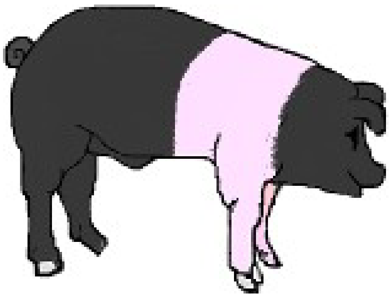

Great Britain pig quarterly report: disease surveillance and emerging threats

Volume 26: Quarter 4 of 2022 (October to December)

Highlights

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the fourth quarter of 2022, 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 theAPHA 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 most frequently in the fourth quarter of 2022 compared to the same quarter in 2021 through the Great Britain (England, Wales and Scotland) scanning surveillance network are listed 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 4 of 2022 and for the whole of 2022

15 most frequent diagnoses in quarter 4 of 2022 (total 285)	15 most frequent diagnoses in 2022 (total 1,116)
1. Salmonellosis – *S.* Typhimurium	1. *Lawsonia* sp. associated disease
2. *Lawsonia* sp. associated disease	2. Salmonellosis – *S.* Typhimurium
3. Salmonellosis – other serotype	3. Colibacillosis - enteric
4. Porcine reproductive and respiratory syndrome (PRRS) - systemic	4. PRRS - systemic
5. *Streptococcus suis* disease	5. PRRS - pneumonia
6. PRRS - pneumonia	6. Rotavirus
7. Swine dysentery – *B. hyodysenteriae*	7. *Streptococcus suis* disease
8. Colibacillosis - enteric	8. *Brachyspira pilosicoli* colitis
9. Intestinal torsion	9. *Pasteurella multocida* pneumonia
10. *Brachyspira pilosicoli* colitis	10. Salmonellosis – other serotype
11. *Pasteurella multocida* pneumonia	11. Swine dysentery – *B. hyodysenteriae*
12. Pneumonia – other causes	12. Swine influenza
13. Rotavirus	13. Pneumonia – other causes
14. Trauma/fracture	14. Intestinal torsion
15. Salmonellosis – monophasic variants	15. Streptococcal meningitis

Note: that further diagnoses may be added for records for submissions made in quarter 4 of 2022 which are finalised at a later date.

Surveillance data for diagnostic submissions in quarter 4 of 2022, and in the whole of 2022 are illustrated in Figures 1 and 2 respectively.

Figures 1a to 1d: summary surveillance data for 421 submission records in quarter 4 of 2022 (432 in quarter 4 of 2021)

Figure 1a: pig age

Age Category	
Adult	77
Mixed	3
Neonatal	10
Postwean	223
Prewean	26
Unknown/other	82

Figure 1b: disease syndrome

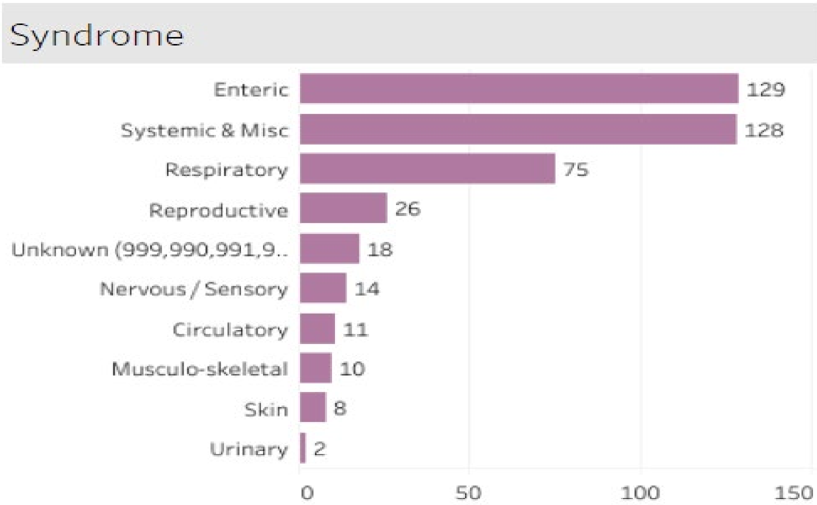


Figure 1c: submission type

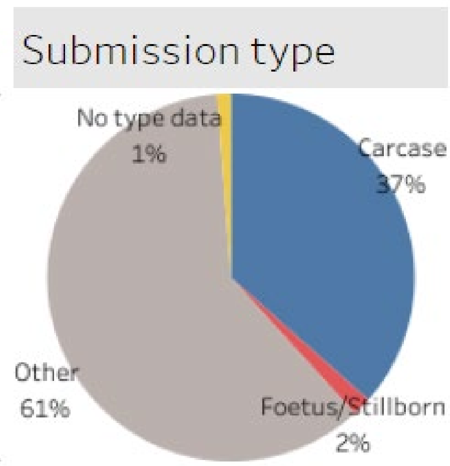
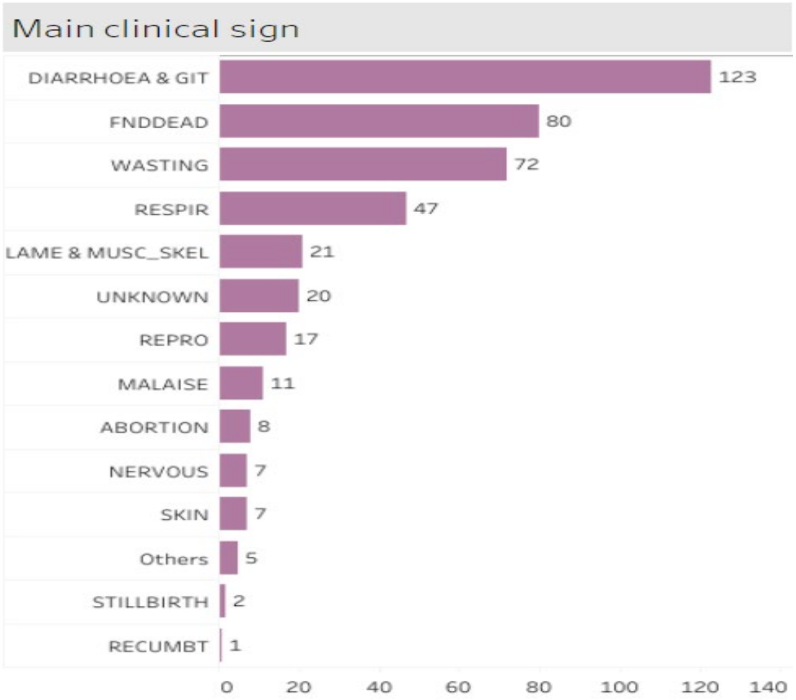


Figure 1d: main clinical sign reported



Figures 2a to 2d: summary surveillance data for 1,732 submission records for the whole of 2022 (1800 in 2021)

Figure 2a: pig age

Age Category	
Adult	263
Mixed	28
Neonatal	83
Postwean	903
Prewean	138
Unknown/other	317

