# REPORT ON CURRENT & FUTURE SURVEILLANCE FOR BOVINE SPONGIFORM ENCEPHALOPATHY

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## Executive Summary

In 1985 a new cattle disease was observed in GB. This was recognised as BSE in 1986. In 1988, the disease was made notifiable in the UK. The EU introduced active BSE surveillance in 2001 when the epidemic was already in decline. Since 2001, the number of BSE tests in the UK has increased annually and the number of BSE cases has declined rapidly. Since 2001, the UK has detected only four BSE cases aged less than 48 months in emergency slaughtered cattle and none in fallen stock or healthy slaughtered cattle.

Following an EU review of surveillance, the UK and other EU15 MSs expect to be able to revise their active BSE surveillance programmes from 1 January 2009, by raising the threshold above which all fallen stock, emergency slaughtered cattle and cattle showing clinical signs at ante-mortem inspection require testing from 24 to 48 months; and all healthy slaughtered cattle require testing from 30 to 48 months. Public health will continue to be protected by SRM removal, which has been shown to be the key public health measure, by ante-mortem inspection and by the ban on slaughtering cattle born or reared in the UK before 1 August 1996 for human consumption. Animal health will continue to be protected by feed controls. Under the new active surveillance programme, the UK would test over 600000 cattle per year compared to over 770000 in 2007. Passive surveillance will continue.

Classical BSE has a long incubation period. Increasing the age threshold for testing all fallen stock from 24 to 48 months should not delay detection of a re-emerging epidemic unless this involves a catastrophic failure of the controls, which is very unlikely. In fact maintaining effective feed and SRM controls should prevent any re-emergence of the classical BSE epidemic. Although the active surveillance programme for classical BSE has detected a very small number of atypical BSE cases in old cattle it may not be appropriate for detecting all potential new TSEs which may or may not arise. Defra has a Veterinary Surveillance Strategy in place to detect any new TSEs, which are not detected through active or passive BSE surveillance. In the unlikely event of a new TSE emerging, the feed and SRM controls would prevent recycling of the disease though contaminated feed.

From 1 January 2009, abattoirs in GB will have to pay for BSE tests but the MHS will continue to audit controls designed to ensure that cattle are tested as required under EU rules and that they do not enter the food chain unless the result is negative. From 12 January 2009, farmers in GB will have to pay for the transport of fallen stock cattle which require BSE testing, to approved sampling sites, and for their disposal. Defra will continue to pay for sampling and testing of fallen stock in GB and will continue to carry out checks designed to ensure that cattle are tested as required by EU rules.

## Introduction

On 15 October 2008, the FSA asked Defra to provide a report on current and future BSE surveillance. This report addresses both risk assessment and risk management. A glossary of terms and abbreviations is at **Annex 1**.

## History of BSE Surveillance in UK

In 1985 a new cattle disease was observed in GB through passive surveillance. This was recognised as BSE in 1986.The disease was made notifiable in UK in 1988 i.e. it is an offence not to report suspicion of disease. The Government pays market value compensation for cattle killed on suspicion of being affected with BSE, providing farmers with a further incentive to report suspected disease.

In 2001, the EU introduced an active BSE surveillance programme to monitor the prevalence of classical BSE in the EU. The peak affected birth cohort years[1] for the EU15 MSs were between 1987 and 1997 (EFSA 2008a) so the EU15 epidemic was already in decline in 2001, as a result of feed controls introduced in 1994[2] or earlier. **Annex 2** provides further information on the history of BSE surveillance in the UK.

## World Organisation for Animal Health (OIE) Requirements

In May 2005, the OIE adopted a new, science-based system for categorising countries according to their BSE risk for the purposes of international trade. OIE requirements for safe trade in beef and other bovine products rely upon feed controls and the removal of SRM, rather than on BSE testing. OIE categorisation (OIE 2008) is based on a risk assessment plus the presence of controls and surveillance for BSE. Countries are categorised as "negligible", "controlled" or "undetermined" risk. Following achievement of "negligible" or "controlled" risk status, countries must provide annual updates on surveillance to remain on the list. The UK has been categorised as "controlled" risk since 2008.

OIE surveillance requirements are based upon the BSurVE model (EFSA 2004; Prattely *et al.* (2007); Prattely *et al.* (2007)). OIE defines four surveillance sub-populations – clinical suspects, emergency slaughtered, fallen stock and healthy slaughtered cattle. It requires countries to investigate all clinical suspects and survey at least three out of the four sub-populations. OIE Type A and Type B surveillance allow the detection of BSE around a design prevalence of at least one case per 100000 or 50000 respectively, in the adult cattle population in a country, at a confidence interval of 95%. The surveillance points target is determined on the basis of the size of the adult cattle population. Points are awarded according to the age of an animal and the surveillance sub-population in which it is tested. Countries seeking "controlled" risk status must have carried out Type A surveillance and retain Type B surveillance in place. UK could meet Type A or Type B surveillance requirements by testing 48000 or 24000 fallen stock aged 48 to 84 months[3] per year respectively (plus a small number of cattle from other sub-populations). By testing all fallen stock aged over 48 months UK would test over 70000 fallen stock per year in this age band alone.

## EU Review of BSE Surveillance

[1] The peak affected birth cohort year is the calendar year in which the highest number of BSE cases was born. Cattle are most at risk of being infected with BSE during their first year of life.
[2] The EU ban on feeding mammalian protein to ruminants.
[3] For the fallen stock sub-population, the 48-84 month age band offers the highest number of surveillance points. The model considers that it is the most likely age group in which BSE cases would be detected.

The European Commission is the risk manager for TSE controls and surveillance in the EU. It manages risk in accordance with the precautionary principle, which requires that controls must not be disproportionate to the desired level of protection (European Commission 2000). Intra-Community controls may be more stringent than OIE-based controls on imports from TCs.

European Regulations are directly applicable and the Commission's Food and Veterinary Office monitors compliance. The TSE Regulation[4] requires each MS to carry out an annual surveillance programme for BSE based on active and passive surveillance and to provide annual reports to the Commission. The EU surveillance programme is intended to ensure that all cattle in each MS are tested when they are killed, slaughtered or die aged over 30 months except that all[5] cattle with a higher risk of testing positive for BSE (fallen cattle, emergency slaughtered cattle or cattle showing clinical signs at ante-mortem inspection) are tested if they are aged between 24 and 30 months. Cattle born or reared in the UK before 1 August 1995 that are slaughtered and incinerated under the OCDS are exempt. The Commission publishes annual EU reports. The current active BSE surveillance programme in UK tests[6]:

- **all emergency slaughtered cattle (human consumption) aged over 24 months;**
- **all cattle showing clinical signs at ante-mortem inspection (human consumption) aged over 24 months;**
- **all healthy slaughtered cattle (human consumption) aged over 30 months;**
- **all fallen stock aged over 24 months;**
- **(for UK only) all cattle in the 1995/96 birth cohort entering the OCDS[7];** and
- **all feed cohorts born after 31 July 1996.**

[4] Regulation (EC) No.999/2001 as amended.
[5] MSs may derogate from the requirement to test fallen stock in remote areas with a low animal density where no collection of dead animals is organised. The derogation must not cover more than 10% of the cattle population of the MS.
[6] In 2007, the UK tested over 771000 cattle for BSE including 492000 healthy cattle slaughtered for human consumption, 4000 emergency slaughtered cattle/cattle showing clinical signs at ante-mortem inspection, for human consumption; 238000 fallen stock, 35000 cattle slaughtered through the Older Cattle Disposal Scheme and 400 killed as cohorts or offspring of BSE cases.
[7] These cattle are tested to identify and remove feed cohorts born in the year 1 August 1996 to 31 July 1996. Cattle born before 1 August 1995, killed through the OCDS are **not** tested.

The TSE Regulation also requires MSs to ensure that any animal suspected of being infected with a TSE is notified immediately for investigation.

The adult cattle population in the EU is approximately 43 million (approximately 5 million in UK). Between 2001 and 2007, over 70 million cattle were tested in the EU (over 3.6 million in the UK). From 2001 to 2007, the number of BSE cases detected in the EU fell from 2181 to 175 and the detection rate fell from 2.55 to 0.18 positive BSE cases per 10000 tests carried out (**Figure 1**). The mean age of BSE cases in the EU15 is increasing as the epidemic declines (**Figure 2**).

***Figure 1: BSE Cases Detected per 10,000 Cattle Tested in EU from 2001 to 2007***

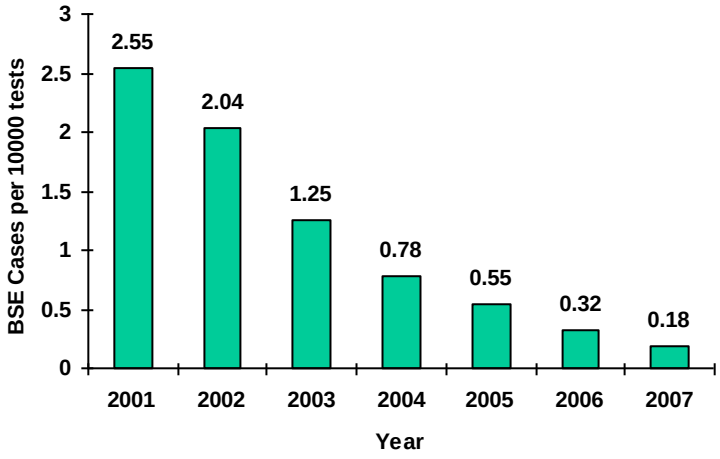
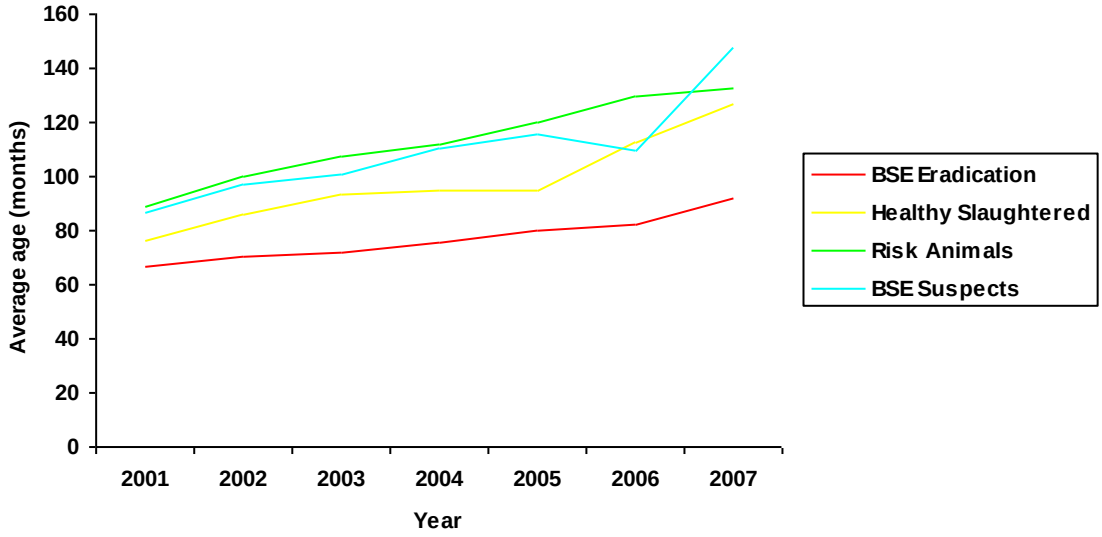



***Figure 2: Average age (in months) per target group of BSE cases detected in the EU15 from 2001 to 2007***



Between 2001 and 2005, there were 27 BSE cases in cattle aged under 48 months in the EU15 (**Annex 3**) in fallen stock, emergency slaughtered or healthy slaughtered cattle. Four of these were detected in the UK's OTMS[8]. There were no BSE cases in cattle aged less than 48 months detected in these sub-populations in the EU15 in 2006 or 2007, and there have been none to date in the UK in 2008.

