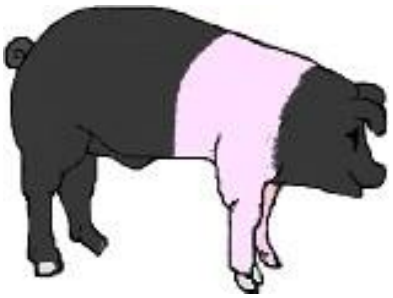
Animal & Plant Health Agency



SRUC

Great Britain pig quarterly report: disease surveillance and emerging threats

Volume 26: Quarter 2 of 2022 (April to June)

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the second quarter of 2022, April to June. 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.

Pig disease surveillance dashboard outputs

Diagnoses made in the second quarter of 2022 compared to the same quarter in 2021 through the Great Britain (England, Wales and Scotland) scanning surveillance network are illustrated in table 1. These can be interrogated further using the interactive pig disease surveillance dashboard which was launched in October 2017.

Table 1: Great Britain scanning surveillance 15 most frequent diagnoses in quarter 2 of 2022 and quarter 2 of 2021

15 most frequent diagnoses quarter 2 of 2022 (total 185)	15 most frequent diagnoses quarter 2 of 2021 (total 314)
1. Lawsonia sp. associated disease	1. Streptococcus suis disease
2. Rotavirus	2. Swine influenza
3. Brachyspira pilosicoli	3. Lawsonia sp. associated disease
4. Colibacillosis - enteric	4. Rotavirus
5. Streptococcus suis disease	5. PRRS - pneumonia
6. Salmonellosis – S. Typhimurium	6. Brachyspira pilosicoli
7. Pneumonia – other cause	7. PRRS - systemic
8. Swine influenza	8. Colibacillosis - enteric
9. Porcine reproductive and respiratory syndrome (PRRS) - pneumonia	9. Salmonellosis – other serotype
10. Coccidiosis	10. Pasteurella multocida pneumonia
11. Pasteurella multocida pneumonia	11. Actinobacillus pleuropneumoniae pneumonia
12. PRRS - systemic	12. Glaesserella parasuis disease
13. Arthritis – other cause	13. Salmonellosis – S. Typhimurium
14. Colibacillosis - oedema disease	14. Digestive disease – not listed
15. Exudative epidermitis (greasy pig disease)	15. Exudative epidermitis (greasy pig disease)

Note: that further diagnoses may be added for records for submissions made in quarter 2 of 2022 which are finalised at a later date.

Figures 1a to 1d: summary data for 323 submission records in quarter 2 of 2022 (457 in quarter 2 of 2021)

Figure 1a: pig age

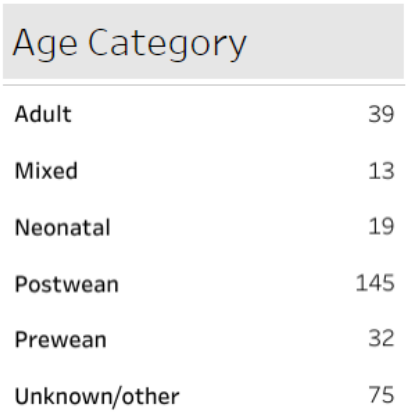


Figure 1b: disease syndrome

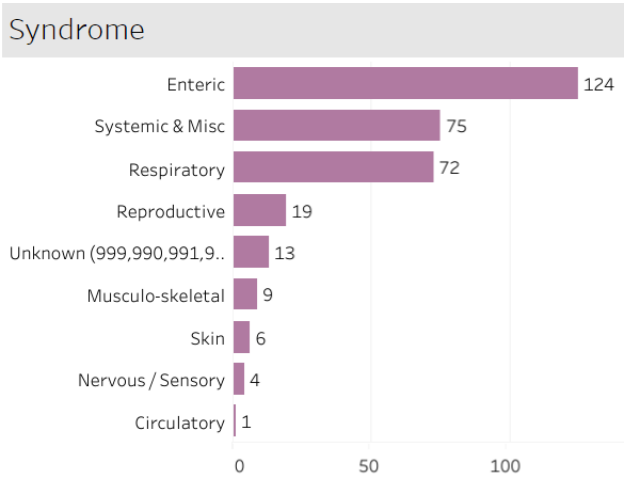


Figure 1c: submission type

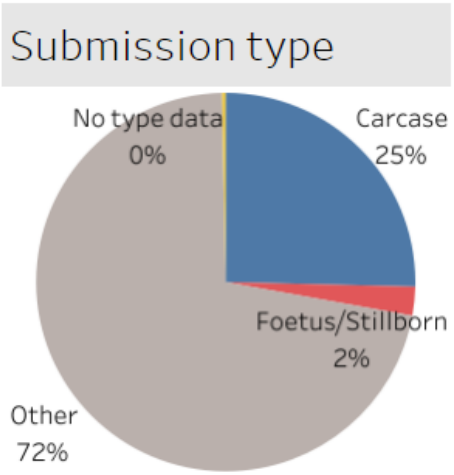
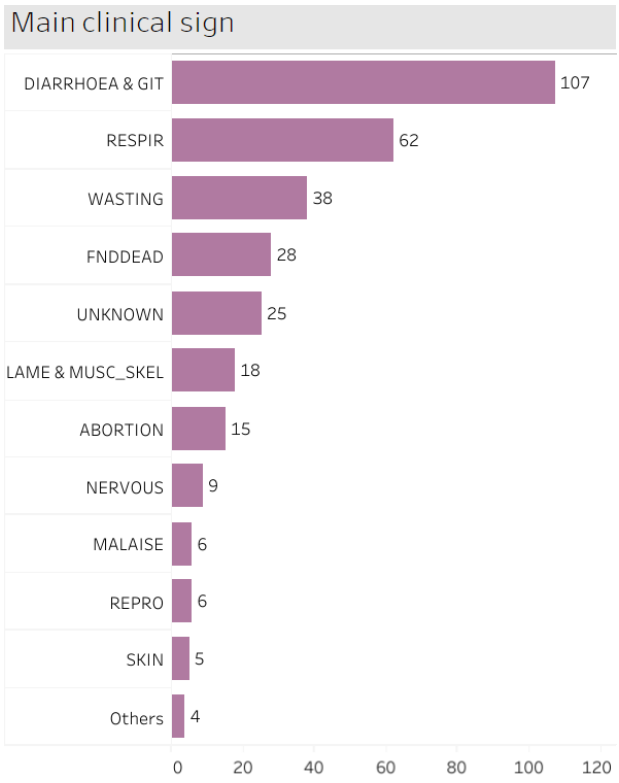


Figure 1d: main clinical sign reported



These diagnostic submissions are voluntary and subject to several sources of bias. The profile of submissions for the second quarter of 2022 differs from that of the same quarter of 2021 in that the most frequent main clinical sign was diarrhoea and gastro-intestinal, rather than respiratory. Also, the most frequent syndrome in quarter 2 of 2022 was enteric, while this syndrome was third most frequent in the same quarter in 2021 (Figure 1).

Total Great Britain diagnostic submission records for quarter 2 of 2022 were lower than the total for the same quarter in 2021, with lower numbers of both carcase and non-carcase submissions. The balance of submission types also changed from being 33% carcases in quarter 2 of 2021 to 22% carcases in quarter 2 of 2022. These changes in balance and numbers affect the number of diagnoses achieved as carcases enable full diagnostic investigation. They can also affect the diagnoses made as submission of non-carcase samples is a more reasonable means of investigating enteric disease than non-carcase samples for investigation of systemic disease. Enteric diagnoses represent four of the top five most frequent diagnoses made in quarter 2 of 2022. Three of the five most frequent diagnoses in quarter 2 of 2022 are also in the top five diagnoses in quarter 2 of 2021 (table 1), namely rotavirus, *Lawsonia*-associated disease and *Streptococcus suis*.

