VIDA diagnoses are recorded on the AHVLA FarmFile database and SAC LIMS database and comply with agreed diagnostic criteria against which regular validations and audits are undertaken.

The investigational expertise and comprehensive diagnostic laboratory facilities of both AHVLA and SAC are widely acknowledged, and unusual disease problems tend to be referred to either. However recognised conditions where there is either no diagnostic test, or for which a clinical diagnosis offers sufficient specificity to negate the need for laboratory investigation, are unlikely to be represented. The report may therefore be biased in favour of unusual incidents or those diseases that require laboratory investigation for confirmation.

AHVLA Regional Laboratories and SAC Veterinary Surveillance Centres have UKAS Accreditation and comply with ISO 17025 standard.

The Scottish Government

Horizon Scanning

Contents

<table>
<thead>
<tr>
<th>Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>2</td>
</tr>
<tr>
<td>New and Emerging Diseases</td>
<td>3</td>
</tr>
<tr>
<td>Unusual Diagnoses</td>
<td>4</td>
</tr>
<tr>
<td>Changes in Disease Patterns and Risk Factors</td>
<td>6</td>
</tr>
<tr>
<td>Horizon Scanning</td>
<td>9</td>
</tr>
<tr>
<td>References</td>
<td>10</td>
</tr>
</tbody>
</table>

Highlights

These reports aim to identify emerging animal disease related threats. Their production is underpinned by a large amount of surveillance data and information compiled as part of the Defra Food and Farming Group animal disease surveillance programme. Some of these data can be viewed on the AHVLA website. http://www.defra.gov.uk/ahvla-en/publication/pig-survreports/

- Spread of Porcine Epidemic Diarrhoea virus within North America
- Single episode of piglet deformities on outdoor unit
- Increase in Haemophilus parasuis disease incidents
- Swine influenza outbreaks with salmonellosis
- African Swine Fever detected in Lithuania
INTRODUCTION

This report contains analysis of disease data from AHVLA and SAC Consulting: Veterinary Services (SACCVS) from samples submitted for diagnosis to regional laboratories in the fourth quarter of 2013 and selected annual data for 2013.

Table 1: Pig Diagnostic Submissions, Quarter 4 (October to December), 2009-2013

<table>
<thead>
<tr>
<th>Oct-Dec</th>
<th>Non Carcase Submissions</th>
<th>Carcase Submissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AHVLA</td>
<td>SAC</td>
</tr>
<tr>
<td>2013</td>
<td>183</td>
<td>63</td>
</tr>
<tr>
<td>2012</td>
<td>137</td>
<td>63</td>
</tr>
<tr>
<td>2011</td>
<td>163</td>
<td>120</td>
</tr>
<tr>
<td>2010</td>
<td>133</td>
<td>59</td>
</tr>
<tr>
<td>2009</td>
<td>125</td>
<td>116</td>
</tr>
</tbody>
</table>

Table 2: Pig Diagnostic Submissions, Annual 2009-2013

<table>
<thead>
<tr>
<th>Year</th>
<th>Non Carcase Submissions</th>
<th>Carcase Submissions</th>
<th>Total submissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AHVLA</td>
<td>SAC</td>
<td>Total</td>
</tr>
<tr>
<td>2013</td>
<td>603</td>
<td>254</td>
<td>857</td>
</tr>
<tr>
<td>2012</td>
<td>628</td>
<td>324</td>
<td>952</td>
</tr>
<tr>
<td>2011</td>
<td>601</td>
<td>417</td>
<td>1,018</td>
</tr>
<tr>
<td>2010</td>
<td>598</td>
<td>339</td>
<td>937</td>
</tr>
<tr>
<td>2009</td>
<td>588</td>
<td>596</td>
<td>1,184</td>
</tr>
</tbody>
</table>