TSE Roadmap

On 15 July 2005, the Commission adopted the TSE Roadmap (European Commission 2005). This proposed that the significant decline in the BSE epidemic and new scientific and technological developments provided for amendments to EU TSE controls and surveillance, whilst food safety and consumer protection remained paramount. This would enable a re-prioritisation of resources to focus on new and emerging (non-TSE) threats to animal and public health. The Roadmap proposed that targeting active BSE surveillance would allow a reduction in the number of BSE tests undertaken whilst continuing to measure the effectiveness of the control measures. In November 2006, the Commission published a Work Programme for TSEs (European Commission 2006) following a wide consultation. This proposed that MSs meeting strict conditions, could apply for a revised BSE surveillance programme, devised on the basis of the national epidemiological situation.

The TSE Regulation allows MSs meeting specified criteria to apply for a revised active surveillance programme. Applicant MSs must ensure protection of human and animal health and provide a risk analysis and meet other criteria. These include demonstrating:

- **a declining or consistently low BSE prevalence**; and
- that **EU rules** have been **in place for at least six years on**
    - **cattle identification**;
    - **BSE surveillance**; and
    - **feed controls**.

More specific criteria were adopted in July 2008[9]. These include **epidemiological criteria (**see **Annex 4)** and the requirement to provide evidence that following the six year period referred to above, there is **no evidence of the BSE epidemiological situation deteriorating**. Should the epidemiological situation deteriorate in a MS

[8] Over Thirty Month Scheme. The emergency slaughter rules were tightened in 2006, such that 95% of previous cases would now be disposed of as "fallen stock".
[9] Regulation (EC) No.571/2008.

implementing a revised programme, the Commission would amend the surveillance programme.

In 2007, the Commission proposed a “harmonised” approach to revised active surveillance programmes in the EU15. The Commission asked EFSA to assess the additional risk to human and animal health from various options for raising the minimum testing age for BSE. **Annex 5** summarises the EFSA and VLA risk assessment considered by SEAC in April and October 2008. The VLA model highlighted that the removal of SRM is the key public health control measure. Should detectable BSE cases be missed by a failure to test, the additional infectivity entering the food chain is very low provided that SRM is removed.

Revised Active Surveillance Programme

The UK applied for a revised active surveillance programme in August 2008 and its application was favourably assessed by an independent expert group. Following EFSA’s advice (EFSA 2008a, EFSA 2008b) the Commission proposed legislation to allow the EU15 the option of raising the age threshold above which their national cattle must be tested to 48 months for fallen stock, emergency slaughtered cattle, cattle showing clinical signs at ante-mortem inspection, and healthy slaughtered cattle, from 1 January 2009. This proposal was agreed in October 2008. Assuming that the EU measure is adopted, and that the FSA Board and UK Health Ministers agree that the age at which cattle slaughtered for human consumption can be increased to 48 months, UK Rural Affairs Departments intend to implement an active surveillance programme in line with EU requirements. This would test[10]:

- **all emergency slaughtered cattle (human consumption) aged over 48 months;**
- **all cattle showing clinical signs at ante-mortem inspection (human consumption) aged over 48 months;**
- **all healthy slaughtered cattle (human consumption) aged over 48 months;**
- **all[11] fallen stock aged over 48 months;** and
- **all feed cohorts born after 31 July 1996.**

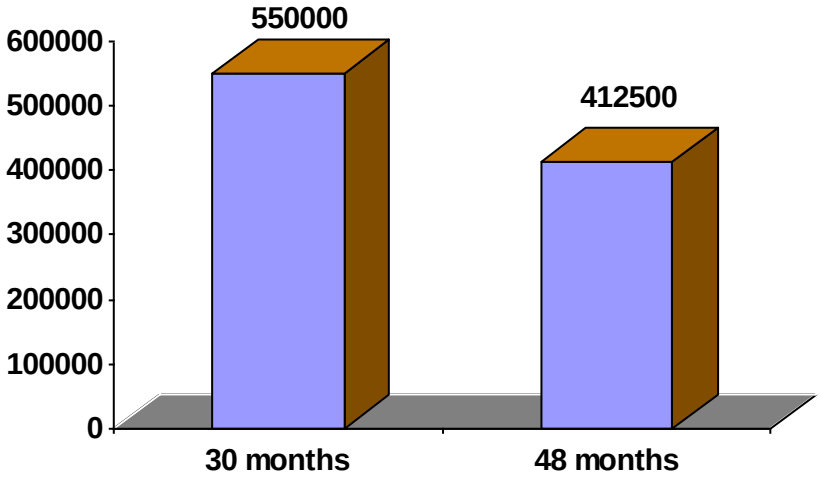
[10] This covers all cattle which are killed or slaughtered or die aged over 48 months including those born or reared in UK before 1 August 1995 (which are not currently tested if they are killed through OCDS) other than those covered by the remote area derogation (see footnote 5).
[11] Other than those covered by the remote area derogation (see footnote 5).

Additionally, it will remain illegal to slaughter cattle born or reared in the UK before 1 August 1996[12], for human consumption. Passive surveillance and ante-mortem inspection of animals slaughtered for human consumption will continue.

This approach would support a harmonised trade position throughout the EU15. EU15 MSs which elect to retain the current testing requirements for cattle slaughtered for human consumption will be unable to prevent the placing on the market or import of meat from untested cattle aged 30-48 months from other EU15 MSs or TCs, for human consumption. This would put domestic producers at a trade disadvantage, particularly when (in GB) they incur the cost of the testing.

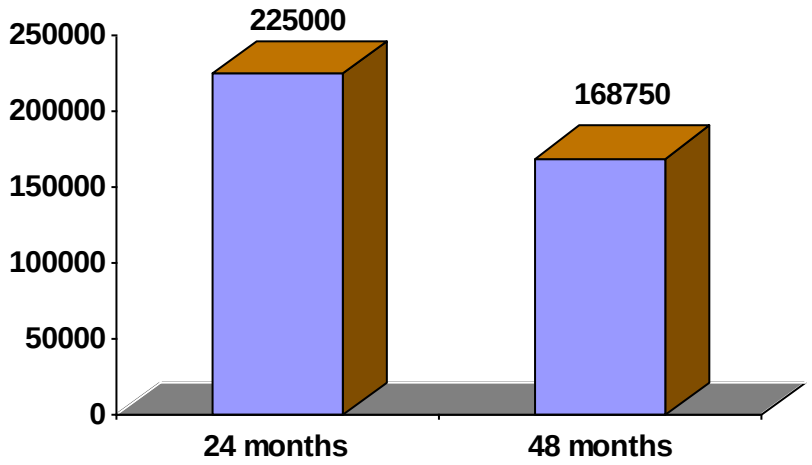
We estimate that raising the age threshold for testing to 48 months would reduce the number of cattle tested by approximately 25%. As a result of changes in the number of cattle eligible for testing, we estimate that the number of cattle tested would fall from over 770000 in 2008 to over 600000 cattle in 2009. This exceeds the number of cattle tested annually from 2001-2004. **Figures 3** and **4** provide estimates for healthy slaughter and fallen stock testing in GB.

**Figure 3: Estimated number of tests on <u>healthy slaughtered</u> cattle carried out in GB in 2009 as a result of raising the testing threshold from 30 to 48 months.**




[12] The date the UK's reinforced ban on feeding mammalian meat and bone meal to farmed animals is considered effective

**Figure 4: Estimated number of tests on fallen stock carried out in GB in 2009 as a result of raising the testing threshold from 24 to 48 months.**




## Detection of a Re-Emerging Classical BSE Epidemic

EFSA (2008a) noted that the likelihood of detecting BSE in fallen stock, emergency slaughtered cattle or cattle with clinical signs at ante-mortem inspection was twenty times higher than in healthy slaughtered cattle and that focussing active surveillance on these sub-populations was “an interesting option”. It concluded that testing such animals animals aged over 48 months would allow for the detection of the majority of cases if classical BSE re-emerged; but that testing such animals aged over 24 months would increase the sensitivity of surveillance to detect a re-emerging classical BSE epidemic.

### Epidemiological Modelling

Wilesmith *et al.* (1988) reported that the age-specific incidence in affected herds in 1987, shortly after BSE was first recognised, when there were *no controls* to limit exposure such as a feed ban or SRM controls, was considerably higher in 4 and 5 year old cattle at 2.67% and 1.70% respectively, than in 2 and 3 year old cattle at 0.11% and 0.76% respectively.

Arnold and Wilesmith’s (2004) estimate of the BSE age of onset distribution from back-calculation modelling of passive surveillance cases born between 1984 and 1996 in GB indicated that only 4.6% of *infected* cattle reached an age of onset of less than 48 months of age. This estimate may *overestimate* the proportion of younger cases as the data were biased to cases during the peak of the GB epidemic when exposure doses were probably higher.

EFSA (2008a) calculated that for a re-emerging epidemic of classical BSE similar to that in the UK in the 1980s, where there were *no BSE controls* before 1988, some 64% of BSE cases would be expected to be found in cattle aged 48-72 months, and that 11% of re-emerging cases would be found in cattle aged less than 48 months. EFSA further calculated that for a re-emerging epidemic of classical BSE, where at least *some BSE controls* remained in place, some 55% of BSE cases would be expected to be found in cattle aged 48-72 months, and that only 5.5% of re-emerging cases would be found in cattle aged less than 48 months.

Development of the Epidemic

Epidemiological data provides evidence that the BSE epidemiological situation in UK is developing favourably (**Annex 4 and Annex 6**).

Assessment of Controls

Results of a risk-based programme of monitoring compliance with the TSE-related feed controls in the UK demonstrate a very high level of compliance (**Annex 7**).

Dose & Incubation Period

Classical BSE has a mean incubation period of 5.0 – 5.5 years (Ferguson *et al.* (1997)) (Wells *et al*. (2007). Wells *et al.* (2007) established an experimental dose-response with extremely high doses (>100 grams) of infectious brain required for shorter (less than 50 months) mean incubation periods. This scenario is more likely in the absence of feed and SRM controls – particularly when absence is sustained.

