Contents

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction &amp; overview</td>
<td>2</td>
</tr>
<tr>
<td>New &amp; re-emerging diseases and threats</td>
<td>5</td>
</tr>
<tr>
<td>Ongoing new and re-emerging disease investigations</td>
<td>7</td>
</tr>
<tr>
<td>Unusual diagnoses</td>
<td>8</td>
</tr>
<tr>
<td>Changes in disease patterns and risk factors</td>
<td>10</td>
</tr>
<tr>
<td>Horizon Scanning</td>
<td>12</td>
</tr>
<tr>
<td>References</td>
<td>14</td>
</tr>
</tbody>
</table>

Highlights

- Diagnostic submissions                                    | 3    |
- Adenovirus enteritis                                      | 8    |
- Unusual myopathy in dairy cross calves                    | 9    |
- Horizon scanning: Lumpy Skin Disease and Bluetongue       | 12   |

VIDA diagnoses are recorded on the APHA FarmFile database and SAC Consultancy: Veterinary Services 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 APHA and SAC C VS 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.

APHA VICs have UKAS Accreditation and comply with ISO 17025 standard. SAC C VS have UKAS accreditation at their central diagnostic laboratory and at the Aberdeen, Edinburgh, Perth, Ayr, Dumfries, Inverness, St Boswells and Thurso Disease Surveillance Centres which comply with ISO 17025 standard.

From September 2014 APHA contracted the services of partner Post Mortem providers. From April 2015, these services were provided by the Royal Veterinary College, the University of Bristol, University of Surrey, Wales Veterinary Science Centre and SACCVS. These providers contribute to the VIDA diagnoses recorded on the APHA FarmFile database and comply with agreed diagnostic criteria. To achieve a VIDA diagnosis, all testing must be carried out by a laboratory with ISO 17025 accreditation.
INTRODUCTION

This report contains analysis of disease data from APHA, SAC Consulting: Veterinary Services (SAC CVS) division of Scotland’s Rural College (SRUC) and partner post mortem providers (SAC CVS, University of Bristol Veterinary School, Royal Veterinary College, University of Surrey, Wales Veterinary Science Centre) from samples submitted in the first quarter of 2017 compared to the equivalent quarter of previous years. It aims to identify emerging cattle disease related threats. The production of the report is underpinned by a large quantity of surveillance data and information, compiled as part of the Defra Plant and Animal Health and Animal Health and Policy Implementation Directorates. Further information can be found at http://ahvla.defra.gov.uk/vet-gateway/surveillance/index.htm.

OVERVIEW

Issues and Trends

Climate

![Winter 2017 mean temperature (left) anomaly compared to 1981-2010 and rainfall (right) expressed as % of the average for 1981-2010](image)

Fig 1: Winter 2017 mean temperature (left) anomaly compared to 1981-2010 and rainfall (right) expressed as % of the average for 1981-2010

The winter period 2016-17 has been milder and drier compared with the 20 year average. March was the warmest since 1957, with rainfall about 110% of previous years in the northwest of GB. The warm spring may have had some impact in part on the lower submission numbers of cattle carcases in Q1 2017, although by no means all.
**Dairy**

The ongoing trend of steady increase in milk price (February 2017 average 27.46ppL) and reduced production (yearly cumulative total to February 2017 down 809 million litres compared to the previous year) has continued. This plus a strong cull cow trade has led to an ongoing optimism within the dairy industry. To contrast this some farmers will have a significant debt to pay off following the 2015-16 price downturn. In addition, the cost of feed has continued to rise and hence the margins for much of the dairy industry are likely to remain small.

Early spring grass growth so far in 2017 has been good with the prospect of high quality early cut grass silage for some, however the current concern over reduced rainfall in April could pose problems for grass and crop growth going forward if rainfall does not increase. The weather in April and May can be critical for the subsequent growth for the rest of the year.

