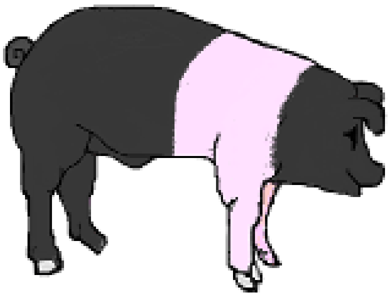

GB pig quarterly report

Disease surveillance and emerging threats

Volume 24: Q4 – October to December 2020

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the fourth quarter of 2020, October to December. It contains analyses carried out on disease data gathered from APHA, Scotland's Rural College (SRUC) Veterinary Services and partner post mortem providers and intelligence gathered through the Pig Expert Group networks. In addition, links to other sources of information including reports from other parts of the APHA and Defra agencies are included. A full explanation of how data is analysed is provided in the Annexe available on GOV.UK:

https://www.gov.uk/government/publications/information-on-data-analysis

Pig disease surveillance dashboard outputs

Diagnoses made in the fourth quarter of 2020 compared to the same quarter in 2019 through the GB scanning surveillance network are illustrated in Tables 1a and 1b. These can be interrogated further using the interactive pig disease surveillance dashboard which was launched in October 2017 and can be accessed from this link: http://apha.defra.gov.uk/vet-gateway/surveillance/scanning/disease-dashboards.htm

Table 1: GB scanning surveillance 15 most frequent diagnoses in Q4-2020 and Q4-2019

Table 1a: Fifteen most frequent diagnoses Q4-2020 (total 221)	Table 1b: Fifteen most frequent diagnoses Q4-2019 (total 265)
Streptococcus suis	Proliferative enteropathy (*Lawsonia* sp)
Brachyspira pilosicoli	*Streptococcus suis*
Actinobacillus pleuropneumoniae	PRRS - pneumonia
PRRS - pneumonia	Salmonellosis - Typhimurium
Proliferative enteropathy (*Lawsonia* sp)	*Brachyspira pilosicoli*
Rotavirus	Rotavirus
Salmonellosis - Typhimurium	Swine influenza
Colibacillosis - enteric	PRRS - systemic
Salmonellosis – other	*Actinobacillus pleuropneumoniae*
Pasteurella multocida pneumonia	*Mycoplasma hyopneumoniae*
Swine influenza	Colibacillosis - enteric
Abortion/foetopathy not listed	*Pasteurella multocida* pneumonia
Mulberry heart disease	Streptococcal infection
Streptococcal infection	Erysipelas
Arthritis - other	Streptococcal meningitis

Note that further diagnoses are likely to be added for records for submissions made in Q4-2020 which are finalised at a later date.

Surveillance data for all diagnostic submissions made in the fourth quarter of this year are broadly in line with Q4-2019, being most common from pigs with diarrhoea, respiratory signs or found dead, which corresponds with the disease syndromes most commonly reported; enteric, respiratory and systemic. The total number of GB diagnostic submissions for Q4-2020 was 113% of the average total number of submissions in the previous four years for Q4. There has been a reduction in non-carcase submissions to APHA and an increase in non-carcase submissions to SRUC VS over this time period, although non-carcase submissions to APHA in Q4-2020 were higher (130%) than in the same quarter in both 2018 and 2019. These diagnostic submissions are voluntary and subject to several sources of bias and external factors which in the fourth quarter of 2020, included the effects of the Covid-19 lockdown. In spite of these differences, four of the five most common diagnoses in Q4-2020 are also in the top five diagnoses in Q4-2019 (Tables 1a and b); namely *Streptococcus suis*, *Brachyspira pilosicoli*, porcine reproductive and respiratory syndrome (PRRS) and proliferative enteropathy (*Lawsonia* sp).

Diagnoses made in the 12 months of 2020 compared to 2019 through the GB scanning surveillance network are illustrated in Tables 2a and 2b. For the whole of 2020, three of the five most common diagnoses are also in the top five diagnoses for 2019; PRRS, *Streptococcus suis*, and rotavirus.

Comparing surveillance data for all diagnostic submissions to the GB scanning surveillance network in 2020 when separated by sample type (carcase/foetus and non-carcase) shows some differences in the types of disease investigated in carcase compared to non-carcase (postal) submissions. The top two main clinical signs reported are found dead (n = 227) or wasting (n = 116) for carcase submissions, while for non-carcase submissions, they are diarrhoea and gastro-intestinal (n = 331) and respiratory (n = 159). The predominance of enteric disease is likely in part to reflect the fact that submission of faecal or other enteric samples to investigate outbreaks of diarrhoea is generally more straightforward than sampling to investigate other types of disease. The data also show that more complete surveillance information is captured for carcase submissions, with fuller and clinical signs data. It is recognised that carcase submissions yield a higher diagnostic rate, and higher number of diagnoses, as they enable full post-mortem examination and diagnostic testing. In 2020 no diagnosis was reached in 10.5% of carcase submissions, while the figure for non-carcase submissions in which no diagnosis was reached was 61%. The value of post-mortem examinations in detecting and investigating new and emerging diseases is acknowledged. The APHA Surveillance Intelligence Unit and Surveillance and Laboratory Services Department have announced that during January and February 2021, three additional post-mortem examination (PME) providers joined the scanning surveillance network in England and Wales. These are the Universities of Cambridge, Liverpool and Nottingham.

This broadens the expertise of, and contributors to, livestock disease surveillance in England and Wales and also brings livestock premises in the areas they cover closer to a post-mortem provider. The new PME providers join the five current PME Providers (Royal

Veterinary College, Universities of Surrey and Bristol, the Wales Veterinary Science Centre, and SRUC Veterinary Services St Boswells) that work together with the six APHA Veterinary Investigation Centres, all of which will continue their valued contribution to scanning surveillance. In addition to the usual factors affecting submissions and submission sample type, Covid lock-downs may have had an additional influence on the number and types of submission during 2020.

Table 2: GB scanning surveillance 15 most frequent diagnoses in 2020 and 2019

Table 2a: Fifteen most frequent diagnoses 2020 (total 958)
Streptococcus suis
PRRS - pneumonia
Salmonellosis - Typhimurium
Rotavirus
PRRS - systemic
Brachyspira pilosicoli
Actinobacillus pleuropneumoniae
Proliferative enteropathy (*Lawsonia* sp)
Swine influenza
Colibacillosis - enteric
Pasteurella multocida pneumonia
Streptococcal meningitis
Pneumonia – other cause
Salmonellosis – other serotype
Salmonellosis – monophasic ST-like variants

Table 2b: Fifteen most frequent diagnoses 2019 (total 1038)
Streptococcus suis
PRRS - pneumonia
Proliferative enteropathy (*Lawsonia* sp)
Brachyspira pilosicoli
Rotavirus
Swine influenza
PRRS - systemic
Streptococcal meningitis
Swine dysentery – *B. hyodysenteriae*
Salmonellosis - Typhimurium
Pasteurella multocida pneumonia
Salmonellosis – monophasic ST-like variants
Colibacillosis - enteric
Streptococcal infection
Erysipelas