In the fourth quarter of 2013 (Q4, October to December), total diagnostic submissions were only slightly lower than the average of Q4 in prior years, 2009-2012, being 3.7% less. The marked reduction in diagnostic submissions to AHVLA and SACCVS in July to September 2013 compared to the same quarter in previous years did not continue in this quarter. Breaking down the submissions into carcase and non-carcase; AHVLA carcase submissions in Q4 were similar to the same quarter in 2012 but 17% reduced compared to the average in prior years, while AHVLA non-carcase submissions in Q4 were higher than in any year since 2009. This is likely in part, to reflect the seasonal upsurge in respiratory and systemic disease which occurs during the autumn and winter months. Carcase submissions to SACCVS in Q4 were also similar to the same quarter in 2012 but were 46% lower than the average in prior years and SACCVS non-carcase submissions were reduced by 30% compared to the average of prior years. The reduced SACCVS submissions continue to reflect the movement of a significant number of weaners into northern England for rearing for slaughter as mentioned in previous reports. This situation may change following a recent announcement that Scotland’s biggest pork processing plant will almost double in capacity following investment from the Scottish Government. The annual pig diagnostic submission figures for 2013 show a 23% reduction in total submissions which mainly reflects reduced carcase and noncarcase SACCVS submissions (by 46%) and reduced AHVLA carcase submissions (by 27%) compared to the averages of prior years, particularly due to low carcase submissions in Q3, 2013. Interestingly, SACCVS reported a 65% increase in pig monitoring submissions from the whole of GB, this is encouraging evidence of pig producers being proactive in assessing herd status for various pathogens. It is still suspected that more on-farm post-mortem examinations are being performed to keep variable costs down. The reduced diagnostic submissions in 2013 continue a decline which began in Q2, 2012 and has been commented on in previous quarterly reports. The balance between feed costs and slaughter pig prices has been more favourable for pig farmers in recent months and, if continued, this may mean that farmers are prepared to invest more in diagnostic investigations. Whether they undertake these through AHVLA or SACCVS will also depend on maintaining effective engagement of private veterinary surgeons (PVS) and clear timely communication to PVS about how AHVLA’s Surveillance 2014 will be implemented is an essential part of this engagement.
NEW AND EMERGING DISEASES

ANALYSIS OF DIAGNOSTIC SUBMISSIONS FROM WHICH NO DIAGNOSIS WAS MADE

This report reviews VIDA data where a diagnosis was not reached (DNR) despite the sample receiving “reasonable” testing. This allows monitoring of this class with the aim of providing information on potential new or emerging diseases or syndromes. ‘Prior years’ refers to pooled data for 2008-2012 for GB VIDA data.

DNR by Presenting Sign and Syndrome

- A total of 18.2% of pig submissions to Q4, 2013 did not reach a diagnosis. This was very similar to the overall DNR for the same period in prior years. Overall DNR rates for SACCVS (13.6%) and AHVLA (19.3%) individually were not significantly elevated for this period compared to the same period in prior years.

- There was a DNR of 11.8% for GB submissions with a presenting sign of ‘Diarrhoea’ which was significantly lower than the DNR of 21.2% in prior years. This was due to a significant reduction in DNR for AHVLA submissions with a presenting sign of ‘Diarrhoea’ (11.6%) compared to prior years (22.9%), while for similar submissions to SACCVS, there was no significant change in DNR (12.5%) compared to prior years (14.8%). For enteric syndrome submissions to Q4, 2013, DNR was 15.4% (AHVLA 16.9%, SACCVS 11.3%) which was also not significantly changed from prior years (18.1%). DNR for diarrhoea as a presenting sign and enteric syndrome are being kept under review in the light of both the emergence and continued spread of porcine epidemic diarrhoea in North America and the reports of a neonatal porcine diarrhoea syndrome in parts of Europe mentioned in the last Emerging Threats report. The reduction in DNR for submissions with a presenting sign of diarrhoea provides some reassurance that these diseases have not emerged in GB pigs.

- There was no significant increase in DNR for AHVLA or SACCVS submissions to Q4 2013 with a presenting sign of “Wasting” compared to the same period in prior years and no such submissions were undiagnosed in Q4. The undiagnosed AHVLA submissions in previous quarters with a presenting sign of wasting were reviewed for past Emerging Threats reports and did not suggest a common clinical or pathological condition, or the presence of periweaning failure to thrive syndrome (see http://www.defra.gov.uk/ahvla-en/files/pub-vet-pfts.pdf).

- There was no other overall significant increase in DNR for other syndromes or presenting signs for GB, AHVLA or SACCVS data.