Figure 2b: disease syndrome

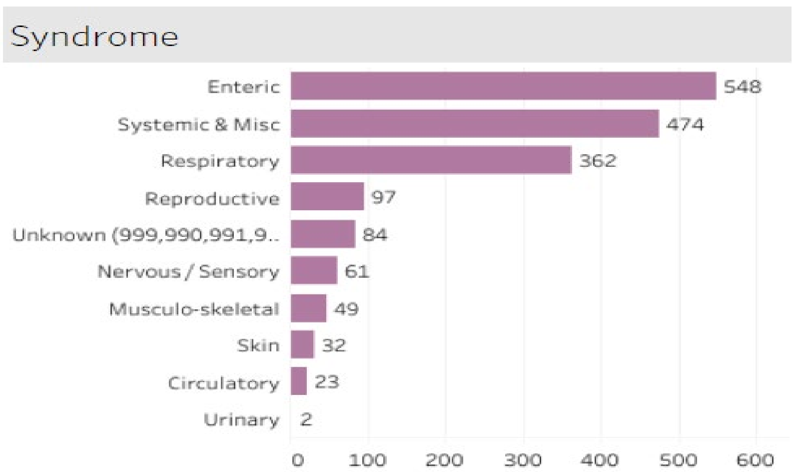


Figure 2c: submission type

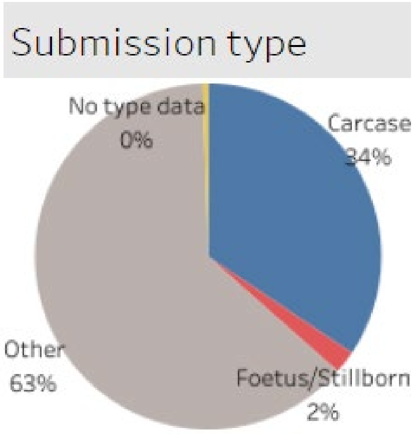
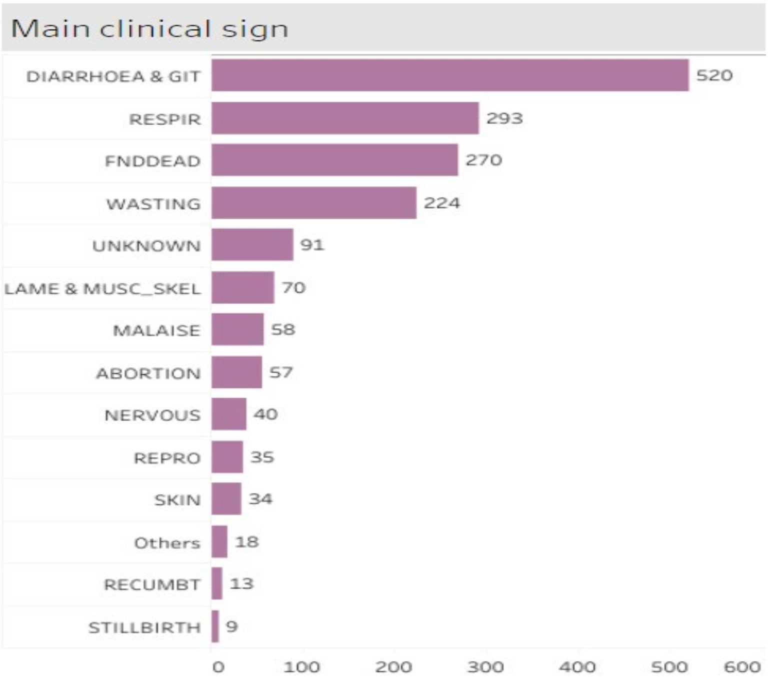


Figure 2d: main clinical sign reported



These diagnostic submissions are voluntary and subject to several sources of bias. The profile of submissions for the fourth quarter of 2022 was similar to that of the same quarter of 2021 in that the most frequent main clinical sign was diarrhoea and gastro-intestinal, and the most frequent syndrome in quarters 4 of 2021 and 2022 was enteric.

Encouragingly, total Great Britain (GB) diagnostic submission records for quarter 4 of 2022 were slightly higher than the total for the same quarter in any of the previous four years. The number of GB carcase submissions in quarter 4 of 2023 was more than the average for quarter 4 in the previous four years. The balance of submission types changed from being 44% carcases in quarter 4 of 2021 to 37% carcases in quarter 4 of 2022, although this balance has changed in favour of carcases since quarter 3 of 2022 when they represented 31% of total sample types. The total GB submissions for the whole of 2022 was the same as for 2021 and more than in 2019 and 2020. However, carcase submissions as a proportion of total sample types in 2022 fell by 10% compared to 2021.

These changes in balance of sample type 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 for some other disease syndromes.

Discussion with pig veterinary and industry representatives suggest that although there are continued financial and resource pressures on pig producers and their businesses, there is some optimism as pig prices have risen and wheat and fuel costs have eased, although both remain high. This may have helped maintain throughput in the GB scanning surveillance network in quarter 4 of 2022. Another important factor to keep under review is the reduction in the national breeding sow population during 2022 which is resulting in a reduction in the postweaned growing pig population from which most diagnostic submissions derive.

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.

The latest updates on the [ASF situation in Europe](#) were issued in December 2022 and January 2023. Figures 3 and 4 show cases reported to World Organisation for Animal Health (WOAH) from August 2022 to January 2023 in domestic pigs and wild boar respectively.

Figure 3: ASF reports for domestic pigs in Europe for August 2022 to January 2023 WOAH data only (mapped 2 February 2023)

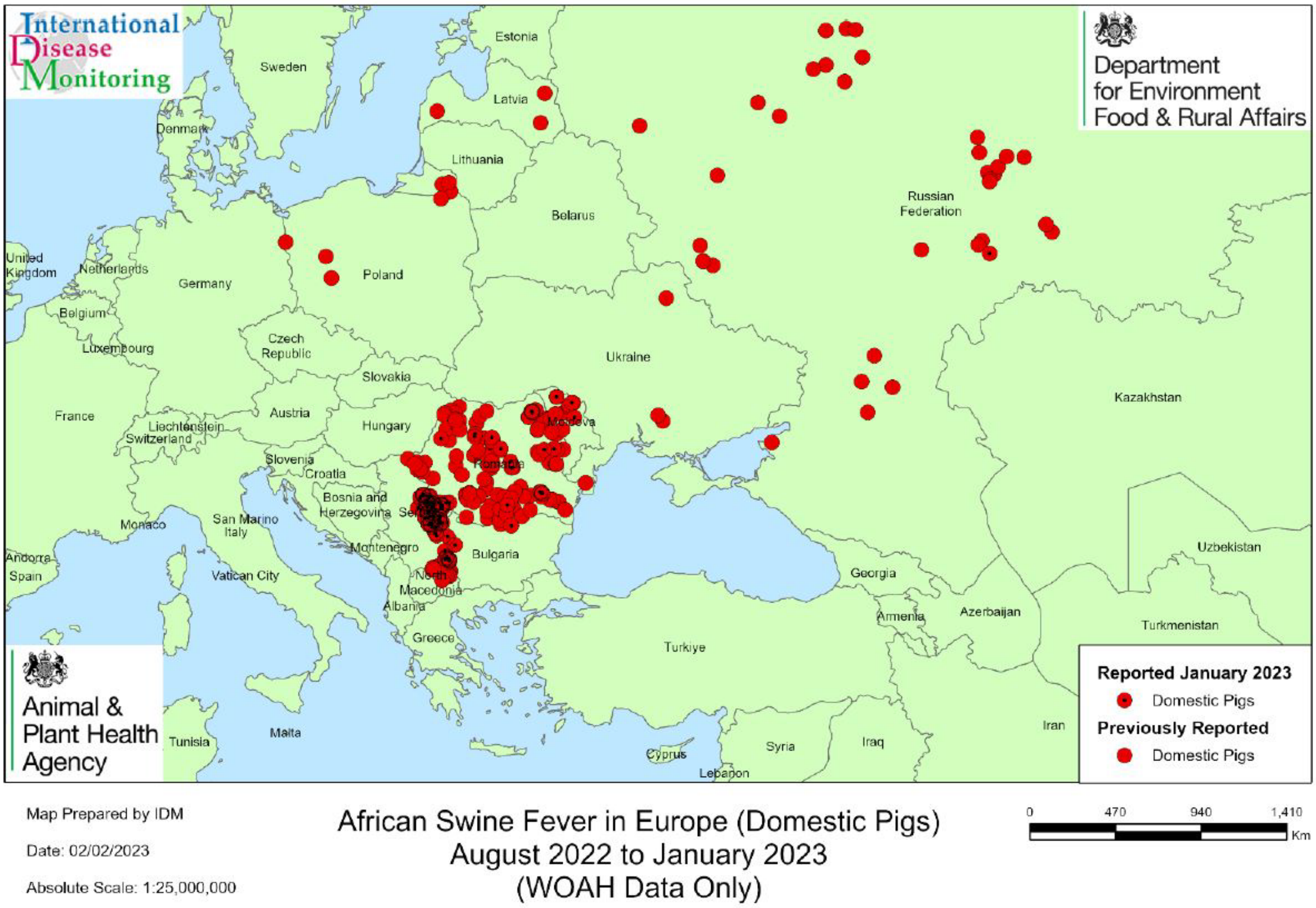
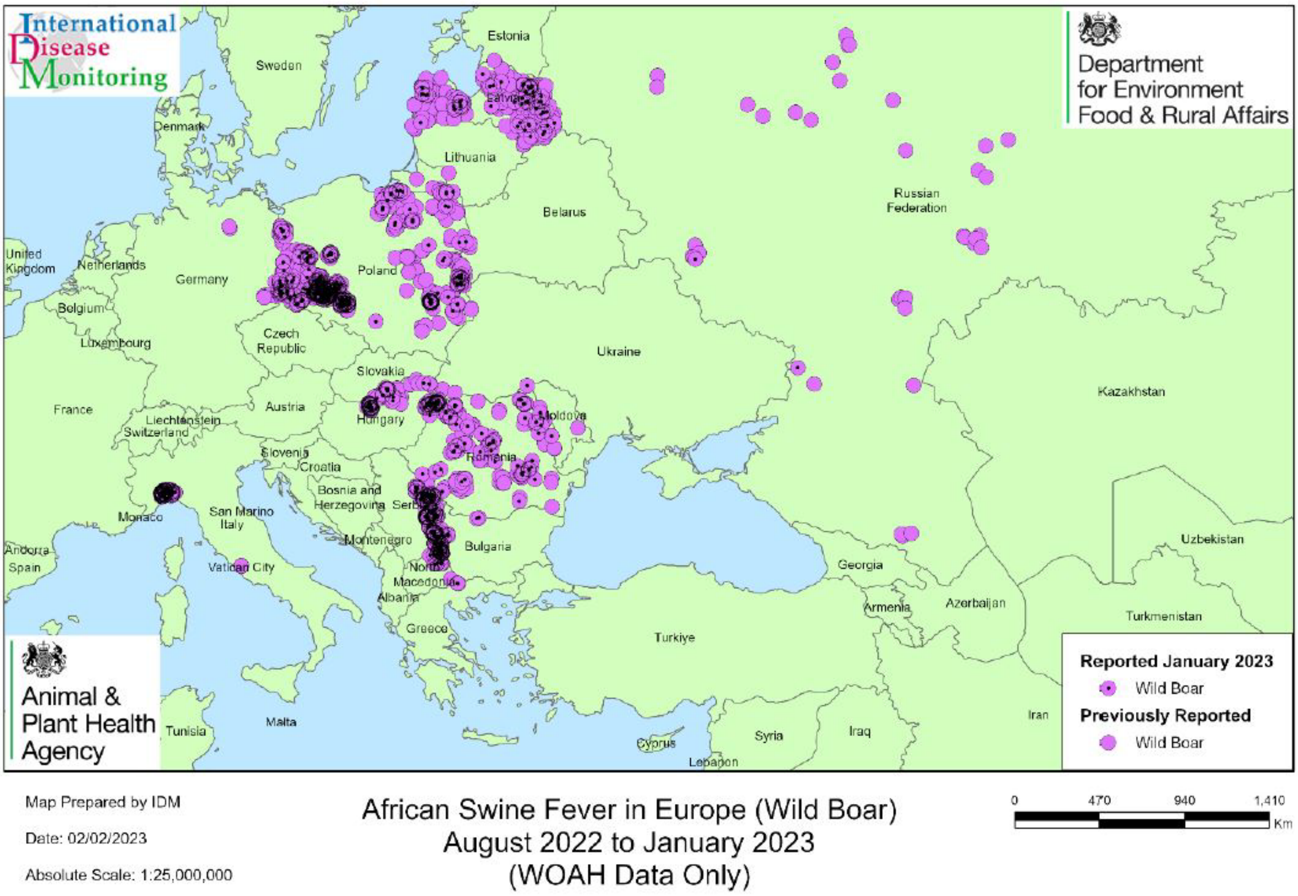