New and re-emerging diseases and threats

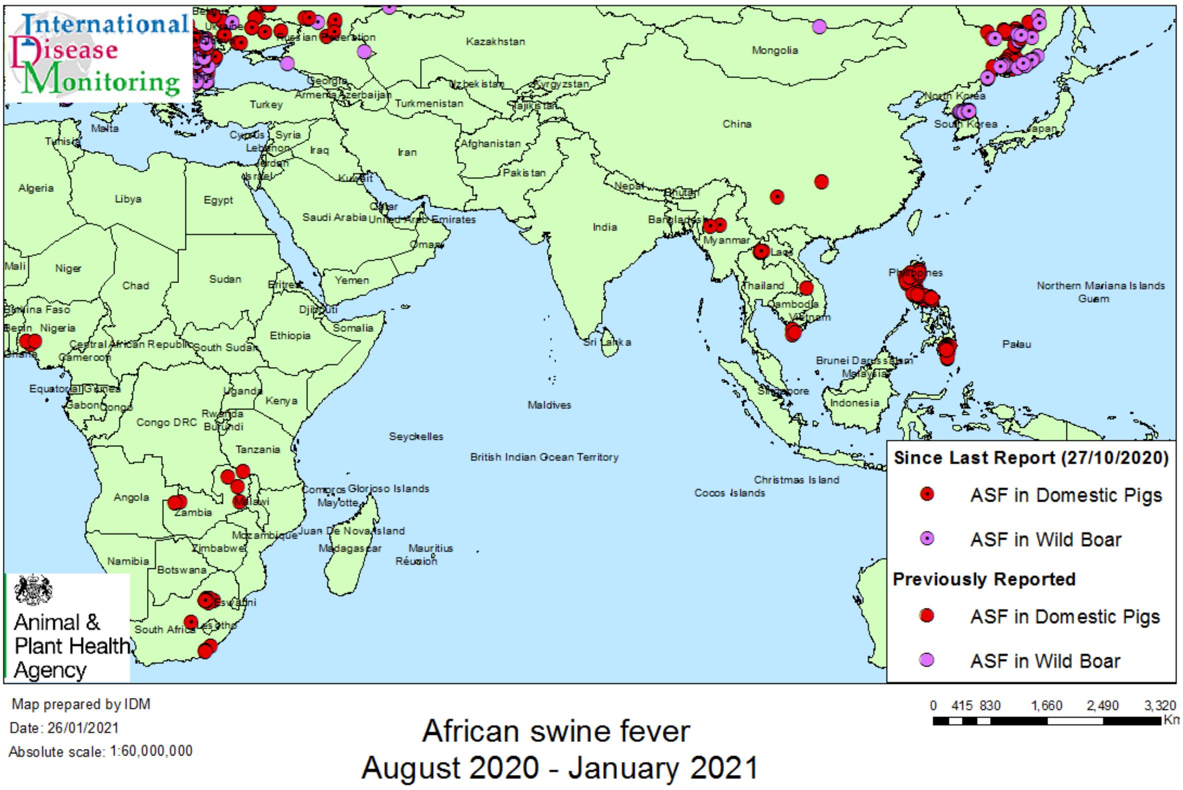
Please refer to the annexe on Gov.UK for more information on the data and analysis.

ASF virus variant with lower virulence in domestic pigs in China

Updated assessments continue to be published on African swine fever (ASF) in South East Asia and Oceania, and in Europe including Germany: https://www.gov.uk/government/collections/animal-diseases-international-monitoring

In Asia and Oceania, ASF has now been reported in China, Hong Kong, Vietnam, Cambodia, Laos, Mongolia, Myanmar, South Korea, North Korea, the Philippines, Malaysia, India, East Timor and Papua New Guinea since first identified in China in August 2018. The confirmation of ASF in multiple countries across Asia and Oceania, and the wide geographic range of infection found within these countries, demonstrates the potential for further spread of ASF into and within the domestic pig and wild suid populations in this part of the world. Most ASF reported in this region (Figure 1) is in domestic pigs; the situation in wild boar is less clear with few, if any, reports in wild boar in most affected countries apart from South Korea which continues to report ASF in wild boar in its northern region bordering North Korea. Figure 1 also illustrates reports of outbreaks of ASF causing high pig mortality in several African countries.

Figure 1: ASF cases reported in Asia and Africa from August 2020 to January 2021 (mapped on 26-01-21)



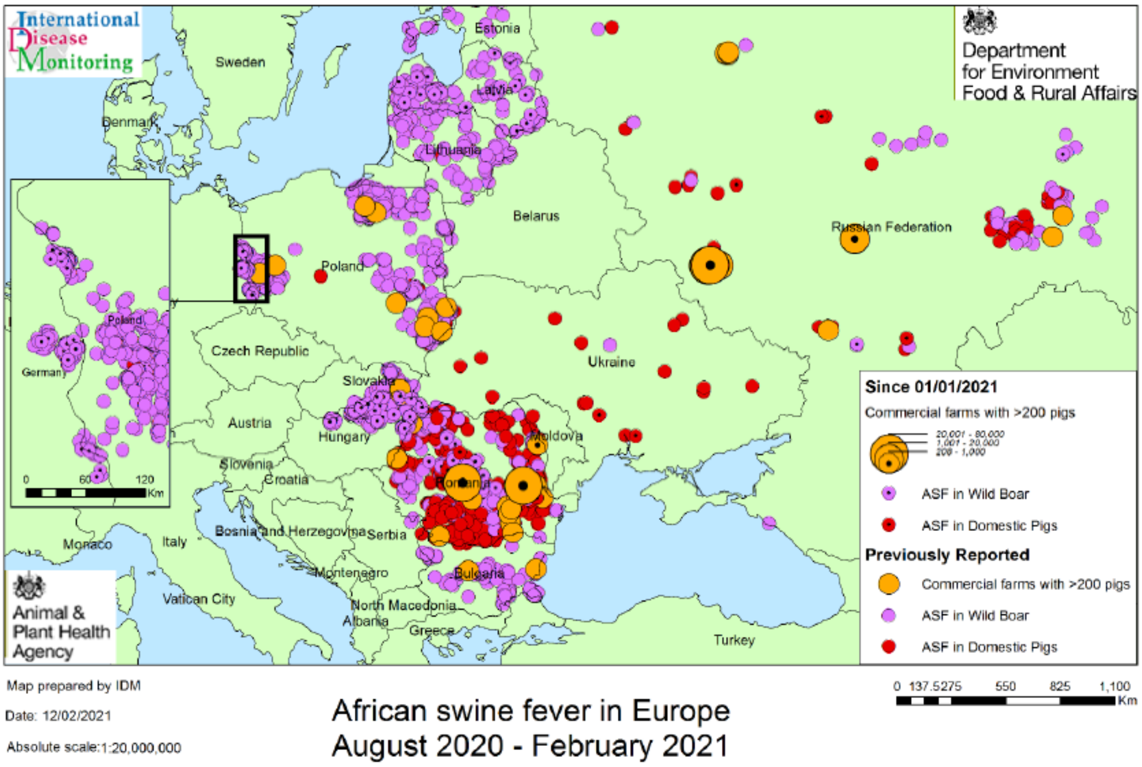
A significant development in ASF in China was highlighted by media reports early in 2021 (Reuters, 2021; Pig Progress, 2021). These described detection in 2020 of a variant of ASF virus in several herds in China causing milder disease. The variant has deletions in the MGF360 locus and the CD2v locus and although concerns were initially raised that the variant arose from illicit vaccine use, Chinese researchers have since published information describing this as a natural attenuated virus evolving from the original strain (Sun and others, 2021). Naturally attenuated isolates which cause chronic disease have been reported in the past in Spain and Portugal (in the past) and Estonia; these had deletions of MGF genes, interruptions in the CD2v gene and some other genes. Disease in pigs in China due to this variant appears to be milder and is described as a PRRS-like viral reproductive syndrome in vaccinated sows, with stillbirths, mummifications, embryonic deaths, infertility, and abortion. Sow mortality is lower and fever is transient. Live-born piglets may be born with reduced viability and those that survive into the growing period are reported to transmit the virus variant virus to other pigs and suffer chronic ASF disease. When detected, these herds are culled as for other ASF outbreaks. The diagnostic ASFV PCR used at the Pirbright Institute would detect this virus variant.

The risk pathways for introduction into the UK are not changed and reports of detection of the ASF variant in China are limited in China. However should there be spread of variants of this nature, there is increased risk of more pigs with ASF going undetected and more infected meat reaching the food chain, and also delay in reporting disease outbreaks as signs may not arouse suspicion of swine fever so promptly. APHA’s International Disease Monitoring team maintain awareness for further reports of these less virulent ASFV strains, in particular whether there is spread outside China.