Discussion with pig veterinary and industry representatives suggest that the reduction of submissions in this quarter in part reflects the financial and resource pressures that pig producers are facing. Factors mentioned include that pig prices have not met the cost of production for a prolonged period, higher pig feed and fuel prices, retained older sows for breeding due to poor cull sow prices, the challenges of recent hot weather and increased demand for feed ingredients from other livestock sectors where grazing has been adversely impacted by the weather. The reduction in the national breeding sow population in recent months is also resulting in a fall in the growing pig population from which most diagnostic submissions derive. Livestock & wildlife health, welfare, and production problems may arise during periods of hot weather. Information was updated by Defra and APHA to highlight some potential risks to livestock and wildlife during the hot and dry weather, and following a period of prolonged heat: Keeping farm animals and horses in extreme weather - Defra and Hot weather and potential risks - APHA .

New and re-emerging diseases and threats

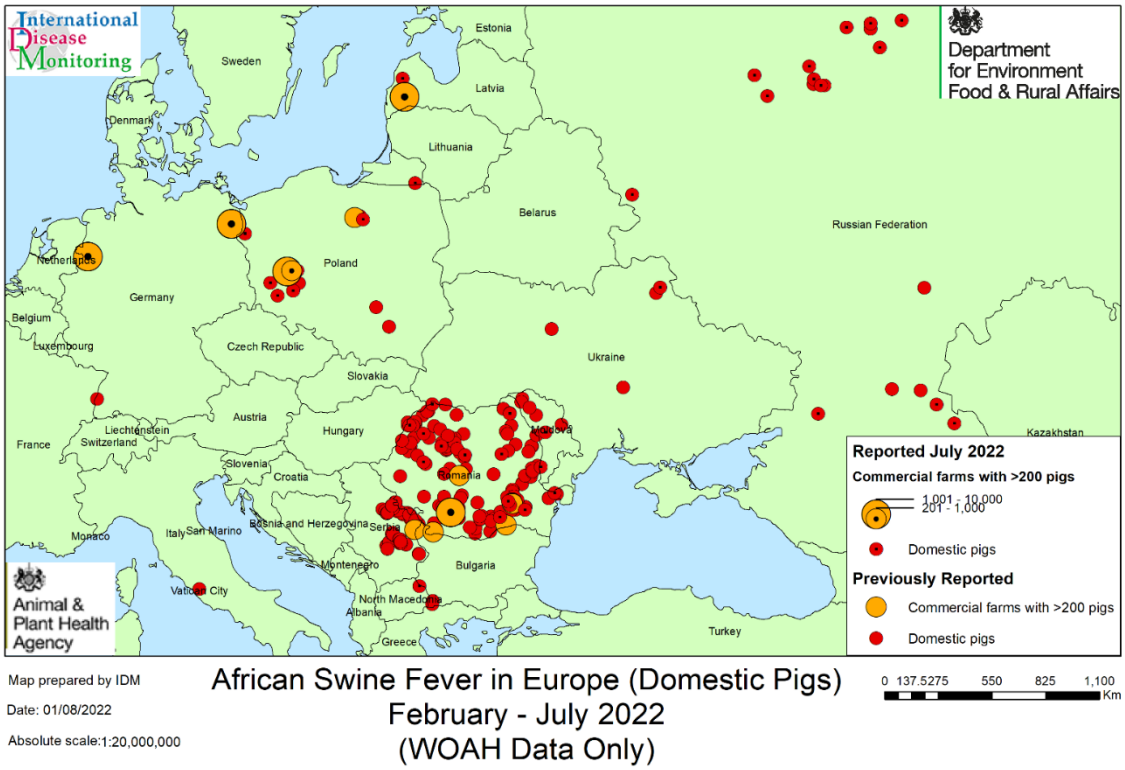
African swine fever summary

Updated assessments continue to be published on African swine fever (ASF) on GOV.UK. Updates on the ASF situation in Europe were issued in May and July 2022. Figures 2 and 3 show cases reported to World Organisation for Animal Health (WOAH) from February to July 2022.

The latest outbreak assessment on ASF in Europe from the International Disease Monitoring Team (IDM) in APHA highlighted the outbreak in domestic pigs detected in July 2022 in north-west Germany. ASF was confirmed in a commercial domestic pig herd in an area with a high density of pig farms close to the border with The Netherlands. This detection was approximately 300km from the nearest wild boar cases in Mecklenberg-Vorpommen and 500km from the May 2022 outbreak in domestic pigs in the south of the Germany, close to the French border. Human-mediated spread was strongly suspected and this is the latest in several large geographical jumps of ASF virus in Europe in recent months. Nearly 300 premises with 195,000 pigs are in the restriction zone.

Intensive surveillance for ASF in wild boar near both of the domestic pig ASF outbreaks in the south and north-west of Germany has not identified infected wild boar near either affected farms, supporting the opinion that ASF was introduced through human-mediated means. When ASF-infected domestic pigs are detected in a new area, there is concern that infection may spread from the pig premises into local wild boar prior to the affected herd being culled and that infection will persist and spread in the wild boar population. There is no evidence that this has occurred around either of these affected pig farms. In contrast, a domestic pig ASF outbreak was detected in eastern Germany near the Polish border in an area with numbers of ASF cases in wild boar also.

Figure 2: ASF reports for domestic pigs in Europe for February to July May 2022 – WOAH data only (mapped 1 August 2022)

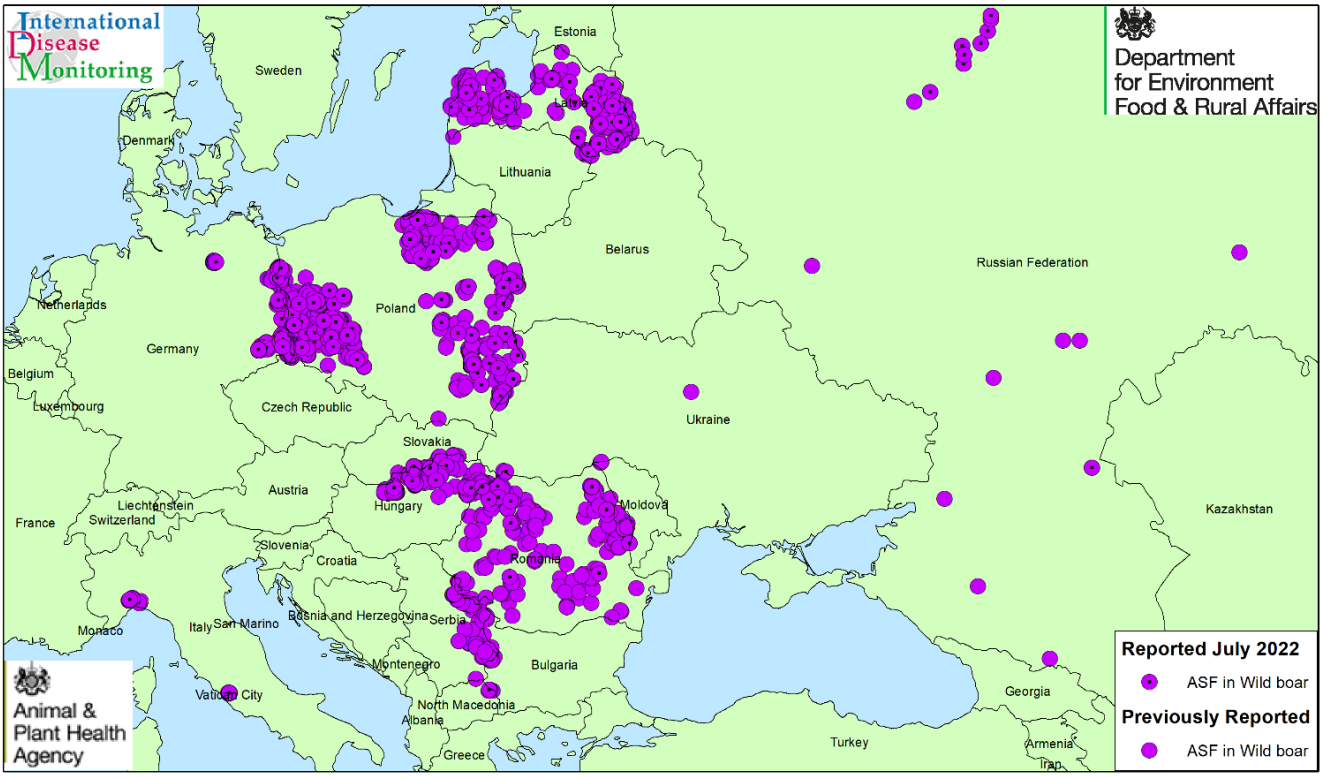


The same July report mentioned an outbreak of ASF in domestic pigs in Italy on a small commercial pig farm which has been culled within the Infected Zone in Lazio, Rome with infection thought to be through contact with infected wild boar, which continue to be detected in that area. This was the first domestic pig outbreak in mainland Italy related to the recent ASF detections in wild boar in two areas of the country. A case of ASF genotype 2 was first confirmed in this region of mainland Italy, in a young wild boar found sick and euthanased in a nature reserve in Rome in early May 2022 and more have been detected since.