Figure 4: ASF reports for wild boar in Europe for August 2022 to January 2023 WOAH data only (mapped 2 February 2023)



Notable findings on African swine fever (ASF) in Europe include the detection of ASF in a dead wild boar sampled after being hit by a car in the Czech Republic. The location was near the border with Poland, and also near the border with Germany. This is the first detection of ASF in the Czech Republic for four years and the first since eradication of the previous ASF outbreak in wild boar which was achieved within 10 months in April 2018. ASF has not been detected in domestic pigs in the Czech Republic. The authorities declared an infection area within which there is restricted entry to the forest and hunting wild boar is prohibited. Any carcasses found during searches for dead wild boar are tested for ASF and removed for disposal. Within the control zone, domestic pigs must be registered and kept housed and hobby and backyard pig herds will be sent for slaughter.

Another development was the confirmation of ASF in two wild boar found dead in the Serres region of Greece in late January 2023. The wild boar were found near the borders with Bulgaria and North Macedonia, both of which are countries affected by ASF. This is the first ASF detected in Greece since an outbreak in domestic pigs on one backyard farm in early February 2020 that was controlled. Following the recent ASF detection in the wild boar, immediate control measures put in place include searching and testing wild boar carcases, checks on pig farms in the affected area, and control of hunting and forestry activities.

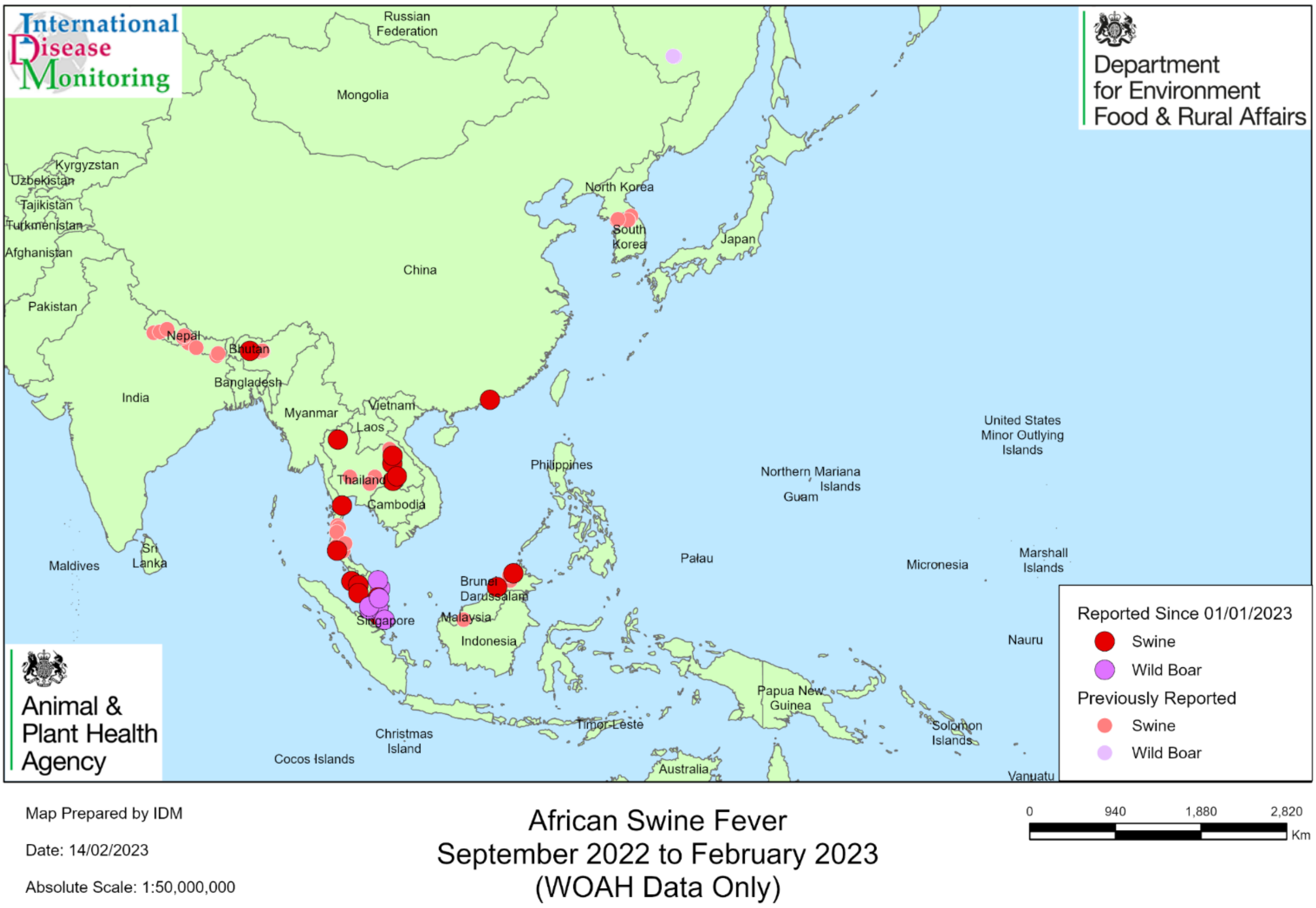
At the end of February 2023, ASF was confirmed in domestic pigs on a small backyard farm with just 11 pigs in eastern Germany, the pigs have been culled. This was the eighth domestic pig case in Germany and the fifth to be located in the Brandenburg state. Three other domestic pig outbreaks have occurred in Mecklenburg-Vorpommern, Baden-Württemberg and Lower Saxony, some of these are likely to have been due to human-mediated spread. Brandenburg was the first German state to detect ASF in wild boar in September 2020, since when, detections of ASF in wild boar have been ongoing despite efforts to fence infected areas and the border with Poland; find, remove and test dead wild boar; reduce the wild boar population and undertake ASF surveillance.

