed call-out charge plus a variable amount according to the number of cattle tested. Batches of animals moving to shows tend to be smaller than average, so the fee per animal would be higher than average. However there would be some cases where the farmer is able to PrMT animals moving to a show together with another batch moving to other farms or livestock auctions, reducing the fee per animal. Based on information about PrMT fees under the existing regulations, this suggests an average fee of £8 per animal. Farmer time to gather and handle animals for the test adds a further £3 per animal. Government pays for tuberculin used in the test at about £1 per animal²⁴.

Total testing costs resulting from removing the shows exemption would then be 5,525 moves at £12 each, amounting to about £66,000 a year and shared £61,000 to farmers and £5,000 to taxpayers.

²² An explanation of this assumption is available in the AHVLA (Animal Health and Veterinary Laboratory Agency, a Defra agency) veterinary risk assessment (VRA) for moves to agricultural shows (below at Annex 2).

²³ Assumptions around moves eligible for pre-movement testing in this section have been agreed by AHVLA vets.

²⁴ The per test cost of pre-movement testing information presented here is taken from the PrMT Review (referenced above).

For a small number of moves, the benefits of moving the animal to the show would no longer cover the slightly increased cost. Therefore removing the exemption is likely to lead to a small reduction in the number of cattle moved to shows. In this small number of cases, the cost to the farmer would be the foregone benefit of the move rather than the higher PrMT cost.

It is assumed that the costs arising from the slaughter of cattle detected by PrMT would have occurred anyway as they would have been detected at the next routine test and triggered a TB incident in the herd at that stage.

30 days

There are 50,000 moves a year of eligible cattle within 30 days of their arrival onto a holding²⁵. This number excludes moves of cattle that have been tested clear within the previous 60 days, and so all 50,000 would need a new test if the 30 day exemption is removed.

The average cost of PrMT for these cattle would be about £10 per animal, as discussed above for the shows exemption but assuming the batch size for 30 day moves is similar to the existing PrMT average.

Total costs of removing the 30 day exemption would therefore be £500,000 a year (50,000 x £10), shared £450,000 to farmers and £50,000 to taxpayers. As with the shows exemption, a small number of moves would not take place and so incur a lower cost.

SOAs²⁶

There are 3,000 recorded moves of cattle between holdings within SOAs per annum²⁷. However, it is widely recognised that there is very likely to be a significant under-reporting of such moves. To correct for this likely under-reporting, we divided the number of reported intra-SOAs moves by the number of keepers (188) reporting those moves, to give an average of 16 intra-SOAs moves per reporting keeper per annum. To give a more realistic estimate of the number of intra-SOAs moves per annum, this average per annum figure was then multiplied by the number of SOAs straddling different TB risk areas (1369), to give an assumed number of intra-SOAs moves (10,923 per annum) between PTI 1/2 and PTI 3/4-based holdings. Further, we assume that only 50% of these will be moves from PTI 1/2 to PTI 3/4 risk areas (rather than vice versa), and so will trigger a PrMT in the Option 1 scenario. Additionally, a number of these cattle moves will be covered by a recent routine herd test, and so will not require a PrMT. Given that the majority of routine herd tests are carried out in winter, while intra-SOAs moves occur throughout the year, we estimate that 25% of cattle moved between SOA holdings will be covered by a routine herd test. This generates an estimate of the number of intra-SOAs moves, which require a PrMT, of 8192.

The average cost of PrMT for these cattle would be about £10 per animal, as discussed above for the Shows and 30 Days exemptions, but assuming the batch size for 30 day moves is similar to the existing PrMT average. **The total cost of (partially) removing the SOAs exemption would therefore be approximately £82k per annum (8192 moves tested at £10 each). This is shared £74,000 to farmers and £8,000 to taxpayers.**

Given the objective of intra-SOAs moves – for instance, the moving of cattle between holdings for foraging opportunities – it is unlikely that the cost of the pre-movement testing of animals moving between holdings within a SOA would prevent those moves from taking place.

²⁵ This is taken from AHVLA analysis conducted for the PrMT Review.

²⁶ See footnote 8.

²⁷ Reported intra-SOAs moves data are taken from Defra's Rapid Analysis and Detection of Animal-Related Risks (RADAR) database.

Benefits

The benefits of amending the PrMT exemptions are the savings in costs of bTB control measures under the wider control regime that are expected to follow. The majority of the costs of control measures under the wider regime are met by taxpayers, hence the benefits of changing PrMT exemptions are shown here as benefits to taxpayers (in reduced control costs). The benefits of the wider control regime accrue primarily to the cattle industry.

Shows

The benefits of PrMT for cattle moving to shows arises in three ways: (i) reducing the spread of bTB [or *M bovis*] from a infected animal to an animal from another herd at the show premises; then, by finding infection in the herd earlier than it would have been found in a routine test, both (ii) reducing its spread within that herd, and also (iii) reducing the chances that it spreads through later sales of cattle to other herds.

(i) Assuming the proportion of reactors as found in all PrMTs as previously applied, the 5,525 extra PrMTs would result in 9 extra cattle detected as reactors or converted inconclusive reactors (IRs). **This is calculated as $5,525 \times (0.00103 + 20\% \times 0.00142)$ ²⁸.** The probability that one of these 9 animals would transmit infection to other cattle during the course of the show is not known. Therefore, we have assumed that infections at agricultural shows are triggered in the same way as those in PTI 4 areas. TB incidents in the low risk, four-yearly tested (PTI 4) parishes can be assumed to have started from animals moved in (as with infections that occur at agricultural shows), and often by a single infected animal. About 45% of these incidents have more than one animal slaughtered as a reactor, which is a possible indication of the probability of transmission to other animals within a herd over the period of about two years (104 weeks) from the initial infected inward move to the routine test that first found a reactor²⁹. Assuming independent equal weekly probability of spread, this implies a probability of 0.57% that infection spreads from one animal to (at least) one other in a week. Assuming that this probability applies to spread at a show (in fact it is likely to be lower because of separation of animals from different herds at shows, and because animals are normally housed together for less than a week per show), and that spread would affect about 10 other herds, then the 9 extra cattle detected would have transmitted bacteria to about 0.5 other herds a year. **The benefit of preventing this other 0.5 incident is about £12,000.**