Post-Mortem Tests & Detection

Arnold *et al.* (2007) reported that the point at which abnormal prion protein in 50% of BSE-infected animals would be detected by immuno-histochemistry applied to medulla–obex was estimated at 9.6 and 1.7 months before clinical onset for cattle dosed with 100 gram and 1 gram of infectious brain tissue, respectively, with a low probability of detection at more than 12 months before clinical onset. Although post-mortem rapid tests used in active BSE surveillance can detect sub-clinical disease, they only do so relatively close to the onset of clinical disease. Earlier testing of exposed animals (i.e. at a younger age) will *not* necessarily result in earlier detection of disease.

Sensitivity of Surveillance to Detect Re-Emergence

VLA has advised that unless there is an extremely steep increase in infection prevalence in more recent birth cohorts then there will be few, if any, fallen stock BSE cases aged less than 48 months. Therefore the omission of testing fallen stock

aged less than 48 months will have *no practical impact* on the ability of back-calculation models to detect any increase in infection prevalence (**Annex 8**).

Conclusion

EFSA (2008a) noted that since BSE cases could possibly occur in the 24-48 month age group, there would be increased sensitivity in a surveillance system if it continued to be tested. However the fact that the majority of cases have been detected in the 48-72 month age group implies that this increased sensitivity is likely to be small. VLA's analysis provides evidence that unless there is a very large increase in prevalence, the increased sensitivity to detect re-emergence, from testing 24-48 month old fallen stock is likely to be negligible. A very large increase in prevalence would require a catastrophic and sustained failure in the controls, the likelihood of which is negligible.

SRM and feed controls (i.e. the prevention of intra-species recycling in ruminants) will remain in place for the foreseeable future. The risk of re-emergence of BSE is negligible. Defra believes that raising the age threshold for BSE testing all fallen stock to 48 months is an appropriate first step to achieving a more proportionate active BSE surveillance programme, based on testing a sample of fallen stock.

## Detection of New TSEs

Animal Health and DARD carry out epidemiological investigations into all confirmed cases of BSE, with a particular focus on cases born on or after 1 August 1996. Where possible, these later born cases are subject to additional tests to look for genetic mutations or changes to the BSE strain.

Approved rapid post-mortem biochemical BSE tests used in active surveillance, rely on detecting the abnormal (proteinase-K resistant) prion protein, associated with classical BSE, in the brain stem. EFSA (2008a) noted that newly emerging TSEs may behave differently to classical BSE and that there is no data on the sensitivity and specificity of current rapid post-mortem BSE tests to detect atypical TSEs. There is no guarantee that active surveillance for classical BSE would detect new TSEs.

In contrast, suspected clinical BSE cases have their brains removed for histopathological examination and this is why passive surveillance remains important. For example, although probably not a TSE, the new disease, Idiopathic Brainstem Neuronal Chromatolysis was detected through passive BSE surveillance but not through active BSE surveillance. (Jeffrey *et al*. (2008)). 90% of suspected clinical BSE cases slaughtered in recent years have tested negative for BSE and many of these have been found to be affected with other neurological diseases, particularly Listeriosis.

In recent years small[13] numbers of atypical cases of BSE *have* been detected through active BSE surveillance. The significance of these cases is unknown. Most atypical cases have been found in adult and old animals. Apart from a single Japanese case[14], the age of the atypical cases ranged from 6.3 to 18 years, with an average of 11.8 and 11.6 years for H- and L-type forms respectively. (Ducrot *et al.* (2008)).

EFSA (2008a) concluded that it was highly unlikely that increasing the minimum BSE testing age to 48 months would reduce the likelihood of detecting atypical BSE. This conflicts with its conclusion that testing fallen stock, emergency slaughtered cattle or cattle with clinical signs at ante-mortem inspection would result in an optimised system for early detection of emerging new TSEs in cattle.

We cannot rule out the emergence of "new" TSE disease with a shorter incubation period than classical BSE. However, the UK has not detected any atypical cases in cattle aged less than 48 months of age during over 6 years of active BSE surveillance. The two atypical cases detected to date in GB in 2005 and 2007, were in older cattle (13 and 14 years old respectively) born before the feed controls were reinforced in 1996. Controls preventing the feeding of ruminant protein to ruminants should reduce the risk of a new epidemic of feed borne TSE-disease in cattle. Similarly, the SRM controls should remove the vast majority of any TSE-infected material from the food chain, assuming that infectivity is concentrated in the CNS as with classical BSE. In 2007, SEAC concluded that because of the feed and SRM controls, with certain assumptions, the risk to human health from atypical BSE was likely to be very low to negligible (SEAC 2007). Defra's Veterinary Surveillance Strategy (**Annex 9**) offers a more risk-proportionate approach to detecting new TSEs than testing all fallen stock aged 24-48 months for classical BSE.

## Responsibility & Cost Sharing

In 2007, there were over 770000 cattle tested through active surveillance in UK and 60 BSE cases detected. The UK Government spends over £60 million per year on active surveillance for BSE in UK. It received €4.6 million EU co-financing for BSE surveillance in 2007. UK expenditure includes the following costs:

- £6 million on BSE tests for cattle slaughtered in abattoirs.
- £5.5 million on MHS/DARD charges related to TSE testing (excluding contributions to hygiene and SRM controls).
- £5.5 million on BSE tests for fallen cattle.

[13] 36 cases described worldwide by 1 September 2007 (Ducrot *et al.* (2008)).
[14] The laboratory test for a reported case of atypical BSE in a 23 month old Japanese animal was not verified independently and is open to question.

- £44 million on charges for fallen stock including collection, sampling, disposal, MLC supervision, Helpline etc.

Following a consultation,[15] Defra has announced that from 1 January 2009, abattoirs in GB will be responsible for paying for BSE tests on cattle slaughtered for human consumption; and that from mid-January 2009, farmers will have to pay for the transport of carcases of cattle which require BSE testing, to approved sampling sites, and for their disposal. Defra will pay for sampling and testing of fallen stock in GB. Official controls on surveillance will remain in place. For example the MHS will continue to audit controls designed to ensure that cattle are tested as required under EU rules and that they do not enter the food chain unless the result is negative. In addition, Defra will continue to audit fallen stock tested against eligible cattle reported as dead to the cattle database. Cattle Identification Inspections are carried out on 10% cattle holdings each year and if deaths of cattle are not reported correctly, significant financial penalties may be applied to EU Single Farm Payments.

Defra's total TSE surveillance budget at the VLA for 2008/09 is £9.5 million. This includes the costs of the NRL, passive TSE surveillance of all species and active BSE surveillance of fallen stock cattle, sheep, goats and deer.

[15] England consulted in December 2007, Scotland and Wales consulted in March 2008; Northern Ireland consulted in July 2008.

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**Further Reading**

Detailed results of the active surveillance programme in Great Britain and Northern Ireland are available at http://www.defra.gov.uk/vla/science/sci_tse_stats_intro.htm.

Detailed results of the active and passive surveillance programmes in the EU are available at http://ec.europa.eu/food/food/biosafety/bse/annual_reps_en.htm

## Annex 1: Glossary of Terms and Abbreviations

Active surveillance - defined in the TSE Regulation *as the testing of animals not reported as suspected of being infected by a TSE, such as emergency slaughtered animals, animals with observations at ante mortem inspection, fallen stock, healthy slaughtered animals and animals culled in connection with a TSE case, in particular in order to determine the evolution and prevalence of TSE in a country or region thereof.*

Ante-mortem inspection - veterinary inspection of all live cattle intended for slaughter for human consumption.

BAS - Beef Assurance Scheme, a scheme which allowed cattle from a small number of low BSE risk herds to enter the food chain at 30-42 months while the OTM rule was in place.

BIP - Border Inspection Post, a route of entry into the EU for animals or products from TCs.

Birth Cohort - Cattle born in a defined calendar year.

BSE - bovine spongiform encephalopathy, a TSE affecting cattle.

BSE eradication - refers to cattle culled as BSE offspring or feed cohorts.

BSE offspring - cattle born to a female BSE case

Cattle database - Government databases holding details of cattle and their movements.

CIE - Counter-Immuno Electrophoresis, a test for animal protein in feed.

Clinical signs - Detectable signs of a disease or other abnormality on clinical examination or inspection.

DARD - Department for Agriculture and rural Development in Northern Ireland.

Defra - Department for Environment, Food and Rural Affairs

EFSA - European Food Safety Authority, an independent source of advice on risk.

ELISA - Enzyme Linked Immuno-Sorbant Assay, a test for animal protein in feed.

Emergency slaughter - The slaughter of an animal, usually on farm, for acute welfare reasons. Since 1 January 2006, when EU rules were tightened, only animals slaughtered on- farm that have suffered an ‘accident’ and are otherwise healthy are eligible for the food chain. Emergency slaughter usually refers to animals

slaughtered for human consumption, but may also include animals killed in the OTMS and OCDS.

EU - European Union of 27 Member States.

EU15 - Fifteen MSs which joined the EU before 2004, namely Austria, Belgium, Denmark, France, Finland, Germany, Greece, Republic of Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

Fallen stock - cattle which die or are killed, other than for human consumption.

Feed cohort - cattle which may have consumed the same feed as a BSE case in the first year of their lives when they are considered most susceptible to infection.

FSA - Food Standards Agency

GB - Great Britain (England, Wales and Scotland).

Incidence - The number of BSE cases detected in a defined area in a defined period. E.g. the number of BSE cases in the UK in 2008.

Incidence Rate - The number of BSE cases detected in a defined population in a defined period. E.g. the number of BSE cases in adult cattle in the UK in 2008.

MAT - Microscopic Analysis Test, a test for animal fragments in feed.

MHS - Meat Hygiene Service, an agency of the FSA responsible for enforcement in approved meat premises.

MLC - Meat and Livestock Commission.

Monitoring - the making of routine observations on health, productivity and environmental factors and the recording and transmission of the observations. The identity of individual diseased animals is not usually recorded.

MS - Member State of the European Union.

NI - Northern Ireland.

Notifiable - where there is a legal obligation to report suspected disease.

NRL - National Reference Laboratory, a laboratory approved for EU testing.

OCDS - Older Cattle Disposal Scheme, an EU market intervention scheme for cattle born or reared in UK before 1 August 1996 which are not eligible for the food or feed chain, which opened in January 2006 and closes in December 2008. This Scheme

replaced the OTMS after OTM cattle born after 31 July 1996 became eligible for the food and feed chain subject to a negative BSE test result from November 2005.

Offspring - see BSE offspring.

OIE - World Organisation for Animal Health

OTM - Over Thirty Months (old). The OTM Rule prohibited OTM cattle entering the food chain from April 1996 to November 2005.