Analysis of undiagnosed submissions in Q4, 2013 has not revealed evidence of a new and emerging syndrome in GB pigs.

Spread of virulent Porcine Epidemic Diarrhoea virus within North America

Porcine epidemic diarrhoea (PED) emerged earlier in 2013 in a virulent form in the United States of America (USA) and, in January 2014, the first diagnosis of the disease in Canada was made on a breeder-finisher unit in Ontario in a relatively pig-dense area. There are thousands of livestock movements between the US and Canada each year and Canada had been concerned about the risk of introduction of PED virus either by live pigs or on vehicles contaminated with infected faeces. The route of introduction of infection into the USA has still not been established although the virus is believed to be of east Asian origin. By January 2014, 23 US states had reported at least one confirmed case of PED.

BPEX funded an assessment of seroprevalence to PEDv in GB pigs using samples collected for a recent abattoir survey in pigs jointly funded by Government and industry. Antibody to PED virus was detected in approximately 10% of slaughter pigs suggesting that the national pig herd is largely naïve to PEDv, whether endemic or virulent. Caecal samples from just the seropositive pigs were tested for PED virus by PCR and no viral nucleic acid was detected. The low seroprevalence indicates that PEDv serology
could be a useful tool to detect exposure to virus at herd level but PEDv PCR on individual faecal samples remains the method of choice for diagnosis. Batch PCR testing of routine diagnostic samples submitted to AHVLA from pigs with diarrhoea through a combination of BPEX funding and Defra-funded surveillance has not detected PED virus so far. **These results suggest a high degree of susceptibility of the national pig herd to PEDv, and the limited PCR testing of diagnostic samples has not implicated endemic PED viruses as a significant current cause of diarrhoea in pigs in England and Wales. Funding for diagnosis of suspected virulent PED outbreaks, should they occur, remains available from the Defra-funded pig scanning surveillance project (ED1200).**

**UNUSUAL DIAGNOSES OR PRESENTATIONS**

There were a number of unusual diagnoses this quarter; details of these have been included in monthly AHVLA and SACCVS reports and AHVLA highlights to BPEX, BPA and Pig Veterinary Society. These will be kept under review to assess whether they are seen on other units and justify initiation of emerging disease investigations.

**Otitis with bacterial and mycoplasmal involvement in pigs with swine influenza**

Further to the unusual outbreak of head tilt in outdoor gilts described in the last Emerging Threats report, another outbreak of middle and inner ear disease causing nervous signs was diagnosed in 10-week-old growing pigs being reared in cosikennels. Thirty of 700 were affected and five died. Clinical signs were principally head tilt, head tremor and circling, and there was also weight loss and some respiratory disease in the group. The previous batch of pigs weaned three weeks earlier from the same breeding herd had also been affected. The pigs were vaccinated for PRRSV, PCV2 and *Mycoplasma hyopneumoniae*. Five typical cases were submitted live (figure 1) showing head tilts and poor body condition. Sectioning of the cranium in all the pigs revealed exudate accumulation in the region of middle and inner ears with softening, fragmentation and pale irregular discolouration of the adjacent cancellous occipital bone (figure 2). Exudate was also present in the adjacent ear canal in two pigs. *Pasteurella multocida* and *Trueperella pyogenes* were both isolated from these lesions. Lesions were well established and involved bone tissue, thus it was not surprising that a poor response was reported to recent antimicrobial treatment.

Figure 1: Pigs with head tilt due to suppurative otitis  
Figure 2: Section through cranium - suppurative otitis lesions and adjacent osteomyelitis

All the pigs submitted also had severe pneumonias from which *Pasteurella multocida* was mainly isolated, with *Trueperella pyogenes* from the lung of one pig. Active swine influenza virus infection was detected in two pigs by PCR and would have exacerbated the clinical disease. Histopathology also revealed lung lesions suggesting possible mycoplasmal involvement and *Mycoplasma hyorhinis* was
detected in the lung of two pigs together with *Mycoplasma hyopneumoniae* in the lung of one. The case was discussed with colleagues in Europe and the possibility of involvement of *Mycoplasma* species infection as an initiating cause of the otitis was raised. Further testing of samples from the otitis lesions yielded both *Mycoplasma hyorhinis* and *Mycoplasma hyopneumoniae*, supporting their possible involvement. Infection may have spread to the ears from the tonsils by ascending infection via the Eustachian tubes; alternatively haematogenous spread may have occurred.