**Beef**

Total UK cattle numbers were stable in 2016 (9.8 million) according to the Defra December report. There were slight increases in both dairy and beef in GB overall despite reducing numbers in Scotland, which declined 1% overall to 1.71 million. Recent hard winters, higher costs, tighter specification requirements and changes to support systems are all thought to have contributed to the 2016 drop in the Scottish herd.

AHDB Beef reported a stable GB market for prime beef in the last quarter of 2016 and this trend has generally continued through the first quarter of 2017. Reducing prices through the first quarter are regularly seen each year, and R4L deadweight steer price stayed around the 5-year average, but well ahead of Q1 2016 (and have been improving further in April). The commodity end of the market (cull cows) has been supported by the weaker pound and stronger exports. Scottish beef (which normally trades ahead of the rest of the UK) dropped more sharply over the quarter, ending much closer to the GB average price than is historically typical.

**Diagnostic submission trends**

**Coverage maps**

The map (fig 2) shows submissions for sheep and has been developed in collaboration with the Data Systems Group GIS team at APHA Weybridge, who generate the outputs to support the work of the SIU in evaluating the coverage of scanning surveillance activities in England and Wales.

Submission data was extracted from the VIDA database in order to include submissions to the diagnostic laboratories of SAC from holdings in England and Wales and are limited to those holdings that could be georeferenced. Please note that it is not currently possible to include Scottish data.

Demographic data on the underlying population of holdings by species is based on the work of the Livestock and Demographic Data Groups and derived from Cattle: Annual Inventory extracts as at December 2015.
The submission ratio for each species is the proportion of cattle holdings that submitted **at least one** carcase or diagnostic sample in the reference period over all holdings of that species in the spatial unit county.

**Fig 2:** Percentage of cattle holdings submitting at least one cattle diagnostic sample in Q1 2017, expressed as equal-sized hexagons
Diagnostic submissions

![Diagram showing cattle carcase submissions by year for Q1]

The slight increase in cattle carcase submissions noted across GB in 2016 has not continued. There are a number of potential explanations, not least the relatively favourable weather in winter 2016/7 which may have reduced disease burden. However, the trends are most marked in Eastern England (28% of the prior 5 years average) which is very concerning. It is to be hoped that the improved carcase collection service will encourage submission of more carcase material. This has been expanded since January 2017 to include most of England and Wales outside the hour drive time around each APHA Veterinary Investigation Centre and Partner post-mortem provider centre (fig 4).
Fig 4: Service provision for post-mortem examination and carcase collection in England and Wales, also showing SAC Disease Surveillance Centres in Scotland.

Free carcase collection is for pre-agreed surveillance PMEs only, and is not a free disposal service.

Fig 5: Cattle fetus/stillbirth submissions, Q1
Fetal/stillborn submissions have improved; perhaps the recrudescence of Schmallenberg virus has contributed (fig 5; see below)

NEW AND RE-EMERGING DISEASES AND THREATS

Monitoring the trends in diagnoses of known diseases cannot, by definition, detect either new diseases or changes in endemic diseases that would prevent a diagnosis from being reached (for example a change in the pathogen that compromised the usual diagnostic test). Such new or emerging diseases would probably first be detected by observation of increased numbers of submissions for clinical and/or pathological syndromes for which a diagnosis could not be reached in the normal way. Submissions for which no diagnosis is reached (DNR) despite testing deemed to allow reasonable potential for a diagnosis to be reached are regularly analysed to look for increases in undiagnosed disease which could indicate the presence of a new or emerging disease. Undiagnosed disease submissions are summarised broadly by the clinical presentation of disease and, once this has been determined by further investigation, the body system affected. Both groups are investigated and trends in the levels are compared over time.

Data recording by APHA and SACCVS was harmonised from 2007. The Species Expert Group reviews trends in VIDA DNR data each quarter with the aim of providing information on potential new or emerging diseases or syndromes. ‘Prior years’ refers to pooled data for 2012-2016 for GB VIDA data.