Updates on the ASF situation in Europe are also available here:
https://www.gov.uk/government/publications/african-swine-fever-in-pigs-and-boars-in-europe

In brief, these report that since Germany’s first case of ASF in a wild boar found dead in Brandenburg, about 6km from the German-Polish border on September 10th 2020, ASF cases in wild boar have been reported across the states of Brandenburg and Saxony. At the end of January 2021, following ASFV detection in a dead wild boar in the buffer zone around the core area in Saxony, the restriction zone had to be expanded and fenced southwards. Buffer zones of 5km around the core infected zones are being subjected to intensive shooting to create corridors free of wild boar. More permanent fencing is planned at the Polish border to prevent further entry of wild boar. Poland continues to report new ASF cases in wild boar, some of which are found along the border with Germany. No ASF has been reported in domestic pigs in Germany to date.

Figure 2: ASF reported in Europe August 2020 to February 2021 (mapped on 12-02-21)



There have been large numbers of outbreaks on backyard pig premises in Romania, and a small number in Russia and Ukraine (Figure 2). A small number of outbreaks have been reported on large commercial pig farms in both Romania and Russia. Figures 3 and 4 show 2020 ASF reports in wild boar and domestic pigs by country in Europe. Cases of ASF in wild boar continue across most of the previously affected countries in Europe, particularly Hungary and Poland. The European Commission and the World Organization for Animal Health have declared Belgium officially free from ASF, a significant achievement. A total of 833 wild boar were found infected with ASF in Belgium between September 2018 and March 2020.

Figure 3: ASF reported in Europe in 2020 in wild boar by country

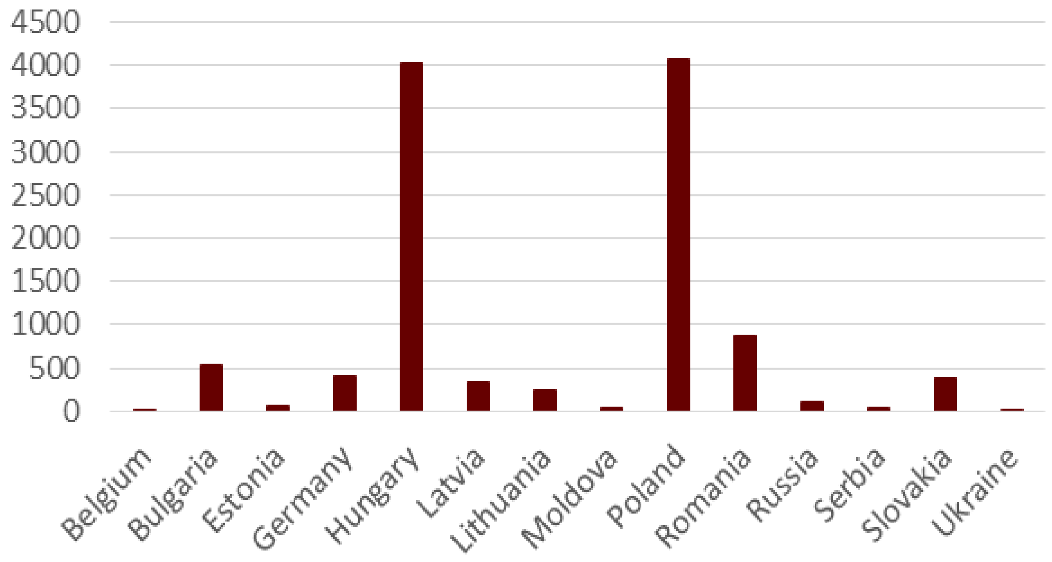
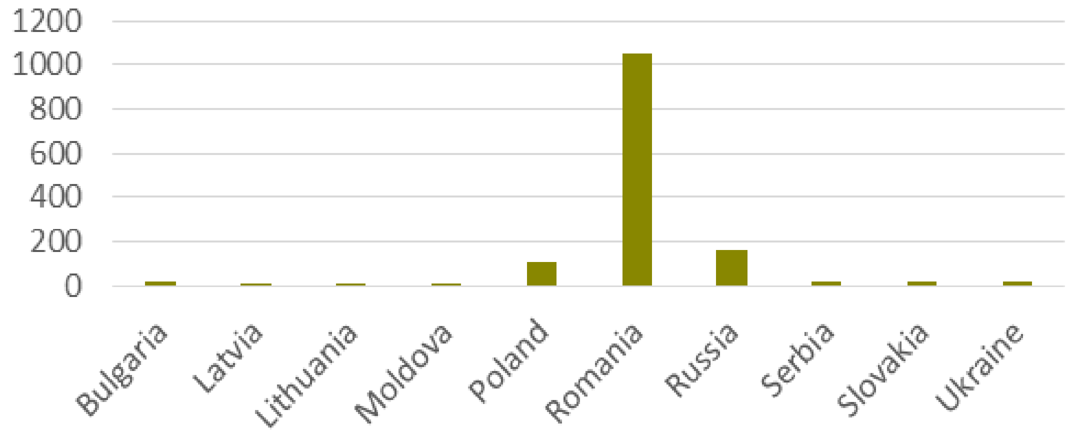


Figure 3b: ASF reported in Europe in 2020 in domestic pigs by country



Global disease reports produced monthly by the US Swine Health Information Center are also a good source of information and these can be viewed and received by email by signing up: https://www.swinehealth.org/global-disease-surveillance-reports/

The Pig Veterinary Society sponsored a webinar on ASF in June 2020 aimed particularly at veterinarians who are less familiar with pigs. This is available to view here: https://thewebinarvet.s3-eu-west-1.amazonaws.com/Webinar_Video_2020/16Jun2020-African+Swine+Fever+%E2%80%93+what+ALL+vets+need+to+know.mp4

Information on ASF reports is disseminated to veterinary practices and Pig Veterinary Society members. The assistance of veterinary practitioners in raising awareness about ASF amongst their pig-keeping clients in UK is vital together with advising them on resolving biosecurity weaknesses to reduce the risk of introduction.

The biggest risk for ASF virus entering the UK's pig population remains pigs or wild boar eating infected pork or pork products derived from infected animals. The ASF virus can survive for months in smoked, dried and cured meats, and for years in frozen meat. The greatest risk of introduction is from meat products brought into the UK from affected countries as personal imports; the commercial trade of such products is not permitted from ASF- affected areas. Pig keepers are reminded that it is illegal to feed pigs catering, kitchen or domestic waste or meat/meat products. Providing dedicated clothing and boots for staff and visitors, limiting visitors to a minimum, and preventing outside vehicles or equipment which may be contaminated from coming on to the farm, are also all valuable procedures to reinforce.

Images of the clinical signs and pathology of ASF are available; suspect cases must be reported promptly to APHA and this is followed by an official veterinary investigation: https://www.gov.uk/guidance/african-swine-fever and http://apha.defra.gov.uk/documents/surveillance/diseases/african-swine-fever-images.pdf

Negated notifiable disease clinical report cases in 2020

Passive surveillance is an important component for detection of exotic notifiable diseases. Two cases of suspect swine fever were reported to APHA during Q4-2020, both of which were negated after testing negative for swine fevers in official investigations. In total, three suspect notifiable disease report cases were prompted by clinical signs or pathological findings in 2020, all of which were negated and details are provided in Table 3. The October case confirmed as an outbreak of *Actinobacillus pleuropneumoniae* (APP) was described in the November 2020 Veterinary Record surveillance report (APHA, 2020a). Disease due to APP can present as sudden deaths in a group of pigs with blood-stained nasal discharges and red-purple skin discolouration (Figure 5), an appearance which can resemble pigs dying from acute or subacute swine fever. Typical APP-like lesions were found when post-mortem examinations were undertaken.