ASF genotype 2 was detected for the first time in mainland Italy in January 2022 in the north-west of the country near Genoa, in the province of Alessandria (Piedmont Region), in a wild boar found dead. Further cases in wild boar continue to be detected within the Infected Zone, although there has been some westward spread to the other side of one of the main highways which was considered to be a physical barrier to movement of wild boar. The ASF detections in mainland Italy are distinct from the strain of ASF (genotype 1) that has been endemic on the island of Sardinia since 1978.

The overall risk of entry of ASF virus into the UK from all combined pathways remains medium (no change). However, because of the regular detection of outbreaks and wild boar cases in new areas in Europe as a result of human-mediated means, this particular pathway is now considered to be high risk. There is also considerable uncertainty as the movement of people into the UK is being affected by travel disruption, fuel prices and reducing seasonal worker numbers.

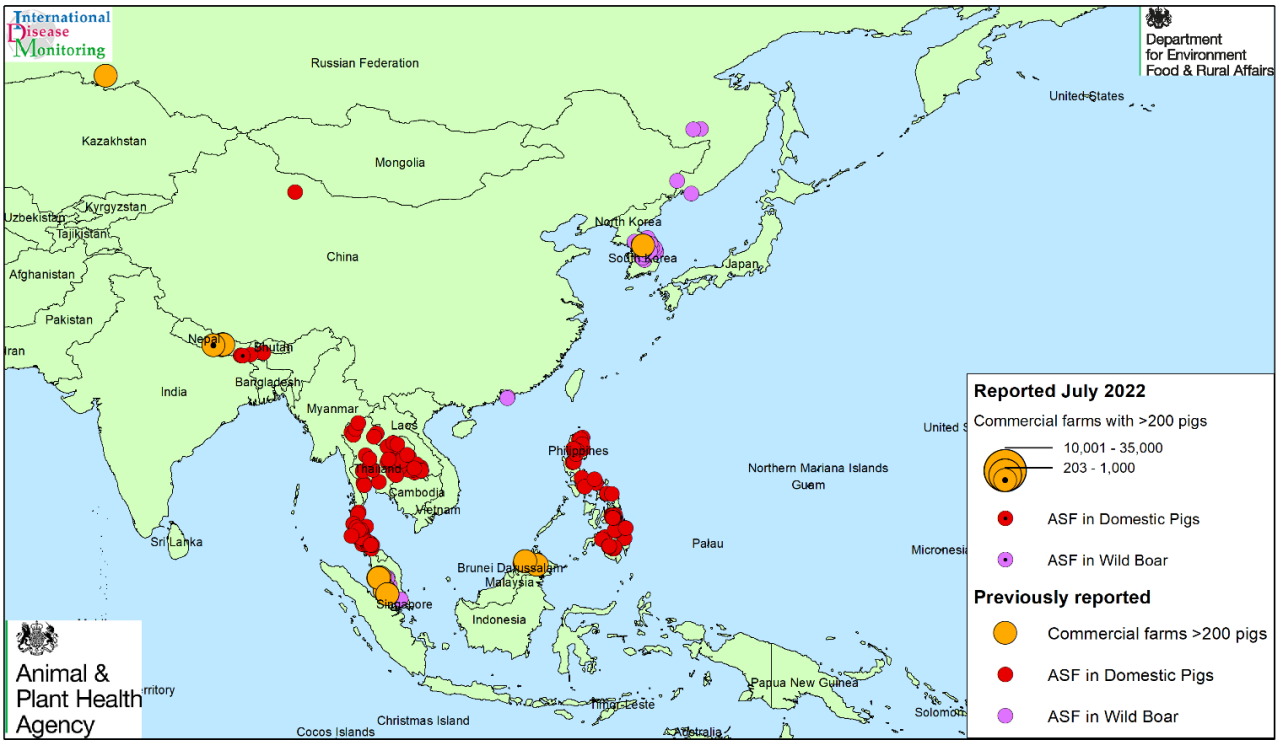
Figure 3: ASF reports for wild boar in Europe for February to July May 2022 – WOAH data only (mapped 1 August 2022)



Maps showing information on the EU ASF restriction zones are available.

No new updates on the ASF situation in the Caribbean were issued by IDM since the previous IDM report in September 2021. Both the Dominican Republic (DR) and Haiti continue to report ASF cases in domestic pigs. A summary of the current ASF situation in the DR, how it is affecting pig keepers, and a long term view of the prospects for control from two agricultural experts within DR was given in Pig Progress earlier in 2022.
No further updates on the ASF situation in Asia have been issued by IDM since January 2022. The Swine Health Information Centre (SHIC) global reports include a round-up of ASF each month and the September report referred to a halt to the deployment of the first commercial ASF vaccine which was approved for use in Vietnam. This was prompted by the death of apparently healthy pigs after vaccination. An investigation into the pig deaths is in progress. ASF continues to cause domestic pig outbreaks in the region as illustrated in Figure 4, showing cases reported to WOAH from February to July 2022. Notably, Nepal reported its first ASF outbreaks in domestic pigs in May 2022, although disease had been present on the first affected units to be reported since the end of March or in April. ASF is also said to be spreading into new areas of India including west of Nepal, and ASF-infected feral wild boar have been found dead to the east of Bangladesh.

Figure 4: ASF cases reported in Asia from February to July 2022 – WOAH data only (mapped 1 August 2022)



Njau and others (2021) published a review which includes the distribution of ASFV genotypes in sub-Saharan Africa. Genotype 2 originated in south-east Africa and is spreading there. There is no current evidence to suggest it is being reintroduced from Europe or Asia, although future information from sequencing may inform whether this is occurring. However there has been an increase in reported ASF cases from different regions of Africa to WOAH. Increasing pig production and improved surveillance in affected countries such as South Africa, Nigeria and Uganda may in part account for the increase.

Elsewhere, ASF preparedness in unaffected countries is being stepped up. An updated

integrated surveillance plan for ASF and CSF was published by the United States Department of Agriculture (USDA) in July 2022. This is a comprehensive document describing activities to fulfil two objectives; to strengthen detection capabilities and enhance outbreak preparedness for ASF and CSF and to support claims of disease freedom for ASF and CSF.

The mission of Global ASF Research Alliance (GARA) is to establish and sustain global research partnerships that will generate scientific knowledge and tools to contribute to the successful prevention, control and, where feasible, eradication of ASF. Their news and activities are accessible on the GARA website.

Information on ASF 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 the 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 continues to be pigs or wildboar eating pork or pork products derived from infected animals. ASFV can survive for months in smoked, dried and cured meats, and for years in frozen meat.