(ii) The PrMT Review found a ratio of 0.55 new herd incidents triggered by reactors at PrMT per reactor detected, and 0.25 triggered by IRs per IR. Applying these ratios to the proportion of reactors and IRs identified by PrMT (as explained above) suggests that the 5,525 PrMTs would trigger about 5 new incidents in the herd of origin. Expected spread within these herds would be reduced by detection earlier than waiting until the next routine herd surveillance test. Estimating the probability and cost of a larger incident by taking parameters from incidents in four-yearly tested herds as above, this suggests 20% of incidents involve spread that could be reduced to save about £2,700 in the cost of slaughtered animals and £1,500 in testing and restrictions. **The benefits of reducing spread in the herd of origin amount to £4,400.**

(iii) The PrMT Review found that 3.38 further reactors were found in herds following the initial detection of a reactor or converted IR at PrMT (and so, a total of $3.38 + 1 = 4.48$ reactors per infected herd). When PrMT finds an infected herd earlier (on average about 6 months earlier in annually tested parishes), the chance is reduced that one of these other animals would be moved on to another herd, causing a new incident there. The probability that any animal will be moved to a new herd in a six-month period is about 16%, but is likely to be higher than average

²⁸ These figures are explained in the VRA for moves to agricultural shows, which is included below at Annex 2.

²⁹ These data are taken from Defra's RADAR database.

in the type of herd that shows cattle because a important part of their business is selling breeding stock to other farms³⁰. We assume 50% higher, at 24%. Possibly these herds are more likely than average to move animals to other farms at an age when they are more likely to become reactors (e.g. relatively more in-calf heifers and cows, relatively fewer calves). About nine reactors could have moved. **This is calculated as the nine initially detected x 4.48 x 24%**. Of course, PrMT would apply and would detect only about 70% of these 9 moves, due to the relatively low sensitivity of the skin test for small groups of animals on a single occasion, leaving 30% not prevented. Allow also for the “batch factor”, which is the small chance that two or more individual reactors might be destined for the same herd so would not each create a separate new herd incident, and is about 0.93³¹. The estimated number of extra incidents saved by preventing moves out of the infected herd is then about 2.5 (9 x 30% x 0.93). **The avoided costs of these incidents are about £25,000 each (as above), so the benefit of preventing transmission from the herd of origin to other herds is £63,000.**

Adding these three elements, the total benefit of removing the shows exemption is estimated at £80,000 per year, divided £24,000 to farmers and £56,000 to taxpayers.

30 days

The benefits of PrMT of cattle moving within 30 days of arrival on a holding arises in three ways: (i) by preventing a new TB incident on the destination holding that would otherwise probably have been uninfected, possibly causing further onward spread of disease; then, by finding infection of the origin herd earlier than it would have been found in a routine test, both (ii) reducing its further spread within that herd, and also (iii) reducing the chances that it spreads through later sales of other infected cattle to other herds. (ii) and (iii) are similar to their counterparts for shows (above), but (i) is relatively more important because the tested animal would otherwise have moved to a new holding and caused a TB incident there, either when that individual was identified in future tests or when the herd of origin was found to be infected in future routine tests, leading to tracing that individual for testing.

(i) Based on the test results in past PrMT (as discussed for Shows above), we can say that the probability of an animal becoming a reactor or converted IR in the period between its previous routine herd test and its PrMT is about 0.0013. In annually tested parishes, this period is likely to average about 6 months, assuming moves are randomly distributed during the year in relation to the routine test. Cattle covered by the 30 days exemption can be assumed to have been tested clear at some point in the past 60 days, or they came from a low risk area and are at risk only in the less than 30 days on the present holding. (In theory there may be a few animals moving regularly every 29 days to avoid PrMT, but this would make no management sense in most farming situations and would be as costly to the farmer as fewer moves with PrMT.) This suggests a period when the animal is at risk of becoming a reactor or converted IR of about 60 days, so the probability of that occurring is about 0.00043 (calculated as $(1-(1-0.0013)^{(60/182)})$). Many of the herds that move animals within 30 days of their arrival are likely to make a business of dealing in cattle on a large scale, with many animals from different sources mixing into new combinations before onward sale. These practices are likely to increase transmission risks, so we assume that the probability is about 10% higher than for average herds. The number of reactors or converted IRs in 50,000 PrMTs is then 24 ($50,000 \times .0043 \times (1+10\%)$)³². Applying the batch factor (as for shows), 22 new TB incidents would be avoided in the destination herds, at an average cost of £20,000 (estimated in the PrMT review). **This gives a benefit of £441,000.**

³⁰ The probability that an animal is moved to a new herd in a six-month period is calculated from an analysis of moves data for 2010/11 taken from Defra's RADAR database.

³¹ The batch factor is taken from the PrMT Review.

³² As mentioned above AHVLA analysis for the PrMT Review suggests that there are approximately 50,000 movements of cattle that have been on a given holding for less than 30 days.