Table 3: Details of negated suspect swine fever clinical report cases in pigs in 2020

Month	Clinical signs/pathology	Negation of notifiable disease	Diagnoses established
April	Sudden deaths of nine finisher pigs over 24 hours with marked skin reddening	Negated on grounds of further clinical findings and pathology	*Streptococcus dysgalactiae* subsp. *dysgalactiae* septicaemia (practitioner sampling)
October	Sudden death of single captive suid, haemorrhages at postmortem	Tested negative for swine fevers	Not investigated further, death possibly stress-related
October	Sudden death of 35 finisher pigs over a four-day period with skin reddening and epistatic discharges	Tested negative for swine fevers	Respiratory disease due to *Actinobacillus pleuropneumoniae* with PRRSV also detected

Figure 5: Negated suspect swine fever case confirmed as APP: purple skin discolouration, haemorrhagic nasal discharge and hyperaemic conjunctivae

Porcine epidemic diarrhoea surveillance

Porcine Epidemic Diarrhoea (PED) due to any strain remains notifiable in England and Scotland and suspicion of disease, or confirmation of infection, must be reported (Defra, 2015; Scottish Government, 2016). The last diagnosis of PED recorded in the GB diagnostic database (VIDA) was in 2002 on a farm in England. No suspect incidents of PED have been reported in England or Scotland since January 2018. Enhanced surveillance for PED continues and diagnostic submissions from cases of diarrhoea in pigs (non-suspect) submitted to APHA are routinely tested by PCR for PED virus (PEDV) on a weekly basis. None have been positive for PED in 1160 diagnostic submissions tested under Agriculture and Horticulture Development Board (AHDB) Pork funding from June 2013 to December 2020. The AHDB PED contingency plan has been updated and a PED exercise is planned for 2021, led by the Pig Health and Welfare Council. Further information on PED is available on this link:

https://pork.ahdb.org.uk/health-welfare/health/emerging-diseases/pedv

Disease monitoring reports from the US Swine Health Information Center show that PEDV persists and the seasonal occurrence with a tendency for higher numbers of positive tests over cooler, darker and wetter months remains evident from submissions tested (SHIC, 2020).

PCV3 associated with myocarditis in stillborn pigs and neonatal pigs

A third incident of disease associated with porcine circovirus 3 (PCV3), a relatively newly discovered virus in pigs, has been detected in Q4-2020 in an APHA scanning surveillance submission from breeding pigs in England - the two previous detections were in 2018 and 2014 (the latter identified retrospectively). The disease manifested as an increase in stillborn piglets and neonatal piglets described as abnormal by farm staff, litters from any parity of sow were reported to be affected. Polymerase Chain Reaction (PCR) testing for PCV3 confirmed low Ct values indicative of high viral loads and histopathology revealed myocarditis and periarteritis suggestive of in utero viral infection in all of four neonatal pigs and one of three stillborn piglets submitted for investigation. PRRSV and PCV2 involvement was ruled out. Interestingly, no PCV3 or non-suppurative myocarditis lesions have been detected in pigs or samples submitted from the herd earlier in 2020 when diagnostic submissions were made for different reasons. These lesions are similar to those found in previous APHA PCV3 cases and described by US authors (Arruda and others, 2019). PCV3 is distinct from PCV2 and has been reported in pigs since 2016 in a growing number of countries globally, including the US, China, Poland, Italy, Spain and the UK.

PCV3 detection in archived samples from UK pigs was reported in 2017. PCV3 detection is reported worldwide in samples from both healthy pigs and from pigs with a variety of disease presentations and its clinical significance remains uncertain. No zoonotic concern is reported. Publications suggest that this virus, although newly discovered, has been in the pig population for a number of years. Pig industry-funded work at APHA is in progress to assess the prevalence of PCV3 in serum of healthy pigs at slaughter and the genetic relatedness of PCV3 detected will be assessed. Enhanced surveillance for myocarditis in pigs, foetuses and stillbirths submitted for post-mortem examination to APHA is in place with further PCV3 testing where non-suppurative inflammation is detected. The clinical significance of occasional single postnatal pigs with myocarditis and PCV3 detection is uncertain (APHA, 2020b), this surveillance will help indicate how commonly they occur in diagnostic submissions. Interestingly, experimental infection of caesarean derived/colostrum deprived weaned pigs recently revealed all to develop PCV3 viraemia and histological lesions of multisystemic inflammation characterized by myocarditis and systemic perivasculitis, however none showed clinical signs (Mora-Díaz and others 2021). There is also an excellent review by Segales and Sibila (2020) summarising current knowledge and key features of PCV3.

Unusual diagnoses or presentations

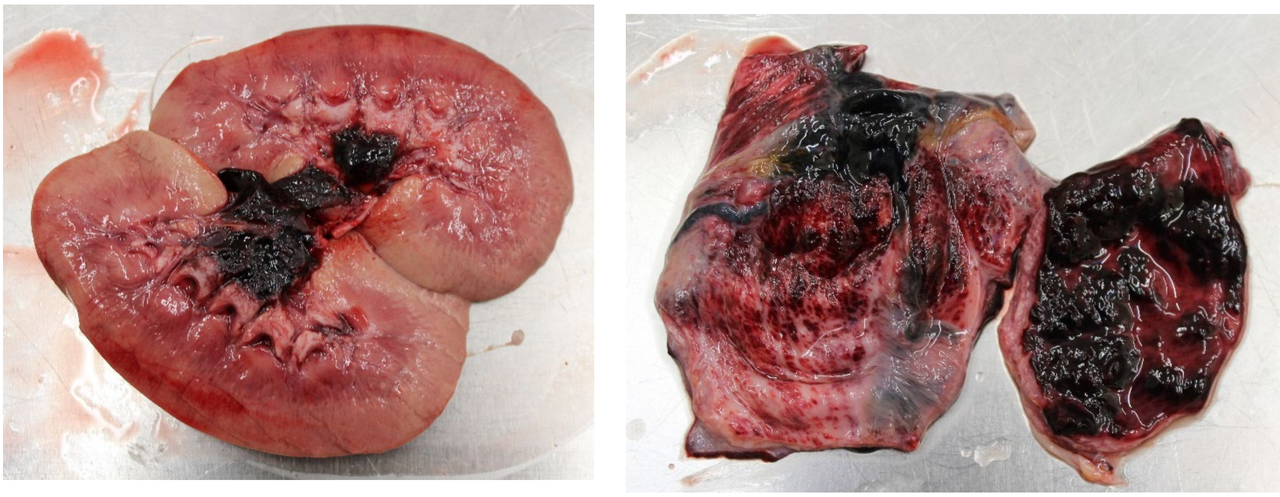
Septicaemic pasteurellosis in finishing pigs

Septicaemia due to *Pasteurella multocida* was diagnosed when three pigs aged 21 weeks were submitted to investigate the cause of acute death which had affected 30 pigs over three days. The pigs examined were in good bodily condition; two had not been eating recently and all had congested lungs and a fibrinous polyserositis (peritoneal, pleural and pericardial). Pure and predominant growths of *Pasteurella multocida* were isolated from multiple visceral sites from all of the submitted pigs, confirming the diagnosis. No underlying viral infections were detected. Whilst this is an uncommon disease presentation of *Pasteurella multocida* compared to pneumonic pasteurellosis, APHA has recorded 17 such cases since 2013. Disease has occurred in both outdoor and indoor-reared pigs and in pigs aged three days to six months. Precipitating causes common to these incidents have not been identified. Previous typing of *P. multocida* isolates from APHA diagnoses of septicaemia in pigs showed no evidence of a single emergent strain associated with systemic *P. multocida* disease (APHA, 2014). Isolates have been retained for further investigation in the event of an increase in cases.

Haemorrhages in single Kunekune pig

An unusual presentation of haemorrhagic disease in a single young adult Kunekune pig was investigated, not dissimilar to individual cases seen previously at APHA and described by Bidewell and others (2013). Haemorrhagic disease is a feature of the swine fevers, however there was a good clinical history in this case and there was no suspicion of notifiable disease; the pig was fed pig nuts, was not pyrexic, was anaemic; it's penmate remained healthy and there was a protracted course of disease during which the pig appeared to respond to vitamin K treatment but relapsed. Post-mortem examination revealed an anaemic carcase with widespread haemorrhages, particularly evident in the kidney and bladder (Figures 6a and b).