Meat and meat products brought into the UK from affected countries as personal imports and illegal imports represent the most significant risk of introduction of exotic notifiable diseases including ASF, Classical swine fever and foot and mouth disease (FMD), the commercial trade of such products is not permitted from ASF-affected areas. The Government announced new restrictions on the movement of pork and pork products into Great Britain to help safeguard pigs from the threat of ASF. These came into force from 1 September 2022 and mean it is no longer legal to bring non-commercial pork or pork products weighing over two kilograms in from EU member states and European Free Trade Association states unless they are produced to the EU's commercial standards. This does not apply to commercial imports. It remains illegal to trade in pork or wild boar meat from ASF-affected areas or to bring in meat products from Asia or Africa.

Pig keepers are reminded that it is illegal to feed pigs catering, kitchen or domestic waste, or meat or 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.

Porcine epidemic diarrhoea surveillance

Porcine Epidemic Diarrhoea (PED) due to any PED virus strain remains notifiable in England and Scotland and suspicion of disease, or confirmation of infection, must be reported (Defra, 2015 and Scottish Government, 2016). The last diagnosis of PED recorded in the Great Britain diagnostic database (VIDA) was in 2002 on a farm in England.

No more suspect incidents of PED have been reported since the case in May 2022 on a small pig premises in England which was reported by a private veterinary surgeon, this was the first suspect PED case since January 2018. The affected pigs were six weeks old and housed and 50% of the group had diarrhoea and poor growth, with one death. The high morbidity had prompted the concern about PED in accordance with guidance about what might lead someone to suspect and report PED. Faecal samples were sent to APHA Weybridge for rapid PED PCR testing at no charge to the submitting vet or pig keeper. No PED virus was detected, and PED was ruled out. Also no transmissible gastroenteritis virus or porcine deltacoronavirus

were detected by PCR. The dead piglet was submitted for post-mortem examination (PME) to the University of Surrey, a partner PME provider within the scanning surveillance network for Great Britain (GB). This pig was found to be in poor body condition and anaemic. No PEDV or other entero- pathogens were detected, however liver iron estimation confirmed a diagnosis of iron deficiency anaemia. Similar signs had been seen in previous litters with stunted growth. Small herds sometimes do not provide iron supplementation to piglets, pigs may be weaned later and not have access to outdoors, increasing the risk of iron deficiency anaemia which can be prevented by iron supplementation of neonatal piglets.

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 over 1,370 diagnostic submissions tested under Agriculture and Horticulture Development Board (AHDB) Pork funding from June 2013 to June 2022.

Notifiable vesicular disease ruled out in suspect case

A case of vesicular disease in pigs was reported as suspect foot and mouth disease (FMD) to APHA for investigation in Norfolk in late June 2022 and a Temporary Control Zone was placed around the premises. Notifiable vesicular diseases of pigs including foot-and-mouth disease (FMD), swine vesicular disease and vesicular stomatitis were all ruled out by testing and restrictions were lifted. This serves as a reminder of the need for vigilance for clinical signs of vesicular disease in pigs, and for suspect cases to be promptly reported.

FMD has been detected this year in Indonesia, a country that was previously FMD-free (without vaccination). Failure to detect and control the initial clinical cases has led to the rapid spread of the disease across five main islands, including Bali. An outbreak assessment has been published by APHA's International Disease Monitoring Team: https://www.gov.uk/government/publications/foot-and-mouth-disease-in-south-east-asia

FMD, like other notifiable and non-notifiable viral causes of vesicular disease in pigs, is characterised by lameness and vesicular (blister) lesions which rapidly rupture. The lameness may affect one or all four feet. Vesicles may also occur on the snout and mouth and tend to rupture and heal rapidly. Foot lesions are more obvious than those on the snout or lips and involve the coronary bands of the hooves and accessory digits, and/or interdigital spaces. Ruptured lesions can form erosions and deep ulcerations. Pig keepers should inspect their pigs at least once a day and be vigilant for lameness and foot or snout/mouth lesions. Pigs should be observed moving to be able to detect lameness as they may appear otherwise healthy. Inspection of lame pigs may require the feet to be washed to inspect the coronary band properly especially in wet conditions or where wallows are present. Snout lesions are more transient and may be harder to notice in an outdoor setting.
Where pigs develop lameness over a short period of time with coronary band foot lesions, these should be reported to APHA as suspect FMD/vesicular disease even if the vesicular stage is not seen, and no snout or mouth lesions are visible. There are images of FMD in pigs available and a useful presentation with videos covers FMD in a range of livestock species, note that some aspects are not applicable as this is of Australian origin.

Communications were issued to veterinarians requesting them to advise their pig-keeping clients to be strict regarding their pig premises biosecurity, address any weaknesses and report any increase in lameness promptly so it can be investigated or, if vesicular disease is suspected, reported to APHA for investigation. Pig keepers and the public should be reminded that it is illegal to feed pigs meat or meat products, and kitchen or catering waste as doing so endangers the health of the pigs and risks introducing exotic diseases, such as foot and mouth disease or African swine fever, into the country. You can download biosecurity information and

posters.

First detection of *Brachyspira suanatina* in pigs in England

Whole genome sequencing (WGS) analysis at APHA on a *Brachyspira* culture isolated by SRUC has identified *Brachyspira suanatina.* This is the first known detection of this *Brachyspira* species in pigs in Great Britain. *B. suanatina* was detected by APHA on one occasion previously in GB in an avian species; a rhea. The *B. suanatina* was isolated from one of three samples submitted in February 2022 from 10-week-old growing pigs with diarrhoea in England. It was not detected in the other two sampled pigs, one of which had salmonellosis.

B. suanatina is not a notifiable or reportable disease. It is not zoonotic and transmission through pork/pork products is not a recognised route of transmission for enteric *Brachyspira*. APHA has genomic information from only a few pig *B. suanatina* isolates including the *B. suanatina* type strain from a pig in 2003 from Sweden (Mushtaq and others, 2015) and the UK rhea isolate (McFadzean and others, 2021). Core genome SNP analysis of this pig isolate showed that it is not similar to any of these other *B. suanatina* genomes (SNP distance >7400 SNPs). The isolate has the 23S rRNA A2058T SNP associated with reduced susceptibility to lincomycin, tylosin and tylvalosin in B. hyodysenteriae. No genes or SNPs associated with reduced susceptibility, in *B. hyodysenteriae* to tiamulin, valnemulin or doxycycline were present.

B. suanatina can cause diarrhoea in pigs and was first described in 2007 in pigs and mallard ducks in Sweden by Råsbäck and others (isolates from early 2000s). Outside Scandinavia, infection was detected in pigs in 2017 in Germany (Rohde and others, 2018). Enteric *Brachyspira* species are spread by the faeco-oral route. Risk pathways for introduction into the UK, and into pig herds, could be through importation of clinically mildly or asymptomatically infected pigs. *B. suanatina* could also be introduced into new areas and pig herds by migratory waterfowl. Direct or indirect contact between waterfowl and pigs, particularly if outdoors, would be a risk factor for introduction although it is not known how commonly *B. suanatina* is found in waterfowl.

Risk factors existed for the pigs in which *B. suanatina* was detected; they were kept outdoors with a nearby lake with visiting waterfowl, particularly ducks, regularly seen. Follow-up sampling will determine if infection continues to be detected in the pigs. This detection demonstrates the value of whole genome sequencing of haemolytic *Brachyspira* species isolates and others of interest obtained in culture to confirm their identity. This is funded by the pig scanning surveillance project and enabled the detection of this exotic *Brachyspira* species and another, *Brachyspira hampsonii*, which was similarly first detected in pigs in England in 2019 (APHA, 2019).

Unusual diagnoses or presentations

Cutaneous candidiasis in growing pigs

An interesting diagnosis of skin disease was made by SRUC. An outbreak of skin lesions occurred in finishing pigs in a unit where pigs were wet-fed including surplus milk from a dairy on a related farm. The condition presented as non-pruritic, multi-focal red lesions with early crusting that were distributed widely over the bodies of many of the pigs, resembling greasy pig disease. The pigs were in good condition with no other signs of illness. Investigation including bacterial cultures and histopathology which confirmed an unexpected diagnosis of

cutaneous candidiasis with yeast organisms visible in the superficial layers of the epidermis and fungal hyphae invading the epidermis. Bacterial cultures yielded heavy growths of *Candida albicans*. No significant staphylococcal species were isolated. The feed troughs were wide and somewhat unsuitable as pigs were able to lie in the surplus food material. It was speculated that the infection arose from yeast contamination in the troughs and on the slats. It was recommended that the pigs be moved to well-ventilated dry straw pens and dry-fed for a period while hygiene could be improved in their pens and troughs.