Maps showing information on the European Union (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. The Dominican Republic (DR) and Haiti continue to report ASF cases in domestic pigs. The United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) has increased its input into raising local ASF disease awareness, and ASF surveillance and is assisting with feral pig control in the region.

The latest update on the ASF situation in Southeast Asia and Oceania was issued in February 2023. Figure 5 shows cases reported to WOAH from August 2022 to January 2023.

Figure 5: ASF cases reported in Asia and Oceania from September 2022 to February 2023 – WOAH data only (mapped 14 February 2022)



Singapore has reported its first case of ASF in a dead wild boar; and Hong Kong has reported an outbreak of ASF in domestic pigs - their first report in domestic pigs in around two years. There have also been reports of ASF in domestic pigs in China, Bhutan, India, Malaysia, Nepal, the Philippines, Thailand and South Korea. ASF in wild boar continues to be reported in Hong

Kong, India, South Korea and the Malaysian peninsula (Malaysia also reported ASF in wild bearded pigs).

In India, according to ProMED (citing media reports), ASF has been spreading and has been detected in wild boar populations in the Sigur plateau in southern India in tiger reserves in Karnataka and Tamil Nadl states. Both reserves are part of the same contiguous jungle. There are concerns that the disease could decimate the wild boar population, which is an important prey species for tigers, leopards and wild dogs. In some parts of India, there are also populations of rare suid species, such as the pygmy hog which has a small population in Assam, where ASF has been found in wild boar.

A second vaccine against ASF has been developed in Vietnam. Testing of the vaccine began in March 2022 and the vaccine was approved for circulation in July. This is a different vaccine to the other one also being trialled in Vietnam, use of which was temporarily suspended in August 2022 following pig deaths related to off-label use of the vaccine.

Monthly IDM summaries are also included in the disease surveillance items in the Veterinary Record. The Swine Health Information Centre (SHIC) global reports include a round-up of ASF each month.

A detailed paper has been published by US and German authors showing that transmission of ASF via semen and artificial insemination (AI) does occur (Friedrichs and others, 2022). ASF was transmitted from infected boars to naïve gilts through AI. ASFV was detected in blood at one day post infection and in the semen just two days post infection, with semen quality remaining unaffected. This finding highlights another risk pathway for introduction of ASF to new areas and countries and the risk of infected semen being a means by which ASF could be rapidly disseminated to multiple distant locations.

A German-Swedish ASF research project has begun to investigate in more detail whether the ASF virus can be transmitted via feed, water and bedding: This will assess the stability of ASF viruses in various animal feeds and bedding materials under practical storage conditions with some potential overlap with work done by researchers in the US (Dee and others, 2018).

The history, management, and current research on feral pigs in the US was detailed in an interesting talk from the University of Georgia. There are interesting parallels with the situation in Europe with rapid expansion of the populations in recent years. The recorded talk is available here.

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.

DIFFERENTIAL DIAGNOSIS NEGATED NOTIFIABLE DISEASE REPORT CASES

Two investigations that took place during quarter 4 of 2022 and ruled out notifiable disease involvement are described below.

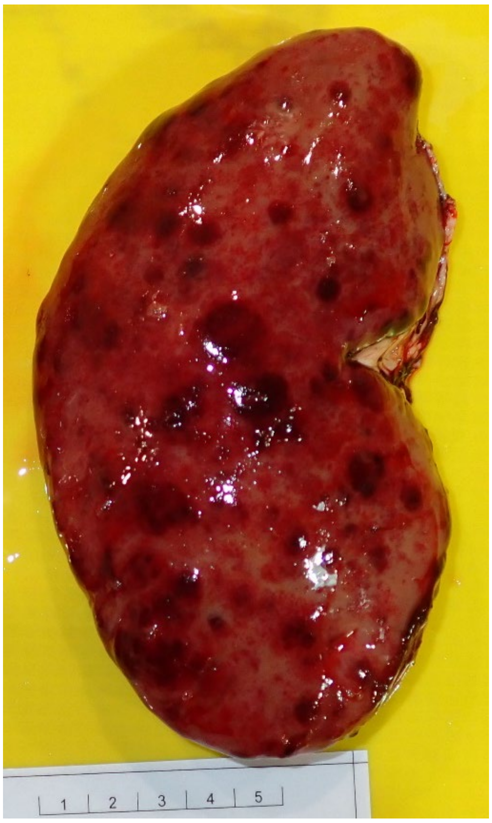
Neoplasia diagnosed in pig with haemorrhagic lesions resembling swine fever

In November 2022, a private veterinary surgeon found widespread haemorrhagic and lymphoid lesions in a finisher pig during on-farm postmortem examination and reported it to APHA as suspect swine fever. The pig was on an indoor nursery unit with nearly 2000 pigs, in which there had been early losses due to salmonellosis. At a private veterinary visit, two pigs were euthanased for investigation. The haemorrhages were found in one pig which was wasted, lethargic, dyspnoeic and ataxic, the other pig had signs of meningitis and there was minimal pathology. No other pigs had skin lesions or clinical signs suspicious of swine fevers.

The case was discussed in depth with the APHA duty vet and swine fevers were ruled out based on the wider epidemiological and clinical findings. Detailed inspection of the lesions also raised suspicion that the lesions were due to neoplasia. The most striking pathology was in the kidneys and lymph nodes. Kidneys had pale cortices with large, variably sized multifocal slightly raised haemorrhagic lesions (Figure 6a) which extended into the cortex on the cut surface. The lymph nodes were generally haemorrhagic and enlarged (Figure 6b). The renal lesions were consistent with cellular infiltration and neoplasia was confirmed by histopathology which revealed widespread infiltration of multiple organs (kidney, liver, lymph node) by a highly cellular round cell neoplasm, most likely a lymphoma. The haemorrhages in multiple organs were likely to be related to necrosis of the tumour and/or interference with normal haemostatic mechanisms leading to, for example, disseminated intravascular coagulation.

Figure 6: multifocal variable sized raised renal lesions (6a) and enlarged haemorrhagic lymph nodes (6b) due to neoplasia, most likely lymphoma

6a



6b

Cases of multifocal haemorrhages in pigs affecting the skin, mucosal and serosal surfaces and viscera may raise concern when the lesions resemble those described for the porcine notifiable diseases, African and Classical swine fevers. This concern is significantly increased where several pigs are unwell and pyrexic with mortality. Occasionally when pigs are submitted to the GB scanning surveillance network for diagnostic post-mortem examination, haemorrhagic lesions are found. Where these lesions, together with the clinical history and epidemiological information, raise suspicion of swine fevers, this must be reported promptly to the APHA for official investigation. A presentation is available to Pig Veterinary Society members on differential diagnosis of swine fevers “If it’s not swine fever, what is it?” from a talk given to at the Society’s meeting in Spring 2021.

Viral diseases ruled out in notifiable vesicular disease investigations

Foot and mouth disease, swine vesicular disease, vesicular stomatitis and Seneca Valley virus were all ruled out by testing during official APHA investigation of a report from a veterinary surgeon of suspect notifiable vesicular disease in pigs. The foot lesions were subsequently suspected to be the consequence of unusually cold conditions outdoors.