Figure 6a and 6b: Kidneys with pelvic haemorrhage (left) and bladder with haemorrhages (right) in a Kunekune pig



There was no evidence of septicaemia or PRRS, ruminant pestivirus infection was ruled out by testing and there were no lesions seen in the bone marrow to suggest an immune-mediated thrombocytopenia, all conditions which have resulted in past cases of haemorrhagic disease in individual pigs. The possibility of rodenticide toxicity was ruled out when no anticoagulant residues were detected in the liver following testing by FERA, York. A cause for the haemorrhages was not found, however information from the case has added to the series. If there are further cases, obtaining EDTA bloods ante-mortem will help investigations to determine if there is a previously unrecognised disease, of undetermined aetiology, affecting individual pigs of this type which has the appearance of a clotting disorder.

Actinobacillus rossii abortion

Actinobacillus rossii was diagnosed as the cause of abortion when isolated from stomach contents of foetuses in an aborted gilt litter. The material was submitted from a breeder-finisher unit also experiencing low conception rates and decreased litter sizes but no real increase in abortions or mummifications, apart from the one submitted. *A. rossii* is as an inhabitant of the porcine vagina and RTX toxin genes have been identified in strains of *A. rossii* (Mayor and others, 2006). Possession of these virulence factors may contribute to the organism's ability to act as a sporadic cause of porcine abortion. This organism is not known to be of zoonotic significance and there is no recognised risk to the wider pig industry. It is worth noting that *A. rossii* can be confused with *Pasteurella pneumotropica* in culture. There is a publication which references a personal communication reporting *A. rossii* isolation from a cluster of abortions (20/2500 sows) on a unit which also experienced decreased conceptions rates and increased vaginal discharges. Wet bedding and feeding of liquid whey were suspected to have been contributory factors in the abortions (Holyoake and Thompson, 2017).

Changes in disease patterns and risk factors

Please refer to the annexe on Gov.UK for more information on the data and analysis.

Increased diagnostic rate for *Actinobacillus pleuropneumoniae*

The Q3-2020 pig report described an upward trend in the diagnostic rate of *Actinobacillus pleuropneumoniae*. The data for Q4-2020 shows that this increase continued and reached a higher diagnostic rate than seen in any individual quarter for several years (Figure 7). Two cases early in 2020 involved beta lactam resistant APP isolates, with the resistance confirmed as being plasmid-mediated and thus transferable (APHA, 2020c). However, other 2020 isolates have not shown beta lactam resistance and this does not explain the rise in the diagnostic rate.

Figure 7: GB APP diagnoses by quarter as a percentage of diagnosable submissions

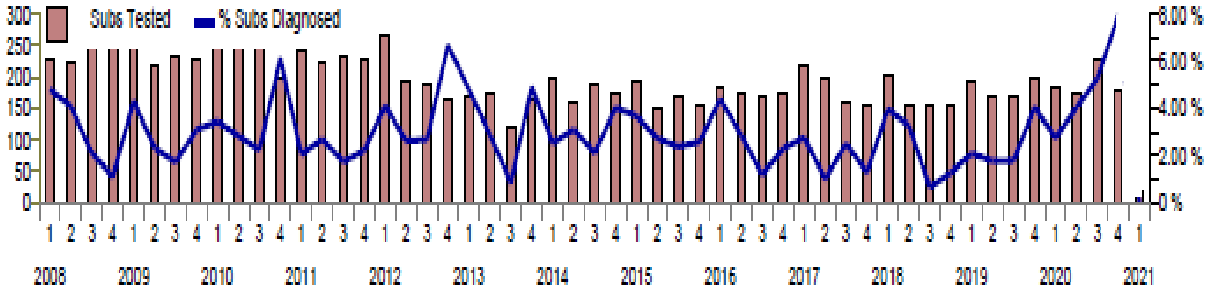


Figure 8 shows the surveillance data for 2020 APP diagnoses with pigs reported to be found dead or showing respiratory disease as the two most common main clinical signs, typical of APP outbreaks; one was described in the Veterinary Record November surveillance report and described pigs which were found dead with blood-stained froth at the nostrils and skin discolouration (APHA, 2020a).

Figure 8: Surveillance data for GB pig submissions in which APP diagnosed in 2020

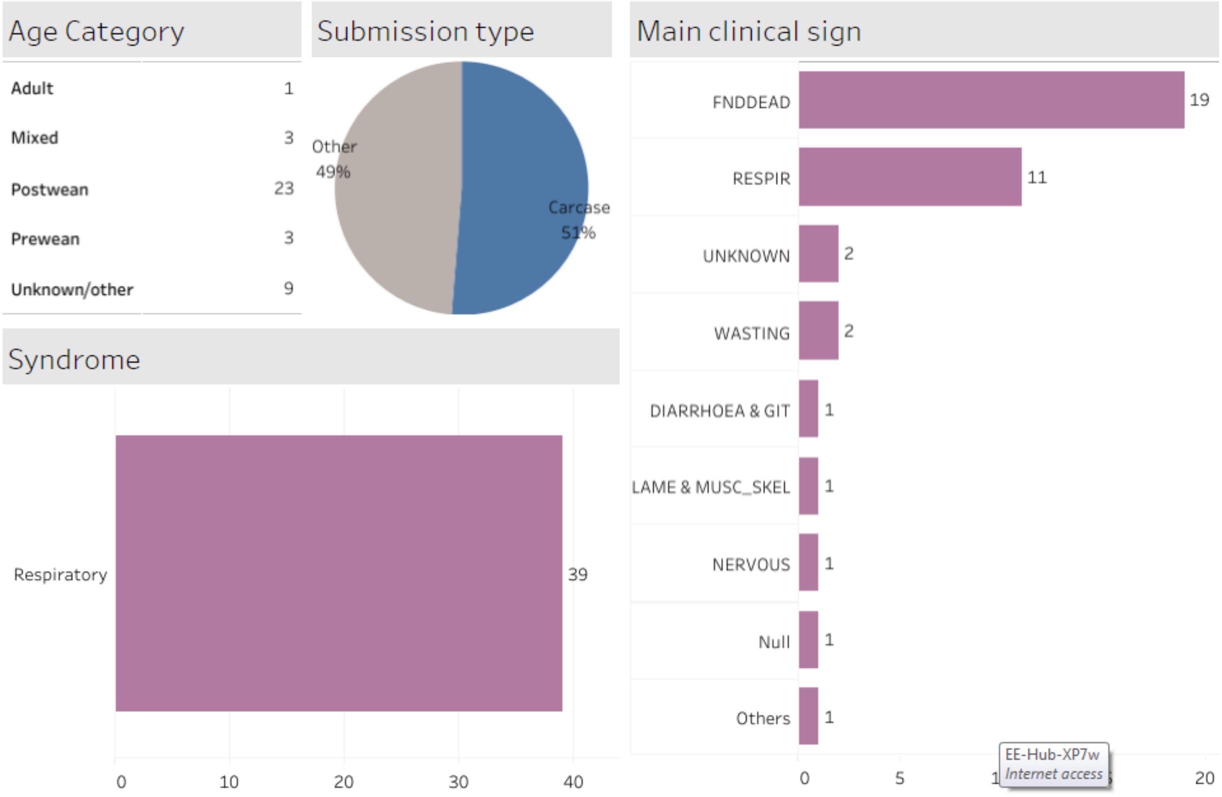


Figure 9 shows the age range of affected pigs in diagnosed APP incidents and compares the data from 2020 with 2012, which had the second highest annual diagnostic rate. The age range is slightly wider for 2020 diagnoses, with 2012 diagnoses tending to be in older pigs. Figure 10 indicates the diagnoses made together with APP, and whilst more 2020 incidents involved PRRS or streptococcal disease, in both years the majority of APP incidents did not have another diagnosis made.