OTMS - Over Thirty Month Scheme, a market intervention scheme for cattle which could not enter the food or feed chain, which operated between May 1996 and January 2006. Under this Scheme, OTM cattle that would otherwise be considered fit for human consumption were slaughtered at the end of their productive lives and incinerated. Slaughter generally took place in abattoirs (latterly dedicated to OTMS or subsequently OCDS) but cattle subject to emergency slaughter on farm were also eligible if certified by a veterinarian as fit (in principle) for human consumption.

PAP - Processed Animal Protein, defined in Regulation (EC) No.1774/2002 as "*animal proteins derived entirely from Category 3 material, which have been treated in accordance with Chapter II of Annex V [of Regulation (EC) No.1774/2002] so as to render them suitable for direct use as feed material or other use in feedingstuffs, including petfood, or use in organic fertilisers or soil improvers; however it does not include blood products, milk, milk-based products, colostrums, gelatine, hydrolysed proteins and dicalcium phosphate, eggs and egg-products, tricalcium phosphate and collagen*".

Passive Surveillance - defined in the TSE Regulation as *the reporting of all animals suspected of being infected by a TSE and, where TSE cannot be excluded by clinical investigation, the laboratory testing of such animals.* NB. Passive surveillance is not necessarily linked to a statutory obligation to report suspicion of disease.

PCR - Polymerase Chain Reaction, a test for animal DNA in feed.

Prevalence – The proportion of infected animals in a population. E.g. the proportion of cattle born in the calendar year 1 August 1996- 31 July 1997 infected with BSE.

RADAR - Rapid Analysis and Detection of Animal Related Risks, Defra's surveillance information management system.

Risk Animals - refers to fallen stock, emergency slaughtered cattle and cattle showing clinical signs at ante-mortem inspection.

RPA - Rural Payments Agency, a Defra agency.

SRM - Specified risk material, tissues such as brain and spinal cord which could contain the most TSE infectivity, if they derive from an infected animal.

SEAC - Spongiform Encephalopathy Advisory Committee, which provides independent advice on TSE risks to the UK Government.

Surveillance - a more intensive form of data recording than monitoring and involves the collation and interpretation of data collected, usually with the identity of diseased animals recorded. Surveillance is carried out with a view to detecting changes in a population's health and it is normally part of a control programme for a specific disease.

TC - Third Country. A country which is not an EU Member State.

TSE - Transmissible spongiform encephalopathy. Fatal brain diseases such as BSE and scrapie.

UK - United Kingdom of Great Britain and Northern Ireland.

VLA - Veterinary Laboratories Agency.

VSS - Veterinary Surveillance Strategy

## Annex 2: History of BSE surveillance in UK

The UK has had **passive surveillance** for BSE (clinical suspects) since June 1988 (November 1988 in NI) when the disease first became notifiable.

Since July 2001, the UK has implemented the EU **active surveillance** programme. This is discussed below.

### A. Cattle Slaughtered for Human Consumption

### 1. Cattle subject to normal slaughter for human consumption

The slaughter of cattle over 30 months of age for human consumption was prohibited in the UK from 1996 to 6 November 2005, by the OTM Rule. However an extremely small number of cattle aged between 30 and 42 months, produced under the strict criteria of the BAS, were permitted to enter the food chain in GB. These cattle were tested for BSE from January 2001 until November 2005 when the scheme ended. This complied with EU requirements [*Commission Decision 2000/764/EC*]. There were no BAS herds in NI.

The UK has tested all cattle over 30 months of age slaughtered for human consumption, since 7 November 2005, when the OTM Rule was replaced by BSE testing for cattle born or reared in the UK after 31 July 1996. This complies with current EU requirements.

### 2. Cattle subject to emergency slaughter or showing clinical signs at ante-mortem inspection

In October 2001, NI introduced BSE testing for cattle subject to emergency slaughter aged over 24 months. In January 2002, GB introduced BSE testing for cattle subject to emergency slaughter and those with clinical signs at ante-mortem inspection aged over 24 months. Eligible cattle showing clinical signs at ante-mortem inspection in NI have been tested since June 2002. [*Regulation (EC) No.1248/2001*]. This complies with current EU requirements.

### B. Cattle Not Slaughtered for Human Consumption

### Cattle which die or are killed other than for human consumption (fallen stock)

In January 2001, the UK introduced voluntary BSE testing for fallen stock aged over 30 months. This complied with EU requirements in place at the time. [*Commission Decision 2000/764/EC*].

In July 2001 the UK introduced compulsory BSE testing for fallen stock aged over 30 months. [*Regulation (EC) No.999/2001*].

In January 2002 the UK introduced compulsory BSE testing for fallen stock aged over 24 months. [*Regulation (EC) No.1248/2001*]. This complies with current EU requirements.

**Cattle slaughtered under Over Thirty Month Scheme – all**

In July 2001 the UK introduced compulsory BSE testing for all cattle subject to emergency slaughter or with observations at ante-mortem inspection under the OTMS. [*Regulation (EC) No.1248/2001*]. This complied with EU requirements in place at the time. OTMS closed on 22 January 2006.

**Cattle slaughtered under Over Thirty Month Scheme – born after July 1996**

In May 2001/September 2001, NI/GB introduced testing for all cattle in the 1996/97 birth cohort slaughtered under the OTMS. [*Regulation (EC) No.1248/2001*]

From November 2001/December 2001 to August 2002[16], NI/ GB tested an annual random sample of cattle slaughtered under the OTMS born after July 1996. [*Regulation (EC) No.1248/2001*].

From August 2002 to October 2004, the UK tested all cattle born after July 1996 and aged over 42 months, slaughtered under the OTMS. [*Regulation (EC) No.1494/2002*]

From October 2004 to January 2006, the UK tested *all* cattle born after July 1996, slaughtered under the OTMS. This *exceeded* EU requirements.

**Cattle slaughtered under OTMS or the Older Cattle Disposal Scheme– born before August 1996**

From May 2001/December 2001 to August 2002[17], NI/GB tested an annual random sample of cattle slaughtered under the OTMS born before August 1996. [*Regulation (EC) No.1248/2001*].

From August 2002 to May 2006, the UK carried out an annual random survey of cattle slaughtered under the OTMS or OCDS [started 23 January 2006] born before August 1996. [*Regulation (EC) No.1494/2002*]

From May 2006, the UK tested all cattle in the 1995/96 birth cohort slaughtered under the OCDS. This complies with current EU requirements. [*Regulation (EC) No.657/2006*]

[16] The annual requirement was a random sample of 50000 cattle slaughtered under the Over Thirty Month Scheme: this included 40000 cattle born after July 1996.
[17] The annual requirement was a random sample of 50000 cattle slaughtered under the Over Thirty Month Scheme: this included 10000 cattle born before August 1996.

**Offspring of BSE cases**

From September 2001 to May 2006, GB tested all offspring of BSE cases aged over 30 months, where those offspring were born after July 1996. In May 2006, the offspring cull was limited to animals born within 2 years (24 months) of clinical onset in the dam and testing in GB was discontinued. NI has tested all offspring born after July 1996, regardless of age, since February 1999. In May 2006, the offspring cull was limited to animals born within 2 years (24 months) of clinical onset in the dam.

The testing of offspring *exceeds* EU requirements.

**Cohorts of BSE cases, where those cohorts were born after July 1996**

In March 2005, GB started culling the feed cohorts of BSE cases, where those feed cohorts were born after July 1996 in preparation for the replacement of the OTM Rule (in November 2005). All these animals have been tested. In NI, the feed cohorts of BSE cases, where those feed cohorts were born after July 1996, have been tested since 2003. The testing of cohorts *exceeds* EU requirements.

**C. Monitoring Compliance**

The UK has carried out regular checks to ensure compliance with the surveillance requirements. These involve cross-checking the cattle on the testing database against eligible cattle reported as dead to the cattle database. These audits have demonstrated a very high level of compliance.

**D. Results**

Tables 1 and 2 provide a summary of the results of BSE surveillance in the UK from 2001-2007.

**Table 1: Passive Surveillance**

| Year | Tested | BSE Positive | Positives per 10000 tests |
|---|---|---|---|
| 2001 | 1220 | 815 | 6680.0 |
| 2002 | 876 | 473 | 5399.5 |
| 2003 | 469 | 185 | 3944.6 |
| 2004 | 344 | 90 | 2616.3 |
| 2005 | 171 | 39 | 2280.7 |
| 2006 | 139 | 15 | 1079.1 |
| 2007 | 70 | 7 | 1000.0 |

**Table 2: Active Surveillance**

| Year | Tested | BSE Positive | Positives per 10000 tests |
|---|---|---|---|
| 2001 | 98142 | 372 | 37.9 |
| 2002 | 392886 | 664 | 16.9 |
| 2003 | 460305 | 426 | 9.3 |
| 2004 | 599205 | 253 | 4.2 |
| 2005 | 642253 | 186 | 2.9 |
| 2006 | 731113 | 99 | 1.4 |
| 2007 | 771335 | 60 | 0.8 |

## Annex 3: BSE Cases Aged Less Than 48 months

BSE cases aged less than 48 months detected in the EU15 since 2001

| | | Year of Detection | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Target Group** | **Age (month)** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| **Emergency Slaughtered** | 28 | DEx1 | | | | | | |
| | 29 | DEx1 | | | | | | |
| | 32 | | UKx1 | | | | | |
| | 39 | | | | | UKx1 | | |
| | 43 | ESx2 | | | | | | |
| | 45 | UKx1 | | | | | | |
| | 46 | | | UKx1 | | | | |
| **Fallen Stock** | 32 | | | | | PTx1 | | |
| | 41 | | ESx1 | | | ESx1 | | |
| | 44 | DEx1 | | | ESx1 | IEx1 | | |
| | 46 | | | DEx1 | DEx1 | | | |
| | 47 | ESx1 | DKx1 | | | DEx1 | | |
| **Healthy Slaughtered** | 34 | | PTx1 | | | | | |
| | 36 | | | ESx1 | | | | |
| | 39 | | DKx1 | | | | | |
| | 42 | DK & FR | | | | | | |
| | 45 | ESx1 | | | | | | |
| | 46 | | | | DEx1 | | | |
| | 47 | | | | PT & ES | | | |

DE=Germany; DK=Denmark; ES=Spain; FR=France; IE=Ireland; PT=Portugal; UK=United Kingdom

## Annex 4: Compliance with Epidemiological Criteria

Regulation (EC) No.571/2008 requires that applications for revision of a BSE surveillance programme may only be accepted if the Member State concerned can demonstrate that (in addition to the other requirements) the following epidemiological criteria are met for a period of at least six consecutive years:

*the average decrease of the annual BSE incidence rate observed within the adult bovine animal population (over 24 months of age) was* ***superior to 20%,*** *and the total number of BSE affected cattle born after the implementation of the Community total feed ban for farmed animals, as referred to in point (c) of the third subparagraph of Article 6(1b),* ***did not exceed 5%*** *of the total number of confirmed BSE cases.*

**Table 1** provides evidence that the average decrease of the annual BSE incidence rate in the UK during the period 2001-2007 was superior to 20% and that the total number of BSE cases during this period, born after 2001, did not exceed 5%.