**Possible mycotoxicosis causing paresis in growing pigs**

Mycotoxicosis was considered a possible differential for nervous disease in seven-week-old weaners in one shed on a multisource single-age indoor straw-based nursery-finisher. Approximately 10% of pigs developed an unusual ungainly gait with apparent paresis of fore and hindlimbs although the pigs could, once standing, walk but the hocks appeared over-extended. The pigs were alert, without tremor and there was no history of meningitis. One pig was submitted live showing the clinical signs described and is shown in Figure 3.

**Figure 3: Paresis of limbs in pig with motor neuron chromatolysis**

The pig was in good body condition with no significant gross lesions but histological findings were very unusual, the most spectacular change being found in spinal cord motor neurons where there was very extensive chromatolysis. Overall there was a very limited inflammatory response, strongly suggesting a neurodegenerative process as a consequence of toxic or of intrinsic or acquired metabolic cause. Porcine breed-related (presumptive inherited) motor neuron disease has been reported in Yorkshire and Hampshire pigs (Montgomery and others, 1989), although the pathology in this case was somewhat different. As the pigs were a commercial hybrid of Large White, Landrace, Duroc and Hampshire breed, an inherited cause was not considered likely. The pathology had some overlap with that reported by Wohlsein and others (2012) in cases of sudden onset neurological signs associated with extensive motor neuron degeneration suggestive of a toxic cause, although their toxicological and microbiological investigations failed to identify the cause. By extrapolation from findings in other species, possibilities raised by the histopathologist to consider included *Aspergillus clavatus* mycotoxicosis, aluminium toxicity, tin toxicity, copper deficiency, vitamin E deficiency and plant intoxication (*Chrysocoma tenuifolia*). Biochemistry ruled out copper and vitamin E deficiency and selenium status was also satisfactory. Interestingly, other affected pigs recovered after showing transient signs and the problem did not recur or spread and no more pigs were submitted to investigate further. Given this, the acute nature of the clinical disease and pathology, and other epidemiological features of the outbreak, an extrinsic cause was probable and toxicity due to *Aspergillus clavatus* mycotoxicosis from fungal contamination of the environment, particularly the straw bedding was suspected to be the most likely cause but was not proven and a source was not evident from an on-farm visit by the attending veterinarian.
Single episode of piglet deformities on outdoor unit

Piglets with head deformities were born into eight of 100 litters in a single batch of sows farrowing on an outdoor unit. One or two piglets were deformed in each affected litter with littermates appearing to be unaffected. Some mummified piglets were also delivered in the affected batch. The problem did not occur in the subsequent batch to farrow, nor on a sister outdoor breeding unit nearby, and no other health problems were reported in the herd. Meningoencephalocele (figure 4) and cyclopia were the main deformities seen although the one piglet submitted to AHVLA had deformity of the lower jaw and oral cavity (figure 5). Histopathology and virus microarray (Gurrala et al., 2009) were undertaken on tissues from the submitted piglet and neither provided evidence to support viral involvement in the problem. Familial associations to meningoencephalocele are reported in some breeds (Wijeratne and others, 1974; Vogt and others, 1986). The piglets were Landrace cross Duroc and farm records indicated that more than one boar had sired litters, and that all of these boars had normal litters before and after the event making a genetic cause unlikely and exposure of the sows to a transient environmental factor affecting embryos early in development was considered most likely. Hemlock toxicity remains a possibility. Human neural tube defects are generally considered to result from a combination of genetic and environmental factors, as well being influenced by folic acid supplementation, and exposure to an environmental factor which acted as a folic acid antagonist is another possibility. The piglets derived from matings in mid June 2013 and it was known that the sows had been subject to significant heat stress in mid to end of July, the significance of this in the clinical problem was unclear.