All APP isolates from 2020 are undergoing Apx toxin gene typing to investigate further and the diagnostic rate of APP will be kept under review to see whether it appears to be seasonal. A useful summary of disease due to APP is at this link: https://www.nadis.org.uk/disease-a-z/pigs/actinobacillus-pleuropneumonia/

Figure 9: Age range in weeks of pigs in APP incidents in 2012 compared to 2020

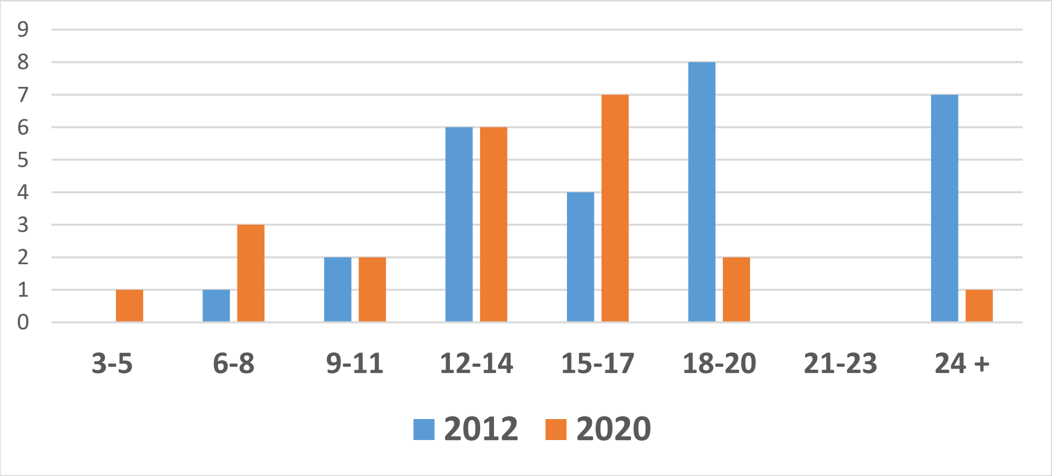
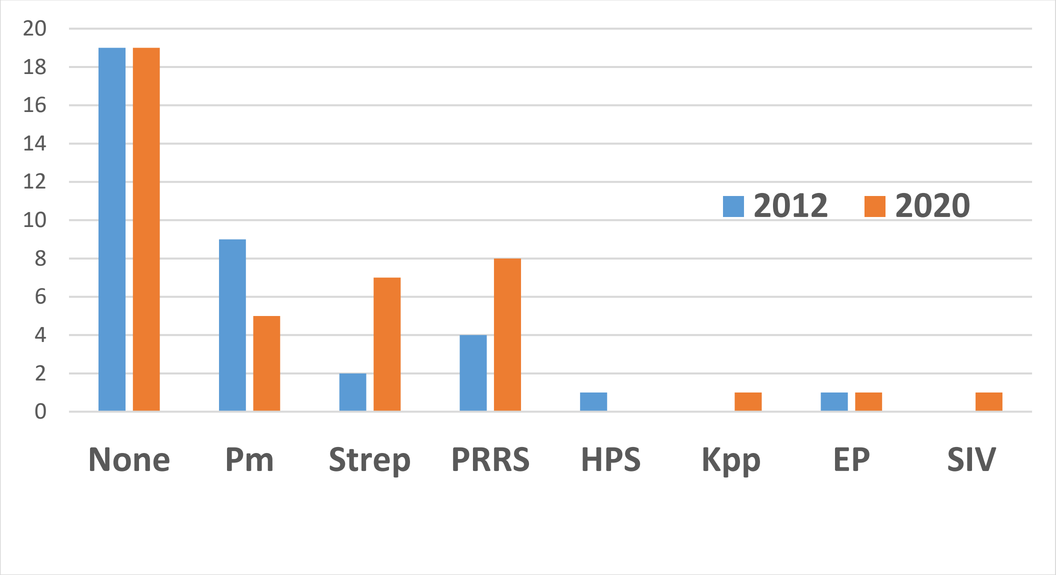


Figure 10: Concurrent diagnoses in pigs diagnosed with APP in 2012 compared to 2020

Pm - *Pasteurella multocida*; Strep - streptococcal; PRRS – PRRS; Hps – *Haemophilus parasuis*; Kpp – *Klebsiella pneumoniae*; EP – enzootic pneumonia; SIV – swine influenza virus

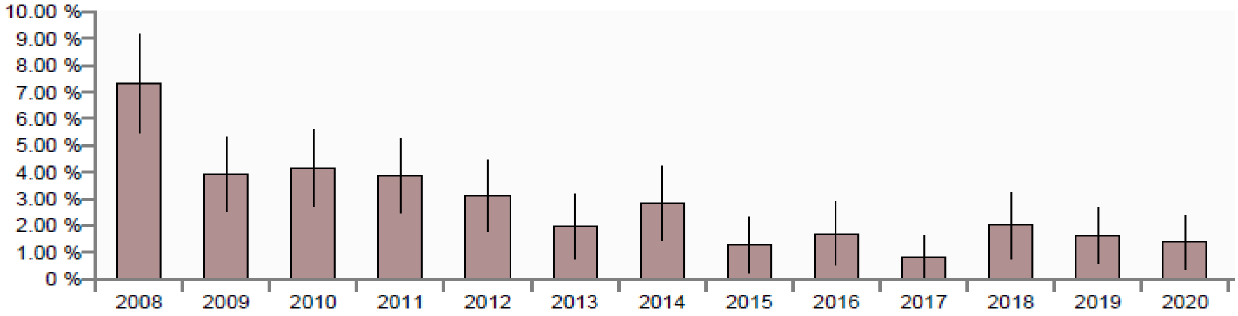


Porcine circovirus 2 genotyping from disease-associated incidents

Porcine circovirus 2-associated disease (PCV2 disease) diagnoses in GB pigs have reduced to a low level since commercial porcine circovirus 2 (PCV2) vaccines became available (Figure 11). Monitoring of PCV2 genotype through sequencing of the ORF2 gene in PCV2 associated with confirmed PCV2 disease cases in England and Wales has continued since the update provided in the Q4-2019 pig surveillance report (APHA, 2019a). Seven diagnoses of PCV2 disease were made during 2020, from six of which PCV2 genotyping has been completed and all were identified as PCV2d; no PCV2b were detected. These results indicate that for cases diagnosed at APHA, the genotypic shift from PCV2b to PCV2d in England and Wales has progressed further and PCV2d has become and remained predominant over the last 12 months. The significance of this shift is uncertain; PCV2a-based vaccines have been shown to be effective against PCV2d challenge under experimental conditions (Opriessnig and others, 2014). The clinical and pathological details, and PCV2 genotype of PCV disease cases diagnosed at APHA will continue to be monitored.

The first detection and emergence of PCV2d was described in a genotyping study characterising PCV2 associated with confirmed PCV2 disease cases in England and Wales from 2011 to January 2016 (Grierson and others, 2017) in which the majority were identified as PCV2b. There have not been significant changes in the diagnostic rate for PCV2-associated disease in GB submissions during the period of emergence of PCV2d (Figure 11). When disease due to PCV2 is diagnosed, cases are usually in either unvaccinated herds, in individual pigs in vaccinated groups suspected of having been missed at group vaccination or in groups of pigs where a problem was identified with the vaccination regime.

Figure 11: Annual GB PCV2 disease incidents as a percentage of diagnosable submissions



Two typical examples of PCV2 disease incidents in 2020 in commercial pigs are described below.

PCV2 disease was confirmed by histopathology and immunohistochemistry in 19-week-old pigs selected as showing early onset of wasting from an all-in, all-out indoor nursery-finisher which had had continuous respiratory and lameness issues throughout the batch and from around 16-weeks-old had a continuous stream of pigs found to be wasting which responded poorly to antimicrobial treatment in water. Pigs were sourced from three breeding units and the clinical problem was only affecting pigs from one source. There was reason to believe that weaner vaccinations were not being comprehensively performed on the source breeding farm. Mortality reached six per cent in pigs from that source.