**Table 1 – BSE Incidence Rate**

| **Year** | **Adult Cattle Population (over 24 months)** | **Incidence of BSE Cases** | **Incidence Rate (cases per million adult cattle)** | **Decrease in Incidence Rate (%)** | **Incidence of BSE Cases born after 2000** |
|---|---|---|---|---|---|
| 2001 | 5087065 | 1187 | 233 | NA | 0 |
| 2002 | 4988840 | 1137 | 228 | 2% | 0 |
| 2003 | 4969683 | 611 | 123 | 44% | 0 |
| 2004 | 4954639 | 343 | 69 | 44% | 0 |
| 2005 | 4893697 | 225 | 46 | 33% | 3 |
| 2006 | 4931836 | 114 | 23 | 50% | 5 |
| 2007 | 4913547 | 67 | 14 | 39% | 4 |
| **Average** | | | | **35%** | |
| **Total** | | 3684 | | | 12 |
| **Percentage** | | | | | **0.33%** |

## Annex 5: Risk Assessments

### Veterinary Laboratories Agency Risk Assessment

In April 2008, VLA carried out a risk assessment (SEAC 2008) using the back-calculation model (Arnold & Wilesmith 2003) and the unpublished BSE control model (Adkin et al. 2007; Adkin et al. (in preparation)). Both models can estimate the expected number of BSE cases that will be missed following a change in the surveillance parameters. The latter model can also estimate the amount of infectivity entering the food chain. VLA estimated that the maximum, mean and minimum number of missed BSE test-positive animals in GB:

- arising as a result of increases in the age limit for testing **healthy slaughtered** cattle from 30 up to 60 months (including 6-month increments) would be less than 1 for the two year period 2008-09.
- arising as a result of increases in the age limit for testing **emergency slaughtered** cattle from 24 up to 60 months (including 6-month increments) would be zero for the two year period 2008-09.
- arising as a result of increases in the age limit for testing the **fallen stock** cattle from 24 up to 60 months (including 6-month increments) would be less than 1 for the two year period 2008-09, except for the maximum value for a 60 month testing age limit which would be 1.5.

VLA further concluded that, since the number of missed BSE test-positive animals was so low in the human consumption streams, the testing age limits modelled resulted in a negligible impact on the total amount of infectivity entering the food chain. As an alternative scenario, VLA also modelled the impact of between 1 and 10 missed BSE test-positive animals, on the total amount of infectivity consumed each year. As a result of the high effectiveness of SRM controls in removing infectivity from the food chain, each missed case would have a very small impact on the total amount of infectivity consumed each year – particularly when compared to historic levels.

### European Food Safety Authority Risk Assessment

In July 2008, EFSA published two opinions on possible changes to the BSE surveillance programme in the EU15 (EFSA 2008a and EFSA 2008b).

The EFSA conclusions included:

- The purpose of the BSE surveillance in cattle in the EU is mainly to monitor the BSE epidemic.
- Prevention of human exposure to BSE agent mainly relies on SRM removal.
- Prevention of animal exposure and propagation to TSE agents mainly relies on the feed ban. If the age of BSE testing increases to 36, 48 or 60 months of

age for healthy slaughtered animals, the modelling shows that less than one case for the first two age limits and less than two cases for the third age limit can be expected to be missed annually in the EU 15.

- If the age of BSE testing increases to 30, 36, 48 or 60 months of age for emergency slaughtered cattle, cattle with clinical signs at ante-mortem inspection and fallen stock, the modelling shows that less than one case for the first three age limits and less than three cases for the fourth age limit can be expected to be missed annually in the EU 15.
- If the age of BSE testing increases to 72 or 84 months of age for healthy slaughtered animals, the modelling shows that respectively less than four and six cases can be expected to be missed annually in the EU 15.
- If BSE testing would be stopped in healthy slaughtered cattle born after 31/12/2003, the expected value estimated from modelling shows that less than 6 BSE cases per birth cohort can be expected to be missed in the EU 15.

## Annex 6: Estimates of Prevalence

The prevalence of infection of BSE was estimated for the post-August 1996 birth cohorts separately for GB and NI using a back-calculation model described in Arnold and Wilesmith (2003). The model uses the data from active and passive surveillance up to 31 December 2007. The age of onset distribution in the model was derived from the age-dependent risk of infection and the incubation period distribution estimated in Arnold and Wilesmith (2004). The sensitivity of the rapid test, for which there was no data in 2003, was taken from Arnold et al. (2007) where the timing of detectable infectivity relative to clinical onset in the obex was estimated for 1 gram dosed cattle.

The resulting estimate of prevalence for GB was analysed to determine any significant trend, and a comparison with the prevalence for NI is also carried out.

### Results

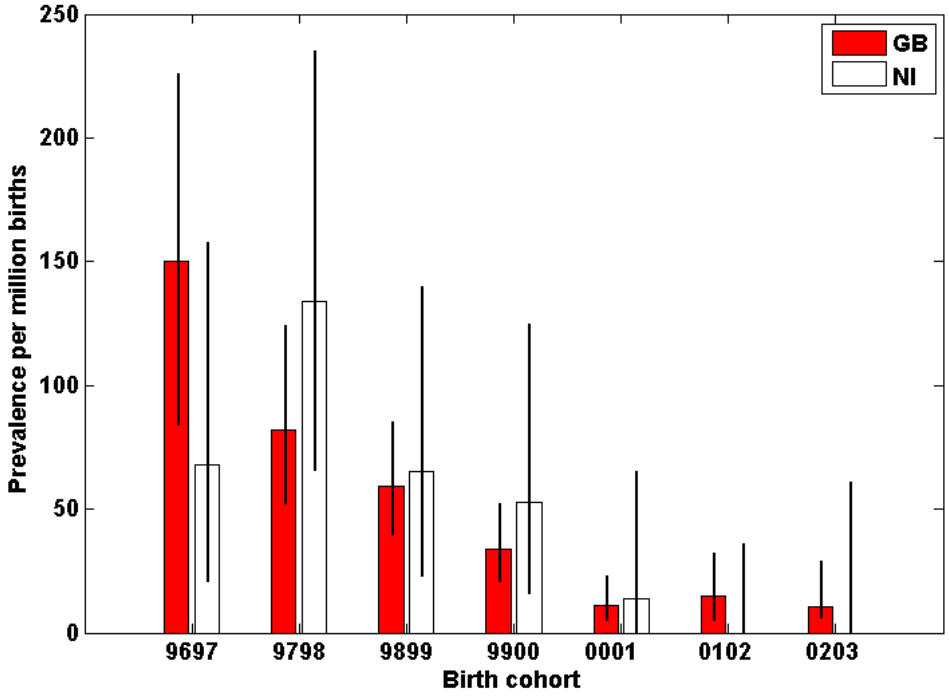


**Figure 1. The estimated prevalence of infection of BSE (per million born) in successive birth cohorts for GB and NI. The bars represent the uncertainty in the prevalence.**

The estimated prevalence of infection in each birth cohort from 1996/97-2002/03 [birth cohorts are 1 July-30 June] is given in **Figure 1** for both GB and NI.

A log-linear regression showed a highly significant decreasing exponential trend in the GB prevalence in successive birth cohorts ($P<0.001$). A Tukey-HSD heterogeneity of regression test applied to the log of the prevalence in birth cohorts 96/97-00/01 in both GB and NI showed no significant difference between either the intercept ($P=0.68$) or the slope of the downward trend ($P=0.77$) between GB and NI i.e. there was no significant difference between the prevalence in GB and NI, and NI also had a decreasing exponential trend of infection. Log-linear regression of the pooled GB and NI prevalence estimates showed a mean reduction in prevalence in successive birth cohorts in both GB and NI of 40% (95% CI: 27-51).

While there was no significant difference between the prevalence in GB and NI, the overall mean prevalence in NI was lower at approximately 90% that of GB. As the case numbers decline, it becomes more difficult to detect relatively small differences between the prevalence in GB and NI, and the large uncertainty in the prevalence in each NI birth cohort can be seen in Figure 1.

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**July 2008**

## Annex 7: Compliance with Feed Controls

### Summary

The feeding of ruminant protein to ruminants was banned in GB in 1988 and in NI in January 1989. In 1994, the EU banned the feeding of mammalian protein to ruminants. Additionally, from 1996, the UK banned the use of mammalian meat and bone meal in all farmed livestock feed, removing all such material from the livestock feed production and supply chain and from end-use on farm, to prevent the possibility of low-level cross-contamination of cattle feed. Since 2001, there has been an EU ban on feeding of PAP to farmed animals.

### Detail

From 1996, official monitoring and feed sampling to check for compliance with the feed ban has been conducted in the UK, throughout the feed production and supply chain and on-farm. This surveillance has demonstrated widespread compliance with the feed controls. **Table 1** shows the results of sampling from 1999 to 2000. **Table 2** shows the results of sampling from 2001 to 2007.

The current UK programme of sampling and testing feed for the presence of PAP is risk-based under Regulation (EC) 882/2004. In recent years it has been designed on the basis of Community Recommendations arising under Council Directive 95/53/EC. The most recent of these was Commission Recommendation 2005/925/EC.

Feed testing is carried out at VLA, the NRL for animal proteins in feed under Regulation (EC) 882/2004. Screening testing is carried out using the MAT in accordance with Commission Decision 2003/126/EC. Other tests have also been used, particularly for MAT-positive samples e.g. ELISA, PCR and CIE.

**Table 1: UK Feed Sampling 1999-2000**

| Year | No Samples Tested (all feed) | Number Positive for Mammalian Protein (ELISA)[18] | % Positive for Mammalian Protein (ELISA) |
|---|---|---|---|
| 1999 | 20656 | 27 | 0.13 |
| 2000 | 19476 | 28 | 0.14 |

[18] Includes multiple samples from single holding.

**Table 2: UK Feed Sampling 2001-2007**

| Year | No Samples Tested (all feed) | Number Positive for Prohibited Proteins[19] | % Positive for Prohibited Proteins[20] |
|---|---|---|---|
| 2001 | 8348* | 19 | 0.22 |
| 2002 | 8225* | 39 | 0.47 |
| 2003 | 10453 | 18 | 0.17 |
| 2004 | 17495 | 24 | 0.14 |
| 2005 | 13142 | 20 | 0.15 |
| 2006 | 14737 | 17 | 0.12 |
| 2007 | 9207* | 13 | 0.14 |

(*Impact of FMD)

In addition, all consignments of fish meal from TCs are sampled at UK BIPs and tested for the presence of terrestrial animal protein by MAT.

[19] Includes multiple samples from single holding.
[20] Includes non-mammalian proteins e.g. fish meal.