(ii) The PrMT Review found a ratio of 0.55 new herd incidents triggered by reactors at PrMT per reactor detected, and 0.25 triggered by IRs per IR, as mentioned for Shows above. Applying these ratios suggests that the 24 reactors and converted IRs would trigger about 17 new incidents in their herds of origin. Expected spread within these herds would be reduced by detection earlier than waiting until the next routine herd surveillance test. Estimating the probability and cost of a larger incident by taking parameters from incidents in four-yearly tested herds, as above, suggests 20% of incidents involve spread that could be reduced to save about £1,350 in the cost of slaughtered animals (lower than for show animals because less likely to be pedigree) and £1,500 in testing and restrictions. **The benefits of reducing spread in the herd of origin amount to £10,000 (17 x 20% x (£1,350 + £1,500)).**

(iii) Estimating the number of other infected moves that could be prevented by restricting the herd of origin is more complicated in the case of the 30 day exemption because other infected animals could be found by tracing tests in previous herds where the reactor cattle had lived, as well as – or instead of – in breakdown testing in the herd where they resided for under 30 days. However, for simplicity, the same method is applied as for Shows, but there are some factors here that might make the benefits higher, and some lower. **The calculation implies that about 5 new incidents would be prevented, giving a benefit of £94,000.**

Adding these three elements, the total benefit of removing the 30 days exemption is estimated at £544,000 per year, divided £181,000 to farmers and £363,000 to taxpayers.

SOAs³³

The benefits of the pre-movement testing of cattle moving within SOAs, from PTI 1/2 to PTI 3/4 risk areas, arise in three ways: (i) by preventing the within-SOA spread of TB to uninfected holdings in PTI 3/4 risk areas, and, by finding infection earlier than it would have been found in a routine test, reducing the chances that infection spreads through later sales of these infected cattle to other herds, and; (ii) reducing the chances of the onward spread of infection to PTI 3/4 risk area-neighbouring non-SOA-based herds and wildlife (via the development of either 'controlled' or 'uncontrolled' TB hotspots). The methodology for quantifying the benefits at (i) is similar to (iii) in Shows (above).

(i) Based on the test results in past pre-movement testing (as discussed for Shows above), we can say that the probability of an animal becoming a reactor or converted IR in the period between its previous routine herd test and its PrMT is about 0.0013. Therefore, we could expect approximately 11 reactors to be prevented from moving from PTI 1/2 SOA holdings to PTI 3/4 holdings, as well as the prevention of each of these infecting an average of a further 3.38 animals (also as discussed above for Shows). Further, we assume that there is a 50% chance of these reactor cattle moving off the SOA from a PTI 3/4 area of a SOA (rather than a PTI 1/2 area, which would require a pre-movement test in the 'Do Nothing') via an onward sale, and so being subject to PrMT once the SOA exemption has been lifted. Additionally, we have calculated a 54% chance (given England moves (to live) from agricultural holdings (including via market) of 1.774m (from 5.486m cattle) in the year to June 2011) of cattle moving off a PTI 3/4 SOA holding within two years (with two years being the average period of time detections are brought forward in a PTI 3/4 area) - $1 - (1 - 1.774/5.486)^{(104/52)^{34}}$. This generates a figure for the number of reactors moving off PTI 3/4 area SOA holdings to approximately 13. Applying the batch factor, as explained above in 'Shows', further reduces the number of new infections, caused by the movement of reactor cattle off PTI 3/4 SOA areas via sale, to approximately 12 per annum.

³³ See footnote 8.

³⁴ As with <30 Days, the likelihood of reactor cattle moving from a SOA is based upon an analysis of moves data for 2010/11 taken from Defra's RADAR database.

Given average herd breakdown costs of £20,000 (which includes the cost of additional routine testing of cattle outside of annually-tested parishes), we estimate the benefit of new infections prevented by intra-SOAs pre-movement testing to be approximately £236k per annum.

(ii) Given that the pre-movement testing of animals moving from PTI 1/2 to PTI 3/4 risk areas within SOAs prevents approximately nine new herd breakdowns from the onward sale of reactor cattle into non-SOA holdings, a further benefit of the intra-SOAs pre-movement testing of cattle is the prevention of these herd breakdowns leading to the spread of infection to neighbouring non-SOA-based herds and wildlife (via 'controlled' and 'uncontrolled' hotspots). Firstly, we assume that new hotspots can only become established in PTI 3/4 areas. Additionally, it is assumed that 50% of the herd breakdowns prevented by the pre-movement testing of intra-SOAs movements are in PTI 3/4 areas. There is a 2% chance of each of these leading to the establishment of a controlled hotspot in a neighbouring non-SOA holding, in which there are an average of four herd breakdowns involved per controlled hotspot³⁵. Therefore, a total of 0.47 herd breakdowns are prevented from the avoidance of the establishment of controlled hotspots by the pre-movement testing of intra-SOAs moves off PTI 1/2-based holdings.

Where the average cost of a herd breakdown, including the cost of higher frequency herd testing is £20k, we estimate the benefit of the prevention of the establishment of controlled hotspots from the onward sale of cattle from PTI 3/4-based SOA herds to be approximately £9k.

A further benefit - the prevention of the establishment of 'uncontrolled' hotspots (much larger clusters of herd breakdowns, averaging 100 herds) by the pre-movement testing of intra-SOAs moves off PTI 3/4-based SOA holdings - has been quantified in much the same way. The probability of a new infection leading to an uncontrolled hotspot, however, is much lower than that for a controlled hotspot, at 0.01%. Multiplying the approximately nine prevented new herd breakdowns from the onward sale of reactor cattle into non-SOA holdings by 0.01%, and again by the number of affected herds in an average uncontrolled hotspot (100), the number of years of control measures required to establish control (10) and the average herd breakdown cost (£25k), **generates a herd breakdown cost avoided of approximately £24k.**

Adding these three elements together, the total benefit of partially removing the SOAs exemption is estimated at £269,000 per year, divided £179,000 to farmers and £90,000 to taxpayers.