Supplementary analysis of APHA DNR data is also undertaken using an early detection system (EDS). This uses a statistical algorithm to estimate an expected number of DNR reports and a threshold value. If the current number of DNR reports exceeds the threshold (i.e. exceedance score>1), this indicates that the number of reports is statistically higher than expected. When this EDS tool identifies categories of submissions where the threshold DNR has been exceeded, the Species Expert Group reviews the data to investigate further. This review may involve assessment of individual DNR submissions. Where this DNR analysis finds no evidence of a new and emerging threat or other issue, the detail of these reviews in response to thresholds being exceeded may not be reported here.

Analysis of Diagnosis Not Reached (DNR)*

There was no evidence from DNR analysis in Q1 2017 of new and emerging disease in cattle, including analysis by syndrome and presenting sign.

* When a VIDA diagnostic code is assigned to a specific submission, the decision has to be made if it meets the stated diagnostic criteria. If the criteria are not met, it is marked as “Diagnosis Not Reached” or DNR. If it is a DNR, the next step is then to decide if this was due to limited testing or if reasonable testing had been done. If it is deemed that reasonable testing had been done, there may be reasons why a diagnosis could not be reached and this should be recorded and can include inappropriate disease phase, treatment, inconclusive results, or other reasons. Typical examples of such submissions include: coccidiosis cases where speciation was not done and Johne’s cases in live sheep where the test results may be inconclusive. However, in some cases there is no apparent reason to explain why a diagnosis could not be reached and these are the submissions, if present in significant numbers, which may indicate new and emerging disease.

ONGOING NEW AND RE-EMERGING DISEASE INVESTIGATIONS

Schmallenberg virus

Schmallenberg virus (SBV) was identified in the UK as a new and emerging pathogen of cattle and sheep in 2012, as part of the Europe-wide spread of this midge-borne Orthobunyavirus. Since then detection of SBV declined in GB as in Europe, with few or no cases in 2014 and 2015. SBV is considered endemic and is not a notifiable disease. However, reports from mainland Europe during 2016 of recrudescence were followed by reports from GB of congenital
deformities in lambs and calves (see the APHA Surveillance report http://veterinaryrecord.bmj.com/content/179/22/565?ijkey=9BP1tLzrC1kVg&keytype=ref&siteid=bmjournals). In order to better understand the apparent increase in cases, APHA has encouraged submission of suspect SBV cases (both acute systemic disease in adult dairy cows and congenital forms of the disease). APHA has also provided information on the number of premises where SBV cases in lambs and calves have been confirmed by APHA in England and Wales since December 2016 – this can be found on the Vet Gateway website: http://ahvla.defra.gov.uk/vet-gateway/schmallenberg/index.htm. This information will be updated to show new cases, by county, on a fortnightly basis during the coming months.

UNUSUAL DIAGNOSES

Adenovirus enteritis

A two-year-old heifer was submitted to APHA Starcross VIC. It was bright and healthy before developing haemorrhagic faeces and dying within 24 hours. She was non-pyrexic and was loose housed in a group of 20 other cattle which have remained unaffected. Significant postmortem findings included red abomasal mucosa with bloody contents and a haemorrhagic necrotic enteritis affecting the small and large intestines. Salmonella cultures and BVD PCR testing of spleen were negative. Histopathology results were very interesting and unexpected and included a lymphoplasmacytic enteritis, necrohaemorrhagic abomasitis and a lymphoplasmacytic interstitial nephritis, in which endothelial intranuclear inclusion bodies were detected. The presence of intranuclear inclusion bodies is consistent with a diagnosis of adenovirus infection. This is an uncommon cause of diarrhoeal disease in cattle, although adenoviruses are ubiquitous. Animals aged between 12-18 months are typically affected. Cases are usually sporadic but mini outbreaks can occur. Smyth and others (1996) provide a useful review of cases.

