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A Review of the implementation of the Veterinary Surveillance Strategy (VSS)

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1.1 Introduction

The geographic distribution and types of animal disease changes over time, and therefore it is necessary to have ***ongoing*** surveillance of our animal populations, to ensure that we have an up to date picture.

The UK Strategy for enhancing Veterinary Surveillance (VSS) was developed in partnership, following the emergence of BSE and the devastating FMD epidemic of 2001. Independent enquiries into these disease events concluded that Government must improve the reliability with which it identified animal disease threats. The VSS was developed to put in place procedures and ways of working which would reliably ensure the early detection and assessment of new diseases (the "next BSE"), other animal-related threats such as chemical contamination / intoxication, and incursions of exotic diseases. Early detection of diseases, enables prompt and suitable interventions, and minimises the associated cost and adverse effects.

The strategy is founded on five goals:

I. Strengthen Collaborations
II. Development of a risk and impact- based prioritisation process
III. Derive better value from surveillance information & activities
IV. Share surveillance information more widely and effectively
V. Enhance Quality Assurance of surveillance outputs

At public consultation, 100 percent of organisations and 86 per cent of individuals who responded thought that the proposed strategy identified the right strategic goals.

1.2 What has been achieved so far?

The VSS was launched in 2003, with a ten year implementation plan. This has led to notable improvements in the efficiency and effectiveness of surveillance, through improvements in process, focus, and scientific methodologies. Highlights include:

- *Improved representativeness of surveillance* through various collaborative initiatives which plug previous gaps in coverage. For example, the creation of equine and wildlife quarterly disease surveillance reports, and of a small animal surveillance network, provides disease surveillance information in animal species for which Government previously held no systematic information. Another initiative has harmonised laboratory data from the Veterinary Laboratories Agency (VLA) and the Scottish Agricultural College (SAC) to create the first GB-wide livestock quarterly surveillance reports.

- *Enhanced scanning surveillance for new & emerging diseases* by the VLA – This includes, the development of new databases to flag up increasing cases of undiagnosed laboratory submissions by presenting signs, the exchange of information via VLA species groups and a mechanism of working with veterinary practitioners to investigate unusual health events. This new systematic system has raised 160 'Diagnosis Not Reached' (DNR) alerts'[1] between 2005 and 2008. These cases are the ones most likely to represent new diseases, and the 'follow-up' investigations have ensured that new diseases were detected rapidly and the window of opportunity for silent spread was reduced. Table 1, lists some of the new syndromes which were identified, and risk assessed for wider animal and public health implications.

Table 1: Examples of New Diseases / syndromes identified through scanning surveillance.

2005	*Pseudamphistomum truncatum* in otters and mink	
2006	CNF *E. coli* in pigs	Neurological illness in cattle and sheep
2007	Congenital tremor, "Dancing pigs"	*Toxocara vitulorum* in cattle and buffalo
2008	Virulent Psoroptic mange in cattle	*Paramphistomum cervi* (Rumen fluke) in cattle
2008	Polio-encephalomyelitis in foxes	"Kangaroo gait" in sheep
2009	"Bleeding calf syndrome"	

- *Development and launch of a sophisticated surveillance information management system*, 'Rapid analysis and Detection of Animal- Related Risks' (RADAR) with improved data on our livestock populations, which is now an invaluable part of Government's approach to disease prevention, control, and risk communication. It also provides evidence to underpin analysis to inform a range of other livestock related policies.
- *Launch of a Wildlife Health Strategy*, founded on the same principles as the Veterinary Surveillance Strategy

[1] A Diagnosis Not Reached (DNR) alert is defined as a flag to indicate a significant increase in undiagnosed submissions by syndrome and presenting signs..

- *Development of a risk and impact-based process for prioritising disease conditions* according to the Animal Health & Welfare Strategy's reasons for Government intervention, to assist best use of resources to combat animal diseases

1.3 Does this represent best value for money?

In 2003, implementation of the Veterinary Surveillance Strategy was expected to cost Government £90m over a 10 year period. The actual spend to date was considerably less. £11.5m was spent on the development of a new surveillance information management system, RADAR, and £1.2m for a new system of 'profiling' diseases to help ensure surveillance activity is prioritised effectively.

The concept of **RADAR** was endorsed by the majority of the respondents to the consultation document as the best way to derive better value from surveillance information and activities, and has been subject to several independent reviews and business cases over the last 5 years to ensure that it continues to be the most effective way of achieving the greater integration of data held in currently incompatible forms within Government.

RADAR initially went live in 2005 and since then has delivered a step-change in evidence-based policy and decision making, allowing Defra to target surveillance activities and disease control measures, and be better able to justify statements about GB disease status and fulfil statutory reporting requirements to the EU. It has been actively and extensively used in all eleven of the exotic disease outbreaks experienced since 2005, reducing the economic impact of outbreaks by providing better evidence to justify the lifting of restrictions more quickly.

This, together with work to share information more widely including, reducing the administrative burden of collecting statistical data, sharing information with the academic and modelling communities and supporting the operational delivery of animal health policies is currently delivering quantifiable benefits in the region of £2.35m per annum[2]. Projected over the estimated 15 year life span of the system, it is conservatively expected to deliver a total benefit of £35.25m.

The **disease profile** tool enables the majority of animal related threats to be considered and ranked in the same context, based on a 'level playing field' of evidence. It has been developed in close collaboration with stakeholders and already has widespread endorsement within Defra, informing recent priority setting in the Exotic Disease Programme, and providing the basis of an indicator for monitoring achievement against Departmental Strategic Objectives, and the approach is also being adopted by the EU to inform its resource planning. The next phase of development is anticipated to see it published online and influencing the development of animal health policies and the allocation of resources across Defra's whole animal health remit. It is expected to deliver

[2] RADAR Business Case, March 2009

a 16% return on investment over the next 5 years[3].

To illustrate the advances made in veterinary surveillance since 2003, it has recently been estimated[4] that if BSE were to occur in GB now, the time taken from the detection of the first case, through to the recognition of the emergence of a new disease and the communication of this to stakeholders, would shorten from the 2 years outlined in the BSE Inquiry, to a far more acceptable 3-12 months.

1.4 Review of implementation

When the VSS was launched six years ago, it was envisaged that it would take 10 years to put in place the fundamental procedures and ways of working which would enable robust and affordable surveillance. The purpose of this review is to 'take stock' in relation to what has been achieved, to consider what has changed since 2003, whether there are changed requirements, and what this means for future approaches to Veterinary Surveillance in the next 5 years or so. The review was also an opportunity for further engagement with key players across the United Kingdom to assess their current perspectives and future priorities for veterinary surveillance.

1.5 What is different now?

1.5.1 Funding

There has been increasing pressure on Government funding available for veterinary surveillance over the last 4 years, and the effects of the current global economic downturn are likely to deepen and accentuate this over the next 5 years or so.

1.5.2 Climate change

The 2003 Strategy recognised that 'global warming', 'increased global travel' and 'changes in livestock production systems' would play a role in the emergence and distribution of animal disease. Recent disease events have re-enforced the global nature of disease spread and the need for a 'One Health' (humans and animals) approach to control. Equally, improved evidence about the causes of climate change and the compelling need to prevent and manage its adverse effects, has raised the profile of this issue.

1.5.3 Devolution of government

The VSS was developed and launched as a UK strategy with **endorsement** by each UK Minister. It is important to maintain a UK overview, and also to recognise the particular

[3] Profiles Business Case, 2009
[4] Demonstrating the benefits of scanning surveillance activity of Animal health in England and Wales, A Report by the Veterinary Laboratories Agency, May 2009

importance of understanding disease occurrence and distribution within the three administrations of mainland Great Britain, which collectively form a single epidemiological unit in terms of opportunities for disease transmission. Nevertheless, there are undoubtedly important regional differences, and over the last few years there has been a trend towards increased devolution of responsibilities and diversity of policy approaches across the four UK countries, in relation to animal health and other areas. Discussions are currently taking place in relation to devolution of budgets for animal health which could change the surveillance landscape in the future.

1.5.4 Responsibility and cost sharing initiative

This ongoing initiative seeks to extend the degree to which responsibility for animal health policies and costs is shared between government and the livestock industry. At this stage it is not clear whether this would lead to altered priorities in relation to disease surveillance.

1.6 Vision for veterinary surveillance over the next 5 years

1.6.1 Outcomes to be achieved through veterinary surveillance

Early detection and assessment of new diseases (the “next BSE”) and incursions of exotic diseases, to enable prompt and suitable interventions, and minimise the associated cost and adverse effects.

Knowledge of endemic disease to inform action to improve livestock production efficiency to make a sustainable contribution to food security and reduce the climate change impacts of livestock production.

1.6.2 Priorities

A vital purpose of veterinary surveillance will continue to be to detect and assess new and emerging diseases and to provide a ‘safety net’ for detection of incursions of exotic diseases, particularly where these present in a clinically unusual way. This function will continue to be predominantly provided by scanning surveillance supported by a quality assured laboratory diagnostic service.

Statistically-based, targeted surveillance to confirm the presence or absence of specific diseases and conditions, and to monitor the efficacy and progress of control measures, will remain a high priority – particularly those with public health (e.g. Salmonella, antimicrobial resistance), or international trade implications (e.g. Aujeszky’s Disease, Bovine Tuberculosis, Brucellosis, Enzootic Bovine Leukosis, Bluetongue)

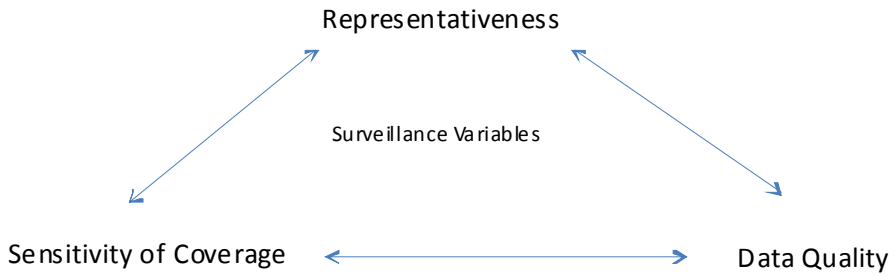
The mandatory reporting of suspect cases of notifiable disease by animal keepers and their veterinary surgeons will continue to be the primary route for detection of incursions of exotic disease, and for this reason, the role of the VSS in communications to assure disease awareness, remains crucial.

Climate change is likely to assume a greater priority in relation to veterinary and other surveillance. This will include attention to the possible effects of climate change on the distribution of disease, but also the contribution of animals to Greenhouse Gas (GHG) emissions. There is likely to be an increasing emphasis on the importance of healthy and efficient livestock production, as a means of minimising GHG.

A move towards more responsibility and cost sharing with the livestock industry, would also be likely to raise the emphasis on the importance of understanding endemic diseases, which is dependent on surveillance to understand their level and distribution.

1.6.3 Approaches

Funding pressures will inevitably impact on the way surveillance is delivered. There are three key variables in surveillance which could be adjusted to meet such demands. These are **representativeness, sensitivity** and **quality.**



Representativeness refers to the degree to which surveillance data reflects the characteristics of the population which is being 'watched over'. Truly representative surveillance would ensure that each animal of a given species, age group and production type would have an equal chance of being selected for surveillance. Thus regardless of which species became diseased, or whether disease occurred in Devon or Dumfries, it would be equally likely to be detected by a surveillance system that captured data from a representative range of animals.

Sensitivity refers to the level which disease must reach in order be to be detected, and is dependent on the proportion of the population which is being watched. In theory, this could vary from 0 to 100 per cent. The lower the sensitivity, the longer it is likely to take to detect changes in disease prevalence, occurrence and distribution, but the cheaper the surveillance is likely to be.

Quality refers to a mixture of attributes in relation to precision, accuracy, completeness and timeliness of the data on which surveillance is based. It is important to have information of sufficient quality to be able to draw sensible conclusions, but perfect data

are not always necessary or affordable. For example, it is essential to have very high accuracy in diagnosis of critical diseases e.g. Foot and Mouth Disease, however for many endemic diseases an estimate of prevalence that is within a few percent of the true figure is sufficient to inform policy decisions.