Overall net benefit

The total cost of the proposed changes to PrMT exemptions (30 Days, Shows and SOAs) is estimated to be £648,000 per annum, while the annual total benefit is £893,000. **This generates an annual net benefit of £244,000.**

Over a period of five years, 2011 to 2015, in present value terms, the total costs amount to £3.03m, and the total benefits to £4.17m, **giving a Net Present Value of £1.14m, shared - £0.94m to farmers (a net loss) and +£2.08m to taxpayers (who bear the majority of the cost of dealing with TB incidents under the present arrangements).**

³⁵ Data on the likelihood of new infections leading to controlled and uncontrolled hotspots is taken from the Pre-movement Testing in England Regulatory Impact Assessment, published by Defra in 2005 (<http://archive.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/tb/documents/prmt-regulatory.pdf>).

Veterinary Risk Assessment of the spread of bovine TB through movements of cattle to agricultural shows in England and the role of pre-movement testing

1. Executive summary

A qualitative veterinary risk assessment (VRA) has been commissioned to aid policy decisions regarding the need to extend pre-movement TB testing (PrMT) to cattle of 42 days of age (and over) that move to shows in England and then return to their home premises. Such movements are currently exempt from statutory PrMT.

There is a risk of transmission of *Mycobacterium bovis* (bovine TB) between cattle at shows, either directly (through airborne spread or nose-to-nose contact) or indirectly via fomites (equipment and environment contaminated with the bacterium).

The risk is likely to be higher in an enclosed environment or where cattle from different herds are kept on the showground for extended periods of time, relative to that posed by open-air shows and where cattle return to their herds of origin within a few hours.

Given the historical information of the detection rate of reactors and inconclusive reactors at pre-movement tests in England, it would appear that the introduction of compulsory PrMT for cattle moving to shows could prevent approximately 7 reactors and 9 IRs travelling to shows in England in a typical year – although undisclosed infected animals would still be present.

The veterinary advice is that

1. The risk of spreading bTB at shows is generally low and, in most cases, potentially less than at livestock markets. However, the risk is not negligible;
2. That risk will increase where cattle from annually and biennially tested OTF herds are kept confined in the same air space and/or where an overnight stay at the show premises is necessary;
3. Under the current regime, eligible cattle already require a pre-show test unless they move after the show back to their premises of origin or direct to slaughter (Schedule of the Tuberculosis (England) Order 2007);
4. In order to further mitigate the risks of bTB spread, it is recommended to abolish the current PrMT exemption for eligible cattle going to shows (or a series of shows) and then returning to their home premises, when the event is held indoors and/or involves at least one overnight stay;
5. Cattle under 42 days old moving to shows from OTF herds which are subject to routine TB testing every 3 or 4 years (or tested annually for public health reasons), should continue to be exempt from mandatory PrMT under Art. 9(2) of the Tuberculosis (England) Order 2007.
6. Nevertheless, to enhance the reputation of agricultural shows and safeguard the TB status of the high-value animals often attending them, the show societies should consider introducing a voluntary PrMT requirement for all cattle, even if the event in question does not involve an overnight stay and cattle are not housed;
7. Furthermore, to provide additional protection for their herds, cattle owners are recommended to undertake voluntary on-farm isolation for at least 60 days followed by post-movement testing for all cattle returning to their premises from a show, or series of shows.

2. Introduction / background

Ever since the introduction in March 2006 of mandatory pre-movement TB testing (PrMT) for cattle in England, there has been an exemption in the Schedule of the Tuberculosis (England) Order 2007 for animals moved to an agricultural show or series of shows. This exemption only applies when the animal returns to its original farm or is taken directly to slaughter after the show [1]. A 'pre-show' test with negative results is valid for 60 days.

Additionally, cattle moving to shows from herds that are subject to routine TB testing every 3 or 4 years (or tested annually for public health reasons) and cattle under 42 days old at the time of movement do not have to be tested under the general exemptions at Art. 9(2).

PrMT was quite an unpopular policy among livestock auctioneers and farmers in endemic bovine TB (bTB) areas, so there was strong pressure on the government at the time to make a number of concessions that would render it more acceptable to the cattle industry and to ease delivery. The 'shows' exemption was recommended by the Government-stakeholder PrMT working group in 2005, as the risk of bTB spread presented by those movements was considered to be lower than other cattle movements, due to:

- (i) the generally high biosecurity standards at shows,
- (ii) relatively short period of time that cattle will spend there (compared e.g. to movements to common grazing) and
- (iii) the normally high value of show cattle, which may be kept in some form of isolation within their herd during the showing season and be subject to higher biosecurity levels.

More recently, as part of the Coalition Government's commitment to introduce a science-led policy for the control of TB in badgers and to strengthen the existing bTB control measures in cattle in England, four of the PrMT exemptions (namely shows, 30-day window, SOAs and movements to/from common grazing) have been under review by Defra. This follows from a retrospective assessment of the first three years of the PrMT policy published in September 2010, which highlighted the overall benefits of this measure in terms of enhanced disease surveillance, prevention of new bTB breakdowns and slower rate of disease spread [2].

In May 2010, the Welsh Government ended the exemption where cattle from herds in Wales are moved to shows held on multiple days and/or where cattle are housed. Different PrMT testing rules for shows in England and Wales can give rise to anomalies whenever cattle move to shows across the border and back: if a show is in Wales, PRMT cannot be imposed on animals moving from 1- and 2-yearly tested herds in England. Conversely, if a show is held in England, mandatory PRMT applies to Welsh herds, but not to cattle entering the show from England. Such inconsistencies make the PrMT regime unnecessarily more complex, difficult to explain and justify and open to inadvertent or deliberate non-compliance.

PrMT costs are normally borne by the farmer, unless moving on the back of a government funded statutory test and may vary in terms of costs per animal depending on how many animals are presented for testing and the timing of the show relative to the last herd test paid for by the Government. Unsurprisingly, there is some resistance from the agricultural societies and exhibitors to the abolition of the current PrMT exemption for movement to shows, as this is seen as an additional cost for a limited perceived benefit which might endanger the future of agricultural shows in England. Although high-profile, prestigious shows would likely be able to cope with the change as the exhibitors would be content to absorb the additional costs of testing, smaller shows (local agricultural shows, calf handling events, etc) could potentially lose entries to the extent that they became unviable, although such shows are also less likely to be housed or run over several days.