Suspected urea poisoning

Urea poisoning was suspected as the cause of disease in a group of 60 suckler cows in a Staffordshire herd. The practitioner was attending the herd for the first day of tuberculin testing. On arrival he was informed that 2 of the cows in one of the two pens, one an 18 year old, the second an in-calf heifer, were down. The old cow was relatively calm, the heifer was on its side, paddling or ‘mildly fitting’. Two of the animals in the other half of the building developed signs while present on the farm. One went down similar to the heifer; the other suddenly became very aggressive and charged the personnel. They were not blind. One other cow later also developed clinical signs. Two of the animals were blood sampled and all were treated with calcium and magnesium, antibiotics and NSAIDs. There was no beneficial response and all died. Around 10 to 11 others later developed milder signs, were treated with minerals subcutaneously and survived.

The animals were fed only hay and minerals and were on a straw bed. Very old mouldy baled silage had been added to one of the pens. The blood magnesium concentration in one of the two cows sampled, which had not been treated, was 0.86 mmol/l whereas it was 1.8 mmol/l in the second which had been treated (APHA reference interval 0.7-1.3 mmol/l). No lead was detected in either.
Further questioning of the farmer revealed that the mineral used contained urea and was intended for use mixed in cereal, whereas he had added it directly onto the surface of the hay.

It was concluded that urea poisoning was the likely cause of the clinical signs and deaths of the 5 animals. Intake of excess urea leads to breakdown to ammonia in the rumen, which causes a rumenitis, and its absorption into blood results in nervous signs, aggression being one reported feature. Clinical signs can occur within 10 minutes of ingestion, though they can take longer. Diagnosis can only be confirmed by postmortem examination: carcases can show dramatic multifocal haemorrhages and an ammoniacal rumen smell may be detected. Unfortunately no carcases were submitted in this case. Blood biochemistry for ammonia concentration could potentially also be diagnostic but no assay is currently available.

**Unusual myopathy in dairy cross calves**

APHA VIC Shrewsbury reported a myopathy in young dairy cross calves. Two calves aged about 1 week were submitted from a large (1100 cow) high performance dairy herd. The cows calve all year round.

In the week beginning 13 February, 6 calves had been affected similarly, 5 died, one was alive at the time of submission. The calves were clinically unremarkable for the first 5 days or so after calving. They then developed weakness and inability to rise on their hindlimbs, followed by being totally unable to rise on all 4 limbs. They were reported to vocalise in pain, become laterally recumbent and die in 2 to 3 days. Postmortem examination of the two calves revealed bilateral ‘tiger stripe’ pathology affecting the dorsal lumbar muscles (fig 6), with subcutaneous oedema overlying. The calves were Belgian Blue crossbred, with Holstein calves, which were fed a different milk powder, unaffected. The history, pathology and timing suggested a toxic or nutritional cause possibly in association with a batch of milk powder. Further investigations are in progress.

![Image of myopathy](image.png)
CHANGES IN DISEASE PATTERNS AND RISK FACTORS

This section of the report gives information on occurrence of selected diseases. The data originate from submissions and are summarised and presented according to the diagnosis reached and assigned as a VIDA code. Our charts show the number of diagnoses (numerator) as a proportion of the number of submissions in which that diagnosis was possible (denominator), for all of GB, England & Wales and for Scotland. The bars indicate the 95% confidence limits. Note that the y-axis of the charts varies and therefore care must be taken when comparing individual charts.

Schmallenberg virus and congenital abnormalities

Schmallenberg virus (SBV) was first diagnosed in GB in 2012. Since 2013, diagnoses recorded to the VIDA database declined in subsequent years. Although there was likely to be a submission bias as farmers and their veterinarians became familiar with the distinct gross pathology of arthrogryposis, hydranencephaly and spinal lesions, data from other sources indicated a true decline to apparent absence in SBV cases until late 2016, when cases began to be recorded again, initially in sheep but subsequently in cattle, reflecting the breeding patterns and different length gestation of these two species. The numbers and counties in which holdings affected by SBV in cattle and reported to VIDA in Q1 2017 are recorded in the table in fig 7 below.