In a future subject to funding pressures, it is vital to work to maximise the **representativeness of surveillance**; compromise here would mean that a disease problem could be widespread before it is detected if it occurred in an under-represented part of the population. However, *compromising selectively* on the **sensitivity** and **quality** of surveillance, while potentially delaying detection, is unlikely to have such a devastating outcome and would have an equivalent impact across the board, so the risk to any one population is less, and is shared equally. ***However this compromise will require an appreciation and acceptance of the risk that new disease events are likely to take longer to detect.***

In terms of laboratory-based scanning surveillance, there is a need actively to assess and manage the samples being tested, so that where necessary, information on 'under-represented' animal groups, can be gathered in other ways Efforts to improve representation of existing surveillance have produced some improvements during the first six years of the VSS, however constrained resources will mean that even more care will be needed to ensure an appropriate split of resources across different types of surveillance to achieve equality of representation, and so equal likelihood of detection.

The collaborative approaches to collecting surveillance information (e.g. for equine and wildlife surveillance) which have been adopted under the VSS, have proved particularly cost effective. The quality of these data are not as high as for the harmonised laboratory-based approach, but is nevertheless useful in providing a qualitative disease picture, and achieves the important goals of maintaining awareness of the need for, and value of surveillance, and of developing collaboration between government and industry. .

Communication of surveillance outcomes (Goal 4 of the VSS), remains an essential outcome. The development of a suite of surveillance reports, SMS text message alerts and RADAR maps and charts has been a massive advance since 2003. However, further work to tailor reporting and alerting to the specific needs of the public, animal keepers, vets and policy makers remains a priority.

1.6.4 Organisational aspects

With a trend in policy-making towards a smaller policy 'core' and a stronger partnership with Delivery Bodies, there will be an increasing requirement on the VLA and other Delivery Bodies to take responsibility for implementing the VSS to meet Government and industry requirements, including developing holistic solutions to any critical deficiencies.

Working practices will also need to become more and more efficient. An obvious example to pursue is the requirement to de-duplicate activities such as awareness raising efforts by the various government organisations involved in surveillance, exemplified by attendance of VLA and Defra colleagues at the same scientific meetings. This would save money and free-up working time, but obviously needs careful management to ensure that attendees are fully briefed, and can effectively represent all interested parties.

1.6.5 Summary recommendations

- Maintain focus on ensuring surveillance activities capture data from animals that are representative of the populations of interest, in respect of key criteria such as the different industry sectors (beef versus dairy, large versus small holdings, etc), and the geographic distribution of these animal populations. If necessary this should be at the expense of sensitivity of detection and quality of primary data. This will ensure an even distribution of risk; reducing the likelihood of very late detection should disease occur first in under-represented sectors.
- Ensure effective geographic footprint of surveillance activities through affordable mechanisms for stakeholder engagement and surveillance intelligence gathering, which takes account of the structure of the different animal industry sectors and is supported by a quality-assured laboratory diagnostic service.
- Explore and develop new approaches to capturing surveillance data that are more cost-effective, as exemplified by initiatives with the horse and wildlife sectors.
- Enable delivery bodies to take on more responsibility for implementing the VSS to meet Government and industry requirements, including developing holistic solutions to any critical deficiencies, and offering expert insight on emerging requirements.
- Review governance arrangements for implementing the VSS, including re-establishing the Programme Board, but re-configuring it in the light of the conclusions from this review.

2 Introduction

When the VSS was launched six years ago, it was envisaged that it would take 10 years to put in place the fundamental procedures and ways of working which would enable robust and affordable surveillance. A detailed review of progress with implementation of the strategy was conducted in 2006 (Lysons, Gibbens, & Smith, 2007).

The purpose of this review is to 'take stock' in relation to what has been achieved, to consider what has changed since 2003, whether there are changed requirements, and what this means for future approaches to veterinary surveillance in the next 5 years or so. The review was also an opportunity for further engagement with key players across the United Kingdom to assess their current perspectives and future priorities for veterinary surveillance.

3 Background

3.1 What is veterinary surveillance?

Surveillance (derived from the French word *surveiller,* meaning *to watch over*) is the "ongoing scrutiny" of diseases and infections of animals. A variety of methods are used, chosen for their practicability, cost, and fitness for purpose, rather than for accuracy alone.

The geographic distribution and types of animal disease change over time, and therefore it is necessary to have ***ongoing*** surveillance of our animal populations, to ensure that we have an up to date picture.

3.2 What is the purpose of surveillance?

Its main purpose is to detect changes in prevalence, severity or distribution of animal disease in order to initiate investigative or control measures. Surveillance is not an 'end' in itself, but a tool to guide decision-making. It is useful for:

3.2.1 Measuring the effectiveness of the statutory disease control programmes

Endemic diseases are those which are known to occur in the UK. Some of these are subject to statutory controls. Where statutory controls exist, for example to reduce prevalence of bovine tuberculosis (TB), Bovine Spongiform Encephalopathy (BSE) or Salmonella in poultry, then ongoing surveillance is an essential component to measure the effectiveness of the control programme.

3.2.2 Protecting Public Health

Many endemic diseases (both Statutory and non-statutory) can be transmitted from animals to people, and are known as zoonoses. Such diseases may have occupational health implications for farmers, abattoir workers, sewage workers and others, or may pose risks to pet owners, visitors to 'open farms' or pet shops, or cause food safety concerns. In a recent study, 58 percent of the 1,407 recognised species of human pathogen were described as zoonotic (Woolhouse M E J and Gowtage-Sequeria, 2005), and some 24 of these were identified through surveillance in the United Kingdom in 2008 (Defra, 2008). Laboratory-based surveillance is essential for detecting these diseases, many of which are carried 'silently' by animals, which act as a reservoir of human infection or environmental contamination.

3.2.3 Understanding and measuring the impact of animal disease on climate change

Endemic diseases and inapparent infections cause a slowing in the rate of growth, and increased mortality rates in affected animals. In so doing, they reduce the efficiency with which animal feed is converted into meat, milk, or other animal products for human use,

(their 'food conversion efficiency'). The component of an animal's 'carbon footprint' which is due to disease is therefore an environmental cost, which could be reduced by improving the UK's animal health status. Disease surveillance is an obvious mechanism for measuring the environmental impact of disease in farmed livestock, as it can interpret the observed impacts of disease in the context of the animal population which is at risk. An understanding of the endemic disease burden is also an important factor for farmers in achieving safe and efficient farm businesses.

3.2.4 Detection of new and re-emerging disease, infection or toxicity

Early detection of an inherently new disease offers particular challenges as it is inevitably accompanied by uncertainty as to its severity and zoonotic potential. Equally, diagnostic tests will often not be available at the time of first suspicion of disease which makes it difficult to define and detect reliably. Nevertheless, recent disease events make it clear that new diseases represent a global threat, and can move rapidly around the world - especially via air transport - carried by infected people or animals. It is clear that early detection of new threats, through effective surveillance, is essential to enable the 'best chance' of containing or eradicating the next major infectious threat through timely risk assessment and appropriate interventions.

3.2.5 Providing assurance of freedom from specified diseases

The international movement of animals and animal products is beneficial to global economic development and assurance of food supplies. However, it carries the risk of unwanted spread of disease. To strike a balance between these issues many countries, including all EU member states, are signatories to an international framework drawn-up by the World Trade Organisation (WTO) on the Application of Sanitary and Phytosanitary Measures, the SPS Agreement. Details of the SPS agreement can be found at www.wto.org . The agreement seeks to liberalise trade in animals and their products by requiring its signatories to define their import policies based on risk posed to human or animal health by livestock or their products from the exporting country, and to avoid protectionist measures. For such risk assessments to be meaningful, they require robust evidence from disease surveillance.

Ongoing disease surveillance in livestock provides the evidence to confirm national or regional freedom from specified animal diseases. This has important consequences in relation to official certification of health status of animals or animal products and in negotiating the animal health requirements for international trade. In practical terms, this is particularly important, for providing the evidence to support claims to the European Commission and OIE that an incursion of exotic disease (e.g. Foot and Mouth Disease) has been 'stamped out', and that the UK national disease-free status should be restored.

Such surveillance also enables the routine disease reporting obligations of European Union (EU) and World Animal Health Organisation (OIE) member countries to be met.

3.2.6 Detection of incursion of a disease which is not usually present (exotic disease)

Surveillance is also crucial for early identification of known diseases which are not normally present in a country or region. For some designated animal diseases there is a defined policy to contain and eradicate them, should an incursion occur. An example is highly pathogenic Avian Influenza in poultry in the UK. Several outbreaks of this disease have been detected in poultry in recent years, and all have been effectively 'stamped out' through early detection and a robust policy of movement controls, tracing epidemiological links, killing of infected flocks, cleansing of depopulated sites and structured surveillance to ensure no residual pockets of disease remained.

3.3 Mechanisms of veterinary surveillance

There are four main mechanisms for capturing surveillance information, each with their own advantages and disadvantages, the choice of which depends on the available sources of information, the degree of precision and accuracy needed, the urgency of ascertainment, and the resources available. These mechanisms are:

3.3.1 Mandatory reporting

In the UK there is an obligation for any animal keeper who suspects that their animal may have a notifiable disease [as listed in the Specified Diseases (Notification and Slaughter) Order 1992 and the Specified Diseases (Notification) Order 1996] to notify the Animal Health Agency immediately. The Zoonoses Order 1989 (and equivalent legislation in the Devolved Administrations) requires laboratories to report the isolation of Salmonella and Brucella. There are also extensive mandatory reporting requirements under EU legislation, both general (in relation to animal movements between Member States) and in relation to specific diseases (such as Avian Influenza (AI), bovine TB, TSEs, Salmonella etc). The Meat Hygiene Service collects and communicates important surveillance information in relation to food-borne disease under the requirements of the EU Meat Hygiene regulations.

3.3.2 Voluntary reporting

This requires co-ordinated capture and reporting of disease information and is likely to work best and be highly cost- effective where data-providers are strongly motivated, but under-reporting and variable accuracy of information are likely. Examples are given in Section 4.1.2.

3.3.3 Scanning surveillance

This approach focuses on watching animal populations of interest in order to detect new, unexpected or changed patterns of disease. Data are obtained through veterinary investigation of disease outbreaks (mainly by the VLA and SAC), by analysis of laboratory submissions for unusual levels of un-diagnosed cases which could potentially signal a new

disease (see section 4.1.1), or by sentinel networks of selected observers.

Scanning surveillance can operate at three levels, leading to a “pyramid of scrutiny” (Meah & Lewis, 2000) in which farmers see most disease events but define them with least accuracy, veterinary clinicians see less, but can report with more accuracy, and veterinary laboratories see least, but can report with greatest accuracy and precision, and the events that they observe are likely to be the most severe. In practice, most surveillance is laboratory-based.

3.3.4 Targeted surveillance

This uses a structured approach to sample the relevant animal population, to answer a specific question about a disease or condition, using a defined test(s). For example, the annual survey for *Brucella melitensis* in sheep and goats, (which is required under European Commission Decision 93/52) provides evidence to support UK’s disease-free status, by testing ‘at least 5% of sheep and goats...over the age of 6 months’, using an agreed method.

3.4 The UK Strategy for enhancing Veterinary Surveillance (VSS)

The UK Strategy for enhancing Veterinary surveillance (VSS was developed in partnership, following the emergence of BSE, E coli O157 food poisoning, and the devastating FMD epidemic of 2001. Independent enquiries into these disease events concluded that Government must improve the speed and reliability with which it identified animal- related disease threats. The VSS was developed to put in place procedures and ways of working which would reliably ensure the early detection and assessment of new diseases (the "next BSE"), other animal related threats - such as chemical contamination/intoxication, antimicrobial and anthelmintic drug resistance - and incursions of exotic diseases. Early detection of diseases enables prompt and suitable interventions, and minimises the associated cost and adverse effects. Given the climate change impacts of livestock production and the need for a competitive farming sector to make a sustainable contribution to food security, an important outcome of knowledge of endemic disease is to inform action to improve livestock production efficiency.

The specific objectives of the VSS, derived from the range of purposes of surveillance defined above at paragraph 3.2, can be divided into two broad categories, namely strategic outcomes and enabling objectives.