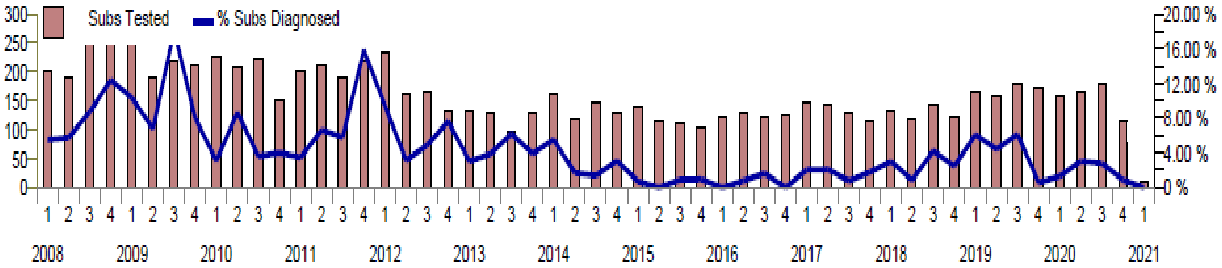
In another incident, pigs affected with diarrhoea and wasting at seven-weeks-old were submitted for investigation. All three pigs had moderate cranioventral consolidation and colitis; one pig had typical PCV2 disease lesions with viral inclusions in lung and lymph node, and positive PCV2 immunohistochemistry. The colitis was associated with

Brachyspira pilosicoli and *Trichuris suis* infections. PRRS was diagnosed in another pig which also had bacterial pneumonia from which *Streptococcus suis* serotype 25 was isolated as a likely secondary infection. Investigation by the submitting veterinarian found that although the weaners themselves were vaccinated, the usual vaccination regime on the source breeding farm, which included PCV2 and PRRSV, had not been followed, likely leading to instability in immune and pathogen status in the progeny.

Several MLST sequence types in *B. hyodysenteriae* 2020 isolates

Fewer diagnoses of swine dysentery (SD) due to *Brachyspira hyodysenteriae* were made in 2020 compared to 2019 when SD was the ninth most frequent diagnosis made. SD has been identified as a priority disease for control by the pig industry, thus diagnoses of SD in GB remain a concern. The diagnostic rates in the first three quarters of 2020 were lower than those in the same period in 2019 as illustrated in Figure 12. The numbers of diagnoses and the diagnostic rate were lower in 2020 than in 2019. During 2020 diagnoses were recorded in VIDA in submissions from Wales, Scotland, and several counties in England indicating the potential for spread of *B. hyodysenteriae* in different regions and the need to maintain biosecurity measures. It is worth noting that VIDA records capture diagnoses of swine dysentery, not detections of *B. hyodysenteriae* made from submissions monitoring herd status without associated clinical signs.

Figure 12: GB swine dysentery by quarter as a percentage of diagnosable submissions



When *B. hyodysenteriae* isolates are provided from either diagnostic or monitoring submissions, antimicrobial sensitivity testing and whole genome sequencing are undertaken in batches under APHA's funding for antimicrobial resistance and pig disease surveillance respectively. This assist veterinary practitioners' decisions about treatment of SD and epidemiological investigations to identify or rule out possible links and origins of infection. As indicated in the Q3-2020 pig surveillance report, one isolate had a tiamulin MIC above the clinical breakpoint (>4 µg/ml), no other tiamulin-resistant isolates have been found amongst those tested in 2020 and some were fully sensitive to all six antimicrobials tested; tiamulin, valnemulin, doxycycline, tylvalosin, lincomycin and tylosin.

Whole genome sequencing identified ten multi-locus sequence types (MLST) in the 2020 isolates as shown in Table 4, five of which had not been identified in isolates that have been sequenced previously within APHA. These five were assigned new MLST.

Table 4: MLST detected in *B. hyodysenteriae* isolates from 2020 submissions

Genetic similarity to	MLST	Number of isolates in 2020	MLST detected prior to 2020
N/A	167	1	Yes
	240	1	Yes
	266	1	No
	270	1	No
	271	1	No
	272	1	No
	277	1	No
52	52	1	Yes
	partial	1	-
88	88	2	Yes
251	251	1	Yes

Advice on swine dysentery, its control and information about the pig industry's Significant Diseases Charter can be found on these links:

http://pork.ahdb.org.uk/health-welfare/health/swine-dysentery/
https://pork.ahdb.org.uk/health-welfare/health/significant-diseases-charter/
http://apha.defra.gov.uk/documents/surveillance/diseases/swine-dysentery.pdf
www.nadis.org.uk/disease-a-z/pigs/swine-dysentery/

Disease due to *Actinobacillus suis* in preweaned piglets

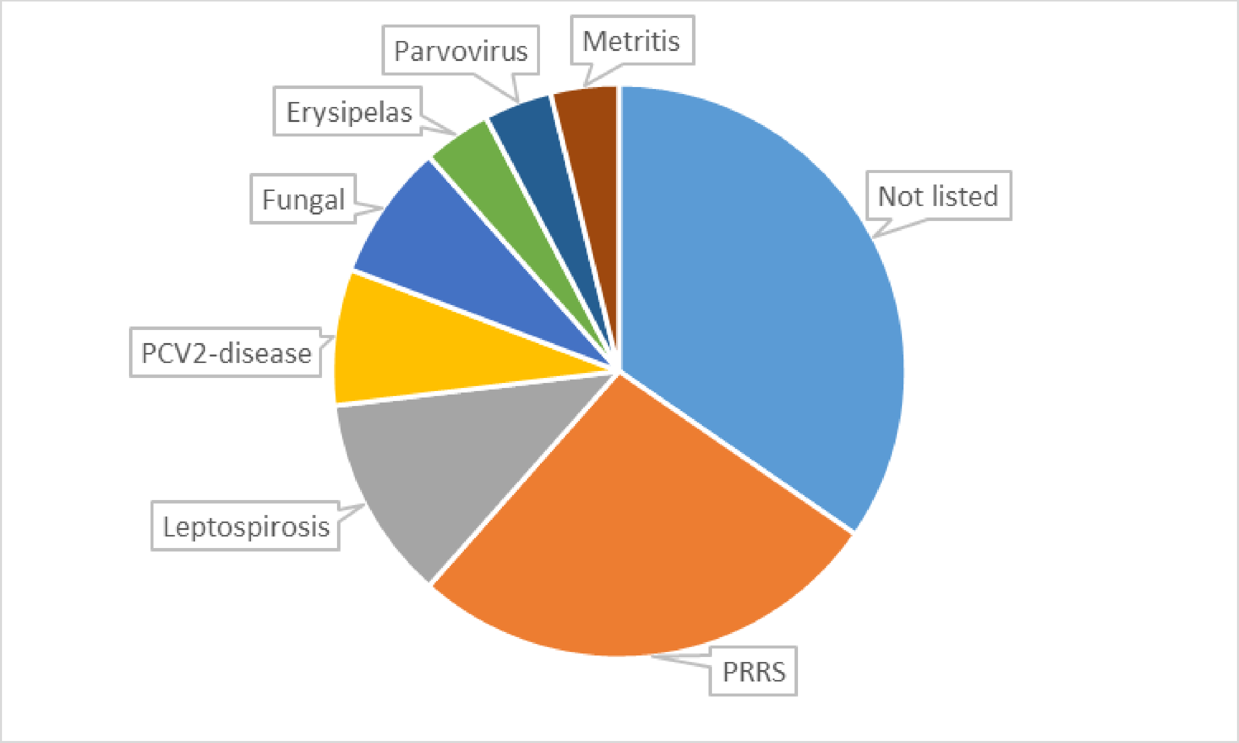
Disease due to *Actinobacillus suis* is not a common diagnosis recorded in submissions to the GB scanning surveillance network; seven diagnoses were recorded in the two-year period 2019-20 compared to three in 2017-18. Three of the seven 2019-20 diagnoses were made in Q4-2020, all in preweaned pigs. Diagnoses of *A. suis* septicaemia are mainly associated with preweaned pigs, as in these Q4-2020 cases, or recently weaned pigs. *A. suis* is a less common cause of septicaemia in preweaned pigs submitted to APHA than *Streptococcus suis*, *Escherichia coli* or *Klebsiella pneumoniae*. There are reports that outbreaks are more common in high-health status herds, especially during their start-up phase. Where disease occurs in older pigs, it can be more diverse in clinical presentation and include septicaemia, pneumonia, polyarthritis or abscessation. Abortions have also been reported due to *A. suis*.