Feral wild boar diagnostic submissions in 2022

ASF surveillance testing of feral wild boar (*Sus scrofa*) is undertaken on single wild boar found dead within the Forest of Dean (FoD). This surveillance is part of ASF preparedness, Defra and the APHA work with Forestry England to facilitate early detection if ASF should enter wild boar. Currently, feral wild boar found dead or those shot for welfare reasons because they look acutely ill are eligible for this surveillance, while those involved in road traffic accidents or shot for welfare reasons due to traumatic injury or wasting are not currently eligible for sampling. This approach aligns with recommendations by the European Food Safety Authority that ASF surveillance in the wild boar population is most effective when targeted at wild boar found dead. Surveillance requirements would likely change if ASF were to be confirmed in the UK.

Two wild boar euthanased in 2022 on welfare grounds by FE rangers due to appearing unwell and in poor body condition were submitted to the Starcross Veterinary Investigation Centre (VIC) for post-mortem examination. One was found to have a large laryngeal fibroma partially occluding the airway (Figure 6). The other had been found with hindlimb paralysis and had a lumbar spinal abscess explaining the clinical signs. Purulent material was found in the spinal canal at the level of L3-L4 with associated osteomyelitis and *Staphylococcus aureus* was isolated. There was abscessation elsewhere involving the left hindlimb fetlock joint and subcutaneous tissues of the limb, and the right gluteal area.

Previous findings in wild boar dying in the FoD were described in a focus article in the Veterinary Record (Man and Williamson, 2022).

Figure 6: Laryngeal neoplasia in a euthanased feral wild boar

Changes in disease patterns and risk factors

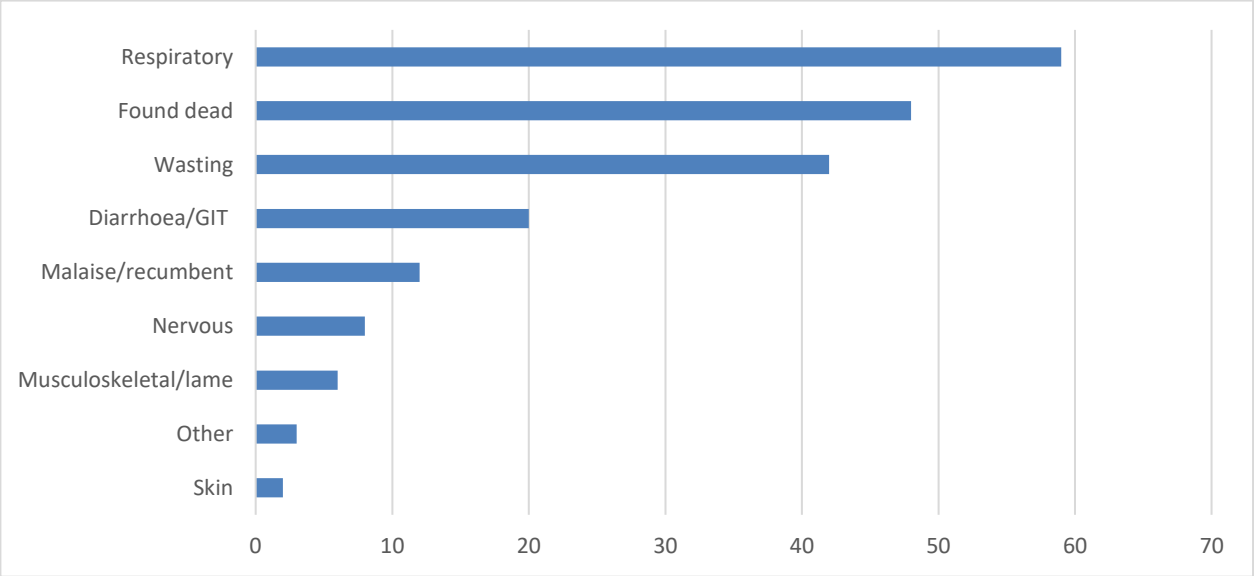
Porcine reproductive and respiratory syndrome dashboard

The APHA porcine reproductive and respiratory syndrome (PRRS) dashboard has been updated with 2021 data to include clinical and pig details from diagnostic submissions to the GB surveillance network from 2012 to 2021 in which PRRS was diagnosed. No PRRS virus – 2 (PRRSV-2) has been detected in GB pigs to date, thus all data described relate to submissions in which disease was due to PRRSV-1. The updated dashboard is now available.

In 2021, 120 diagnoses of PRRS were made, seven of which were recorded as reproductive disease (abortion, stillbirths, weak neonates) and the remainder were recorded as systemic or respiratory disease, with the majority of diagnoses (82) made in post-weaned pigs. As systemic disease and pneumonia due to PRRS are often present together in the same outbreak, data from these are grouped together in the PRRS dashboard. The annual diagnostic rate is shown in the dashboard and has shown a general upward trend, in part reflecting anecdotal reports of disease from the field, but also likely to reflect the increased focus on efforts to control PRRS and also to reduce antimicrobial use. The prominence of PRRS as a diagnosis emphasises the need for collaborative efforts to control this virus, limit spread from infected units, and protect units which are free of PRRSV so they can maintain their infection-free status.

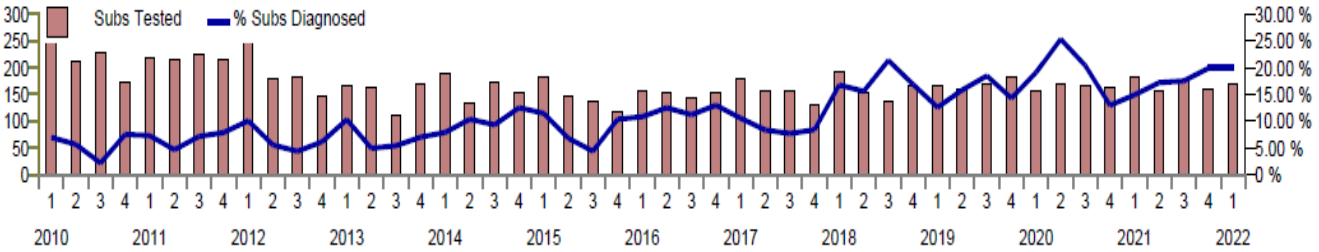
The frequency of clinical signs reported, whether main or secondary, in pigs diagnosed with PRRS (systemic or pneumonia) in 2021 are illustrated in the PRRS dashboard (adapted for Figure 7). In order of frequency: respiratory, pigs being found dead and wasting were the three most common clinical signs. Where foetopathy due to PRRS was diagnosed, abortion/stillbirth was the most frequent sign, with other signs described being reproductive (e.g. returns) and milk drop in the breeding pigs.

Figure 7: Clinical signs described for respiratory and systemic PRRS diagnoses in 2021



Seasonality data shows that PRRS remained a prominent diagnosis throughout 2021 although the diagnostic rate has declined from its peak in Q2-2020 (Figure 8). Previously there was a tendency for a seasonal increase in diagnoses over the winter months, however since 2018, this pattern has not been evident.