Figures 4: Meningocele (image kindly provided by practitioner)  Figure 5: Developmental abnormality of oral cavity by and mandible

Changes in Disease Patterns and Risk Factors

Increased rate of diagnosis of Haemophilus parasuis disease incidents

In 2013, AHVLA saw the highest annual rate of diagnosis of respiratory and systemic disease due to Haemophilus parasuis (Hps) since 2002 (figure 6). In spite of reduced submission numbers in July to September 2013, the diagnostic rate was highest in quarter 3 and the trend continued into the fourth quarter of 2014 as illustrated in figure 7.

Figure 6: Annual rate of AHVLA diagnoses of disease due to Hps as % diagnosable submissions
Hps diagnoses are a combination of Glässer's disease and pneumonia due to Hps. All the disease incidents were diagnosed in pigs aged 3–15 weeks apart from one case of Glässers in an adult. There were outbreaks where Hps disease occurred concurrent with viral disease as illustrated in figures 8 and 9. However it was streptococcal disease and salmonellosis which were the two most frequent concurrent diagnoses, together with pasteurellosis with Hps pneumonia.

A presentation on this increased rate of Hps diagnosis was given at the November 2013 Pig Veterinary Society conference ("Increase in Haemophilus parasuis disease incidents - Laboratory anomaly, myth or reality?" Susanna Williamson) to disseminate the findings and obtain the views of practitioners as to whether these laboratory observations reflect a true increasing disease trend in the field. The view was that more disease was being seen although discussion did not reveal why this was occurring. To investigate the possibility of a shift in the Hps serotypes involved in disease, MSD UK Ltd kindly funded serotyping of all AHVLA Hps isolates from 2011-2013 and the serotypes detected by year are shown in figure 9.
The results did not provide evidence to indicate that a change in serotype accounts for the increased Hps diagnostic rate. However, the analyses showed that serotypes 4 and 5 together comprise 34% of the Hps isolates identified between 2011 and 2013 and remain, in 2013, the two most commonly identified serotypes (9 of 24 isolates) identified. However, they do not represent the majority and a significant proportion of isolates (24%) from 2011-13 were not typeable. Commercial vaccines currently available are based on serotypes 4 and 5 and the degree of immunity offered by vaccines to serotypes other than 4 and 5 is uncertain. It is important that AHVLA continue to isolate Hps and retain isolates stored. Veterinarians considering the use of vaccine may wish to fund serotyping before implementing this intervention as a control measure.

**Swine dysentery shows an annual decline but outbreaks persist in Yorkshire**

The diagnostic rate of swine dysentery (SD) by AHVLA and SACCVS has declined since 2011 as illustrated in figure 10. SD was identified by the British pig industry in 2011 as one of the top four diseases to be targeted for control as indicated in the vision for the 20:20 Pig Health and Welfare strategy and embraced by BPEX’s Pig Health Improvement Project (PHIP). Significant progress has been made in sharing information about SD outbreaks and provision of advice. More recently, BPEX have funded multi-locus sequence typing on SD isolates from AHVLA and SACCVS to assist in understanding the epidemiology of outbreaks. In spite of these initiatives, there are some areas where SD persists and, at the end of 2013, infection spread to newly infect three pig units in Yorkshire which declared their infected status and are working to contain the infection. Tiamulin resistance occurs in a high proportion of \(\text{B. hyodysenteriae}\) isolates in some European countries and has been detected in a minority of isolates in GB, some of these have been multi-drug resistant. Spread of a multi-drug resistant \(\text{B. hyodysenteriae}\) isolate is particularly serious and has resulted in depopulation of some pig units as the only means of control. **Surveillance for tiamulin, and other antimicrobial resistance, in \(\text{B. hyodysenteriae}\) is vital** and AHVLA undertakes tiamulin minimum inhibitory concentration testing on \(\text{Brachyspira hyodysenteriae}\) isolates when isolated from diagnostic submissions.