In summary the ***strategic outcomes***, are:

- Earlier warning and more rapid detection of threats
- Faster, better targeted control measures
- Reduced carbon footprint of livestock production

These outcomes depend on the following ***enabling objectives***:

- Open, transparent and defensible prioritisation of surveillance activities
- Clear and well defined rationale for all surveillance activities
- Sound surveillance evidence base underpinning all reports
- Improved livestock production efficiency through better understanding and control of endemic diseases

3.4.1 The strategy is founded on five goals

I. *Strengthen Collaborations*

II. *Development of a risk and impact- based prioritisation process*

III. *Derive better value from surveillance information & activities*

IV. *Share surveillance information more widely and effectively*

V. *Enhance Quality Assurance of surveillance outputs*

At public consultation, 100 percent of organisations and 86 per cent of individuals who responded thought that the proposed strategy identified the right strategic goals.

The VSS is a key component of the Animal Health and Welfare Strategy (2004), which emphasised the importance of clarity of *roles and responsibilities* and that *prevention is better than cure*. (Defra, 2004)

3.5 The threat from new and emerging diseases

Infectious diseases have had a massive global impact on human and animal populations over many centuries.

> ***Jared Diamond***, describing the impact of diseases introduced from Europe into North America in the 16th Century, said:
> **"Infectious diseases introduced with Europeans, like smallpox and measles, spread from one Indian tribe to another, far in advance of the Europeans themselves, and killed an estimated 95% of the New World's Indian population"** (Diamond, 2005)

By the early 1970s, many scientists considered that the major threat from infectious diseases had been overcome, through technical advances such as vaccines and antimicrobial medicines. This was exemplified by the opinion recorded below:

> "**The most likely forecast about the future of infectious disease is that it will be very dull. There may be some wholly unexpected emergence of a new and dangerous infectious disease, but nothing of the sort has marked the past fifty years"** (Burnet & White, 1972)

Unfortunately, this prediction has proved incorrect and new diseases have continued to emerge, and by the late 20th Century, "an increase in the emergence and re-emergence of infectious diseases was evident in many parts of the world" (Weiss & McMichael, 2004).

> **Of a reported 1407 recognised species of human pathogen,**
> **87 were first reported in humans since 1980, and**
> **75 per cent of these emerging or re-emerging pathogens are zoonotic**
> (Woolhouse M E J and Gowtage-Sequeria, 2005) (Woolhouse & Gaunt, 2007)

Defra funded surveillance carried out by the VLA raised 160 alerts of possible new animal disease between 2005 and 2008, which on further investigation led to the identification of 26 emerging (or re-emerging) animal diseases or syndromes which were taken to the multi-disciplinary Human Animal Infections Risks and Surveillance group (HAIRS), for risk assessment in relation to their potential to cause disease in people.

In most cases, a new disease event is a self-limiting, sporadic event, confined to a single species, but occasionally such conditions can have far wider adverse implications, spanning human and animal health & well-being, food safety, food supply, the rural economy, and triggering international movement or trade restrictions. An example is the emergence of Bovine Spongiform Encephalopathy in England in 1986, as a serious neurological disorder of cattle, which led to a major statutory control programme, caused the imposition of substantial livestock trade restrictions and which in 1996 was implicated as the cause of a severe, (though rare) new variant of Creutzfeld Jacob Disease in people.

More recently, Highly Pathogenic Avian Influenza has proved effective at spreading globally in the bird population, and not easily transmitted to people, although when such spread has occurred it is accompanied by a high case fatality rate. In contrast, the Influenza A / H1N1 “swine flu” virus, spread highly effectively from person to person to cause a global human pandemic in 2009, but we were fortunate that the infection was relatively mild for most people.

4 What has been achieved so far?

The VSS was launched in 2003, with a ten year implementation plan. This has led to notable improvements in the efficiency and effectiveness of surveillance, through improvements in process, focus, and scientific methodologies. A resume of achievements is given below, by VSS strategic goal and Annex B summarises progress against the original VSS delivery plan.

4.1 Collaboration

The objective of this Goal was to deliver effective partnership –working which would improve surveillance by:

- ***harmonising approaches, avoiding unnecessary duplication of effort,***
- ***joining-up surveillance activities to achieve a comprehensive network which would plug gaps in surveillance coverage,***
- ***improving speed of detection of animal-related disease threats***

4.1.1 Harmonising approaches

Considerable progress has been made in harmonising approaches to surveillance. In the laboratory context this has been focused on VLA and the Scottish Agricultural College (SAC) laboratory, where standardisation of data capture between the two organisations has enabled quarterly surveillance reports covering GB to be produced for all the major livestock species.

Further work remains to be done in relation to harmonising the approach to scanning surveillance across the different livestock species, including further refinement of the VLA animal species expert groups, and of surveillance reporting to maximise its value to policy makers and other interested parties.

Through Defra's 'scanning surveillance' and 'delivering intelligent surveillance' projects with the VLA, disease case definitions have been improved, and more sophisticated analyses of the diagnoses reached / not reached, has enabled more informative outputs on disease trends. Analysis of submissions where a Diagnosis was Not Reached (DNR) by syndrome and animal species (e.g. neurological signs in cattle), has enabled 'DNR alerts' to be triggered, where unusually high levels of undiagnosed syndromes are identified. This is important, as these could be an early signal of the emergence of a new disease. 160 'DNR alerts' were triggered and investigated between 2005 and 2008.

Scanning surveillance (investigation of the DNR alerts and of animal disease outbreaks) resulted in the identification of 26 new, or re-emerging diseases or infections which were referred to the Human Animal Infection and Risk Surveillance Group (HAIRS), for risk

assessment in relation to human health between 2006 and 2009. These are summarised in Table 2.

Table 2: *New and re-emerging diseases/syndromes identified through scanning surveillance and referred to HAIRS, 2006 -2009.*

CATTLE	SHEEP & GOATS	PIGS	POULTRY	OTHER SPECIES
	Infectious venereal disease (? Herpes virus) 2006	CNF *E. coli* 2006	Hepatitis E in poultry 2007	Respiratory disease in rooks 2007
Neurological illness in cattle and sheep 2006		Congenital tremor "Dancing pigs" 2007	Avian Influenza H7N2 2007	Tuberculosis in a dog (*M. avium*) 2007
Fasciolosis in calves 2007	"Kangaroo gait" in sheep 2008	Cryptosporidiosis 2007	Intestinal spirochaetosis in layers 2008	Brucella in marine mammals 2008
Bovine Influenza A 2007	Bovine TB in goats 2008	Neurological disease (porcine enterovirus-8) 2008		Ljungan virus (equivocal diagnosis in fox) 2008
Toxocara vitulorum in cattle and bison 2007		*Streptococcus suis* (unusual serotypes) pigs & cattle 2009		Trichomonosis in Garden Birds2008
Paramphistomum (Rumen fluke) in cattle and reindeer 2008				Mycobacterial infection in cats 2008
Virulent Psoroptic mange in cattle 2008				Polioencephalomyelitis (foxes) 2008
Bleeding calf syndrome 2009				*Vibrio cholerae* (swans) 2009

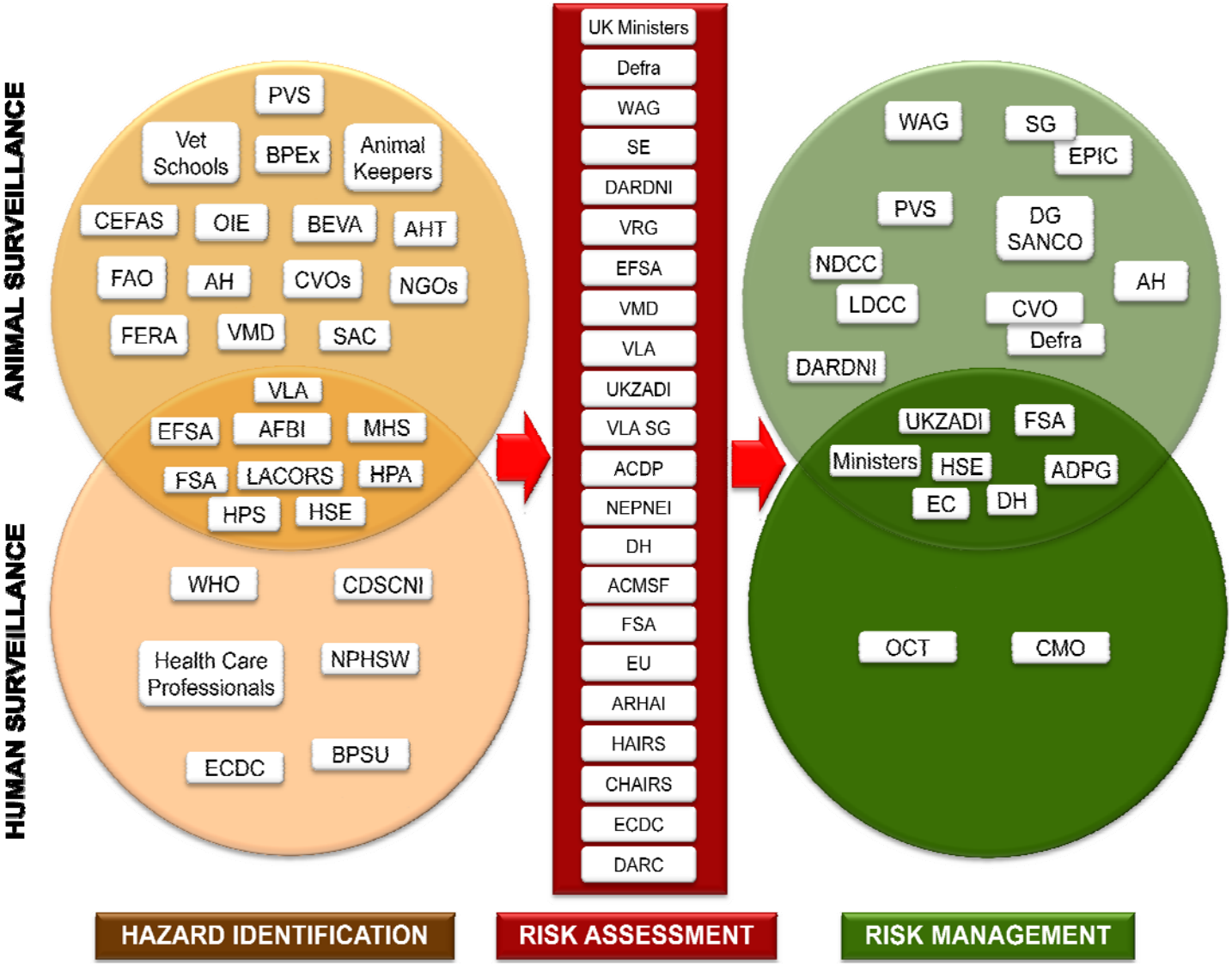
Using samples for more than one purpose. Every year, many samples of substances such as blood, tissue, excreta and milk are taken from a range of animals to be tested for signs of infection with various animal diseases, or human diseases which can be transmitted by animals. This is part of a general strategy of disease surveillance and the powers to take samples are provided by a range of legislation, including statutory sampling and testing powers for surveillance purposes under the Animal Health Act 1981. Unless

the owners of the animals have given specific permission, it is not possible to use such samples to screen for other diseases. Given that collection of samples is a costly process, the VSS proposed that changes should be made to relevant legislation to allow more extensive use of this material. These changes have been achieved (in 2008) in relation to zoonotic diseases, and other animal diseases and infections are encompassed within newly drafted sections of the new Animal Health Bill.

4.1.2 Building a comprehensive Surveillance Network to reduce gaps in coverage

Since the launch of the VSS, considerable effort has been expended on reviewing and refining the structure of the multi-disciplinary, collaborative, virtual surveillance network. This provides a multi-layered approach to hazard identification, risk assessment and risk management. *Figure 1* depicts the roles and interactions of UK and EU Government The current landscape is complex, but shows a high level of effort to gather, assess and act on information on animal diseases and infections at the animal – human interface. The cross government fora are subject to periodic review, including whether there is a need to streamline them or redefine their membership or terms of reference.