Figure 8: Seasonality of GB PRRS diagnoses as a percentage of diagnosable submissions to the Great Britain scanning surveillance network

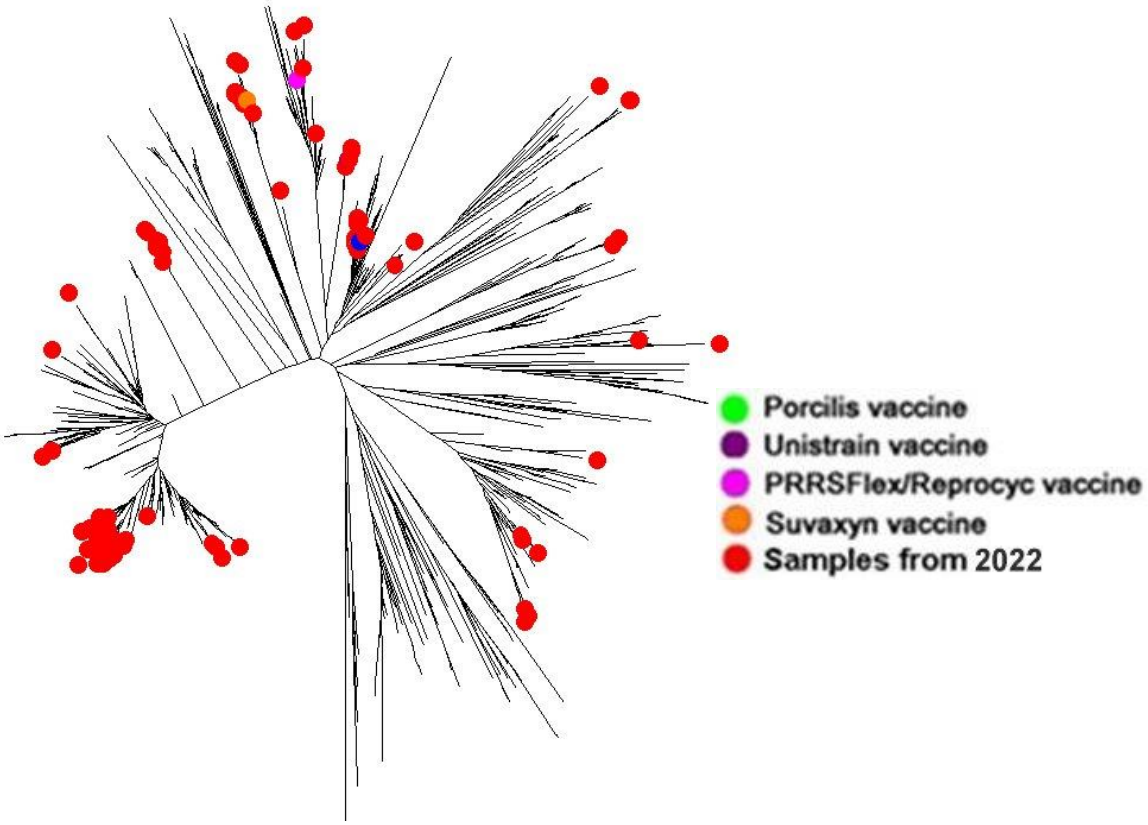


Concurrent diagnoses made in addition to PRRS in the same submission are collated in the dashboard. In 2021, streptococcal disease (mainly *Streptococcus suis*), salmonellosis, disease due to *Pasteurella multocida* and swine influenza were the most frequently identified diseases concurrent with PRRS. Most submissions in which PRRS was diagnosed (105 of 120) recorded diagnoses additional to PRRS. Twelve of the 15 submissions that did not were postal non-carcase submissions in which further investigation is limited by the material available. This underlines the value of the full diagnostic investigation that carcase submissions enable. As these findings illustrate, PRRS can act as a driver for antimicrobial use with bacterial disease prominent amongst the concurrent diagnoses which reflects, in part, the immunosuppressive nature of the PRRS virus. Full diagnostic investigations in disease outbreaks assist veterinarians in developing targeted disease control, including antimicrobial treatment and/or vaccination for other pathogens where appropriate. Controlling and, where possible, eliminating PRRS is a focus for disease control initiatives in the pig component of the Animal Health and Welfare Pathway developed by the pig industry in partnership with Defra.

An item in the July 2022 APHA surveillance report in the Veterinary Record emphasised the importance of comprehensive testing to identify causes of respiratory disease (APHA 2022a). The APHA diagnostic guide has a section on porcine respiratory disease sampling and testing and sampling sites were illustrated in the Veterinary Record report.

Currently, the PCR-positive sample with the lowest Ct value in each PRRSV positive diagnostic submission to APHA from pigs in England or Wales is being sequenced under pig disease surveillance funding to maintain awareness of the diversity in GB PRRSV detected and detect different strains. To date in 2022, ORF-5 sequences have been generated for 103 submissions and multiple different lineages are present as illustrated in Figure 9 but there is no evidence of novel introductions.

Figure 9: Phylogenetic tree showing APHA ORF-5 sequences for PRRSV strains detected in GB pigs in 2022



Information about the genetic analysis of a PRRS strain known as “Rosalia” has recently been published (Martín-Valls and others, 2022). This strain has been described associated with severe outbreaks of PRRS in Spain. The Rosalia strain is a Western European strain of PRRSV-1. Its presence in Spain is not new; virulent outbreaks of PRRS were noted in the north-east of Spain in February-March 2020. It appears to have originated from the Italian PR40 “highly pathogenic” PRRSV strain which was described in 2017 and is thought to have been around from 2012 or so. This strain has established in Spain and has continued to diversify there, possibly with some recombination events.

The Rosalia strain is a subtype 1 PRRSV-1 strain, like most in Europe and is not an Eastern European sub-type which tend to be more virulent. However the paper describes severe disease with high abortion rates and mortality in sows and mortality over 20% in weaners and growers. The PRRSV National Reference Laboratory lead at APHA has looked at the Rosalia sequence and there are no known issues with detection of the Rosalia strain in our diagnostic PCRs. There are no UK sequences in the cluster of the ORF-5 phylogenetic tree where Rosalia falls. It is distinct from the GB strains of PRRSV-1 that have been sequenced by APHA. ORF-5 gene sequencing should readily identify this strain and distinguish it from resident GB strains. The presence of diverse and, sometimes, more pathogenic PRRSV-1 in parts of Europe, alongside PRRSV-2, emphasises the importance of preventing strains exotic to the UK from entering. The NPA live pig import protocol has recommendations about testing for PRRSV. Imported pigs and semen should only be sourced from PRRSV-negative herds.

Enteric disease surveillance: trends in Quarter 2 of 2022

The diagnostic rates for disease due to *Escherichia coli* and *Lawsonia intracellularis* remained high in quarter 2 of 2022, continuing a trend first noted in 2021 (Figures 10 and 11), although the numbers of diagnosable submissions were reduced during this quarter.

Figure 10: Seasonality of *E. coli* disease incidents in pigs to quarter 2 of 2022 as a percentage of diagnosable submissions to the Great Britain scanning surveillance network

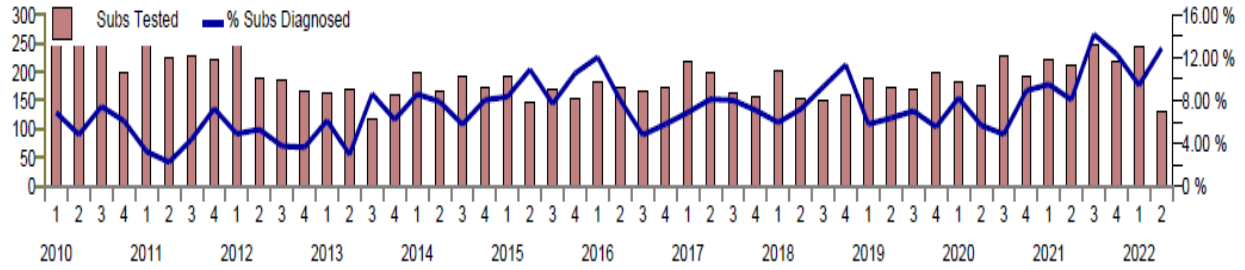
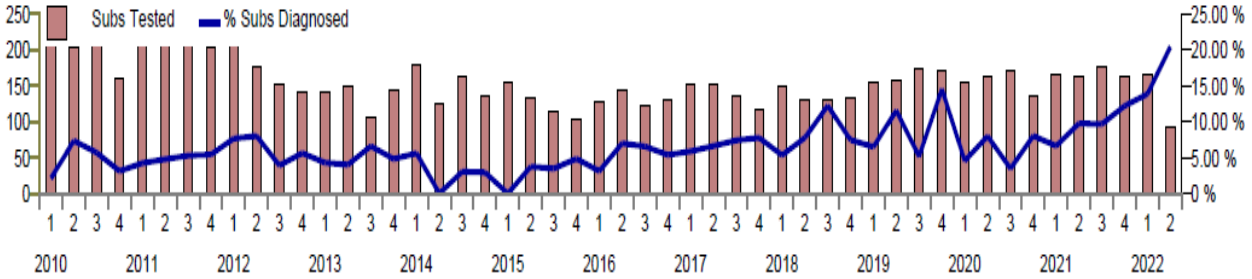