Two percent of a batch of weaners that were checked at a routine veterinary visit after their arrival at an indoor nursery unit were found to have foot lesions involving the coronary band with a number of them showing mild lameness. No other clinical signs were evident, in particular, no pyrexia, no oral lesions or hypersalivation, although the affected pigs were smaller than average in the batch.

The pigs derived from an outdoor breeding unit and the investigating APHA veterinarian established that, during the week prior to weaning, the ground had frozen solid and temperatures dropped to -9^{o}C. The piglets had been active and trauma and/or local cold damage may have been responsible for the lesions with abrasions and bruising of the coronary band (Figure 7a) and hoof below (Figure 7b). Some also had bruising of the soles of their feet. There was no particular pattern to whether front or back feet, or inner or outer claws were affected. Only a few smaller pigs within the batch had these lesions and no further pigs subsequently became affected.

Samples tested negative for the viruses listed earlier, including Seneca Valley virus. No further outbreaks of vesicular disease due to Seneca Valley virus were diagnosed in 2022 since the five herds affected between June and September and described in the quarter 3 of 2022 report (APHA, 2022a).

Figure 7: Hoof lesion involving coronary band (7a) and bruising of hooves with haemorrhages (7b) suspected to be the result of trauma and/or local cold damage

7a

7b

Porcine epidemic diarrhoea and other porcine enteric coronavirus 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). No more suspect incidents of PED have been reported since the case in May 2022 on a small pig premises in England in which PED was ruled out and iron deficiency anaemia was diagnosed.

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) and transmissible gastroenteritis virus (TGEV) on a weekly basis. None have been positive for PED in over 1,500 diagnostic submissions tested under Agriculture and Horticulture Development Board (AHDB) Pork funding from June 2013 to December 2022.

This enhanced surveillance using diagnostic PCR testing has incorporated testing for TGEV and was recently extended to include porcine deltacoronavirus (PDCoV) under the same funding; veterinary practitioners were informed of this added testing. This triplex PCR porcine enteric coronavirus batch testing is undertaken on all diagnostic submissions from pigs to APHA that involve diarrhoea and/or an enteropathy. This surveillance aims to detect any of these porcine enteric coronaviruses, should they occur as a new and (re-)emerging cause of porcine diarrhoea in pigs and thus a potential threat to pig health and welfare. The last diagnosis of PED and of TGE recorded in the Great Britain national diagnostic database (VIDA) was in 2002 and 1999 respectively. PDCoV has not been detected to date.

A publication from the United States describes a model developed for PEDV using three years of farm-level data. This estimated the effects of different pathways proposed in the literature involved in the spread of PEDV, including local transmission, the movement of pigs and the spread of disease by vehicles visiting farms. The model found strong evidence that local-transmission and pig-movement effects are associated with the spread of PEDV (Trostle and others, 2022)

Unusual diagnoses or presentations

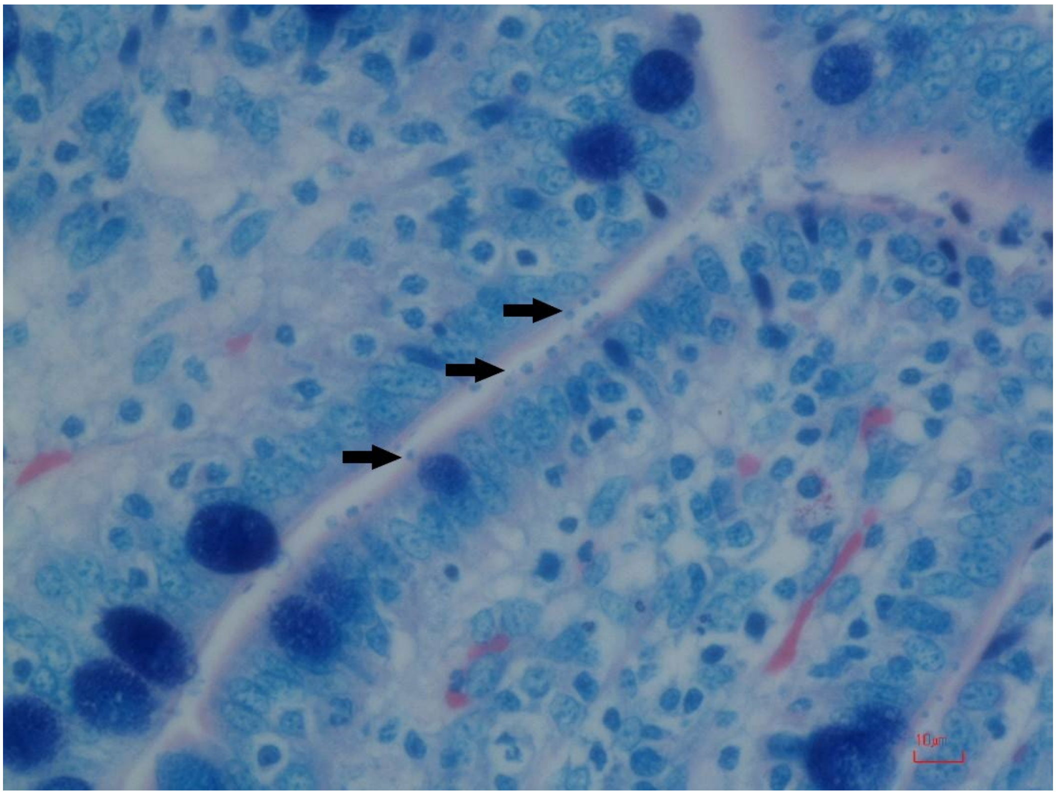
Cryptosporidium species detected in diarrhoeic postweaned pigs

Tentative diagnoses of cryptosporidiosis were made in postweaned pigs submitted from two separate commercial pig premises and described in the APHA January 2023 disease surveillance report in the Veterinary Record (APHA, 2023a).

In the first, three five-week-old pigs were euthanased to investigate an ongoing problem with diarrhoea and wasting on a breeder-finisher unit, batch farrowing every three weeks. The main histological changes in the intestines of all three pigs were consistent with an atrophic enteritis. In one of the pigs (the smallest), the presence of spheroid structures consistent with *Cryptosporidium* species, like those in Figure 9, were adhered to the apical region of enterocytes and were abundant, allowing the histopathologist to attribute the pathology and clinical signs to this protozoan in this pig. These were not seen in intestinal sections in the other two pigs in which no specific cause of the diarrhoea was found through laboratory testing, including porcine epidemic diarrhoea. Histopathology in these pigs suggested contributory intestinal dysfunction rather than a solely infectious issue.

In the second case, three pigs were submitted to investigate wasting post-weaning. Histopathology revealed an atrophic enteritis in one of these pigs, with organisms identified consistent with *Cryptosporidium* species. The cryptosporidiosis was considered likely to account for the villus atrophy, although dietary changes at weaning and enteric infections in earlier life might also have contributed. The attending vet confirmed that there was no direct or indirect contact with ruminants and indicated that hygiene required improvement.

Figure 9: Giemsa-stained section of ileum showing small (1um) ovoid protozoal organisms (arrowed), consistent with *Cryptosporidium* species on the brush border



Cryptosporidium parvum is commonly identified as a cause of diarrhoea in domestic livestock, particularly calves and lambs, and is a zoonotic disease in humans. However, although intestinal *Cryptosporidium* species have been detected in pigs worldwide, infections are usually asymptomatic with a low number of oocysts shed in pig faeces. Few diagnoses of cryptosporidiosis are recorded in pigs through the GB scanning surveillance network; in the last 10 years, just 15 have been made, several of which were in pigs in small herds. It is suspected that the cases of diarrhoea associated with cryptosporidiosis described here were individual cases within batches with wider disease issues. Addressing concurrent and earlier disease issues, improving inter-batch cleaning and disinfection, general hygiene and, as water can become contaminated, reviewing water quality are amongst control measures.