Swine influenza outbreaks with salmonellosis in weaners

Since the emergence of pandemic H1N12009 virus in GB pigs and the introduction of the m gene PCR for routine diagnosis, both in 2009, the annual rate of swine influenza diagnoses increased significantly and in 2013 was 4.9%, similar to 2011-12 (figure 11). Strains H1N2 and pandemic H1N1 2009 were the predominant strains circulating in GB pigs in 2013 with just one detection of avian-like H1N1. A feature of some recent swine influenza outbreaks in weaners has been the diagnosis of salmonellosis at the same time or in slightly older pigs. Although swine influenza alone does not generally cause mortality in pigs, it may affect the ability of young weaners to establish normal feeding and drinking when infection occurs immediately postweaning, which could predispose them to salmonellosis and other enteropathogens. In addition, where antimicrobials are used to treat the respiratory disease seen, these tend to favour colonisation of salmonella organisms which are resistant to the commonly used antimicrobials for respiratory disease. This has been highlighted in a previous Emerging Threats report and active swine influenza infection and its clinical impact through predisposing to other disease may not be recognised.
without diagnostic investigations at the appropriate time. **Descriptions of clinical scenarios involving swine influenza have been included in AHVLA’s monthly highlights to the pig industry and Pig Veterinary Society. AHVLA offers free of charge PCR testing for swine influenza under a Defra-funded surveillance project, details are given in the link:** http://www.defra.gov.uk/ahvla-en/publication/vet-si/

Figure 11: Annual diagnostic rate of swine influenza

---

**HORIZON-SCANNING**

**African Swine Fever detected in Lithuania**

African Swine Fever (ASF) virus was recently reported to have been detected in wild boar in Lithuania. There is no evidence of disease yet being reported in the commercial pig sector in Lithuania however this is the first report of spread into the EU of ASF from neighbouring Eastern European countries. A preliminary outbreak assessment published by AHVLA indicates that spread was by movement of infected animals from affected regions in Belarus, (link for further details http://www.defra.gov.uk/animal-diseases/monitoring/poa/). Wild boar are notoriously difficult to control and the assessment emphasised the need to maintain vigilance in terms of movement of livestock, transport, workers around and out of the region and entering commercial pig farms. The quantification of risk from illegal trade is difficult to measure and it is therefore considered that there is a constant low risk of introduction of various exotic animal diseases into an uninfected area through the illegal trade of infected meat or contaminated products/fomites; this list of diseases includes ASF. BPEX has compiled an ASF webpage for pig producers with a wealth of background information http://www.bpex.org.uk/r-and-d/pig-health/asf.aspx. A consortium of experts working on ASF (ASForce) have produced an on-line training course on ASF http://asforce.org/course/ In the light of the recent spread of African Swine Fever into the EU, this was circulated to AHVLA veterinary staff to refresh their knowledge of the virus and disease. **The key to control of ASF is early detection, and a disease alert was included in AHVLA surveillance centre newsletters to private practitioners asking veterinary surgeons with clients who keep pigs to remind them of the requirement to report any clinical signs suspicious of ASF, and of what those signs look like. Links were provided to information on ASF on the Defra website and a useful ASF leaflet http://www.defra.gov.uk/animal-diseases/a-z/african-swine-fever/, http://asforce.org/flyers/asforce-en.pdf.**

**Brachyspira hampsonii isolated from pigs in Germany**

A new potentially pathogenic Brachyspira species, *B. hampsonii*, was described in 2012 in US and Canadian pigs. This species has not yet been identified in diagnostic submissions to AHVLA or SACCVS, although there has been no comprehensive survey for it and there is no knowledge of the incidence of *B. hampsonii* in Europe. Rhode and others (2013) recently reported detection of *B. hampsonii* in pigs showing mild to moderate diarrhoea imported to Germany from Belgium. Several *Brachyspira* species were cultured from the pigs and identified as *B. murdochii*, *B. innocens* and *B. intermedia*. Three of six *B. intermedia* isolates proved to be negative in a species-specific PCR and sequencing of the nox-gene of these isolates revealed that the sequences were 99% identical to *B. hampsonii* clade I strain KC35 and EB106. The paper describes the phenotypic characteristics of the three isolates and these indicate that the bacteriological methods used by AHVLA and SACCVS would have identified them as *B. hampsonii*. The authors noted that *B. hampsonii* might be phenotypically
confused with indole-negative *B. hyodysenteriae*, which are common in Belgium and Germany, but are unusual in GB. **This finding emphasises the importance of not relying solely on specific (molecular) tests for known pathogens, and the need to maintain a range of clinical microbiology methods that are non-specific and enable detection of emerging pathogens, not previously identified.**

**REFERENCES**