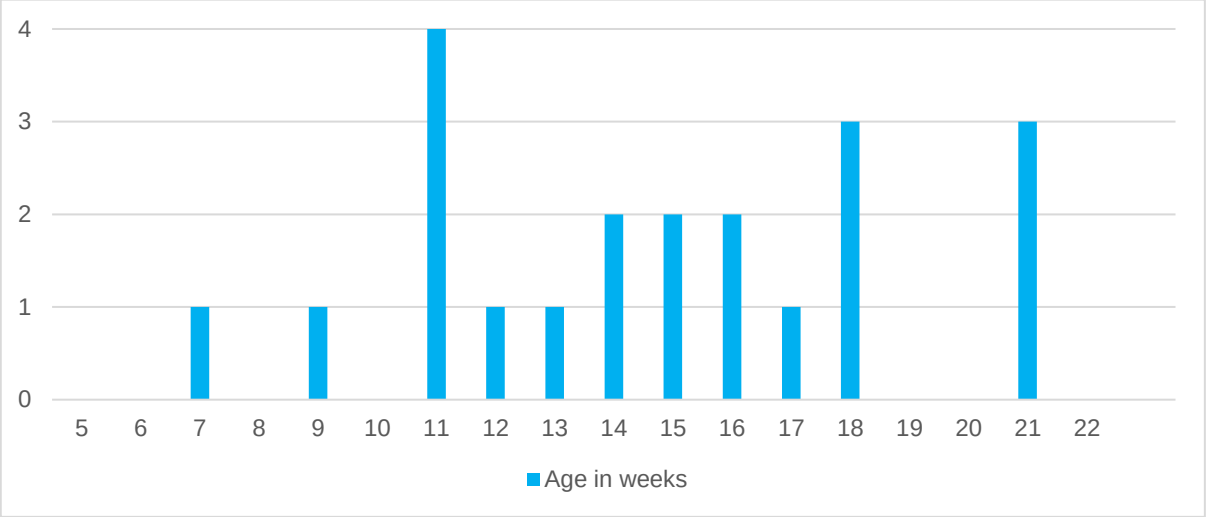
Figure 11: Seasonality of *Lawsonia*-associated disease incidents to quarter 2 of 2022 as a percentage of diagnosable submissions to the Great Britain scanning surveillance network



Although the back logs on pig farms have largely been alleviated, superimposed on the issues those created, pig producers now face increased feed and fuel costs due to the conflict in Ukraine. There may be further effects on enteric disease trends as a result, for example due to variation in feed ingredients and dietary changes, and these diagnostic rates will be kept under review.

Figure 12 shows the age profile of 2022 cases of *Lawsonia*-associated disease where age detail was provided with the submissions (21 of 34). This profile remains fairly typical of what is expected. The main clinical sign described was diarrhoea (70%), followed by wasting (24%), with pigs being found dead (6%) as the third and less common presentation.

Figure 12: Age profile of Lawsonia-associated disease in pigs in England and Wales diagnosed through the scanning surveillance network to July 2022



A similar increase in the diagnostic rate of *Lawsonia*-associated disease in 2017 prompted a Pig Veterinary Society member survey. In that, the most common reason given for the increase was changes in antimicrobial use, and the second most common reason was increased use of diagnostics to aid more specific disease control. Over 60% of respondents suspected then that they were seeing an increase in certain diseases in relation to changes in antimicrobial use, necessitating additional interventions to control them, with the comments mentioning Glässers, *Streptococcus suis* and respiratory diseases most often. Only 20% of respondents thought that they were seeing certain diseases at greater frequency in relation to changes in antimicrobial resistance (APHA, 2018). Some of these are likely to remain relevant. The rise in *Lawsonia*-associated diagnoses was highlighted in the August 2022 APHA Veterinary Record surveillance report (APHA, 2022b).

Swine dysentery diagnoses continue in quarter 2 of 2022

There were 10 diagnoses of swine dysentery confirmed in the first six months of 2022 compared to 11 during the whole of 2021, reflecting an increase in the diagnostic rate in early 2022 which slowed in the second quarter but still saw diagnoses being made and several alerts issued by the pig industry's Significant Diseases Charter. Diagnoses in 2022 have been in pigs in Cornwall, Lincolnshire, Norfolk, Cheshire, Cleveland & Darlington, East Riding and North Lincolnshire and North Yorkshire.

Brachyspira hyodysenteriae isolates obtained from these more recent 2022 outbreaks are undergoing whole genome sequencing (WGS) and antimicrobial sensitivity minimum inhibitory concentration testing, under APHA's pig disease and antimicrobial resistance surveillance projects respectively. Those that have already been sequenced in 2022 have been multi-locus sequence type (MLST) 52, 242 and 251 and one with a new MLST. The B. hyodysenteriae MLST dashboard provides more information about sequence types detected over time and in different counties, with their antimicrobial resistance gene profiles. There have not been any B. hyodysenteriae isolates showing pleuromutilin resistance so far in 2022.

The importance of practicing excellent vehicle biosecurity in preventing introduction and

spread of exotic and endemic diseases, including swine dysentery, has been emphasised in communications highlighting the #MuckFreeTruck campaign from the National Pig Association and AHDB with support from the British Meat Processors Association, the Pig Veterinary Society, the British Pig Association and Red Tractor. The campaign is also endorsed by the UK Chief Veterinary Officer.

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

- ADHB guidance on swine dysentery
- ADHB significant diseases charter
- APHA information note on swine dysentery (PDF)
- NADIS guidance on swine dysentery

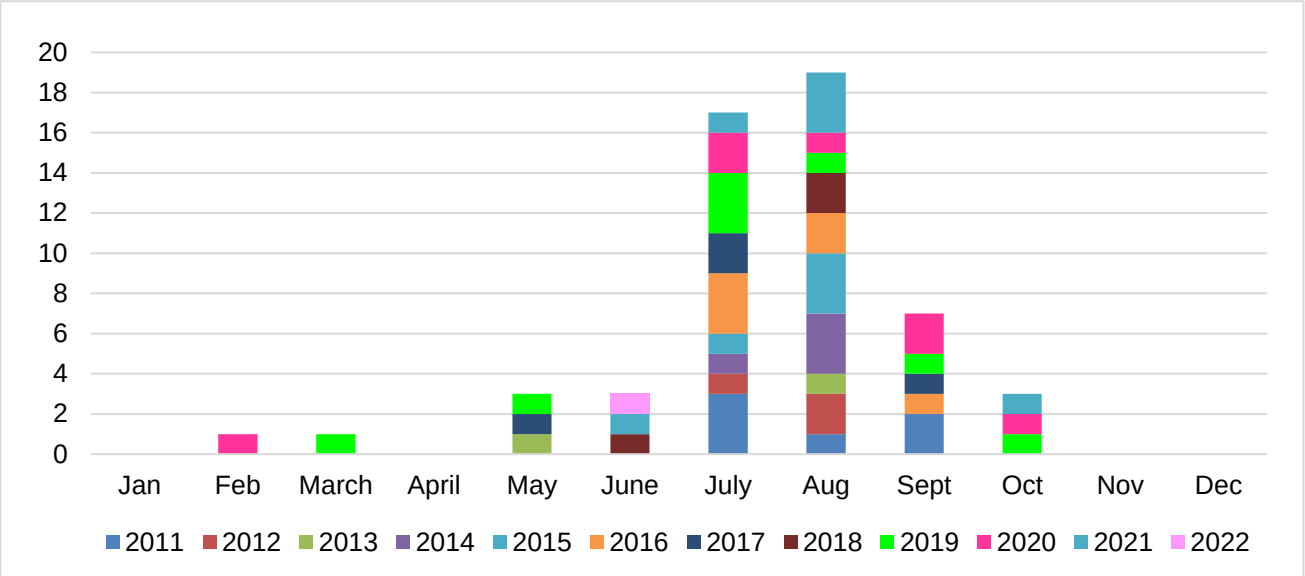
Klebsiella pneumoniae septicaemia diagnoses 2022