Changes in disease patterns and risk factors

Tracheitis associated with swine influenza outbreak disease

An outbreak of coughing affecting around 80 per cent of pigs at 16 weeks of age on an all-in, all-out indoor strawed multi-source finisher unit was diagnosed as being due to swine influenza and involving swine influenza A virus (SwIAV) H1huN2, an endemic strain in pigs in Great Britain. Unusually tracheitis was present in all six pigs examined postmortem on farm by the attending vet. In some tracheas, there was marked mucosal thickening present sufficient to have caused severe respiratory distress. Two pigs also had cranioventral pulmonary consolidation of cranial and middle lung lobes.

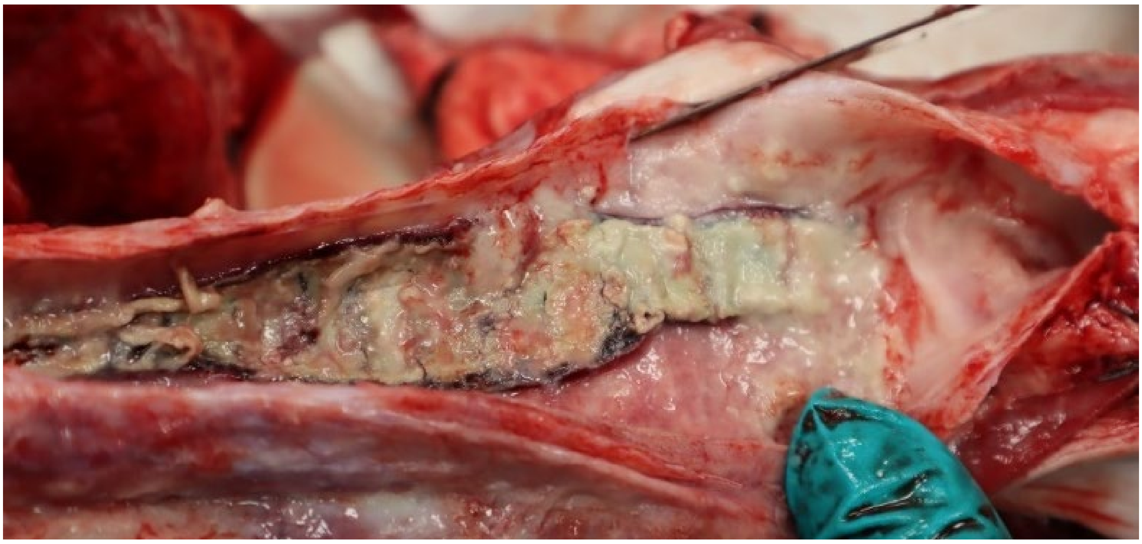
SwIAV was detected by RT-PCR in nasal swabs and in tracheal tissue, as well as by immunohistochemistry on tracheal sections. Histopathology revealed a severe, segmental, acute, fibrinosuppurative and haemorrhagic tracheitis, with coccobacilli visible in the submucosa indicating that bacterial infection, likely secondary to the swine influenza, was also contributing to the aetiology of the tracheitis. No pathogens were identified in bacterial cultures which were heavily overgrown with contaminants. Porcine reproductive and respiratory virus was not detected.

The group was treated with sodium salicylate and amoxycillin in water following which no further deaths occurred and coughing was greatly reduced after around a week. This case was described in the December 2022 disease surveillance report in the Veterinary Record (APHA, 2023b) to raise awareness of this clinical and pathological presentation.

The swine influenza strain involved was detected and subtyped within the Defra-funded swine influenza surveillance project at APHA which provides PCR testing for swine influenza at no charge to veterinary practitioners.

It is important to open the trachea as a routine when undertaking postmortem examination; tracheitis has been a relatively uncommon lesion to find when examining pigs in Great Britain. When seen, tracheal samples should be collected for bacteriology, fungal culture, virology and histopathology in addition to other samples for diagnostic testing according to the postmortem examination findings. Sporadic cases of tracheitis have been described in pig disease surveillance reports, for example due to swine influenza (APHA, 2022b) or fungal infection (APHA, 2019a). Figure 10 shows a previous case associated with swine influenza (pandemic H1N1 20009 strain).

Figure 10: Diphtheresis in the trachea of a pig with acute swine influenza

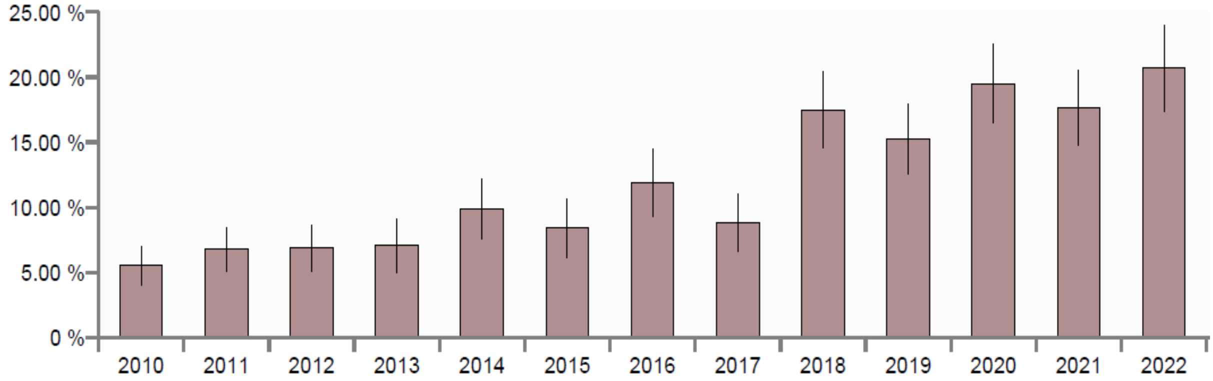


In North America a condition known as "haemorrhagic tracheitis syndrome" has been described in Canada for several years and more recently in the US. Their case definition is of acute onset of a characteristic "honking" cough, usually in a low percentage of pigs aged 14 to 30 weeks old leading to dyspnoea and, in some, to death or euthanasia. A consistent finding in affected pigs is marked oedema and haemorrhage in the tracheal submucosa causing luminal obstruction. The Swine Health Information Centre and American Association of Swine Veterinarians sponsored a webinar about this syndrome.

Porcine reproductive and respiratory syndrome in British pigs in 2022

The diagnostic rate for PRRS showed minimal variation in each quarter of 2022, ranging from 18.4% in quarter 2 to 22.5% in quarter 1, thus although none of these quarters was higher than the most recent peak in Q2 of 2020, the annual diagnostic rate for the whole of 2022 was similar to that in 2020 (Figure 11). To date for 2022, 121 diagnoses of PRRS have been recorded in VIDA from the Great Britain scanning surveillance network which is similar to the number of diagnoses made each year in 2020 and 2021. Nine of these 121 diagnoses were reproductive disease (abortion, stillbirths, weak neonates) and the remainder were systemic disease or pneumonia, with most of those diagnoses made in postweaned pigs. All diagnoses made were due to PRRSV-1 and no PRRSV-2 has been detected in British pigs to date.

Figure 11: Annual PRRS diagnoses as a percentage of diagnosable submissions to the Great Britain scanning surveillance network