## Annex 8: Impact on Surveillance

Back-calculation modelling of infection prevalence by birth cohort has shown an exponential decline with a mean reduction of 40% between successive birth cohorts for the UK. The latest estimate of the prevalence of infection in the 02/03 birth cohort is 6 infections per million births[21]. At such a low prevalence of infection, the likelihood of any BSE-infected cattle being sufficiently close to clinical onset to be detected by the diagnostic test is very low (Arnold et al. (2007)). **Table 1** shows the expected number of positives in the fallen stock stream aged less than 48 months for a range of values of infection prevalence, estimated from the back-calculation model of Arnold and Wilesmith (2003). The expected number of cases in the fallen stock stream aged less than 48 months is very low, and the expected number only rises above 0.5 (1 case every 2 years on average) if the infection prevalence in a birth cohort is more than 10 fold that of the 02/03 cohort. This suggests that, unless there is an extremely steep rise in infection prevalence in more recent birth cohorts (and it is very difficult to envisage how such an increase could occur with current control measures) then there will be few, if any, cases aged less than 48 months and therefore the omission of testing cattle aged less than 48 months will have no practical impact on the ability of back-calculation models to detect any increase in infection prevalence. Even at low prevalence, it is possible to get occasional BSE cases in younger cattle because of variability in the system. Thus even if one tested and detected occasional cases in younger cattle it would not necessarily signal an increase in prevalence.

**Table 1: The expected number of detected cases in fallen stock stream at less than 48 months of age in a birth cohort with a given infection prevalence.**

| Birth cohort infection prevalence (per million births) | Infection prevalence relative to 02/03 cohort | Expected number of BSE cases < 48 months (95% CI) |
|---|---|---|
| 6 | 1 | 0.11 (0-1) |
| 30 | 5 | 0.22 (0-1) |
| 60 | 10 | 0.44 (0-2) |
| 120 | 20 | 0.88 (0-3) |

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[21] Using GB data to end June 2008. 95% confidence interval of 0.1 -18 infections per million births.

## Annex 9: Veterinary Surveillance Strategy

## DEFRA POLICY ON SURVEILLANCE FOR NEW & EMERGING DISEASES

## SUMMARY

*The UK government has focused and strengthened its approach to the early detection and assessment of new (and foreign) animal diseases, through implementation of its Veterinary Surveillance Strategy. Current scanning surveillance captures diagnostic information from veterinary laboratories in a structured way, analysing and reporting findings to Government, and in the veterinary and farming press. In addition, veterinary practitioners, animal owners or keepers are required to report suspicion of Notifiable Disease to Government for follow-up.*

*Assessment and communication of new conditions carries unique challenges. A 'new' condition, by definition, is undefined and unexpected and it takes time to characterise, identify and gather the information needed to determine firstly, whether a reported 'new' health event is genuinely 'new', and secondly, to be able to make an informed risk assessment and initiate appropriate management of the threat. Relevant, proportionate and affordable action must be initiated in the context of incomplete knowledge of the potential implications for human health, animal welfare, international trade and wider society. Hazard identification and Risk assessment of potentially new conditions, is addressed systematically by a suite of multi-disciplinary Groups, with membership including independent experts, and representatives from UK Government Agencies and Departments as appropriate.*

*Since 2002, Defra has maintained a dedicated team of veterinary surgeons, scientists and policy experts for 'New and emerging animal – related issues' to improve the focus on these challenging policy issues. This paper describes work underway in the UK to facilitate early detection, assessment and communication about suspected incidents of new animal diseases or infections.*

## INTRODUCTION

1. New animal diseases and infections have emerged periodically over many years, and will continue to do so for a variety of reasons. In particular, the huge increase in global travel by humans and animals, changes in livestock systems, the challenge of climate change and the remarkable ability of micro-organisms to adapt to changes in their environment, make it inevitable that new animal disease threats lie over the horizon.

2. The UK has a strong track record in veterinary surveillance. However, in recent years, there have been several costly and damaging animal-associated problems, particularly the emergence of BSE in 1986, the Foot and Mouth

Disease outbreak of 2001, and the *E. coli* O157 bacteria, which though inapparent in livestock can be highly virulent in humans.

3. Accordingly, Government followed the advice of independent enquiries into these events and developed a Veterinary Surveillance Strategy published in 2003. Its purpose is to improve the speed and reliability with which animal disease threats can be identified and assessed, so that their cost and impact can be reduced through prompt and suitable interventions. The VSS is being implemented through introducing new working practices over a ten year period from 2003 - 2013.

4. Animal diseases and infections are important to a wide range of people and organisations, ranging from the general public to food and livestock industries, veterinary surgeons and academic institutions. It has therefore been a guiding principle to develop veterinary surveillance openly and in partnership with interested parties, encouraging them to contribute ideas and accept their own roles and responsibilities. Developing our approaches to communicating and sharing information has therefore also been a vital component of the strategy.

## VETERINARY SURVEILLANCE STRATEGY

5. The strategy is founded on five goals- collaboration, prioritisation, making better use of data, sharing knowledge more effectively, and quality assurance of surveillance outputs.

6. Two major innovative approaches have been implemented as part of the strategy. The first is the development of a new surveillance information management system, called **RADAR** (Rapid Analysis and Detection of Animal Related Risks) which is linked to a range of 'source' information technology systems and enables data on diseases, animal populations and risk factors to be drawn together for analysis (Lysons *et al.* (2007)). This has been widely used to provide raw data for Research projects, and to produce maps and statistics to support communications and management of the recent Avian Influenza and Foot and Mouth Disease outbreaks.

7. The second key feature is the development of a system for describing and **prioritising animal diseases** according to the likelihood (risk) of occurrence and the impact (severity) of the consequences. This methodology has been shared with the European Commission and appears a strong contender for adoption as part of the emerging Community Animal Health policy.

8. The UK uses two main approaches to surveillance. Where the threat is known, e.g. Avian Influenza, Bluetongue, surveys can be designed to test for the specific disease, to understand its occurrence and distribution (or to confirm freedom). However, when looking for new or unexpected diseases, this approach is not possible as we do not know which disease to look for. Instead, we conduct 'scanning surveillance' of key animal populations, so that we understand the 'normal' pattern of disease. We are then able to detect any

changes in this pattern, and investigate if these are ‘new’ or evolving threats, or incursions of exotic disease.

## SCANNING SURVEILLANCE

9. The primary approach to detecting new and emerging diseases is the ‘scanning surveillance’ conducted by the UK’s network of Regional Laboratories operated by the VLA (in England and Wales) and the Scottish Agricultural College (in Scotland). These laboratories monitor animal species of interest (mainly food producing species, but also wildlife and companion animals) to monitor the pattern and distribution of endemic diseases in a way which enables the detection of new and unusual syndromes. The laboratories receive submissions of animal carcases and tissues from private veterinary practices. Each submission is accompanied by a form which provides information on the clinical history, husbandry and purpose of the premises of origin, and numbers and species of animals kept. This gives insight into the nature of the disease, possible risk factors, and the likely ‘at risk’ population. Disease events which remain undiagnosed and/ or appear unusual are investigated on farm. All diagnoses are recorded as defined codes, and where a microbiological diagnosis is not made, a syndrome (e.g. mastitis, respiratory) is encoded if possible. This diagnostic data is routinely analysed for unexpected trends. (Gibbens *et al.* (2008))

10. Particular attention is paid to those submissions for which a diagnosis is not reached. An increase in the percentage of such submissions relating to a particular presenting sign or body system might be an early indicator of a new disease. The value of this is most apparent when scanning surveillance is used to build a ‘case definition’, to promote targeted surveillance on farms with continuing unexplained disease. For example, an increase in submissions with ‘diagnosis not reached’ with presenting signs of central nervous system disorder, in adult, lowland outdoor sheep in the Northern Region, would enable a call to veterinary practitioners to submit, or discuss, clinical cases fitting the definition.

## LABORATORY COVERAGE

11. Information is obtained about the occurrence of disease on a large number of farms, including a variety of different species. Submission rates of material to the laboratory can be influenced by a variety of factors, particularly the state of the agricultural economy, and distance of the farm from the laboratory. The maps and **Table 3** at **Annex A** show the location of the Regional laboratories, and (on the assumption that thirty miles is a ‘reasonable’ travelling distance from farm to lab) depict the level of coverage of animal populations of interest. The following **Tables 1** and **2** give information on level of sample submission over a three year period (2006 – 2008), and an indication of the percentage of cattle holdings in England and Wales which submitted samples to VLA in 2006.

**Table 1. The number of farms submitting samples to VLA Regional Laboratories/Surveillance Centres**

| Species group | Number of farms submitting samples[22] to VLA RL/SC 2006-2008[2] | Number (**%**) of farms making diagnostic[23] submissions to VLA RL/SC in 2008[24] |
|---|---|---|
| Cattle | 24,855 | 11,598 (**46.7**) |
| Small ruminant | 10,529 | 3,814 (**36.2**) |
| Pigs | 1,397 | 521 (**37.3**) |

Information is obtained from a large proportion of cattle farms, particularly larger dairy farms as shown by the data in Table 2.

**Table 2. Percentage of all cattle farms submitting samples[25] to VLA in 2006**. This is an extract that used farm numbers and size data from CTS and RADAR.

| Farm size – registered cattle | Dairy | Beef | Mixed |
|---|---|---|---|
| 200+ | 72 | 34 | 53 |
| 100-200 | 51 | 24 | 31 |
| 55-100 | 32 | 15 | 17 |
| 25-55 | 18 | 9 | 8 |
| 6-25 | 4 | 4 | 4 |
| 1-5 | 1 | 1 | 1 |
| All sizes | 47 | 12 | 21 |

[22] Includes samples collected from 'sick' and healthy animals for laboratory testing (DIAG, FOLL, MONI, SUSP & SCRE).
[23] Submissions from 'sick' animals (DIAG & FOLL).
[24] Submissions in 2008 to 27/10/08.
[25] Includes samples collected from 'sick' and healthy animals for laboratory testing (DIAG, FOLL, MONI, SUSP & SCRE).

## OTHER APPROACHES

12. There is regular evaluation of new animal health threats by a hierarchy of expert groups. These comprise groups convened by the Veterinary Laboratories Agency which consider threats in the context of the animal species involved (e.g. pigs or small ruminants) and three other groups which consider emerging diseases for their potential implications for human health. These are the Human Animal Infection & Risk Surveillance (HAIRS) group, the UK Zoonoses, Animal Diseases & Infections Group, and the Chief Medical Officer's National Expert Panel on New and Emerging Infections.

13. We recognise that many cases of animal disease are never referred to a laboratory. However, it is likely that serious disease events will be, and that the diagnosis reached will be robust and unusual findings will be followed up. Nevertheless, we are exploring whether Clinical observations on farm or at abattoirs, could also be captured in a representative and cost effective way, to 'add value' to our understanding of the farm animal disease picture. A pilot study is nearing completion in a defined area of Northern England, to capture data from 30 cattle farms, selected by random sampling on the basis of holding size and frequency. Observations are being gathered from these farmers and their veterinary surgeons, making use of standardised case definitions to assure comparability of data gathered from different premises.