In order to safeguard their reputation, and the safety of the high value animals displayed, some show organisers already take a pro-active approach to risk management and require entries to be compliant with PrMT. However, as such voluntary agreements are the exception rather than the rule, a risk remains of bTB spread linked to shows.

Against this backdrop, and in light of the ongoing high incidence and expanding geographical range of bTB, a VRA has been requested to determine whether the current PrMT exemption for movements of cattle to shows is still justified in England.

3. Risk question

This VRA assesses the risk of *M. bovis* transmission between cattle entering agricultural shows, and whether all shows present the same level of risk of disease transmission, depending mainly on whether the animals are housed or not and whether animals stay on site for long periods. The specific risk question addressed is:

What are the likelihood and potential consequences of the transmission of bTB associated with the movement of infected cattle to agricultural shows?

4. Summary of risk factors for bTB spread at livestock shows

- Numbers of cattle from different herds entering a show
- Proportion of cattle from herds in annual or biennial testing areas entering the show
- Prevalence of undisclosed bovine TB infection in the herds of origin
- Probability of undisclosed infectious cattle entering a show
- Imperfect sensitivity of the comparative intradermal test (SICTT)
- Opportunities for cattle from different herds and different risks coming into close contact during the show
- Opportunities for spread of TB from transport vehicles or contamination at show premises
- Opportunities for spread of TB from other species of animals at the show and, far less likely, via personnel and visitors attending the show
- Protracted contact between cattle kept in an enclosed space
- Layout of cattle accommodation and exhibit areas
- Indoor or outdoor facilities
- Duration of stay at the show
- Destination of cattle after the show (i.e. herd of origin, another herd, or slaughter)

5. Summary of mitigating factors

- Relatively small numbers of cattle moving to shows
- Annual routine testing now implemented across the high-bTB incidence areas of England
- Zero-tolerance regime preventing movements from premises with overdue TB tests
- Numbers of animals identified as reactors as result of PRMTs
- SICTT considered more sensitive as a herd screening test rather than an individual animal test.
- Limited incidence of cow-to-cow spread in natural exposure or in laboratory environments
- Low rate of shedding of *M. bovis* in nasal secretions
- Limited length of time animals are at most show premises
- Transport to and from show usually not shared with any other farmers' stock
- Dedicated personnel
- Fresh bedding (if needed/provided)
- Fresh feed (if needed/provided)
- Biosecurity measures in place at show – C&D facilities for transport, C&D of site, clean clothes worn by handlers, foot dip/mat and hand wash for personnel entering animal area, separate sections for different animal species, etc.
- Distance to show likely to effectively rid transport wheels of contamination
- High value animals from pedigree herds likely to have good biosecurity in place and regularly tested for trade purposes.

6. Summary of the likelihood

□ Between 2004 and 2008, an annual average of approximately 6,500 movements of cattle¹ over 42 days of age to show grounds were recorded from 1- and 2-yearly testing parishes in England (Table 29 at reference [2]).

¹ The actual number of animals moved to shows was probably smaller, as an unknown number of cattle would go to repeated shows over a showing season

□ The data show that the vast majority (97%) of cattle moved to a showground returned to the holding of origin, rather than end in another holding. Therefore, most of the 6,500 cattle movements to a showground from annually or biennially tested herds qualify for the current PrMT exemption and would require testing if that exemption were to be abolished.

□ Given the high incidence of bTB in large tracts of England, it is to be expected that some of the cattle moving to shows will originate from OTF herds that subsequently suffer a bTB breakdown (i.e. infected but as yet undetected herds).

□ Data collected in 2010 by the Welsh Government indicate that over 40% of herds in Wales which show cattle suffer a bTB breakdown within the following three years. The proportion falls to 10% when one only considers breakdowns occurring within 6 months of attending a show. We have not attempted to obtain equivalent figures for England.

□ Between 1st September 2005 & 30th March 2011, there have been 1,729,444 specific pre-movement animal tests in England (i.e. not including other forms of TB test paid for by the Government which acted as PrMTs). A total of 1,781 reactors in 1,018 herds were identified as a result of those tests, equating to just over one reactor in every 1000 PrMTs carried out [3].

□ Furthermore, 2,448 IRs were also identified in 1,764 herds in England (i.e. 1.4 IRs per 1,000 PrMTs), which would also have been prevented from moving. An unknown proportion of those would have become reactors on re-testing.

□ By extrapolating the existing data to the approximately 6,500 cattle movements to shows annually in England, it would be reasonable to assume that approximately 7 reactors and 9 IRs would have been prevented from moving to shows every year since 2006, had there been a requirement to pre-movement test during that period.

7. Summary of the veterinary consequences

□ If a bovine animal infected with TB (and infectious) was exhibited at an agricultural show untested and it came into contact with (uninfected) cattle from other herds before returning to its farm of origin, there would be an unquantifiable (but not negligible) probability of dissemination of infection at the animal gathering. One or more new herd breakdowns could be initiated as the infected cattle return to their home premises and are likely to attend other events during the show season.

□ It could be that the resultant breakdown(s) would be limited to the animal(s) infected at the show, but if secondary spread occurred at the herds of destination or disseminated further by the show animal at other venues before its detection, this might involve a considerable number of reactors and the potential for infecting wildlife in an area where bTB is not already endemic – or introducing a novel genotype to an already endemic area.

□ Many cattle attending shows are high value pedigree stock and the ensuing losses by farmers could, therefore, be more substantial than a bTB breakdown of equivalent severity in a commercial herd (even if the taxpayer's exposure would be limited thanks to the table value system).