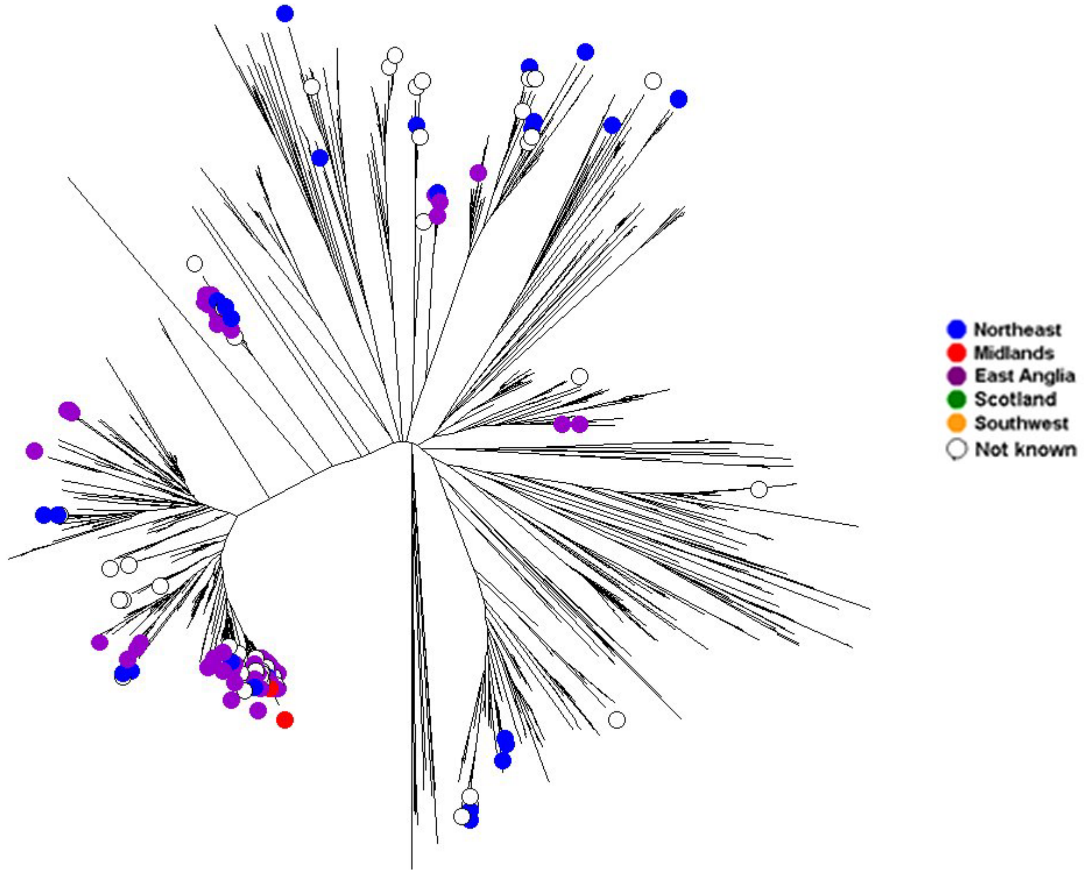


In order to maintain awareness of the diversity in British PRRSV-1 that are detected and to identify unexpected strains, ORF-5 sequencing is undertaken on one PCR-positive sample per submission. This is done under pig disease surveillance funding at no charge to the submitting veterinary practice for pig submissions from premises in England and Wales. In 2022, PRRSV-1 detected in 194 samples from 164 submissions are illustrated in Figure 12 with the geographical region of the premises from which they derive indicated, where this was known.

At least 28 different lineages are seen in 2022, and the increase in diversity over time continues, however there is no evidence of PRRSV-1 strains in different clades, to suggest that there have been novel strains introduced. The increasing diversity reflects evolving resident strains in these different lineages.

During this sequencing analysis, three strains were identified with a single amino acid deletion (three nucleotide deletion) in glycoprotein 5 (ORF5). This has occurred in a portion of the protein not involved in folding, and thus has not resulted in a change in the protein structure. This has not been previously reported and is of virological and molecular evolution rather than clinical significance. It further demonstrates the continuing evolution and diversification of PRRSV-1 strains in the UK. There was no known link between these strains.

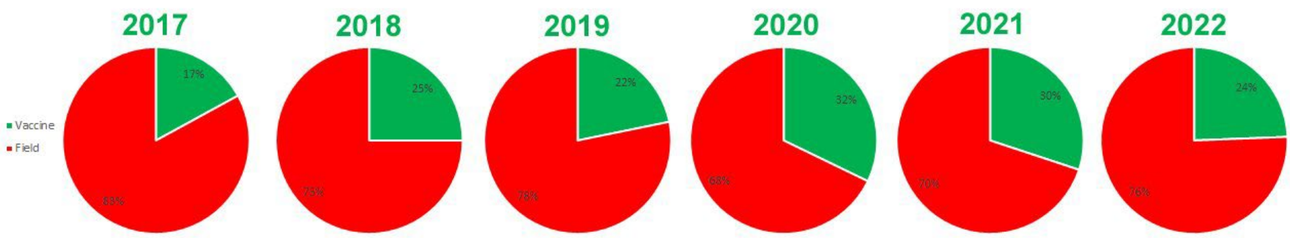
Figure 12: Phylogenetic tree of PRRSV-1 ORF-5 sequences in 2022 showing geographic region in which pigs were kept



Viruses in which the ORF-5 gene sequence has 98.5% or greater similarity to one of the live vaccines are termed “vaccine-like” and are analysed further by sequencing part of the nonstructural protein 2 (nsp2) to help identify any potential recombinants. All of the 40 vaccine-like PRRSV from 2022 examined so far have had nsp2 and ORF5 sequences that are consistent and do not raise concern that they represent potential recombinants.

The proportion of sequenced PRRSV that are found to be vaccine-like has ranged from 17 to 32% each year as illustrated in Figure 13.

Figure 13: Proportions of field PRRSV strains compared to vaccine-like strains identified each year based on ORF-5 and nsp sequencing (red represents field strains, green represents vaccine strains)



PRRSV remains a significant endemic pathogen in British pigs and is the priority for disease control in the pig component of the Animal Health and Welfare pathway alongside a focus on biosecurity improvement to control endemic pig diseases and help prevent the introduction of exotic disease threats.

A comprehensive manual on PRRS and its control has been published by a company producing PRRS vaccine: https://bi-animalhealth.com/swine/resources/prrs-knowledge-manual. This is freely accessible and brings together research outputs and information that have contributed to the control of PRRS.

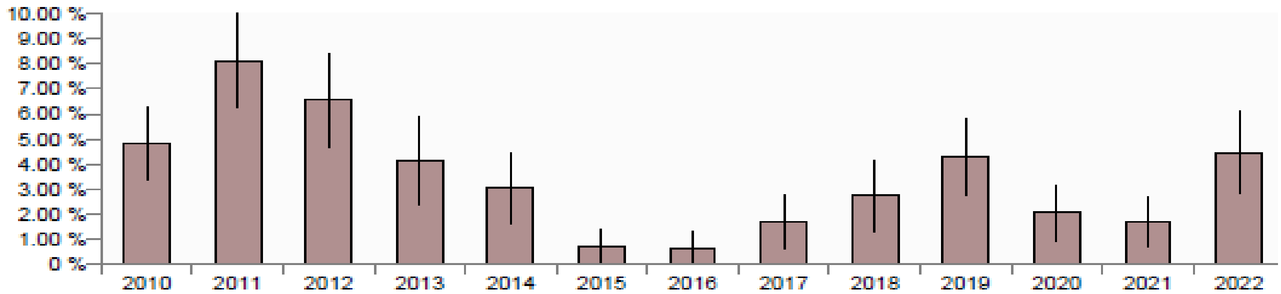
The Swine Health Information Centre in the US brought together speakers at a webinar on emerging PRRS virus strains. This provided information on the PRRSV-2 L1C variant of RFLP 1-4-4 and PRRSV L1C 1-2-4 which has emerged and is affecting US pig herds, and Rosalia, a PRRSV-1 strain with increased virulence affecting pig production in Spain. Both of these have been described in previous quarterly reports (APHA, 2021 and APHA, 2022d).

Swine dysentery diagnostic trend increases in 2022

There have been more diagnoses of swine dysentery recorded to date through the Great Britain scanning surveillance network for 2022 compared to both 2020 and 2021, making the diagnostic rate for swine dysentery in 2022 very similar to that seen in 2019 (Figure 14). Some of these cases resulted in alerts to raise awareness about swine dysentery outbreaks being issued by the pig industry's Significant Diseases Charter.

Diagnoses in 2022 have been in pigs in counties across England including Cornwall, Cheshire, Derbyshire, Cleveland & Darlington, Suffolk, Norfolk, Lincolnshire, East Riding and North Lincolnshire, West Yorkshire and North Yorkshire. Two thirds of the diagnoses were made in pigs on premises in Lincolnshire, East Riding and North Lincolnshire, or North Yorkshire.

Figure 14: Annual swine dysentery diagnoses as a percentage of diagnosable submissions to the Great Britain scanning surveillance network



Annual number diagnosed: 29 13 11 27

The back logs of pigs of slaughter weight on pig farms in recent years, although largely alleviated, have now been superceded by new challenges as a result of increased feed and fuel costs due to the conflict in Ukraine and persistent issues with the cost of pig production exceeding the price paid at slaughter for some pig producers for much of 2022. These issues have been suggested as having potentially impacted on swine dysentery control and may play a part in the raised diagnostic rate.