<table>
<thead>
<tr>
<th>County</th>
<th>Number</th>
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<tbody>
<tr>
<td>Buckinghamshire</td>
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</tr>
<tr>
<td>Cornwall</td>
<td>1</td>
</tr>
<tr>
<td>Cumbria</td>
<td>4</td>
</tr>
<tr>
<td>Devon</td>
<td>3</td>
</tr>
<tr>
<td>Dorset</td>
<td>2</td>
</tr>
<tr>
<td>Dumfries &amp; Galloway</td>
<td>1</td>
</tr>
<tr>
<td>Durham</td>
<td>4</td>
</tr>
<tr>
<td>East Sussex</td>
<td>1</td>
</tr>
<tr>
<td>Hampshire</td>
<td>2</td>
</tr>
<tr>
<td>Kent</td>
<td>1</td>
</tr>
<tr>
<td>Norfolk</td>
<td>2</td>
</tr>
<tr>
<td>Northumberland</td>
<td>3</td>
</tr>
<tr>
<td>North Yorkshire</td>
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</tr>
<tr>
<td>Shropshire</td>
<td>2</td>
</tr>
<tr>
<td>Somerset</td>
<td>2</td>
</tr>
<tr>
<td>South Wales</td>
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</tr>
<tr>
<td>Staffordshire</td>
<td>1</td>
</tr>
<tr>
<td>Surrey</td>
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Fig 7: Number of holdings on which SBV was diagnosed in cattle in Q1 2017, by county (VIDA)

The APHA Cattle (CEG) and Small Ruminant Species Expert Groups, aware of the potential for submission bias to recur, offered free testing to confirm SBV from winter 2016 through Q1. In addition, a member survey carried out by the British Cattle Veterinary Association sought to determine the numbers and counties of cases of SBV suspected by BCVA members, and an indication of whether testing was carried out. At the time of writing this had not been published, but there were early indications of a degree of submission bias away from areas that had previously seen SBV. Anecdotal reports tend to confirm that SBV has been suspected through the areas in which it had previously been diagnosed in 2012-13. However, the table above clearly shows that SBV has also been diagnosed in 2016-17 in a wider area than previously,
including Scotland. APHA is currently reporting holdings affected by SBV on a county basis, with regular updates—see [https://www.gov.uk/government/publications/cattle-disease-surveillance-reports-2016](https://www.gov.uk/government/publications/cattle-disease-surveillance-reports-2016)

Similar recrudescence has been reported in a number of countries in mainland Europe that were previously affected.

There are likely to be several potential reasons for this recrudescence. Firstly, the virus may have been circulating at a level below the threshold for detection in the intervening period. Secondly, there could have been an incursion of infected midges from mainland Europe. Although plausible, this is less likely as reports of SBV in mainland Europe were only received a short time before cases were seen in GB.

SBV is a vector-borne disease, spread by *Culicoides* midges. Conditions in 2016 were favourable for the growth and spread of these midges. In addition, although there is growing evidence that, in common with Akabane virus, natural immunity is likely to be lifelong, the length of time between the current and the previous incursion of SBV (around four years) will have allowed sufficient of the livestock population to be replaced by naïve animals to allow herd immunity to decline sufficiently permitting infection to recrudesce. Although there are effective killed SBV vaccines, the uptake of these vaccines was poor, to the extent that after batches expired the manufacturer chose not to continue production for the UK market, and this failed to mitigate the decline in herd immunity. Thus it should be no surprise that SBV has recrudesced in GB, or that this is likely to continue through 2017.