Figure 1: *The UK Virtual Veterinary Surveillance Network*



Legend

ACDP	Advisory Committee for Dangerous Pathogens
ACMSF	Advisory Committee on the Microbiological Safety of Food
ADPG	Animal Disease Policy Group
AH	Animal Health
AHT	Animal Health Trust
ARHAI	(Advisory Committee on) Antimicrobial Resistance and Healthcare Associated Infection
BEVA	British Equine Veterinary Association
BPex	Body representing pig levy payers in England
BPSU	British Paediatric Surveillance Unit
CDSCNI	Communicable Disease Surveillance Centre Northern Ireland
CEFAS	Centre for Environment, Fisheries & Aquaculture Science
CHAIRS	Chemical Hazards Identification and Risk Surveillance group
CMO	Chief Medical Officer
CVO	Chief Veterinary Officer
DARC	Defra Antimicrobial Resistance Coordination Committee
DARDNI	Department of Agriculture and Rural Development Northern Ireland
DEFRA	Department for Environment, Food and Rural Affairs
DG SANCO	Directorate General for Health and Consumer Affairs
DH	Department of Health
EC	European Commission
ECDC	European Centre for Disease Prevention and Control
EFSA	European Food Safety Authority
EPIC	Centre of Excellence in Epidemiology
EU	European Union
FAO	Food and Agriculture Organisation (UN)
FERA	Food and Environment Research Agency
FSA	Food Standards Agency
GPs	General Practitioners
HAIRS	Human Animals Infection Risk Surveillance Group
HPA	Health Protection Agency
HPS	Health Protection Scotland
HSE	Health & Safety Executive
LACORS	Local Authorities Coordinators of Regulatory Services
LDCC	Local Disease Control Centre
MHS	Meat Hygiene Service
NDCC	National Disease Control Centre
NEPNEI	National Expert Panel on New and Emerging Infections
NGOs	Non-Governmental Organisations
NPHSW	National Public Health Service for Wales
OCT	Outbreak Control Team (HPA-lead)
OIE	World Animal Health Organisation
PVS	Private Veterinary Surgeon
SAC	Scottish Agricultural College
SG	Scottish Government
UKZADI	United Kingdom Zoonoses, Animal Diseases and Infections Group
VLA	Veterinary Laboratories Agency
VLA SG	Veterinary Laboratories Agency Species Group
VMD	Veterinary Medicines Directorate
VRG	Veterinary Risk Group
WAG	Welsh Assembly Government
WHO	World Health Organisation

policy, delivery agents, and non-governmental organisations, across medical and veterinary disciplines.

Representativeness of surveillance has been improved through various collaborative initiatives which plug previous gaps in coverage. For example, the creation of equine and wildlife quarterly disease surveillance reports, and of a small animal surveillance network, provides disease surveillance information in animal species for which Government previously held no systematic information. These have been developed in partnership, using voluntary reporting (section 3.3.2).

The equine scanning surveillance project is a partnership between Animal Health Trust, the British Equine Veterinary Association and Defra, which includes significant input from private veterinary practices and laboratories, and has provided quarterly reports on the baseline health status of the equine population, since 2004. This partnership - together with the knowledge it provides - is vital to our ability to identify new and emerging issues.

The England Wildlife Health Strategy, published in 2009 was envisaged by and founded on the same strategic goals as the VSS, but addresses the unique issues in relation to wildlife. The development included a technical workshop, convened jointly with experts from the Department of Trade and Industry's (now Department of Business, Innovation and Skills) Foresight Programme, "Infectious Diseases: preparing for the future" in response to their concerns over the threat from wildlife as a reservoir of new and emerging diseases.

The Foresight Programme on Infectious Diseases: Preparing for the Future (2006), concluded that the:

"animal reservoir, particularly in wild animals, will be an important and continuing source of infectious diseases in both livestock and humans."

The Great Britain Poultry Register (GBPR) was developed in partnership with industry stakeholders in 2005, following a Prime Ministerial announcement. The GBPR filled a gap in our knowledge about the size and distribution of the poultry population, and was a major advance in preparedness for incursions of AI. Following further public consultation in 2007, the permitted uses of the GBPR were extended to include surveillance and contingency planning for a wider range of purposes.

The use of a veterinary sentinel network for cattle surveillance was piloted in Yorkshire in between 2005 and 2007. This collaborative project sought to obtain representative data from farmers and their veterinary surgeons. Competing demands on the Defra project team's resources have delayed production of the report (now due in 2010), and have meant that a 'sister project' to pilot a pig sentinel network has been deferred.

Annex C provides further detail about collaborative surveillance networks which are operating in relation to a wide range of animal species.

4.1.3 Improving speed of detection of animal related Diseases

One of the major objectives from the work to build scanning surveillance capacity, is to reduce the time that it would take Government to detect an important new health event, and thereby, the window of opportunity for silent spread. Different diseases would be expected to take different amounts of time to detect, depending on their severity, speed and manner of spread, and how readily they can be detected.

In spite of these variables, the timeliness of detection of disease should improve, the more robust the surveillance capability is. It is clear that the innovations in scanning surveillance since the launch of the VSS in 2003, have delivered processes which are capable of detecting new and emerging diseases at an early stage, as illustrated in Table 2.

Whilst it is impossible to predict the future, "process modelling" approaches have been used to estimate the time for detection of different disease events which might be expected under current arrangements compared with those in place 20 years ago.

> ***"Prediction is very difficult, especially about the future"***
> ***Neils Bohr***
> *(Danish physicist, 1885 – 1962)*

In a study by the VLA, different animal health events were considered using this approach. For the first, assessing the validity of a reported increase in calf diarrhoea, they concluded that current surveillance capability could provide a comprehensive response within 1-2 days, compared with 6-12 months under the 'inadequate' systems in place in 1987. The second (real) scenario related to possible incidents of melamine toxicity in livestock following the import of melamine-contaminated soya into GB in 2008. This assessment took 2 days, but it was estimated that this would have taken between 12 and 15 months in 1987.

4.2 Prioritisation

The main objective of this strategic goal was the *development of a risk and impact-based process for prioritising disease conditions.* This would:

- be founded on standardised recording of animal disease information within 'profiles'
- provide evidence to enable Government Intervention to be prioritised and aligned with the reasons set out in the GB Animal Health & Welfare Strategy
- assist best use of resources to combat animal diseases,

- help with detection of evidence ‘gaps’, and
- be open and transparent.

The approach to capture and validation of comprehensive disease details within “Disease profiles” was piloted and has now been finalised. (Profiles provide a standardised format for recording the most up to date knowledge on epidemiology, risk and impact and control measures applicable to a disease. These are subject to peer review and regular updating). To date 21 disease profiles have been peer reviewed and published and a further 60 are in draft form. These allow comparisons between different diseases to be made ‘on a level playing field’, and form the evidence from which ‘disease rankings’ are determined.

In addition a ‘triage profile’ was designed to assist with risk assessment of new and emerging disease events, where the available evidence is limited, and the emphasis is primarily on assessing any potential threat to public health and is used by the cross-government HAIRS group.

A ‘multi-criteria’ disease prioritisation methodology has been developed with stakeholders and experts, to enable diseases or infections to be ranked in relation to their risk (likelihood) and impact (if they did happen) on animal welfare, public health, the wider economy, environment and society, and opportunities for international trade. This methodology is currently undergoing independent expert peer review.

A bespoke database has been designed and built, using a phased approach, with the most recent IT release in July 2009. Further extensions to scope of the system have been proposed, principally to enable prioritisation of diseases of wildlife, new and emerging diseases, welfare issues and antimicrobial resistance occurrence. At present, these extensions are ‘on hold’ until funding can be secured.

The maintenance of comprehensive, up-to-date and validated disease profiles also offers considerable corporate benefits in terms of its potential to provide easy access to authoritative briefing on animal diseases, for a variety of policy and communications purposes.

The approach has also been important in discussions on disease categorisation and prioritisation in the context of discussions on the future European Union animal health strategy. This unique and ‘leading edge’ approach to assessment and prioritisation of animal related threats has brought added credibility to UK negotiators and has materially added to the UK’s ability to influence developments in EU animal health policy.

That said, the policy benefits from the new prioritisation ‘decision support’ tool have only recently started to be realised. There will be a continuing challenge to ensure that priority is afforded within Government, to the development and maintenance of disease profiles.

In its final report, published in January 2010, on progress and challenges in delivering the Animal Health and Welfare Strategy in England, the **England Implementation Group (EIG)** *commended the Disease Prioritisation tool but expressed reservations about its slow development* and the lack of progress with other initiatives. (see Annex A)

A possible solution is for the VST management team to prioritise staff and programme budget resource to enable a 'critical mass' of disease profiles to be completed, so that the new prioritisation process and ancillary benefits are part of normal Defra business processes, by December 2010.

4.3 Derive better value from surveillance information and activities

There are many types of information which can contribute to surveillance, ranging from clinical observations of farmers and vets (which typically include reporting suspicion of notifiable disease), laboratory and necropsy findings, to data on fallen stock, abattoir condemnations as well as the risk factor information, especially on animal populations, which enables observations on disease to be put in context. The main objectives for this goal were to develop:

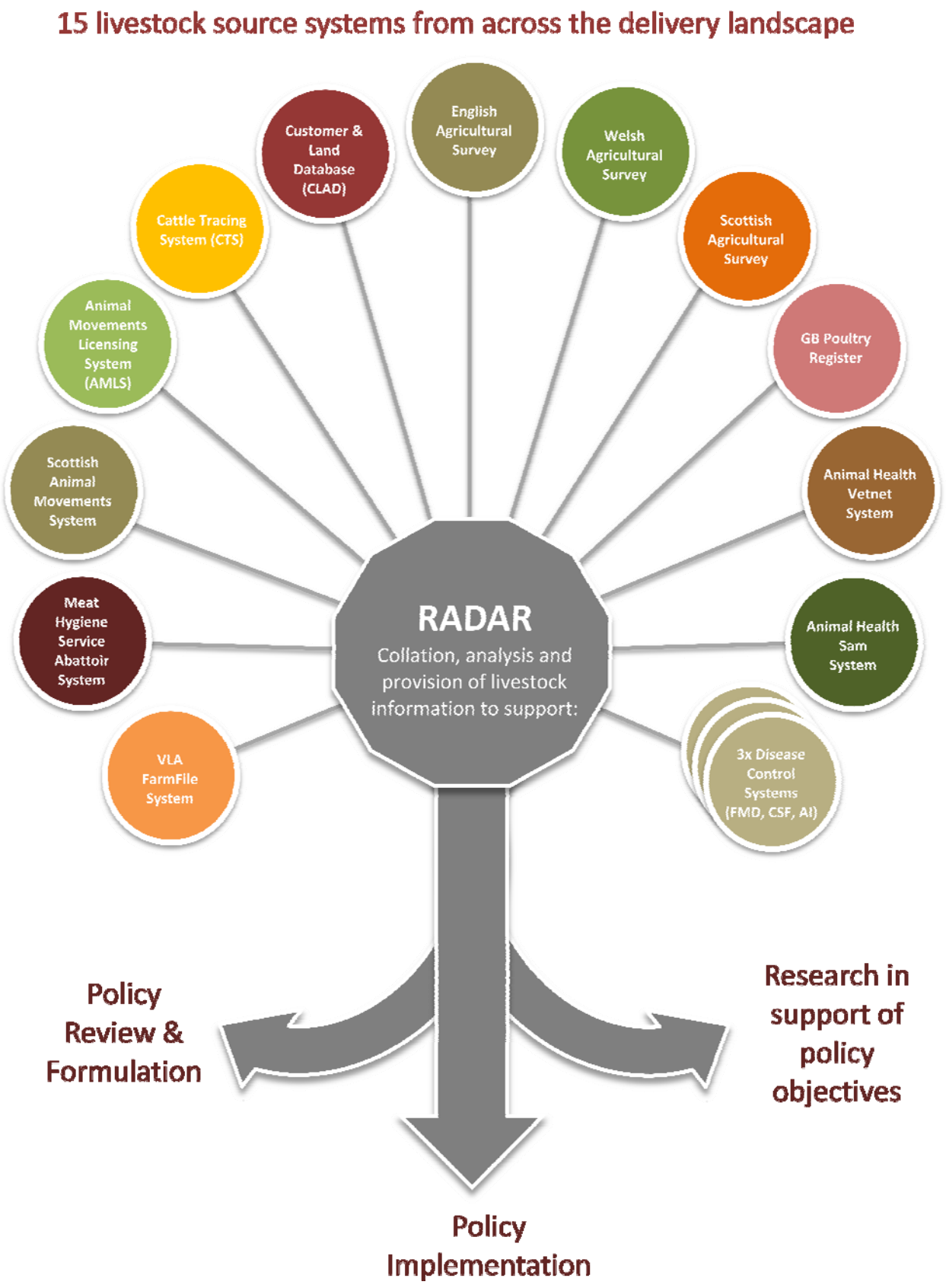
- A flexible and functioning range of approaches to data collation, integration and analysis
- An up to date repository of livestock population (denominator) data to support disease modelling, research, and enable effective interventions in disease outbreaks
- Increased likelihood of detecting patterns of disease behaviour

Central to the delivery of this strategic goal was the *Development and launch of a sophisticated surveillance information management system, 'Rapid analysis and Detection of Animal- Related Risks' (RADAR)* with improved data on our livestock populations which is now an invaluable part of Government's approach to disease prevention, control and risk communication.

