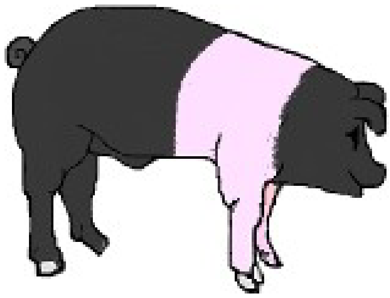
Animal & Plant Health Agency



SRUC

Great Britain pig quarterly report: disease surveillance and emerging threats

Volume 25: Quarter 4 of 2021 (October to December)

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the fourth quarter of 2021, October to December. It contains analyses carried out on disease data gathered fromAPHA, 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 fourth quarter of 2021 compared to the same quarter in 2020 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 4 of 2021 and quarter 4 of 2020

15 most frequent diagnoses quarter 4 of 2021 (total 276)	15 most frequent diagnoses quarter 4 of 2020 (total 250)
1. Porcine reproductive and respiratory syndrome (PRRS) - pneumonia	1. Streptococcus suis
2. Brachyspira pilosicoli	2. Brachyspira pilosicoli
3. Salmonellosis - Typhimurium	3. Actinobacillus pleuropneumoniae
4. Colibacillosis - enteric	4. PRRS - pneumonia
5. Lawsonia sp. associated disease	5. Salmonellosis - Typhimurium
6. Pasteurella multocida pneumonia	6. Colibacillosis - enteric
7. Salmonellosis - other	7. Rotavirus
8. Rotavirus	8. Lawsonia sp. associated disease
9. Streptococcus suis	9. Pasteurella multocida pneumonia
10. Intestinal torsion	10. Salmonellosis - other
11. Gastric ulceration	11. Swine influenza
12. Actinobacillus pleuropneumoniae	12. PRRS - systemic
13. Swine influenza	13. Abortion/foetopathy diagnosis not listed
14. PRRS - systemic	14. Mulberry heart disease
15. Colibacillosis - oedema disease	15. Streptococcal infection

Note: that further diagnoses may be added for records for submissions made in quarter 4 of 2021 which are finalised at a later date.

Figures 1a to 1d: summary data for 380 submission records in quarter 4 of 2021 (409 in quarter 4 of 2020)

Figure 1a: pig age

Age Category	
Adult	47
Mixed	9
Neonatal	16
Postwean	210
Prewean	42
Unknown/other	56

Figure 1b: submission type

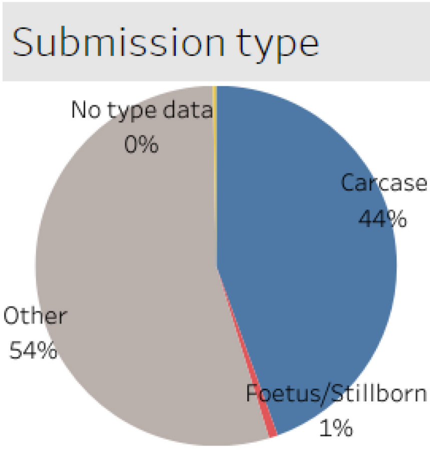


Figure 1c: disease syndrome

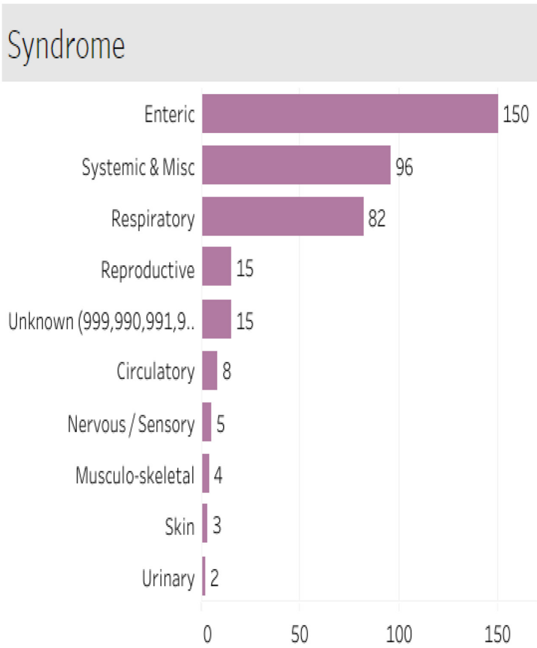
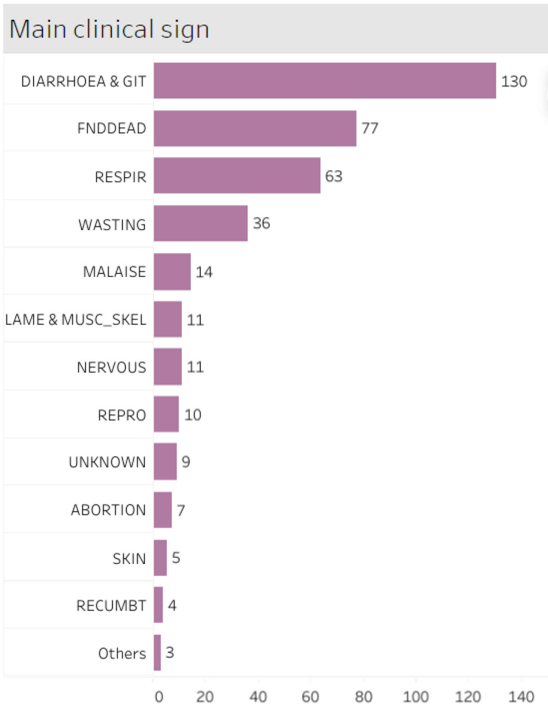


Figure 1d: main clinical sign reported



These diagnostic submissions are voluntary and subject to several sources of bias. The profile of submissions for the fourth quarter of 2021 differs from that of the same quarter of 2020 (quarter 4 of 2020) in that the most frequent clinical signs were diarrhoea and gastro-intestinal signs rather than found dead, although enteric syndrome was most frequent in quarter 4 in both 2020 and 2021. Enteric is regularly the dominant disease syndrome investigated in pig diagnostic submissions.