8. Summary of uncertainties

□ The average number of cattle movements to shows in England between 2004 and 2008 was skewed down by an unusually low total number of movements recorded in 2007, probably due to the national livestock movement ban imposed in the summer of that year in response to the FMD outbreak in Surrey and bluetongue virus outbreak. It is also quite possible that the equivalent annual total movements for

2010 from high-risk herds) exceeded 6,500 due to the substantial expansion of annual routine bTB testing since 2008, but we have not been able to obtain more current statistics.

□ It is impossible to categorically ascribe every herd breakdown that takes place after an animal returns from a show to the presence of that animal at a show. The data quoted in section 6 above for Wales simply record the herd breakdowns, not whether the animals attending shows had actually become infected at the show and if so, whether that was the only source of infection for the affected herds. Clearly the longer the time between attendance at the show and the next TB test, the greater the probability that the exposure to *M. bovis* occurred elsewhere.

□ Although data from Wales indicate that 5-15% of herds recording moves to shows had suffered a breakdown ending in the previous 6 months, and 23-37% within the previous 3 years, there is no degree of certainty about the infection status of the animals sent to shows from such herds.

□ The most frequent number of reactors disclosed in a TB breakdown is one, but the infectiousness and number of secondary cases caused by one typically infected bovine that may be at a show (the basic reproduction ratio R_0) is very difficult to assess.

9. Summary of assumptions

□ Animals travelling to shows have a similar probability of acquiring bTB on the farm of origin as any other PrMT-eligible bovines in the herd moved to other destinations, unless by virtue of being a highly prized show animal they are kept in higher biosecure conditions.

□ Biosecurity precautions at shows agreed as part of the licensing procedure are robust and adhered to, although they are designed to minimise the dissemination of Foot and Mouth Disease rather than bTB.

□ Cattle reacting to a statutory PrMT are considered infected with *M. bovis*, as they originate in high TB risk herds.

10. Discussion

□ In addition to the 6,500 cattle movements to shows from English herds every year, an approximate annual average of 2,500 cattle movements were recorded from Welsh farms to shows between January 2004 to August 2009, thus making a total of 9,000 movements per annum in England and Wales.

□ To put the relevance of the volume of cattle movements to agricultural shows into context, there were a total of 831,860 movements of PrMT-eligible cattle in England and Wales in 2009. In other words, cattle movements to shows from annual and biennial TB testing herds in England constitute a very small proportion of the total eligible cattle movements in any given year. Therefore, the proposed change to the existing PrMT regime for England would represent a relatively modest additional burden to the cattle industry;

□ The SICTT is known to have a higher sensitivity for detecting disease on a herd basis, than when used on individual animals [4]. PRMT requirements for animals moving to shows would be likely to be applied to the single or few animals entered.

□ Given the imperfect (80% or less) sensitivity of the comparative intradermal (SICCT) test at standard interpretation [4] and the window of infection which would not be detected by a PRMT (up to 120 days if the PRMT was conducted 60 days before the movement), the likely numbers of reactors and IRs quoted in section 6 above represent an underestimate of the true number of infected cattle from English herds attending shows in a typical year.

□ If herds sending animals to shows were to use a routine or other herd test as a qualifying test for PRMT purposes, then it would be reasonable to assume that the increased sensitivity of herd testing would result in movement restrictions preventing further infected animals from attending shows.

□ About 45% of all herds in England are now on an annual testing schedule, so it is likely that most newly infected herds should be recognised at an early stage, with consequent suspension/withdrawal of OTF status. If undisclosed reactors are sent to shows, the testing regime in the endemic bTB areas of

England should provide reassurance that the majority of cattle attending shows would be in the early stages of disease and therefore likely to be less infectious than those with advanced pathology.

- Experimental and observational studies suggest that transmission of *M. bovis* is less likely to occur when a tuberculous animal is in the early stages of infection, when shedding is intermittent and involves low numbers of bacilli [5,6].
- Even if infected animals do move to shows, research has shown that cattle-to-cattle transmission is relatively infrequent, even over extended periods, at pasture or with nose-to-nose contact [5,6]. Open-air shows will mean that cattle are not kept in confined spaces with other cattle or livestock and any opportunities for close contact will be minimal and short.
- However, it is clear that cattle-to-cattle transmission of *M. bovis* does occur. The respiratory route is accepted as the primary method of infection for cattle [7]. The enclosed nature of shows that take place inside buildings with overnight accommodation means that the likelihood of airborne spread is greater than where contact is usually only transient in an outdoor setting. Shows should be encouraged to design their livestock sections in such a way as to minimise nose-to-note contact wherever possible. This would help reduce the transmission rate of many infectious diseases, not just bTB.
- Infection via the oral route is far less efficient than through the respiratory route. Cattle at shows are normally provided with feed and other equipment brought from their farm of origin. This should reduce the opportunity for infection via contaminated feedstuffs or utensils.

11. Conclusions

The veterinary advice is that:

1. The probability of bTB spread at shows is probably low in most cases, although not insignificant.
2. The risk will largely depend on the origin of the cattle attending the show and the opportunities for direct and indirect transmission of *M. bovis* at the show grounds (layout and biosecurity of the premises, etc.).
3. To minimise the risks mandatory pre-movement testing for all cattle of an eligible age (42 days old) and from eligible herds (with a routine TB testing interval of 1 or 2 years) should be introduced if not carried out voluntarily.

12. References

(1) The Tuberculosis (England) Order 2007. S.I. 2007/7740.

(2) Bovine TB - A Review of the Pre-Movement Testing Policy in England and Wales: April 2006-March 2009. Phase 1 Report. Defra, September 2010.

<http://archive.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/tb/documents/pre-movement-testing-review.pdf>

(3) Bovine TB: Pre-movement testing monitoring data, Defra.