The importance of practicing excellent biosecurity in preventing introduction and spread of exotic and endemic diseases, including swine dysentery, has been emphasised in communications and the industry has a webpage dedicated to swine dysentery and its control and there is NADIS guidance on swine dysentery.

Vehicle biosecurity is specifically highlighted in 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. This campaign is also endorsed by the UK Chief Veterinary Officer.

To assist in epidemiological investigations, disease control and treatment choices, *Brachyspira hyodysenteriae* isolates undergo whole genome sequencing (WGS) and antimicrobial sensitivity minimum inhibitory concentration testing, under APHA's pig disease and antimicrobial resistance surveillance projects respectively. Table 2 shows the multi-locus sequence types (MLST) of the *B. hyodysenteriae* isolates in 2021 and 2022, some isolates are still being processed.

Table 2: MLST of *B. hyodysenteriae* isolates in 2021 and 2022

MLST	Number of 2021 isolates	Number of 2022 isolates
52	5	1
88	-	2
240	1	-
242	1	10
251	2	6
266	1	-
297	-	2
New	1	2

The MLST data shows fewer ST52 in 2022, this is an MLST that has mainly been detected in small pig herds. The B. hyodysenteriae MLST dashboard provides more information about sequence types detected over time and in different counties, with their antimicrobial resistance gene profiles. A range of different MLST have been found in 2022, with two (242 and 251) being most numerous and, as shown on the dashboard, detections of these have been in northeast England (251) or northeast England and East Anglia (242).

Clinical resistance to tiamulin has been identified in just one *B. hyodysenteriae* isolate in 2022 by antimicrobial sensitivity testing so far, some isolates are still being tested. The resistant isolate was sequence type, ST 251, which is the same ST as isolates from one premises found to be tiamulin-resistant in 2020-21 (APHA, 2021). The MIC values for the 2022 isolate were also at or above clinical breakpoint for other licensed antimicrobials tested. No further multi-drug resistant isolates have yet been identified in quarter 4 of 2022.

Multi-drug resistance of this nature in *B. hyodysenteriae* isolates in British pigs is an uncommon finding and severely limits treatment options. The development of resistance in *B. hyodysenteriae* to antimicrobials commonly used in the control of swine dysentery is a recognised risk, particularly in situations where medication is used longer-term. Control of swine dysentery using alternative interventions (all-in, all-out management systems; cleaning and disinfection; and partial and total depopulation leading to eradication) is vital to prevent the development of wider antimicrobial resistance.

Horizon scanning

Septicaemia due to *Streptococcus equi* subsp. *zooepidemicus* in Canada

A Promed item described another outbreak of *Streptococcus equi* subsp. *zooepidemicus* septicaemia causing significant acute sow mortality in Canada (Promed, 2022). The outbreak occurred on a 5000-sow unit on which 69 sows died over the period of a week. Treated pigs responded well to antibiotics, which meant that the outbreak was not investigated as suspect swine fever. Instead samples were tested for African swine fever (ASF) under their surveillance testing to rule out ASF and were negative.

Outbreaks of septicaemia due to *Strep. zooepidemicus* have not been diagnosed in pigs in Great Britain through the scanning surveillance network. Given the severity of disease that has occurred in North American *Strep. zooepidemicus* incidents, it is possible that an outbreak could be reported as suspect porcine notifiable disease to APHA. Once official investigation has ruled out notifiable disease, it is vital that, if such cases occur, that they are investigated further and the APHA Pig Expert Group can provide input for this. Field APHA veterinary colleagues assist by encouraging contact to be made with Species Expert Groups for differential diagnostic investigation at the time that notifiable disease restrictions are lifted.

Clinical signs and pathology in *Strep. zooepidemicus* septicaemia outbreaks can resemble the swine fevers, with sick pyrexic pigs and rapid deaths, haemorrhagic lesions and skin discolouration. Disease has mainly been seen affecting finishers or sows. There is more information about these septicaemia outbreaks in North America in previous items on this pathogen in quarterly pig disease surveillance reports (APHA, 2019b and APHA 2021b).

ELISA developed to assess seroprevalence to PCV4 in China

Porcine circovirus type 4 (PCV4) was newly identified in pigs in 2019 in a farm in Hunan province, China (Zhang and others, 2019) and was described in the APHA surveillance report for quarter 1 of 2020. Since then, PCV4 has been detected in pigs in different provinces of China and in South Korea.

A recent publication from China (Hu and others, 2022) has followed up on the 2019 report and describes development of an indirect anti-PCV4 antibody enzyme-linked immunosorbent assay to detect antibody to two different PCV4 immunogenic proteins. This was used in a limited study to assess the prevalence of exposure to PCV4 in sera from intensive pig farms in Jiangxi Province, China. Antibody to PCV4 was detected in less than 8% of the 507 serum samples assessed.

APHA virus discovery methods have the capability of detecting PCV4 and can be used to investigate undiagnosed significant disease outbreaks of suspected infectious aetiology. PCV4 shows highest genomic identity to mink circovirus (66.9%) and has lower genetic homology of 43.2%-51.5% to the other pig PCV genomes. The clinical significance of PCV4 is uncertain at this stage and the literature will be kept under review for more information on this virus, or associated disease.

Perinatal and reproductive failure due to Getah virus in China

A detailed description of the emergence of perinatal and reproductive disease due to mosquito-borne Getah virus in several pig herds in China was given on the pig 333 website (Johnson, 2023). Getahvirus (GETV) is a single-strand RNA alphavirus first isolated from mosquitoes in Malaysia in 1950. It is widespread in Eurasia and has been mostly associated with disease outbreaks in horses, especially in Japan where vaccination is used in horses. GETV was detected causing disease in pigs in Japan in 1985 and was found in pig herds in north China in 2018.

Since autumn 2022, disease due to GETV has been seen in several pig herds in China as abortions in pregnant sows or neonatal piglet disease. Affected neonatal piglets appeared normal at birth and then became pyrexic, uncoordinated, lethargic, trembling, and had diarrhoea. Case mortality approached 100% in spite of supportive treatment, notably, unaffected piglets in the same litters remained healthy.

The increasing incidence of disease due to GETV in recent years in more countries in Asia has some similarities to the emergence of Japanese encephalitis virus in Australia, although disease in humans appears to be milder, and the author suggests that pig to pig transmission is not significant with mosquitoes or iatrogenic (needle) transmission being the main routes. There is a review of GETV by Li and others (2022) which provides more background and indicates that the transmission and migration routes of GETV in continental Asia are similar to those of Japanese encephalitis virus. GETV mutates rapidly, and it is transmitted by different mosquito species with an expanding range. SHIC also has a factsheet on GETV.

Disease due to *Actinobacillus pleuropneumoniae* serotype 15 in the US

Since November 2021, there have been severe *Actinobacillus pleuropneumoniae* (APP) outbreaks in the United States (US) due to APP serotype 15 which was previously a relatively uncommon serotype in the US. Epidemiological investigations have shown evidence of a high rate of spread between farms within a narrow geographic radius. Mortality up to 51% has been reported. The Swine Health Information Centre (SHIC) and the American Association of Swine Veterinarians held a webinar to discuss these APP serotype 15 outbreaks. In the SHIC January 2023 newsletter, more findings from epidemiological investigations into the outbreaks of APP serotype 15 were described (SHIC, 2023). These included assessment of sow herd APP serotype 15 infection status; using different sample types to monitor shedding in pigs; and environmental persistence in finisher barns. Tonsil scrapings were found to be better than nasal swabs for detection over time after outbreaks. Oral fluids were successfully used for detection of APP by PCR. Both tonsils and oral fluids detected APP for nine weeks after an outbreak. Environmental sites testing positive for APP by PCR included the deadstock storage box, door handles, feed plates, and the floor in front of feeders and by a barn entrance door.

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Any enquiries regarding this report should be sent to APHA's Surveillance Intelligence Unitby emailing SIU@apha.gov.uk.

More information about scanning surveillance reports is available on APHA's Vet Gatewayat http://apha.defra.gov.uk/vet-gateway/surveillance/index.htm.

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