RADAR is an innovative information management system which has a 'hub and spoke' technical architecture (see figure 2). This allows raw data about diseases, animals and other risk factors to be extracted from source systems, and transformed into a format that enables collation, analysis and report production.

RADAR was developed following extensive discussions with stakeholders, creation of a prototype, review of equivalent projects internationally and a detailed appraisal of options. The design is highly flexible and low risk, because RADAR can capture data from systems with diverse technical architecture, and can replace existing data sources, as and when improved systems are developed.

Figure 2: the RADAR 'hub and spoke' architecture



Once data have been captured, the RADAR transformation process enables the different datasets to be collated. This process also improves the quality of data (for example by improving location

details of farms, through automated address cleansing). RADAR can also derive additional attributes, for example deriving cattle population data from the individual cattle movement data which are held by the Cattle Tracing System (CTS). The system is kept up to date, according to need, by adjusting the frequency of data-loads from the source system – this can vary from every 30 minutes to annual.

RADAR was launched in 2005, with a single data feed from CTS. Its functionality and links to more data sources were developed in structured phases of the project. In phase 2, with a new IT provider, the RADAR project costs escalated such that the original VSS vision for RADAR became unaffordable. Subsequent development focused on the acquisition of denominator (animal population) data, not disease data. Following a further review in 2006, RADAR moved to 'maintenance and enhancement', meaning that work is now confined to maintaining functionality of existing data loads, and delivery of essential new data loads. No new functionality, such as internet-based interactive reporting is now envisaged.

The system is currently connected to 15 livestock-related systems as illustrated in figure 2. In addition RADAR can receive data from other sources, such as disease and meteorological data.

There are other aspects of this strategic goal, apart from RADAR. Recognising stakeholder concerns about the sensitive nature of some source data, the requirement for data security, and the need to regulate access in accordance with all relevant legislation, a ***Data Sharing Protocol*** was drawn up. This is a high level framework agreement between Government organisations, and sets out the principles and guidelines that partners must follow when sharing data for purposes of veterinary surveillance and disease control in the UK. Signatories include the Veterinary Science Team and English Agricultural Census Departments of Defra, Animal Health, British Cattle Movement Service, the Veterinary Laboratories Agency, the Health Protection Agency and the Welsh Assembly Government (or pre-cursor organisations). There have been no lapses in data security as far as we are aware.

The EIG and others have recommended that the VSS should devote more effort to broadening its range of surveillance data sources. Specifically, the EIG mentions the merit of data from the National Fallen Stock Company (NFSCo) and from the Meat Hygiene Service (MHS). The latter has already been addressed through work to create a data feed from MHS into RADAR. We have looked into the NFSCo data several times, and to date have not found a way to use it ,in its current form. However, new methodologies for using surveillance data, continue to emerge, and we will continue to explore whether one of these could be usefully applied to NFSCo and other data sets.

In considering what new data sources to pursue, we need to be mindful of the nature of the surveillance 'gap' which needs to be addressed. A research project to measure the current representativeness of surveillance coverage is underway. Until this concludes, we need to assess 'gaps' on the basis of expert opinion. Of most concern, would be any gaps in relation to food producing species, where we would need to be aware of any newly emerging disease, as rapidly as possible. As far as we are aware, there are no absolute gaps in these species, although parts

of the sheep, beef and 'hobby farming' sectors may be under-represented by current scanning surveillance. Data capture carries costs as well as benefits, and our approach will continue to be to agree with interested parties, the surveillance questions to be answered, and then to explore the most appropriate data sources to draw upon.

4.4 Sharing information more widely

The principal objectives for this strategic goal were:

- A widely-used system producing structured and *ad hoc* surveillance reports
- Surveillance information communicated rapidly to target audiences (those who wish to know)
- Improved awareness of animal health status in the UK
- Collaboration and use of information on animal health problems to prevent and manage public health problems
- Researchers have improved access to surveillance data

A widely-used system producing structured and ad hoc surveillance reports. The RADAR system has been very successful in this regard. Since 2000, GB has experienced 14 exotic disease incursions, and RADAR has been a critical component of the emergency response to the last 11 of them. By providing information on the susceptible animal population and information about how animals move around the country, RADAR provides the evidence which is vital to ensure that disease control decisions are effective in containing disease. RADAR is used to define disease restriction zones, to provide data for epidemiological purposes, and to provide evidence to OIE and the European Commission once the outbreak has been controlled. For these purposes in relation to the FMD 2007 outbreak alone, RADAR produced approximately 700 maps and outputs (including specialist information for disease modellers)

RADAR also provides outputs between major disease outbreaks, and between 2005 and 2009 reports and data extracts were provided to over 6000 customers, including the Prime Minister, Defra Ministers, Government policy officials, academic experts, veterinary surgeons, the livestock industry and for the European Commission.

During 2007, to assess the usability of the service, feedback forms were sent out to new users. 25 of these were returned. Respondents were asked to answer eight questions on a scale of 1 (not satisfied) to 10 (very satisfied). 92% of answers were scored at 8 – 10, of which 44% were scored at 10.

The high demand for RADAR outputs has knock-on implications for the staff time needed to produce the reports. To address this issues a Radar User Group has been created, which now spans seven groups within Defra and its delivery agents. This now includes over 30 trained users who are able to troubleshoot, agree on 'best practice', and spread the load in terms of production of RADAR reports.

Surveillance information communicated rapidly to target audiences. Apart from the RADAR outputs, a full suite of veterinary surveillance pages were launched on the Defra web site in 2004.

Considerable effort has been made to keep these updated, but unfortunately competing demands on staff time mean that there are now a few sections which are out of date and some links which are non-functional. In the current economic climate, it seems unrealistic to seek to maintain such a complex surveillance web site, and it is necessary to review and streamline the topics covered, so that it can be maintained within available resources, and so that it provides links to other sources of surveillance information such as the VLA web site, which contains comprehensive statistics on disease diagnoses and trends.

Information on current animal health status is provided via various other routes. For immediate requirements during heightened threat from notifiable disease, SMS text message alert systems are available to animal keepers and the veterinary profession through the Animal Health Agency, provided the animal keepers have provided mobile phone details.

For less immediate requirements there is a variety of publications tailored to the needs of the users, who range from public health medical professionals to farmers. Examples of these include:

- Annual UK Zoonoses Report
- Annual UK Zoonoses Trends and Sources Report
- The UK Chief Veterinary Officer's Annual Report
- Monthly VLA Surveillance Reports (England and Wales)
- Quarterly GB-wide, animal species – based reports (VLA and SAC)
- Equine Quarterly Surveillance Reports
- Farmer awareness initiatives such as:
- 'Give Disease the Boot'
- Seasonal warning to pregnant women at Lambing time
- Seasonal Livestock Market Roadshows
- Defra's 'Farming Link' magazine

Disappointingly, there remain external perceptions of an uncoordinated approach to surveillance noted in Prof Lowe's report, by the EIG, and by a keynote speaker at the Association of Veterinary teachers and Research Workers conference in 2009 who said, 'we don't have properly integrated surveillance. We need to be collecting more of the grey materials, the less obvious' In the light of this, it is appropriate that the future VSS Delivery plan should review the communication strategy for surveillance outputs, as well as the balance of resources that it is appropriate to expend on this.

Collaboration and use of information on animal health problems to prevent and manage public health problems. There is some overlap between this objective and those of Goal 1 (strengthen collaboration). The 'virtual surveillance network' (described at Section 4.1.2 and in Figure 1) is the focus of collaborative working to protect public health from animal-related risks. In addition there is close interaction between medical, veterinary and Local Authority specialists with disease 'outbreak control teams' which are convened in response to incidents of animal-associated human disease.

Specific Guidelines for collaborative investigation of Zoonotic Disease in England and Wales, published in 2009, are available at: www.hpa.org.uk/infections/topics_az/zoonoses

Researchers have improved access to surveillance data. Extracts of 'raw data' from RADAR are available to all bona fide animal disease research workers, on completion of a binding confidentiality agreement. Downloads are regularly provided to research workers in all UK veterinary schools and other research institutions. This is mutually beneficial, providing well documented data to the academic community, but also saving cost to the tax payer (because the researcher does not need to gather the data) and by ensuring greater value from surveillance outputs (since these are based on standardised baseline information).

4.5 Quality assurance of surveillance outputs

The main objectives of this goal were:

- Surveillance outputs are 'fit for purpose' – matched to the user's needs
- Users understand the significance of surveillance outputs
- Better use is made of surveillance information for disease control or other interventions

The intention in relation to this strategic goal was for policy makers or other users of reports to have an understanding of the quality of the data which underpinned a map, graph or other surveillance report.

To address this, a Data Quality Framework and a Data Quality Reporting Structure was developed for RADAR reports. This was based on the data categories used by Eurostat and the UK Office of National Statistics. All RADAR reports are accompanied by a Quality Statement which considers these categories, to give an indication of completeness, currency, relevance, precision and accuracy of the data from which the report was derived.

5 Balancing risks, costs and benefits: Does this represent best value for money?

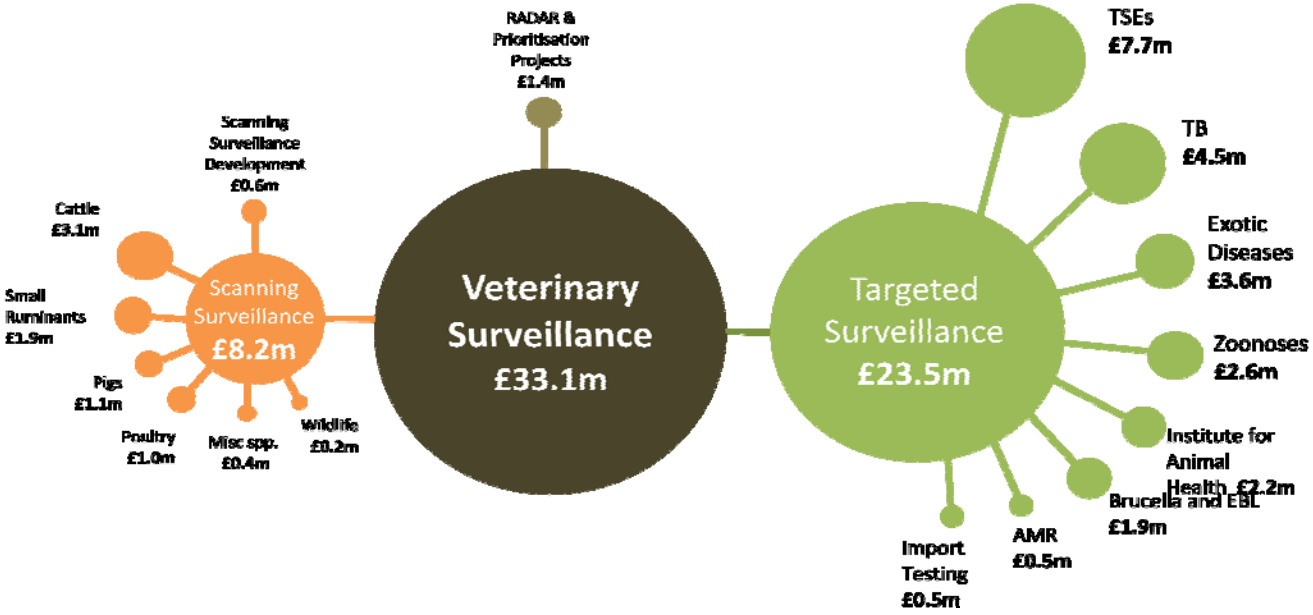
In 2003, implementation of the VSS was expected to cost Government £90m over a 10 year period. The actual spend to date was considerably less. This includes £11.5m spent on the development of a new surveillance information management system, RADAR, and £1.2m for a new system of 'profiling' diseases to help ensure surveillance activity is prioritised effectively.