The first outbreak of *Klebsiella pneumoniae* subsp. *pneumoniae* (Kpp) septicaemia of 2022 was confirmed in June. Since their emergence in 2011, Kpp outbreaks have shown a marked seasonal pattern, with almost all occurring between May and October each year (Figure 13). Molecular analysis of isolates has identified that the same emerging strain of Kpp has been involved in all but one of the outbreaks and is sequence type 25. Outbreaks almost exclusively affect preweaned pigs from ten days of age to weaning, and most, but not all, have been in outdoor pig herds. Herds experiencing outbreaks in consecutive years have used autogenous vaccine in sows to control disease in piglets, reportedly to good effect.

The 2022 outbreak was typical, causing sudden death of well-grown outdoor pre-weaned pigs in East Anglia and was described in the June 2022 APHA surveillance report in the Veterinary Record (APHA 2022c). Approximately 60 from the batch of 1450 three-week-old pigs died. The farm had previously had an outbreak of Kpp septicaemia in October 2020. Heavy, often pure, growths of Kpp were obtained from multiple internal sites in several piglets confirming the diagnosis of Kpp septicaemia.

The clinical signs of sudden death are non-specific and further investigation, including post-mortem examination and culture, is essential to confirm a diagnosis. The case definition for an outbreak of Kpp septicaemia is "'Pigs found dead with lesions consistent with septicaemia and pure/predominant growths of Klebsiella pneumoniae subsp. pneumoniae isolated from internal sites in multiple pigs". Further information can be found in a paper about updates on the Klebsiella pneumoniae septicaemia outbreaks.

Figure 13: Outbreaks of Kpp septicaemia in piglets by month of diagnosis 2011 to June 2022



Horizon scanning

Surveillance for PCV2e genotype in China

Three genotypes of porcine circovirus 2 (PCV-2a, PCV-2b, and PCV-2d) have a worldwide distribution, including the UK. Reports of other genotypes are restricted to certain geographical regions and/or limited time periods. Genotype 2e of PCV2 is present in Asia and North America and was recently detected on one farm in Italy (Franzo and others, 2022) which is the only detection of PCV2e described in Europe. The PCV2e genotype was previously described in the Fujian province of China and this prompted testing of 79 samples from the lungs of pigs with respiratory disease from 2018 to 2021 to obtain preliminary information on the genetic diversity and prevalence of PCV2 genotypes (Xu and others, 2022). PCV2 was detected in 29.1% of the samples and phylogenetic analysis based on the PCV2 ORF2 gene and complete genomes, detected genotypes PCV2a, PCV2b, PCV2d and PCV2e. PCV2e was identified for the first time in some provinces of China. This small study shows that PCV2e is more widespread than previously known in southern China. It is possible that this genotype is present but unrecognised elsewhere also due to lack of surveillance or under-reporting.

APHA regularly genotypes cases of PCV2-associated disease and a shift from PCV2b to 2d was detected in recent years (Grierson et al., 2017). PCV2e genotype has not been detected in these cases. Continued monitoring will help evaluate the efficacy of current vaccines to PCV2e, should it be detected.

Streptococcus zooepidemicus high mortality incidents in the US

Previous reports from the US Swine Health Information Centre (SHIC) have described unusual US and Canadian cases of fatal streptococcal infection in adult sows and finishers due to *Streptococcus equi* subsp. *zooepidemicus*, and abortions in sows (APHA, 2019b). In the US, these high mortality events were first reported in Ohio and Tennessee in 2019 and in early 2021 an outbreak was also confirmed in sows in Indiana. SHIC funded whole genome sequencing analysis which found that the strain causing high mortality outbreaks in Ohio and Tennessee differed genetically from the isolates obtained from affected pigs in Indiana. These results indicated that more than one strain of *S. zooepidemicus* can cause high mortality

events in the US. Further work to identify markers of virulence was described in the May SHIC newsletter (SHIC, 2022b).

There were two genomic islands that were identified only in the Indiana outbreak isolates. In addition, there were two genes (M-like protein gene and the Fic domain-containing protein gene) present in Ohio and Tennessee outbreak isolates but absent from Indiana outbreak isolates. These various markers may provide means of identifying these particular outbreak-associated strains.

Canine parvovirus 2 experimental infection in pigs in US

In their June 2022 newsletter, SHIC briefly described experimental infection of neonatal piglets with canine parvovirus-2 (CPV-2) to follow-up evidence of exposure to, and infection with, CPV-2 in pigs in the field. They reported that colostrum-deprived piglets inoculated oronasally did not appear to develop productive CPV2 infections (SHIC, 2022c). The identification of canine parvovirus type 2 (CPV02) by metagenomic sequencing on archived lung of a pig submitted for diagnostic investigation was described in the scanning surveillance report for quarter 3 of 2021. The detection prompted a study which confirmed wider evidence of spill-over of CPV-2 from canines to pigs in South Dakota by PCR, sequencing, in situ hybridization, and serology. The results of this study have been published (Temeeyasen et al., 2022) and genetic analysis suggests the spillover is from wildlife. Only coyotes are common in the agricultural areas of the upper US Midwest and are peridomestic; the authors hypothesise that CPV-2–infected coyote faeces could be a source of infection to pigs. As foxes and badgers come into indirect contact with outdoor pigs in the UK, this finding may have relevance here, however, it is not yet known whether CPV-2 can cause disease in pigs.

Candidatus *Mycoplasma haemosuis* in pigs in Germany

A novel porcine haemotrophic mycoplasma species named ‘Candidatus *Mycoplasma haemosuis*’ has been described in Asia and on a fattening farm in Germany (Stadler and others, 2020). Ade and others (2022) have investigated the prevalence of this Ca. *M. haemosuis* at farm level in Germany using PCR on blood samples. Three of 21 piglet producing farms and 9 out of 20 fattening farms were positive for ‘Ca. *M. haemosuis’*. Co-infections with *M. suis* were also identified. Significantly Ca. *M. haemosuis* and *M. suis* were detected in the blood of piglets sampled before colostral intake, indicating vertical transmission of these pathogens, which has been recognised for *M. suis* previously. Disease due to Ca. *M. haemosuis* described by Stadler and others (2022) in fattening pigs was characterised by skin pathology (urticaria, haemorrhagic diathesis), inappetance, anaemia and high fever in 30% of the pigs two weeks after their arrival on farm. Affected pigs responded well to treatment with oxytetracycline and non-steroidal anti-inflammatory drugs.

Porcine deltacoronavirus review

Porcine deltacoronavirus (PDCoV) is an emerging enteropathogenic coronavirus of swine that causes acute diarrhoea, vomiting, dehydration and mortality in susceptible neonatal piglets. PDCoV emerged in the US in 2014, soon after the emergence of PED. It is a differential for porcine epidemic diarrhoea (PED), although outbreaks due to PDCoV are generally considered to be milder than those due to PED. A review of PDCoV was recently published by Kong and others (2022) and provides an overview of the origin, evolution, cross-species transmission and zoonotic potential of epidemic PDCoV strains.

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