## COMMUNICATION

14. Information about the endemic disease profile, and potential emerging or foreign disease threats is communicated to the public via stakeholder meetings, press releases and via the web. Communication of RADAR reports and other surveillance information is achieved via the Defra veterinary surveillance web pages at www.defra.gov.uk/animalh/diseases/vetsurveillance/index.htm . In addition, the VLA and its Scottish counterpart publishes regular surveillance reports on livestock and wildlife and the Animal Health Trust and collaborators produce an equivalent equine report.

## CONCLUSION

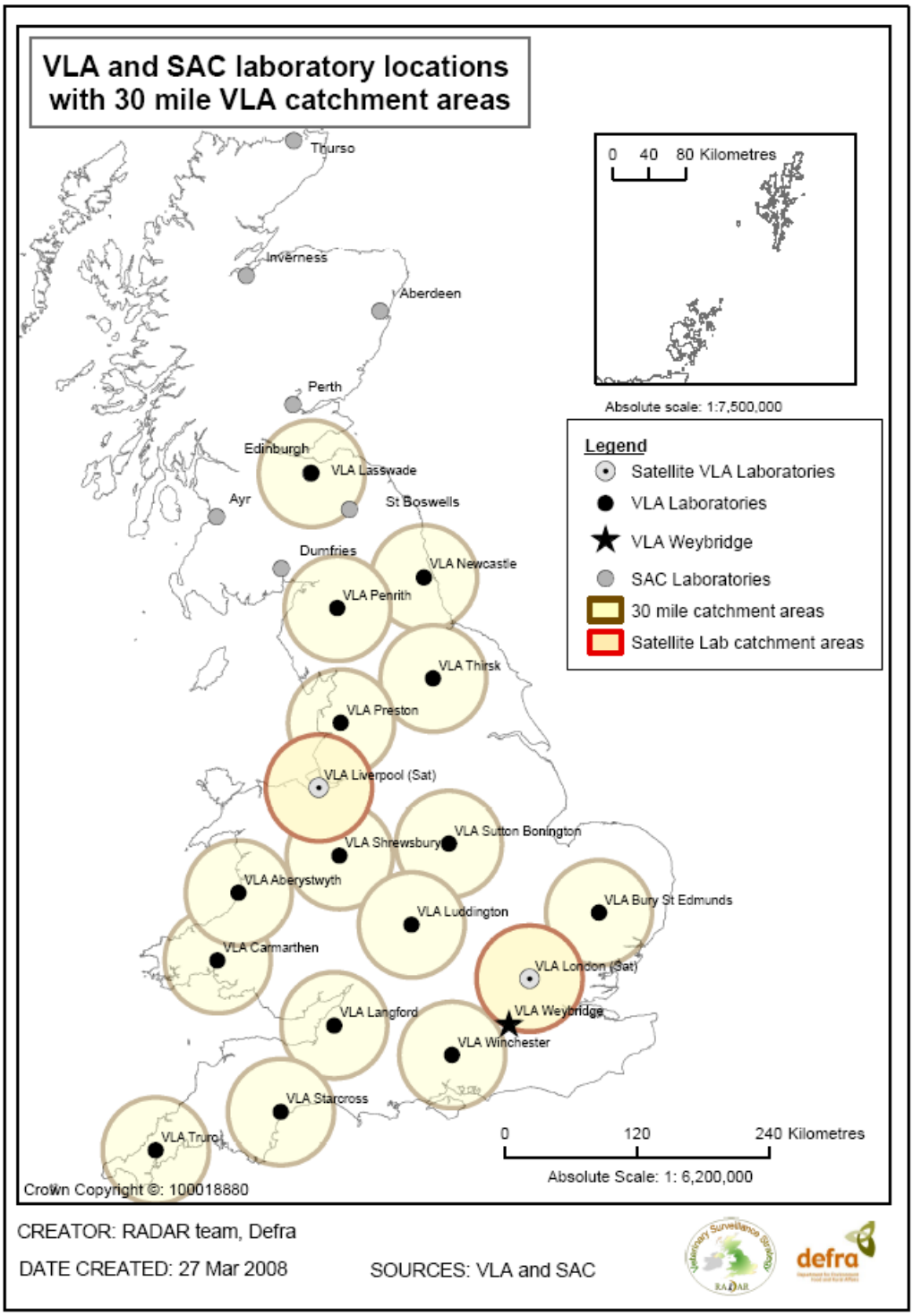
15. New animal diseases and infections will inevitably continue to emerge from time to time. The UK, through its VSS has initiated a major programme of work to strengthen its ability to recognise and manage these. New diseases pose particular scientific challenges in that they are unexpected and ill-defined when first detected There is therefore uncertainty as to whether there is a genuinely 'new' condition, and if so, there is incomplete knowledge of its epidemiology and uncertainty about the likely risks it poses, and impacts it may have on animal health and welfare or for trade and wider society. In particular, the implications for human health are usually not known.

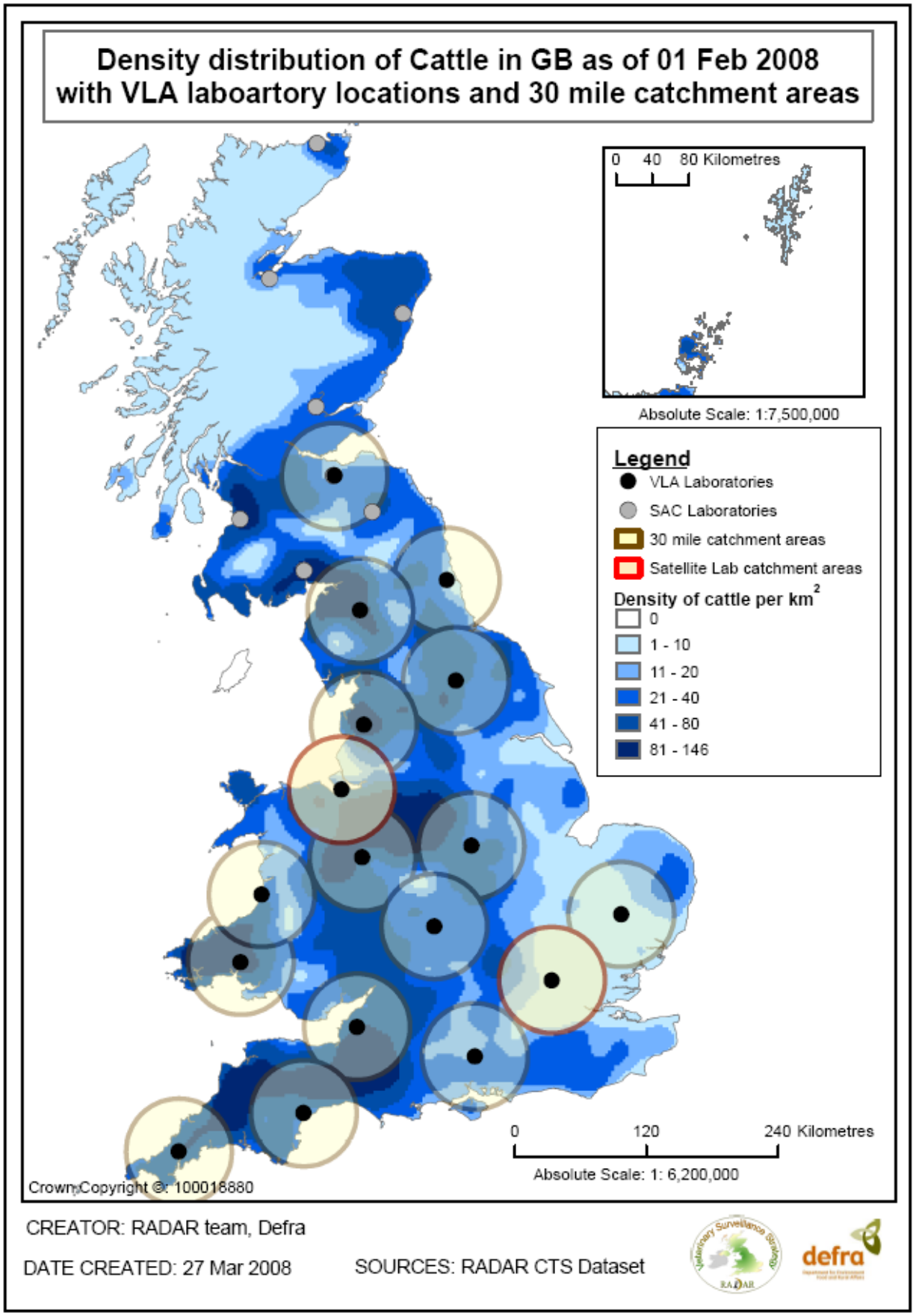
16. Experience with BSE and other disease events in the UK, led to a Government commitment to strengthen our ability to detect new and emerging diseases rapidly and effectively. However, surveillance systems themselves are expensive. Our objective is to ensure that their benefits (in terms of reduced cost of animal disease) will outweigh the cost of the surveillance itself. Our approach has so far concentrated on analysis of veterinary laboratory submissions where a diagnosis was not reached. Whilst failure to reach a diagnosis is a routine and expected outcome of a proportion of submissions, it is possible that occasionally a few of these may signal a new disease or condition. Analysis and communication of such data needs to take account of these different possibilities. We believe that analysis based on standardised case definitions, which takes account of the degree of testing to which a submission has been subjected, and which compares 'nil diagnoses' with retrospective data for equivalent time periods in previous years, offers an affordable approach to identifying suspicious syndromes, worthy of further investigation as possible 'new' diseases.