In addition to these development costs, there are on-going costs for gathering the surveillance intelligence, and for analysing and communicating outputs. For 2009/10 the total programme budget for laboratory-based veterinary surveillance was £33.1 million. This was predominantly

spent with the Veterinary Laboratories Agency but also included £2.2 million for exotic disease surveillance provided by the BBSRC's Institute for Animal Health. This amount was split across three Directors' portfolios in Defra's Food and Farming Group, and covered work areas on TB, TSE, exotic diseases, endemic diseases (including other zoonoses) and animal welfare.

The relative spend in each surveillance area is depicted in Figure 3. This demonstrates marked differences in spend between different surveillance areas. Targeted surveillance (in relation to specific known diseases or infections) accounts for approximately three times the total spend on scanning surveillance. Within the area of targeted surveillance, the majority of expenditure is associated with TB and TSE. Spending on scanning surveillance is also unevenly distributed, with cattle surveillance, at one extreme costing £3.1 million and wildlife surveillance, at the other extreme costing £0.2 million.

Figure 3: Distribution of the 2009/10 veterinary surveillance budget (financial figures refer to planned expenditure. They may not sum exactly due to rounding) Costs of surveillance by Animal Health Agency are not included..



Scanning surveillance monitors the health of defined populations in order to increase the likelihood that there will be timely detection of undefined or unexpected diseases, or of changes in the occurrence of endemic disease. In the England and Wales, scanning surveillance in farmed livestock is undertaken by the VLA through voluntary submissions of carcases to the network of regional laboratories. Relative spend by species is shown in Figure 3. Scanning surveillance in wildlife is undertaken using the same methodology but in addition to the VLA, other Defra agencies and stakeholder organisations participate in the GB Wildlife Disease Surveillance Partnership. Scanning surveillance of horses is undertaken in collaboration with the Animal Health Trust and the British Equine Veterinary Association at a cost of <£40,000 per annum, and is not shown in the diagram. The funds support the collation of data and sharing of information, while laboratory testing costs are covered by others.

Scanning Surveillance Development Projects

These projects contribute to the VSS goal of deriving better value from surveillance activities by developing, implementing and evaluating a new approaches for the collection, collation,

integration, analysis and dissemination of surveillance data. The work is particularly focused on identifying ways to improve the value and efficiency of surveillance activities. For example recent outputs have included a qualitative paper on the benefits of scanning surveillance which has provided a starting point for current work on quantifying these benefits, and the conduct and reporting of an international workshop which explored methods for effective surveillance of livestock and made a number of specific recommendations to improve surveillance efficiency and standardisation.

Targeted surveillance addresses specific questions about the occurrence or epidemiological features of a defined disease or condition, in a defined population, using an agreed protocol, often using specific diagnostic tests. In GB this includes:

- Statutory Notifiable Disease Surveillance - This work includes maintenance of national reference laboratories for those diseases for which European legislation requires this, investigation of suspect cases reported to Animal Health, statutory targeted surveillance programmes, development of diagnostic tests and consultancy and expert advice to policy makers. In addition, costs for maintaining the European Community, OIE and World Reference Laboratories are included.

- Zoonotic Disease Surveillance - The Salmonella surveillance program conducted as a requirement of the EU Zoonoses Directive, considers salmonellosis in various species (in some of these species: e.g. broilers, laying hens and turkeys, there are National Control Programs to reduce the level of Salmonella in the national flock). Targeted surveillance is also carried out for campylobacter in poultry, and for the investigation of suspected toxic incidents in livestock. In addition a range of zoonotic diseases are monitored via the diagnostic material submitted to the VLA so that developing trends can be recognised. VLA work with SAC to achieve this, so that the GB situation can be monitored. A wide range of diseases is covered, including bacterial (e.g. Q fever), viral (e.g. orf), fungal (e.g. ringworm) and parasitic (e.g. liver fluke).

- Antimicrobial Resistance (AMR) - Antimicrobial resistance in bacteria from animals is monitored via the diagnostic material routinely submitted to the VLA. When either a new/emerging type of resistance or a resistance of major importance to public health are identified through this scanning surveillance, then investigation of animals and their environment will be instituted under this contract to better understand the epidemiological situation on the farm from where the samples were submitted. Such visits will also consider the on farm management of the livestock involved (including their medication) and advise on changes to minimise the selective pressure that may otherwise favour the survival and transmission of the resistant bacteria.

- TSE - surveillance costs include statutory testing of animals from TSE flocks; and statutory testing as a result of passive surveillance for TSE; databases to facilitate statutory reporting functions; National, Community and World Reference Laboratories. £6m covers statutory TSE testing of fallen cattle, fallen sheep and goats, and healthy slaughtered sheep.

  TB –Surveillance for bovine TB is part of the government's strategic framework for the sustainable control of TB programme; these costs cover a systematic surveillance programme to identify infected cattle herds so that control measures can be implemented. The costs in

Figure 3 include the statutory surveillance of cattle and farmed deer and a wider generic statutory requirement to notify suspected post mortem lesions in other farmed livestock, and isolation of M. bovis from any animal other than man.

Import Testing **-** The programme consists of compliance checks and laboratory testing carried out on a proportion of consignments imported into the UK. It is a risk-based surveillance system with more emphasis given to high risk consignments. It is non-discriminatory and offers an additional assurance of the effectiveness of a complete suite of legal measures that are in place to protect UK borders from the introduction of a disease.

Whilst there are many reasons why one would expect differences in distribution of spend across these areas, it would seem appropriate to review whether the current balance is optimum. Use of the risk and impact based disease prioritisation tool (described above) could be useful in this process.

Costs involved in maintaining the VLA facilities, which include high containment laboratories and a network of 15 Regional Laboratories, account for an additional £40 million each year.

The concept of RADAR was endorsed by the majority of the 90 respondents to the consultation document as the best way to derive better value from surveillance information and activities, and has been subject to several independent reviews and business cases over the last 5 years to ensure that it continues to be the most effective way of achieving the greater integration of data held in currently incompatible forms within Government.

RADAR initially went live in 2005 and since then has delivered a step-change in evidence-based policy and decision making, allowing Defra to target surveillance activities and disease control measures, and be better able to justify statements about GB disease status and fulfil statutory reporting requirements to the EU. It has been actively and extensively used in all 11 of the exotic disease outbreaks experienced since 2005, reducing the economic impact of outbreaks by providing better evidence to justify the lifting of restrictions more quickly.

This, together with work to share information more widely including, reducing the administrative burden of collecting statistical data, sharing information with the academic and modelling communities and supporting the operational delivery of animal health policies is currently delivering quantifiable benefits in the region of £2.35m per annum[5]. Projected over the estimated 15 year life span of the system, it is conservatively expected to deliver a total benefit of £35.25m.

The **disease profile** tool enables the majority of animal related threats to be considered and ranked in the same context, based on a 'level playing field' of evidence. It has been developed in close collaboration with stakeholders and already has widespread endorsement within Defra, informing recent priority setting in the Exotic Disease Programme, and providing the basis of an indicator for monitoring achievement against Departmental Strategic Objectives, and the approach is also being adopted by the EU to inform its resource planning. The next phase of development is anticipated to see it published online and influencing the development of animal health policies

[5] RADAR Business Case, February 2010

and the allocation of resources across Defra's whole animal health remit. It is expected to deliver a 16% return on investment over the next 5 years[6].

To illustrate the advances made in veterinary surveillance since 2003, it has recently been estimated (Watson & Hoinville, 2009), that if BSE were to occur in GB now, the time taken from the detection of the first case, through to the recognition of the emergence of a new disease and the communication of this to stakeholders, would shorten from the 2 years outlined in the BSE Inquiry, to a far more acceptable 3-12 months.

[6] Profiles Business Case, 2009

6 Factors affecting the future implementation of the VSS

6.1 Funding

There has been increasing pressure on Government funding available for veterinary surveillance over the last 4 years, and the effects of the current global economic downturn are likely to deepen and accentuate this over the next 5 years or so.

6.2 Climate change

The 2003 Strategy recognised that 'global warming', 'increased global travel' and 'changes in livestock production systems' would play a role in the emergence and distribution of animal disease. Recent disease events, such as the emergence of Severe Acute Respiratory Syndrome (SARS) and of the 2009 "swine flu" pandemic, have demonstrated the global nature of disease spread, and the importance of a "One Health" approach (humans and animals) in addressing infectious diseases. Mounting evidence about the causes of climate change and the compelling need to prevent and manage its adverse effects, has also raised the profile of this issue.

6.3 Devolution of government

The VSS was developed and launched as a **UK strategy** with endorsement by each UK Minister, on the basis that diseases do not respect political boundaries, and whereas there are undoubtedly important regional differences, it is important to maintain a UK overview. Over the last few years there has been a trend towards increased devolution of responsibilities and diversity of policy approaches across the four UK countries, in relation to animal health and other areas. Discussions are currently taking place on devolution of budgets for animal health which could change the surveillance landscape in the future. In progressing this work, it is vital to take account of the fact that mainland Great Britain is a single geographical unit in respect of opportunities for spread of animal diseases, and therefore to ensure that surveillance mechanisms across England, Wales and Scotland continue to enable a coherent understanding of disease occurrence and distribution across Great Britain as a whole.

6.4 Responsibility and cost sharing initiative

This ongoing initiative seeks to extend the degree to which responsibility for animal health policies and costs is shared between government and the livestock industry. At this stage it is not clear whether this would lead to altered priorities in relation to disease surveillance. However it is clear that active engagement with the newly established livestock industry sector groups will be vital to secure a coherent approach to disease surveillance.

7 Vision for veterinary surveillance over the next five years

7.1 Priorities

A vital purpose of veterinary surveillance will continue to be to detect and assess **new and emerging diseases** and to provide a 'safety net' for detection of incursions of exotic diseases, particularly where these present in a clinically unusual way. This function will continue to be predominantly provided by scanning surveillance.

Statistically-based, targeted surveillance to confirm the presence or absence of specific diseases and conditions, and to monitor the efficacy and progress of control measures, will remain a high priority – particularly those with **Public Health** (e.g. Salmonella, antimicrobial resistance), or International Trade implications (e.g. Aujeszky's Disease, bovine TB, Brucellosis, EBL, Bluetongue)

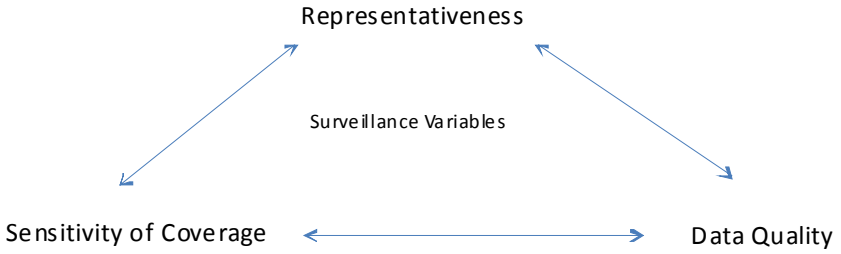
The mandatory reporting of suspect cases of **notifiable** disease by animal keepers and their veterinary surgeons will continue to be the primary route for detection of incursions of exotic disease, and for this reason, the role of the VSS in communications to assure disease awareness, remains crucial.