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(4) DE LA RUA-DOMENECH, R., GOODCHILD, A.T., VORDERMEIER, H.M., HEWINSON, R.G., CHRISTIANSEN, K.H., & CLIFTON-HADLEY, R.S. (2006) Ante mortem diagnosis of tuberculosis in cattle: a review of the tuberculin tests, gamma-interferon assay and other ancillary diagnostic techniques. *Research in Veterinary Science* 81, 190-210.

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(6) MCCORRY, T., WHELAN, A.O., WELSH, M.D. et al. (2005) Shedding of *Mycobacterium bovis* in the nasal mucus of cattle infected experimentally with tuberculosis by the intranasal and intratracheal routes. *Veterinary Record* 157 (20), 613-618.

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Veterinary opinion on the current pre-movement testing exemption for cattle that spend 30 days (or less) on a holding

Introduction and background

1. Bovine tuberculosis (bTB) is an infectious and contagious, mainly respiratory disease of cattle caused by the bacterium *Mycobacterium bovis* (*M. bovis*). Cattle are the natural host of this infection and become infected when directly exposed to infected, infectious cattle or other TB-susceptible animals that can act as reservoirs and vectors of infection. Transmission can also be indirect, through cattle exposure to environment and feed contaminated with bacteria shed in the excretions and secretions or infectious animals.
2. The infection is usually chronic and insidious, with infected animals showing clinical signs of TB only in the final stages of the infectious process. Infected animals can shed the organism before developing clinical signs of TB. Eradication of the disease requires the systematic application of *ante mortem* immunological tests that allow identification and elimination of infected cattle before they become clinically diseased and highly infectious to other animals.
3. Therefore, the uncontrolled movement of undetected infected (and potentially infectious) cattle between herds can spread bTB. The movement of infected cattle between epidemiologically separate locations (*translocation*) is probably the main mechanism whereby bovine TB spreads from high to low bTB incidence areas. Depending on a number of host, environmental and pathogen-related factors, the imported infected cattle can amplify the infection in the herds and areas of destination to a greater or lesser extent, resulting in within- and between-herd *spread*. If this spread into low incidence areas is not checked, it may eventually lead to the establishment of new TB “hotspots” in areas previously considered free from the disease. Once established, these hotspots can be very difficult to eliminate, particularly if the infection spills over into wildlife hosts that can act as alternative reservoirs of infection.
4. On 27 March 2006, the government introduced mandatory pre-movement TB testing (PrMT) of cattle of moving out of high bTB risk herds in England (as defined by their annual or biennial routine testing regime) to another holding. The same policy was adopted in Wales on 2 May 2006. Initially, cattle under 15 months of age were excluded, but on 1 March 2007 PrMT was further extended to animals over the age of 42 days. All such animals must have received a tuberculin skin test with negative results in the previous 60 days.
5. However, Article 9 of the Tuberculosis (England) Order 2007 lays down exceptions to this general PrMT rule for some types of cattle movement. One of those exemptions allows otherwise eligible cattle that have been present on a holding for no more than 30 days to be moved without being tested [1]. This provision has been in place since the introduction of PrMT in March 2006 and is commonly referred to as the ‘30-day residence’ exemption.
6. The 30-day residence exemption applies indefinitely, for instance when an animal is moved quickly through a series of different premises over a short period, even when those movements may have taken place more than 60 days since the animal was last skin tested with a negative result.
7. The government-stakeholder working group that developed the PrMT policy in 2004-05, chaired by Bill Madders, recognised at the time that this and other exemptions would

facilitate the delivery of PrMT and make it more acceptable to the cattle industry. They noted, however, that some exemptions would somewhat undermine its efficacy in reducing TB spread between herds.

8. In particular, with regards to the 30-day residence exemption, the working group stated on page 11 of their final report to the CVO [2]:

2.3.2 Cattle moving off premises within 1 month of arrival

Animals that spend only a short period of time on premises are at a reduced risk of becoming infected during that period. Even if animals were to become infected whilst on the premises, detection within 1 month is highly unlikely due to the constraints of the skin-test.

To overcome potential loopholes, the exemption should be worded precisely in the legislation: “cattle moving off premises, within 1 month of arrival (*with no regard to interim attendance at recognised agricultural shows or other pre-movement testing permitted temporary absence from the premises*) provided that the same exemption had not been used for their movement onto the premises”.

9. The working group therefore acknowledged the risks that could arise where herd owners moved animals repeatedly from one holding to another holding in quick succession. They recommended that the 30-day residency exemption should not be invoked when an eligible animal had already been moved onto a holding on the back of such an exemption. However, this recommendation was not heeded at the time (because it was considered difficult to police and enforce given that there is no requirement for evidence of PrMT to accompany the moved cattle) and the 30-day exemption was introduced without the restriction that it can only be used once for any animal.
10. More recently, as part of the Coalition Government’s commitment to strengthen the existing bTB control measures in cattle in England, four of the PrMT exemptions have been reviewed by Defra and the TB Eradication Group for England (TBEG). This follows from a retrospective assessment of the first three years of the PrMT policy published in September 2010, which highlighted the overall benefits of PrMT in terms of enhanced disease surveillance, prevention of new bTB breakdowns and slower rate of disease spread [3].
11. In May 2010, the Welsh Government decided to revoke the 30-day residence exemption for herds in Wales. Different PrMT testing rules in England and Wales can give rise to anomalies whenever cross-border movements take place. Different rules also make the PrMT regime unnecessarily more complicated and difficult to understand by affected herd owners and animal health law enforcement bodies leading to the potential for inadvertent or deliberate non compliance.
12. Against this backdrop, and in light of the ongoing high incidence and gradually expanding geographical range of bTB, a formal veterinary risk assessment or opinion has been requested to help determine whether the current 30-day residence exemption can be justified in England.