![Incidents of congenital abnormalities as % of diagnosable submissions, Q1 2017, GB](image)

There was a significant increase in the number (n=31) and percentage of diagnosable submissions that presented as congenital abnormalities in GB in the first quarter of 2017 (fig 8). These were predominantly APHA and partner PME provider submissions from England and Wales. A review of these submissions indicated the majority (22/29) fitted the case description for SBV, and that these were SBV PCR negative. It is recognised that the proportion of bovine cases suspected on gross pathology as being SBV that are PCR positive is lower than that in sheep. This may be due to the longer gestation length of cattle allowing more time to clear the virus. The remainder of cases (7/29) were a variety of congenital deformities to be expected from time to time, such as complex vertebral malformation. Therefore it is likely that the majority of cases were unconfirmed SBV (ie PCR negative), which reflects a similar situation in 2012-13 (fig 8). The CEG will continue to monitor the situation.
HORIZON SCANNING

Lumpy Skin Disease

The International Disease Monitoring (IDM) team provides regular updates on the Lumpy Skin Disease (LSD) situation in eastern Europe, and on the risks of spread to GB. These may be found at https://www.gov.uk/government/publications/lumpy-skin-disease-in-bulgaria-and-greece. Although the risk to GB of spread of LSD is currently assessed as very low, the CEG together with the IDM team continues to monitor its behaviour.

Seven cases of suspicion of LSD, a notifiable disease, were reported to APHA in 2016, and negated. The CEG undertook follow-up diagnostic work on these cases, and achieved a diagnosis in four. This was reported in the Veterinary Record (Otter and others 2016).

The European Food Safety Authority has recently published the first paper of a two-part publication on LSD and experiences in the recent outbreaks in southeastern Europe. This first part reviews data collection and analysis of the disease progress, and response to the use of mass vaccination (http://www.efsa.europa.eu/en/efsajournal/pub/4773). A brief summary follows:

- The study reviewed the approach and progress of the various countries’ strategies in control of LSD, and Albania was chosen as a specific case study as it used vaccination without stamping out
- Mass vaccination using modified live vaccine strains was effective in reducing the peak number of outbreaks, and resulted in more rapid decline of infections during the outbreak season. Typically, this was achieved once the magical 70% of coverage at herd level was reached
- The use of mass vaccination has implications for ongoing surveillance as there is as yet no test that can differentiate infected from vaccinated animals (DIVA): this relies on reporting of suspect cases and use of molecular testing to identify likely vaccine strains
- The spread of LSD occurs in two distinct ways: mostly (75%) slow local (about 2km/day) consistent with vector-borne spread; and less frequent larger jumps (around 15km/day) consistent with movement of infected animals
- Previous epidemiological studies suggest that the presence and abundance of potential LSD vectors is one of the major risk factors contributing to LSD spread and persistence. These studies confirmed that, and recognised that further work is necessary to determine which vectors are most influential at country level (through a combination of trapping and vector competence studies)
- The vectors currently under consideration are
  - Ticks (hard and soft, ie Ixodidae)
  - Mosquitoes (Culicidae)
  - Tabanid flies (ie horseflies)
  - Stable fly (Stomoxys calcitrans)
  - Horn fly (Haematobia irritans)
  - Culicoides midges

The vectors likely to be more significant are in bold.
Bluetongue

France has reported over 550 new BTV-8 virus positive animals since January 2017 (fig 9). The majority of these are a result of pre-movement testing which is in place, and the sentinel surveillance in cattle in the areas under disease restriction. BTV-8 has been detected in the Nord département and as of the 17th February the restriction zone was increased to include the départements of the Nord, Pas-de-Calais, Somme, Oise and part of the Seine Maritime. Only 4 departments now remain free of BTV8 in France (Finistère, Calvados, Orne and Eure). The nearest case to the UK is still over 150 km away and therefore there are no restriction zones in the UK for bluetongue. Vaccination against BTV-8 has been carried out in France, principally in animals for export.

The disease situation in Q1 is in the context of the ‘vector-low’ period: looking ahead, the vector active period will begin in the next quarter in France, and similarly in GB. It is highly likely that the risk of BTV-8 reaching GB will increase. Colleagues are reminded of the importance of reporting suspicion of disease, both clinical and pathological.

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**Fig 9:** BTV-8 outbreaks in France since January 2017
REFERENCES