Climate change is likely to assume a greater priority in relation to veterinary and other surveillance. This will include attention to the possible effects of climate change on the distribution of disease, but also the contribution of animals to Greenhouse Gas (GHG) emissions. There is likely to be an increasing emphasis on the importance of healthy and efficient livestock production, as a means of minimising GHG. An understanding of our endemic disease burden will therefore be essential to inform effective interventions to improve livestock production efficiency, to make a sustainable contribution to **food security**, and to reduce the **climate change** impacts of livestock production.

A move towards more responsibility and cost sharing with the livestock industry, would also be likely to raise the emphasis on the importance of understanding endemic diseases, which is dependent on surveillance to understand their level and distribution.

7.2 Approaches

Funding pressures will inevitably impact on the way surveillance is delivered. There are three key variables in surveillance which could be adjusted to meet such demands. These are **representativeness, sensitivity** and **quality**



Representativeness refers to the degree to which surveillance data reflects the characteristics of the population which is being 'watched over'. Truly representative surveillance would ensure that each animal of a given species, age group and production type, would have an equal chance of being selected for surveillance. Thus regardless of which species became diseased, or whether disease occurred in Devon or Dumfries, it would be equally likely to be detected by a surveillance system that captured data from a **representative** range of animals.

Location of Security cameras could be considered as ***a 'metaphor' for*** the concept of **'representativeness'**. If the police are concerned with detecting crimes in car parks, subways and on High Streets, then they need to position their cameras accordingly. If cameras were only positioned on High streets, they would miss offences in the other types of location. Likewise with veterinary surveillance.....to be representative, it needs to 'watch over' all animal sectors and populations of interest.

Sensitivity refers to the level which disease must reach in order be to be detected, and is dependent on the proportion of the population which is being watched. In theory, this could vary from 0 to 100 per cent. The lower the sensitivity, the longer it is likely to take to detect changes in disease prevalence, occurrence and distribution, but the cheaper the surveillance is likely to be.

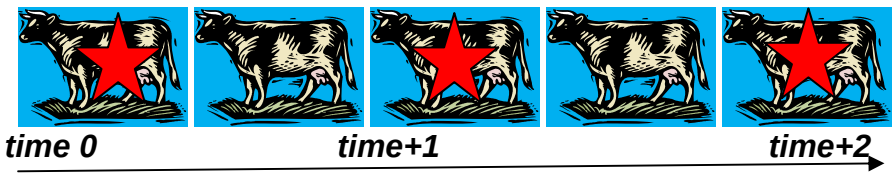
Figure 4 : Sensitivity Of Surveillance

In this figure, fictitious Blue Cow disease (BCD) emerges at "time+0".

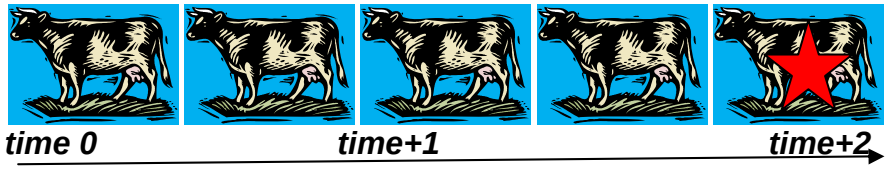
Cows with BCD are depicted as: 

Cows in which BCD has been *detected* are depicted as: 

A: Where surveillance is of a HIGHER SENSITIVITY, the first case of BCD is recognised soon after the disease emerged at "time+0", and 3 cases have been found by "time+2".



B: Where surveillance is of a LOWER SENSITIVITY, fewer animals are under scrutiny, and although the first case of BCD emerged at "time+0", the disease remains un-detected until "time+2"

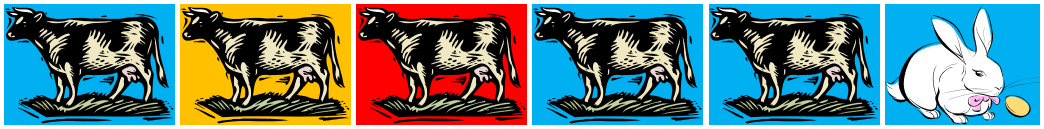


Quality refers to a mixture of attributes in relation to precision, accuracy, completeness and timeliness of the data on which surveillance is based. It is important to have information of sufficient quality to be able to draw sensible conclusions, but perfect data are not always necessary or affordable. For example, it is essential to have very high accuracy in diagnosis of critical diseases e.g. FMD, however for many endemic diseases an estimate of prevalence that is within a few percent of the true figure is sufficient to inform policy decisions.

Figure 5: Quality Of Surveillance

This figure shows two datasets which are said to describe the number of cases of Blue Cow Disease (BCD).

A: This dataset is of *poorer quality*, as it includes cows with other diseases (yellow and red) as well as other animal species (rabbit) with a similar disease.



B: This dataset is of a *high quality*, as all animals included in it are confirmed cases of BCD.

In a future subject to funding pressures, it is vital to work to maximise the **representativeness of surveillance**; compromise here would mean that a disease problem could be widespread before it is detected if it occurred in an under-represented part of the population. However *compromising selectively* on the **sensitivity** and **quality** of surveillance, while potentially delaying detection, is unlikely to have such a devastating outcome and would have an equivalent impact across the board, so the risk to any one population is less, and is shared equally. ***However this compromise will require a greater appreciation and acceptance of the risk that new disease events are likely to take longer to detect.***

In terms of laboratory-based scanning surveillance, there is a need actively to assess and manage the samples being tested, so that where necessary, information on ‘under-represented’ animal groups, can be gathered in other ways Efforts to improve representation of existing surveillance have produced some improvements during the first six years of the VSS, however constrained resources will mean that even more care will be needed to ensure an appropriate split of resources across different types of surveillance to achieve equality of representation, and so equal likelihood of detection.

In addressing the recommendations of EIG and Professor Lowe, in relation to exploring new data sources, it is important that we do not look upon the process of gathering data as an unplanned

'stamp collecting' exercise. As we have learned from the first six years of the VSS, capturing, Quality assessing and maintaining surveillance data is expensive and time-consuming. Whilst it is essential to keep abreast of all potential data sources, it is equally important to ensure that alterations to the current approaches are undertaken in a way which improves the representativeness and value for money of our overall surveillance intelligence.

The collaborative approaches to collecting surveillance information (e.g. for equine and wildlife surveillance) which have been adopted under the VSS, have proved particularly cost effective. The quality of these data are not as high as for the harmonised laboratory-based approach, but is nevertheless useful in providing a qualitative disease picture, and achieves the important goals of maintaining awareness of the need for, and value of surveillance, and of developing collaboration between government and industry. .

Communication of surveillance outcomes (Goal 4 of the VSS), remains an essential outcome. The development of a suite of surveillance reports, SMS text message alerts and RADAR maps and charts has been a massive advance since 2003. However, further work to tailor reporting and alerting to the specific needs of the public, animal keepers, vets and policy makers remains a priority.

7.3 Organisational aspects

With a trend in policy-making towards a smaller policy 'core' and a stronger partnership with Delivery Bodies, there will be an increasing requirement on the VLA and other Delivery Bodies to take responsibility for implementing the VSS in partnership with animal keepers to meet Government and industry requirements, including developing holistic solutions to any critical deficiencies.

Working practices will also need to become more and more efficient. An obvious example to pursue is the requirement to de-duplicate activities such as awareness raising efforts by the various government organisations involved in surveillance, exemplified by attendance of VLA and Defra colleagues at the same scientific meetings. This would save money and free-up working time, but obviously needs careful management to ensure that attendees are fully briefed, and can effectively represent all interested parties.

7.4 Summary recommendations

- Maintain focus on ensuring surveillance activities capture data from animals that are representative of the populations of interest, in respect of key criteria such as the different industry sectors (beef versus dairy, large versus small holdings, etc), and the geographic distribution of these animal populations. If necessary this should be at the expense of sensitivity of detection and quality of primary data. This will ensure an even distribution of risk; reducing the likelihood of very late detection should disease occur first in under-represented sectors.

- Ensure effective geographic footprint of surveillance activities through affordable mechanisms for stakeholder engagement and surveillance intelligence gathering, which takes account of the structure of the different animal industry sectors.
- Explore and develop new approaches to capturing surveillance data that are more cost-effective, as exemplified by initiatives with the horse and wildlife sectors.
- Enable delivery bodies to take on more responsibility for implementing the VSS to meet Government and industry requirements, including developing holistic solutions to any critical deficiencies, and offering expert insight on emerging requirements.
- Review governance arrangements for implementing the VSS, including re-establishing the Programme Board, but re-configuring it in the light of the conclusions from this review.

Annex A: Resumes from recent expert reports on surveillance recommendations

The recommendations for enhanced veterinary surveillance from the recent reviews and inquiry reports are considered in this strategy. A description of the main focus of each of these reports is given below.

- **Animal Health *and* Welfare Strategy, England Implementation Group (EIG) review of veterinary surveillance (June 2006)**

This report reviewed the current state of the Veterinary surveillance programme against what was proposed and agreed, identifying gaps which may have become apparent since its publication. The review considered the engagement of partners and stakeholders as a key component of the strategy. The group recommended engagement and utilisation of expertise and resources from other organisations, continued sharing and publication of data, *gap analysis of key areas and exploration of the fallen stock scheme and abattoirs for the capture of useful disease surveillance data*. It was also considered that monitoring and recording welfare in all sectors needs to be addressed urgently.

Link: http://www.defra.gov.uk/foodfarm/policy/animalhealth/eig/pdf/review-vetsurv.pdf

- **Third and Final report on progress and challenges in delivering the Animal Health and Welfare Strategy (AHWS) in England. England Implementation Group. (January 2010)**

This report reviewed the progress of the AHWS over the last 5 years to indicate where key challenges remain. The group recommended *that Defra must work with the livestock sector to evaluate and coordinate the many surveillance opportunities* to provide a more coherent picture of all types of disease incursion. It also recommended *that data sources need to be collated joined up and disseminated* and that there is an essential need for Defra to *introduce a comprehensive livestock and equine data system* so it is possible to locate and trace animals during an outbreak. The *report commended the Disease Prioritisation tool but expressed reservations about its slow development* and the lack of progress with other initiatives.

- **Unlocking potential: A report on veterinary expertise in food animal production. Philip Lowe (June 2006)**

This report draws on deliberations of a working group set up in the wake of the EFRAcom report following the Foot and Mouth enquiries of 2001, to address the main concern over the sufficiency of veterinary expertise to support the farming industry. This report focuses on the AHWS's reliance on key partners adapting their roles and working together.

Link: http://www.defra.gov.uk/foodfarm/policy/animalhealth/vservices/pdf/lowe-vets090806.pdf

- **Foot and Mouth Disease 2007: A review and lessons learned. Chairman, Dr Iain Anderson CBE (March 2008)**

This inquiry investigated the government's handling of the 2007 Foot and Mouth epidemic in order to draw out lessons and make recommendations. A major recommendation focused on the *need*

to maintain vigilance both nationally and internationally and the need for greater emphasis on preparedness.

Link: http://archive.cabinetoffice.gov.uk/fmdreview/documents/fmd_2007_review_full.pdf

- **Livestock Information Strategy Review. Peter Topping (November 2008)**

This review examined whether RADAR was meeting business needs whilst complying with EU policy. Recommendations focused on *ensuring that the Defra network maximised the business benefits from RADAR.*

- **Defra's Evidence Investment Strategy 2010 – 2013 and beyond. (January 2010)**

This document outlines steps to improve the performance in gathering and using evidence effectively for policy making and in evaluating the outcomes. Key recommendations focus on dissemination and *communication of evidence beyond Defra to ensure wide use of investment,* whilst developing communications/networking skills of in-house specialists and working in partnership.

Link: http://www.defra.gov.uk/evidence/science/how/documents/eis-100126.pdf

- **The 2001 Outbreak of Foot and Mouth Disease. Report by the Comptroller and Auditor General. National Audit Office (June 2002)**

This report examined the adequacy of contingency planning for the 2001 Outbreak of Foot and mouth disease. A key recommendation was to review and ensure communication and information systems were able to cope in an emergency.