Veterinary advice

13. A bovine animal receiving a tuberculin skin test should not be re-tested within 60 days of a prior skin test that yielded negative or inconclusive results. This minimum interval between two successive skin tests must be observed in order to avoid potential false negative results due to de-sensitisation of the skin of the neck caused by the intradermal injection of tuberculin [5].
14. De-sensitisation to tuberculin wanes gradually and most cattle regain their ability to respond to the test after 42 days. The conditions of tuberculin usage set out in the Summary of

Product Characteristics and data sheet for this medicinal product and the relevant EU law prescribe a minimum inter-test period of 42 days, although current Defra policy is to delay re-testing for at least 60 days to provide a reasonable margin of safety that accounts for individual animal variations.

15. The tuberculin skin test is not 100% sensitive and with the current TB testing technology it is not possible to detect every *M. bovis*-infected animal after a single round of testing [5]. Cattle that become infected with *M. bovis* may take up to four weeks (and in some cases evidence shows considerably longer) before they are able to mount an immunological response against the bacterium that is detectable by skin testing.
16. For all these reasons, a negative skin test result cannot be seen to confer absolute certainty of freedom of infection in that animal. The test can only be *indicative* of the animal's state of infection and immunological response on the day it was performed. The longer the animal remains untested and thus increasingly exposed to potential sources of *M. bovis* (in cattle from the same or other herds, badgers or the contaminated environment), the less the certainty about its true TB status and the weaker the confidence in a negative test carried out sometime in the past.
17. Therefore, a negative PrMT result is only valid for 60 days and it may need to be repeated as often as necessary if successive movements of that animal take place outside that 'safety window'. Cattle of 42 days of age and over that are kept in high-risk herds (as defined by their annual or biennial routine TB testing interval) should not be moved on to other herds unless they have been tuberculin skin tested with negative results in the previous 60 days.
18. The time a bovine animal spends on the holding from which it is moved will affect its cumulative probability of exposure to the TB bacterium (the longer the duration of stay in an annually or two-yearly tested herd, the greater the risk of contracting the infection). Yet, there is no reason to presuppose that an animal that has spent 29 or 30 days in a 1 or 2-yearly tested is at a significantly lower risk of infection than another animal spending 31 or 32 days in the same herd. In other words, the 30-day limit is rather arbitrary and the actual length of stay in a herd should be irrelevant in terms of establishing the animals' eligibility for PrMT.
19. The key issues to consider are:
 - (i) the time that has elapsed since the last valid skin test carried out on that animal;
 - (ii) the fact that the animal has been part and is being moved out of a high-risk herd liable to PrMT by virtue of its current annual or biennial TB testing interval; and
 - (iii) the next destination of the animal (directly to slaughter, to slaughter via a finishing unit, or to live in another herd).
20. No cost-benefit analysis or impact assessment was undertaken at the time to underpin the inclusion of 30-day residence exemption in the TB legislation. Nevertheless, we now know that during the first three years of the PrMT policy (April 2006-March 2009), an annual average over 50,000 movements of cattle over 42 days old took place within 30 days of their arrival onto a holding, representing about 5 % of all cattle movements from 1 and 2 yearly tested herds during that period. It is clear, therefore, that substantial numbers of otherwise eligible cattle may escape PrMT as a result of the 30-day residence exemption [3,4]. We don't know what proportion of those were repeat movements on the back of the same rule.

21. In summary, there has never been any veterinary justification or support for such an exemption, other than the inherent technical limitation/immunological feature that prevents us from repeating a tuberculin skin test within 60 days of a previous test, and the lack of information on test history travelling with an animal.
22. In fact, this exemption is potentially open to abuse and has probably prevented identification of infected cattle that move through several high-risk (e.g. dealer) herds over a short period of time.
23. The point made by some of the stakeholders consulted by Defra, namely that removing the 30-day exemption would render it unenforceable since cattle do not travel with evidence of TB testing history, is not unique to cattle moving after less than 30 days on a holding and holds true for any eligible cattle movement. The onus continues to be for farmers moving cattle out of their herds to be able to demonstrate that the animals have been tested with negative results in the previous 60 days, or have proof of a suitable exemption.

Conclusion and veterinary recommendation

24. In order to further mitigate the risks of bTB spread through cattle movements it is therefore recommended to abolish the current PrMT exemption for animals that have been present on a holding for 30 days or less.
25. A negative skin test result will continue to have a validity of 60 days from the day the tuberculin is injected, so that any cattle movements taking place within that period will be compliant with the legislation and will not require a new PrMT. Once that period has expired, any further movements should trigger a PrMT regardless of the time that the animals may have spent on their present holding.

**Veterinary Team
TB Programme, Defra
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(updated July 2011)**

Calculation of Equivalent Annual Net Cost to Business (EANCB) figure

The EANCB figure presented on page 1 of this impacts assessment has been calculated in the following way:

1. The Equivalent Annual Cost to business (EACB) was first calculated by dividing the present value of the total cost to business (£2.73m) by an annuity rate of **4.67**.
2. The annuity rate (a) was arrived at by using the following formula:

$$a = (1+r/r)^1 - (1/(1+r)^t)$$

where t is the period in years over which the policy is being appraised (5 years), and r is the standard discount rate used in the appraisal of policy (3.5%).

3. Dividing the present value of the total cost to business by the calculated annuity rate generates a EACB figure of **£0.58m** (or £0.56m in 2009 prices).
4. An Equivalent Annual Benefit to Business (EABB) figure was then calculated using the same method, and using a present value of the total benefit to business of £1.8m. As a result, an EABB figure of **£0.38m** (or £0.37m in 2009 prices).
5. Subtracting the calculated EABB figure from the EACB figure gives a value for the EANCB of **£0.2m** (or £0.19m in 2009 prices)

References

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