This recent cluster of cases of *A. suis* may reflect enhanced diagnostic investigations as part of efforts to improve disease control and reduce antimicrobial use, rather than representing an increasing trend in disease due to this pathogen, however this will be kept under review. An item was included in January 2021 Veterinary Record surveillance report (APHA 2020c) describing the Q4 cases which involved clinical presentations of polyarthritis, septicaemia and meningitis in five-day-old, 21-day-old and 18-day-old pigs respectively.

Fetopathy diagnoses in 2020

Over the 12 months of 2020, PRRS was the most common individual diagnosis made in GB reproductive syndrome cases (Figure 13). Ninety-two per cent of these diagnoses were made in submissions consisting of aborted/stillborn foetuses and access to this type of material for comprehensive diagnostic testing significantly improves diagnostic rates for abortion and stillbirth. The pie segment labelled “not listed” represents diagnoses which tend to be sporadic and have no VIDA diagnostic foetopathy code. These included diagnoses of abortion due to *E. coli, Enterobacter aerogenes, Staphylococcus hyicus* and *Actinobacillus rossii* (described earlier) and are kept under review to determine if any merit being allocated a specific diagnosis code.

Figure 13: Pie chart showing reproductive syndrome diagnoses made in 2020



Porcine reproductive and respiratory syndrome (PRRS) was diagnosed as the cause of abortions on a large indoor farrow-to-finish unit. The unit was transitioning from batch farrowing groups sows every three weeks, to weekly farrowing and had ongoing issues with low level abortions, usually around two per batch, affecting sows either at days 60-70 in gestation, or around day 105 in gestation. Several submissions were made, including litters and affected sows, which showed signs of general malaise. PRRS virus was detected by PCR in the sows, which were vaccinated for PRRS, as well as the aborted litters confirming the diagnosis. The ORF5 gene sequence indicated the outbreak involved a field virus with 99.0% homology to a PRRS virus sequenced previously at APHA, suggesting a possible epidemiological link.

Erysipelas was diagnosed in a first parity sow which aborted one week prior to her farrowing date. The litter of eight aborted foetuses plus three placentae were submitted for investigation. Five abortions in the batch of fifty outdoor breeding gilts had occurred within a three day period with no clinical signs observed. *Erysipelothrix rhusiopathiae* was isolated from foetal stomach contents confirming the diagnosis. Erysipelas is reported to cause abortion at any stage of pregnancy often without signs in affected sows. The breeding pigs were vaccinated against erysipelas but the private veterinarian indicated that there was concern that the primary vaccination course for the affected batch of gilts had not been completed and a review of the vaccination regime for gilts was underway. No other infectious agent of abortion was detected.

Fetopathy due to fungal infection was diagnosed in a litter submitted from a 250-sow breeding unit that had experienced two abortions over a three-week period. The sows were indoors on straw bedding and fed a home-mix. Placentae were reddened and some were visibly thickened. Fungal cultures yielded pure growths of fungi from the three cultured foetal stomach contents and there was histopathological confirmation of placentitis. The fungal species could not be definitively identified. The submitting vet was advised to review feed and bedding quality and storage as potential sources of fungal spores.

Horizon scanning

Characterisation of rotavirus in pigs in Spain

Rotaviruses (RVs) are classified into nine groups (rotavirus group A to D and rotavirus group F to J). Rotavirus groups A, B and C are recognized as aetiological agents of enteric disease on pig farms mainly in pre-weaned pigs and in the immediate post-weaning period, and they have been identified in all countries with significant pork production. Rotavirus group H has been reported in pigs in Japan, Brazil, USA, South Africa and Vietnam and a recent publication from Spain represents the first report of rotavirus group H in pigs in Europe (Puente and others, 2021). The occurrence of rotavirus group H was investigated in 103 Spanish pig herds. Nine farms were positive for rotavirus group H and four were sequenced or partially sequenced. Phylogenetic analysis showed that Spanish rotavirus group H isolates clustered closely with other porcine rotavirus group H strains and were distantly related to human rotavirus group H as well as bat rotavirus group H strain.

Streptococcus equi subsp. *zooepidemicus* septicaemia in Canada

Another description of outbreaks of septicaemia due to *Streptococcus equi* subsp. *zooepidemicus* associated with high mortality in cull sows and finisher pigs in North America has been published (Costa and Lage, 2020). This pathogen has been described in recent pig quarterly surveillance reports (APHA, 2019b) to raise awareness. As in other recent outbreaks reported from North America, the strain involved was ST-194 with close genetic sequence similarity to ST-194 isolates from pigs in China causing high mortality outbreaks in the 1970s. The outbreak affected three indoor breeding herds, within an integrated system, in 2019. The authors described rapid deaths in sows and abortions; figures in the paper suggest 10 percent mortality over a 12-week period and an eleven-fold increase in abortions. Affected sows were pyrexic, lethargic and unwilling to stand, and then died. Other sows would abort first and then go on to develop similar signs. Post-mortem examination revealed rhinitis (mild, diffuse mucopurulent discharge); pulmonary oedema; gall bladder oedema; and lymphadenopathy with tan-coloured to haemorrhagic lymph nodes. *S. equi* subsp. *zooepidemicus* was isolated in septicaemic distribution. Outbreaks due to *S. equi* subsp. *zooepidemicus* have not been detected through scanning surveillance in GB pigs; the isolation of this pathogen from APHA pig submissions would prompt genetic characterisation to determine the genotype. Avoiding importation of pigs from herds with a history of this disease, or linked to herds with a history of this disease, is important.

OIE factsheet on SARS-CoV2 infection in animals

The OIE have published a technical factsheet on current knowledge about Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2), and infection in animals (OIE, 2021). The exact origin of SARS-CoV-2 and how it was introduced into the human population has not yet been established. Several animal species have been found to be susceptible to infection with SARS-CoV-2 either naturally and/or by experimental infection, however, evidence from risk assessments, epidemiological investigations, and experimental studies indicate that animals do not play a significant role in the spread of SARS-CoV-2, and the pandemic is the result of human-to-human transmission. The factsheet summarises the information available to date from epidemiological investigations and research and will be updated as required.

Review of Toxoplasma gondii infection in pigs

A comprehensive review of *Toxoplasma gondii* infection in pigs has been published by Dubey and others (2020). *T. gondii* is a protozoan parasite and is primarily a public health concern. Although an unlikely cause of reproductive or postnatal disease in pigs, disease due to *T. gondii* has been reported in the literature in pigs and incidents are described in this publication. *T. gondii* is rarely transmitted transplacentally in pigs and although toxoplasmosis is reported causing reproductive losses in pigs, this is rare compared with losses in sheep and goats. Severe clinical toxoplasmosis in pigs is also rare with very few recent reports of clinical toxoplasmosis in pigs. Disease incidents described include details of outbreaks of clinical toxoplasmosis in pigs in China, associated with a unique genotype of *T. gondii* (ToxoDB genotype #9) reported to rarely be found elsewhere. Histopathology is performed on myocardium of piglets in APHA foetopathy submissions and detection of lesions caused by *T. gondii* would prompt further investigation. No diagnoses of toxoplasmosis in pigs have been made at APHA in recent years. The contribution of pigs to the risk of infection in humans is likely to vary between countries. A serological survey of UK pigs sent for slaughter in 2013 detected a low seroprevalence of 7.4% (Powell and others, 2016) although the public health implications of this are uncertain in part because the correlation between seropositivity and the numbers of viable *T. gondii* cysts in edible tissue is not well established. This review represents a useful update on this parasite and the potential role of pigs in food-borne zoonotic infection in some countries.

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