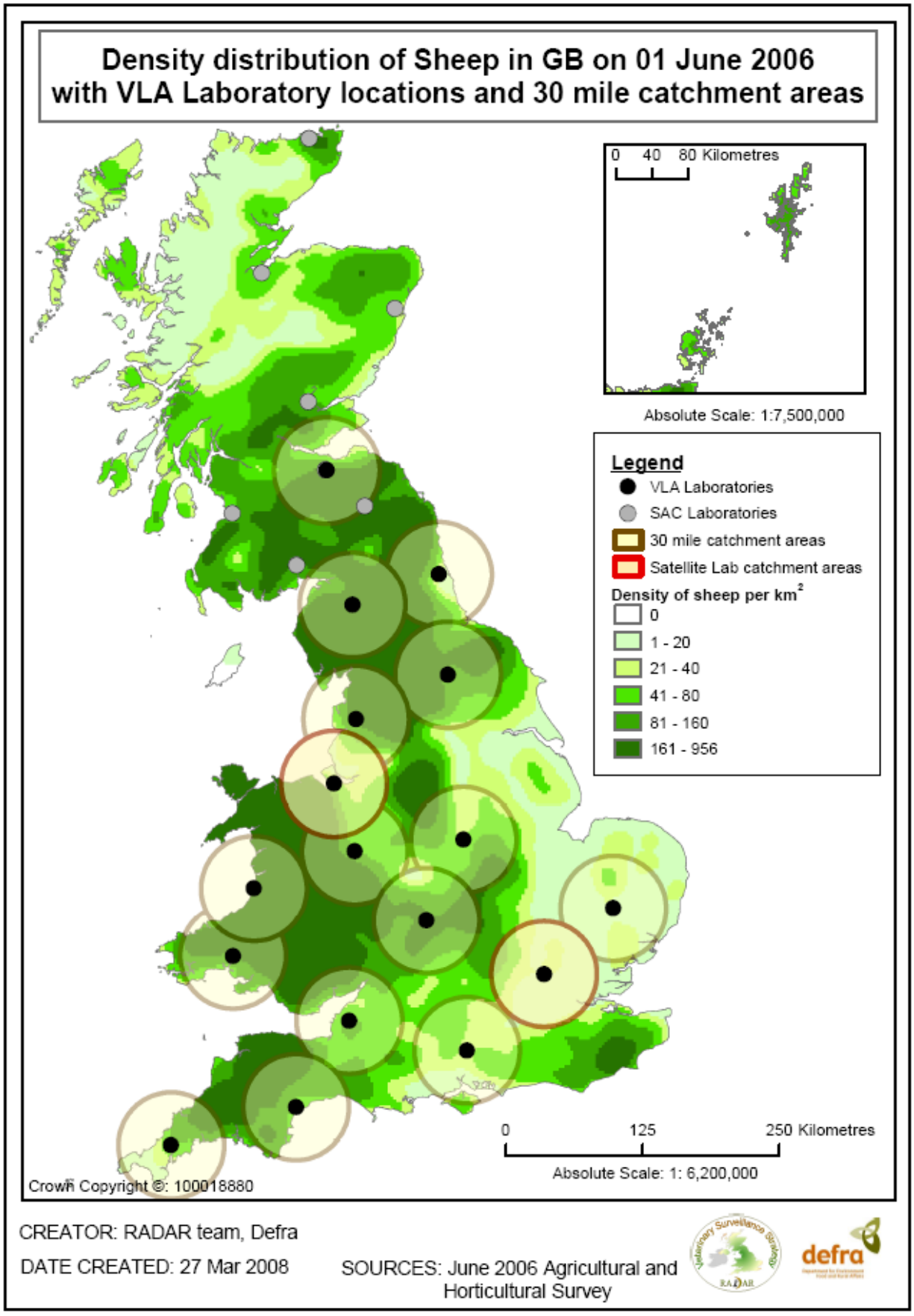
17. Emerging animal diseases- both in the UK and internationally - need to be assessed carefully, taking account of the level of risk they appear to pose, so that any interventions are proportionate, and do not impose unnecessary burdens. This assessment is made through discussions at a suite of multidisciplinary and inter-departmental surveillance groups.

**Ruth Lysons MA VetMB MRCVS**
**Head of Veterinary Surveillance, Defra**
**October 2008**

**Appendix A**




Density distribution of Cattle in GB as of 01 Feb 2008
with VLA laboartory locations and 30 mile catchment areas
0 40 80 Kilometres
Absolute Scale: 1:7,500,000
Legend
VLA Laboratories
SAC Laboratories
30 mile catchment areas
Satellite Lab catchment areas
Density of cattle per km2
0
1 - 10
11 - 20
21 - 40
41 - 80
81 - 146
0 120 240 Kilometres
Absolute Scale: 1: 6,200,000
Crown Copyright ©: 100018880
CREATOR: RADAR team, Defra
DATE CREATED: 27 Mar 2008
SOURCES: RADAR CTS Dataset
defra


Density distribution of Sheep in GB on 01 June 2006
with VLA Laboratory locations and 30 mile catchment areas
0 40 80 Kilometres
Absolute Scale: 1:7,500,000
Legend
VLA Laboratories
SAC Laboratories
30 mile catchment areas
Satellite Lab catchment areas
Density of sheep per km²
0
1 - 20
21 - 40
41 - 80
81 - 160
161 - 956
0 125 250 Kilometres
Absolute Scale: 1: 6,200,000
Crown Copyright ©: 100018880
CREATOR: RADAR team, Defra
DATE CREATED: 27 Mar 2008
SOURCES: June 2006 Agricultural and Horticultural Survey
defra

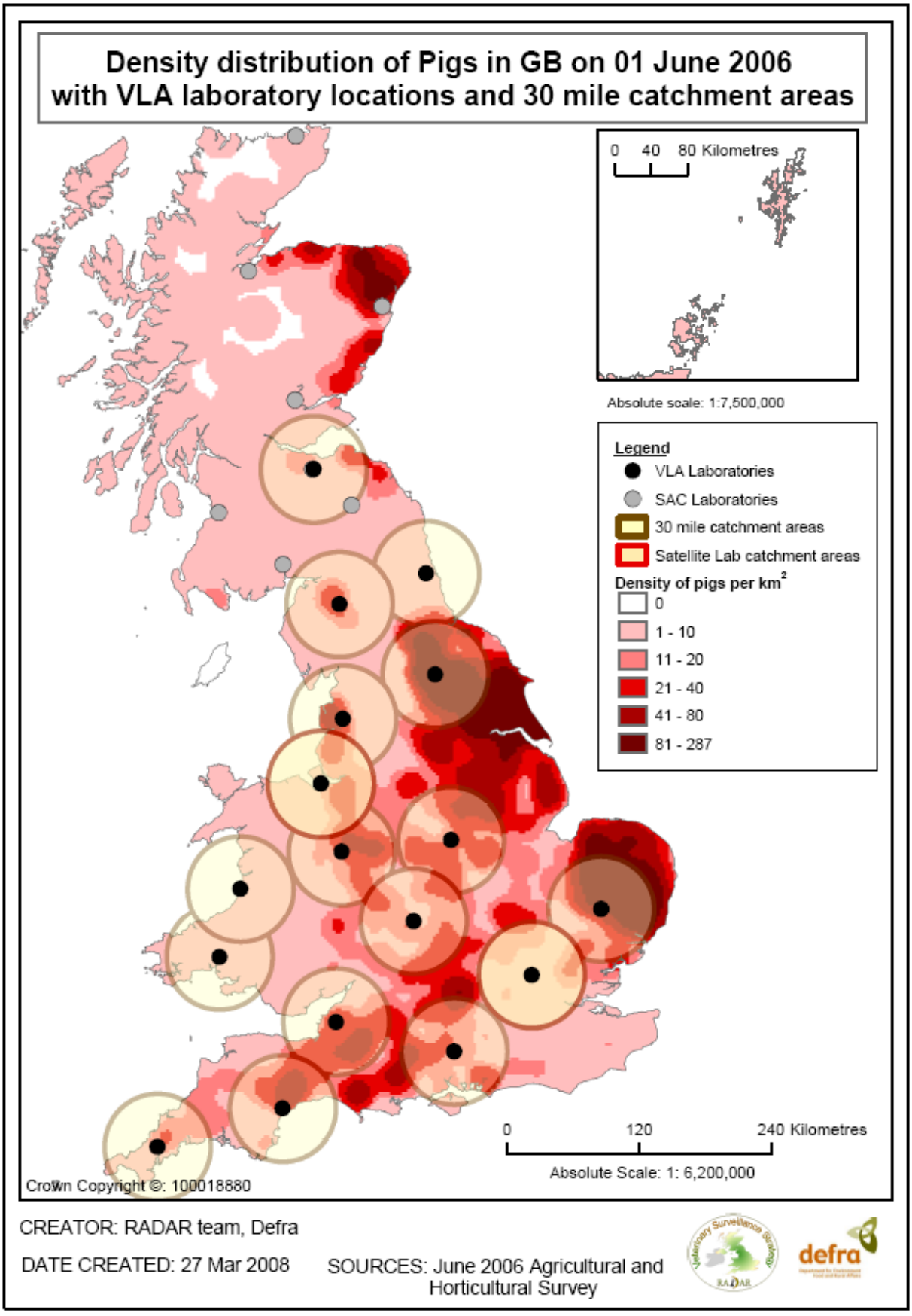

Density distribution of Pigs in GB on 01 June 2006
with VLA laboratory locations and 30 mile catchment areas
0 40 80 Kilometres
Absolute scale: 1:7,500,000
Legend
VLA Laboratories
SAC Laboratories
30 mile catchment areas
Satellite Lab catchment areas
Density of pigs per km²
0
1 - 10
11 - 20
21 - 40
41 - 80
81 - 287
0 120 240 Kilometres
Absolute Scale: 1: 6,200,000
Crown Copyright ©: 100018880
CREATOR: RADAR team, Defra
DATE CREATED: 27 Mar 2008
SOURCES: June 2006 Agricultural and Horticultural Survey
defra

**Table 3. Numbers of premises and animals within 30 mile radius of regional VLA laboratories**

| Laboratory | Number of cattle premises | Number of sheep premises | Number of pig premises | Number of cattle | Number of sheep | Number of pigs |
|---|---|---|---|---|---|---|
| **VLA Newcastle** | 1,469 | 1,607 | 140 | 155,216 | 1,060,341 | 23,794 |
| **VLA Lasswade** | 1,354 | 1,225 | 81 | 220,238 | 1,225,613 | 37,898 |
| **VLA Thirsk** | 3,223 | 3,472 | 654 | 328,057 | 1,403,735 | 596,759 |
| **VLA Penrith** | 3,123 | 3,115 | 134 | 444,233 | 1,910,903 | 37,937 |
| **VLA Preston** | 3,058 | 3,121 | 353 | 313,640 | 1,225,008 | 79,411 |
| **VLA Shrewsbury** | 5,005 | 4,560 | 433 | 583,602 | 1,930,993 | 122,950 |
| **VLA Sutton Bonington** | 3,668 | 2,552 | 480 | 364,594 | 671,953 | 182,631 |
| **VLA Bury St Edmunds** | 998 | 1,004 | 697 | 68,612 | 129,218 | 645,578 |
| **VLA Luddington** | 2,536 | 3,223 | 468 | 217,271 | 997,791 | 132,696 |
| **VLA Langford** | 4,129 | 3,118 | 503 | 455,727 | 603,236 | 133,780 |
| **VLA Winchester** | 1,701 | 1,426 | 403 | 151,076 | 256,580 | 124,528 |
| **VLA Starcross** | 3,724 | 3,497 | 578 | 399,342 | 892,761 | 107,691 |
| **VLA Truro** | 2,186 | 1,194 | 386 | 211,890 | 306,381 | 29,867 |
| **VLA Carmarthen** | 4,487 | 4,159 | 172 | 427,626 | 1,564,571 | 1,746 |
| **VLA Aberystwyth** | 2,287 | 3,355 | 68 | 166,007 | 2,535,734 | 1,087 |
| **VLA Liverpool (Sat)** | 3,544 | 2,804 | 255 | 384,016 | 1,221,563 | 69,047 |
| **VLA London (Sat)** | 979 | 969 | 287 | 64,069 | 154,001 | 52,637 |