- **Detection & Identification of Infectious diseases in plants, humans and animals. Foresight Project, led by the Office of Science and Technology of the Department of Trade and Industry (now Department of Business Innovation and Skills) (April 2006)**

The aim of Foresight is to produce challenging visions of the future in order to ensure effective strategies now. Experts identified eight important categories of infectious disease. In relation to animals, these were New / emerging, zoonotic and drug-resistant diseases. They observed that in recent decades, societies have struggled to manage existing diseases, while, at the same time, a succession of new and novel pathogens has emerged. They concluded that " The best strategy is to stop their spread at an early stage, or prevent them altogether", that this relied on very early detection of the appearance of disease or disease-causing agents," and that the "animal reservoir, particularly in wild animals, will be an important and continuing source of infectious diseases in both livestock and humans.

Link: www.**foresight**.gov.uk

Annex B: Summary of progress against the original VSS delivery plan

Strategic Goal 1: **Strengthen Collaboration**		
Deliverable	**Status**	**Comment**
A functional and comprehensive network of surveillance partners	In progress	This objective has been largely met and there is good evidence of engagement with surveillance partners and collaborators across a wide range of species (see Annex C). Given that representativeness is of paramount importance, there is always a need to assess the relevance of specific groups missed by the current structures (e.g. poultry hobby keepers, pig keepers outside the integrated industry structure, etc).
Working in partnership to improve speed of detection and accuracy of prediction by improving communication between stakeholders.	In progress	Partnerships have been developed with several industries and also with wildlife stakeholders, and a number of examples are provided in the main text. This is a continuous process. Robust and comprehensive approaches to evaluate surveillance attributes (e.g. timeliness) are in progress.
Integration of research and surveillance projects	In progress	This is mostly exemplified by the contribution of existing specific projects (ED1039) and new ones starting in 2010 (R11) to surveillance methodologies. The continuous feedback from surveillance needs and research outputs is an ongoing process.
Using samples for more than one purpose.	In progress	A new generic framework is being developed to allow use of biological samples and data for multiple purposes and powers to allow its implementation are included in Clause 48 of the draft Animal Health Bill, which is currently (March 2010) undergoing public consultation. In the meantime opportunities have been created through amendments to some routine sample collection forms. For example, bloods from 2008 *Brucella melitensis* Sheep & Goat survey have recently been tested for Q fever.
Collaborative approach to funding	Partially done	Some progress has been made through increasing the contribution of private practitioners to the costs of testing samples submitted to VLA regional laboratories, however Defra continues to fund the majority of surveillance activities, with the exception of the equine sector where the input from industry is significant.

Strategic Goal 2: **To develop a Prioritisation process**		
Deliverable	**Status**	**Comment**
A functional and functioning prioritisation system	In progress	A prioritisation mechanism, praised by the EIG, has been delivered; it is in use to prioritise work related to exotic diseases and current work will enable it to prioritise the majority of diseases of domesticated animals. However it does not fully meet the expectation inherent in the VSS which anticipated the use of the mechanism also to prioritise work on i) diseases of wildlife, ii) new and emerging conditions, iii) welfare issues and iv) antimicrobial and anthelmintic resistance problems.
Increased speed of detection by improving scenario analysis, modelling and surveillance approaches reducing scope for surveillance 'gaps' and enabling earlier implementation of control measures	In progress	The key exotic diseases have been prioritised and as a result contingency plans for those of highest priority are being updated, and processes for their surveillance are under review.
Transparent risk and impact based prioritisation of surveillance activity	Now normal working practice	The criteria that define each Reason for Government Intervention, and that are used to determine the priority score, have been thoroughly explored and discussed with stakeholders, and these are set out on Defra's web pages. The undergoing expert review of the methodology will be published in due course.
More efficient use of public money	Now normal working practice	The "*Profiles Business Case 2009*" estimated a 16% return on investment over the next five years. Additionally, the AHWS criteria for Government Intervention are being used to inform the review of research proposals in some fields

Strategic Goal 3: **To derive better value from surveillance information and activities**		
Deliverable	**Status**	**Comment**
A flexible and functioning range of approaches to data collection, integration and analysis.	In progress	The development of RADAR has enabled population data from a range of different sources to be collated, integrated and analysed. Diagnostic data is now captured from both SAC and VLA diagnostic laboratories and includes analysis of unexplained illness ('DNR'); these data are integrated to provide GB level assessment of disease occurrence. A pilot study has explored the practicality of capturing data direct from cattle practitioners and farmers. The horse quarterly surveillance report introduced in 2004/5 captures, integrates and assesses data on horse diseases. The wildlife partnership has been established to capture and assess wildlife disease information.
Standardisation/harmonisation of surveillance approaches	In progress	Case definition at multiple levels has been harmonised to allow comparisons and pooling. This is mostly within Defra family. With the development of further collaboration this could usefully be extended outside Defra to other providers of surveillance data/intelligence.
Standardise denominator data amongst stakeholders	Now normal working practice	This is now well established, by the development and implementation of the RADAR information management system, for domesticated species (and with varying levels of comprehensiveness within them: greater for cattle than for camelids for example). Efforts continue to identify and prioritise gaps in our knowledge with regard to some animal populations.
Increase likelihood of detecting patterns of disease behaviour	In progress	RADAR provided a pool of evidence during recent disease emergencies used to help understand disease risk, target disease surveillance and support policy decisions. Quality assured data from RADAR has supported quantitative modelling exercises, and veterinary risk assessments. Regular analyses of surveillance submissions would benefit from greater perception and use of evidence on population exposures.

Strategic Goal 4: **To share information more widely**		
Deliverable	**Status**	**Comment**
User-friendly and widely used system that produces structured and ad-hoc surveillance reports	Now normal working practice	This is mostly represented by outputs from RADAR and focuses mostly on population data. Additionally, VLA monthly reports are published in the *Veterinary Record* and on VLA's website.
Surveillance information disseminated rapidly to target audiences	In progress	In "peace time", RADAR's median time to respond to surveillance requests was 12 days. Urgent matters are reported to target audiences on an ad-hoc basis, for example by Press Briefs or letters to the Veterinary Record. Work is in progress to better target the VLA's surveillance reports and to review and assess the timeliness of non-RADAR surveillance reports.
Improved awareness of current animal health status in the UK	Partially done	A new system of text messaging to inform poultry keepers of notifiable disease alerts has been introduced and a number of outputs are produced regularly that inform about the animal health status (e.g. CVO Report, Zoonoses Report; see also main text). A clear definition of the animal health status in the UK, integrating evidence from multiple surveillance sources and interventions, would facilitate efforts to improve awareness.
Collation of information on animal health and welfare problems and related potential public health problems	Now normal working practice	The scanning surveillance project collates information from submissions received across the VLA network of laboratories and the Animal Health Trust collates information on equine submissions. Specific cases of zoonotic infections detected are presented in VLA's monthly and quarterly reports. There are also escalated to the DoH and HPA through HAIRS.
Researchers have increased access to surveillance data	Normal working practice	Much work has been done to develop data sharing protocols to allow increased access to data within the relevant legislation. Sharing of data for research on exotic diseases, modelling and other (defined) purposes is now routine, and is managed by the RADAR team.

Strategic Goal 5: **To enhance quality assurance of outputs**		
Deliverable	**Status**	**Comment**
Surveillance reports are better matched to user's needs	Partially done	RADAR reports are directly focused on user's needs through a standardised commissioning process; work to ensure scanning surveillance reports are better matched to user's needs is in progress. VLA have carried out practitioner surveys, and is working with Defra and AH to better understand their needs.
Quality statements on surveillance outputs which enable users to understand their significance/meaning	Now normal working practice	All species specific quarterly surveillance reports and RADAR reports have a quality statement that describes the provenance and potential biases of the data presented. RADAR outputs also follow a flag-system.
Increased confidence of users in reliability of information	Partially done	Feedback forms from RADAR users indicate that they are content with RADAR outputs. Anecdotal evidence supporting the acceptability of the quarterly species surveillance reports is available.
Information on data quality fed back to providers	Partially done	RADAR feeds back information on data quality to several partners/data providers (e.g. SAMU, AMLS) and maintains a feedback log. Other initiatives exist, for example: i) the VLA conduct regular assessments of the quality of their data and feedback information to VIOs, ii) VENDU efforts relating to the collection of data on exotic incidents (e.g. regular feedback to AH).
Education programme to enhance stakeholders participation.	Partially done	The VLA maintains regular contact via newsletters with practitioners within Regional Laboratories' catchment areas. Messages relating to data quality are common. Similarly, there is an active programme of engagement with the Vet Schools where the role of practitioners in scanning surveillance is promoted.
Quality of information, standardised and validated data fields under the *Quality Framework*	Partially done	RADAR outputs provide information to users about the integrity of the data so invalid interpretations are prevented. Other activities suggested under the *Quality Framework* have not yet been delivered.
Independent accreditation	Partially done	Surveillance projects handling data within the VLA adhere to ISO 9001/2000 standards.

Annex C: Examples of functional networks of surveillance partners and collaborators (strategic goal 1) by species.

Cattle

VLA Cattle Group – collaboration between Defra, SG, VLA and SAC established. Wide range of experts involved in the group. Collaboration with contributing veterinary practitioners and farmers.

Cattle Health and Welfare Strategy Council – first met January 2007 – This is industry led but endorsed by Defra. The Council have expressed interest in working with VLA to convert disease surveillance information into practical strategies.

Grants provided by EBLEX and Milk Development Council at request of EIG.

Pigs

VLA Pig Group – collaboration between Defra, SG, VLA, SAC established (2008). Membership includes BPEX, Pig Veterinary Society and academic researchers with interest in pig surveillance. Collaboration with contributing veterinary practitioners and farmers.

Pig Health and Welfare Council – industry led (BPEX) with Defra and welfare organisation involvement.

Launched Pig Health and Welfare Strategy in 2003 where disease surveillance is identified as a priority.

British Pig Health Scheme – industry led. Abattoir based inspection of pigs. Data being collated and Defra considering how this could be used to supplement scanning surveillance data.

A 'Review of surveillance activities in the pig industry in England' was carried out by Prof Katharina Stark in 2007.

This project identified and reviewed the surveillance activities in pigs occurring in UK. The review highlighted the possibilities and challenges in integrating results from more than one surveillance system.

Small ruminants

VLA Sheep and Goats group – collaboration between Defra, SG, VLA, SAC established. Collaboration with contributing veterinary practitioners and farmers

Health and Welfare Sector council first met in December 2007. No health and welfare strategy yet produced. Industry led. Grant awarded initially by EBLEX at request of EIG.

Sustainable Control of Parasites in Sheep (SCOPS). Project is not entirely surveillance, but does have some elements of surveillance. Led by the National Sheep Association with input from Defra, veterinary practitioners and other collaborators.

Poultry

VLA Avian group - collaboration between Defra, SG, VLA, SAC established. Collaboration with contributing veterinary practitioners and farmers

British Poultry Sector Health and Welfare Council.

Camelids

VLA Miscellaneous and Exotic Farmed Species group. Collaboration with contributing veterinary practitioners and farmers/owners

Equine

Scanning surveillance project established in 2004. Delivered by Animal Health Trust. Strongly supported by BEVA and HBLB.

Data collected by network of commercial, government and academic laboratories. Data derived from throughout UK, including collaboration with AFBI, VLA and SAC.

Companion animals

Defra collaborates with the University of Liverpool in an initiative on surveillance of companion animals. This is collaboration between academia, veterinary practitioners, private veterinary laboratories and government, which is funded by a consortium that includes Defra and a number of pharmaceutical companies as well as the University of Liverpool. Defra's involvement began in 2008 (www.liv.ac.uk/SAVSNET).

The Dog and Cat Travel Risk Information (DACTARI) system. This national voluntary reporting scheme aims to collect information on exotic diseases in dogs and cats. This was set up with involvement from British Veterinary Association and British Small Animal Veterinary Association with advice from the Department of Health. http://www.defra.gov.uk/animalh/diseases/veterinary/dactari/

Wildlife

VLA Wildlife Group shares information with SAC and is looking to expand collaboration with formation of the National Wildlife Disease Surveillance Partnership.

Scanning surveillance in wild birds – conducted by VLA.

Scanning surveillance in wild aquatic animals – Collaboration with CEFA and Environment Agency.

Bat Lyssavirus Surveillance – collaboration with Bat Conservation Trust

Breeding Birds Survey – British Trust for Ornithology Study.

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