Total Great Britain diagnostic submissions for the quarter (326) were lower than the total for the same quarter in 2020 (343) due to a reduction in non-carcase submissions to both APHA and SRUC. This slight reduction may be an effect of the financial and resource pressures that pig producers are currently facing.

Despite this, carcase submissions were higher in this quarter than any of the same quarters in 2017 to 2020. The number of diagnoses made in quarter 4 of 2021 was higher than in quarter 4 of 2020 despite the lower number of total submissions.

This is likely to reflect the fact that carcases represented a higher proportion of total submissions in quarter 4 of 2021 (44%) compared to quarter 4 of 2020 (33%). The high surveillance value of carcase submissions which allow full post-mortem examination and diagnostic investigation is recognised. Post-mortem submissions are encouraged from unusual, severe or unresponsive disease incidents.

Enteric diagnoses represent four of the top 5 most frequent diagnoses made in quarter 4 of 2021. This reflects the diagnostic trends for some of these diseases which are discussed further on pages 12 to 16. Only 2 of the 5 most frequent diagnoses in quarter 4 of 2021 are also in the top 5 diagnoses in quarter 4 in 2020 (table 1), namely salmonellosis due to *S*. Typhimurium and *Brachyspira pilosicoli*.

Figures 2a to 2d: summary data for 1745 submission records for 2021 (1642 in 2020)

Figure 2a: pig age

Age Category	
Adult	289
Mixed	31
Neonatal	71
Postwean	869
Prewean	167
Unknown/other	318

Figure 2b: submission type

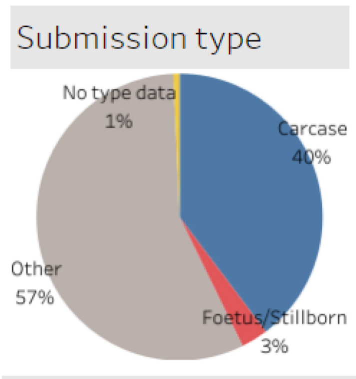


Figure 2c: disease syndrome

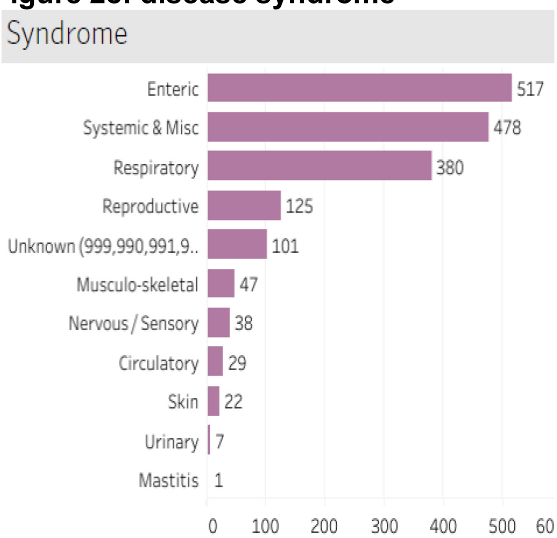
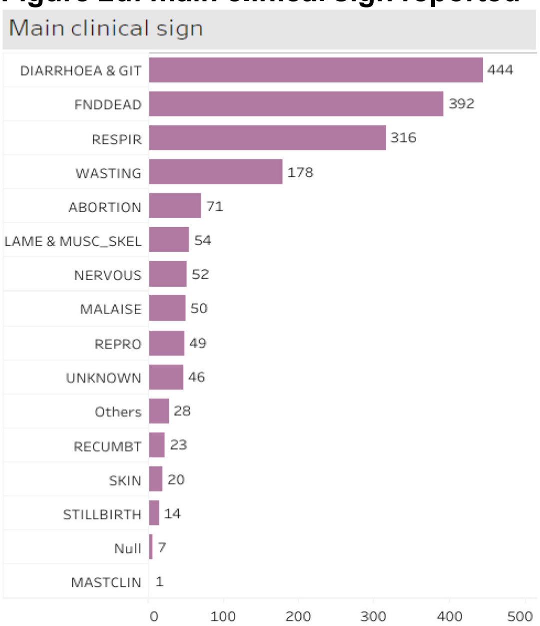


Figure 2d: main clinical sign reported



Looking at surveillance data for submissions for the whole of 2021, enteric disease investigations remain predominant indicating their importance relative to other disease syndromes.

Total Great Britain diagnostic submissions for the whole of 2021 (1458) were higher than the total for any of the prior years, 2017 to 2020 (range 1156 to 1370), due to an upward trend in both non-carcase and carcase submissions.

The higher number of diagnoses in 2021 (1204) compared to 2020 (994) is in part due to the higher submission numbers. It is also likely influenced by the higher proportion and number of carcase submissions in 2021 overall, compared to 2020.

New and re-emerging diseases and threats

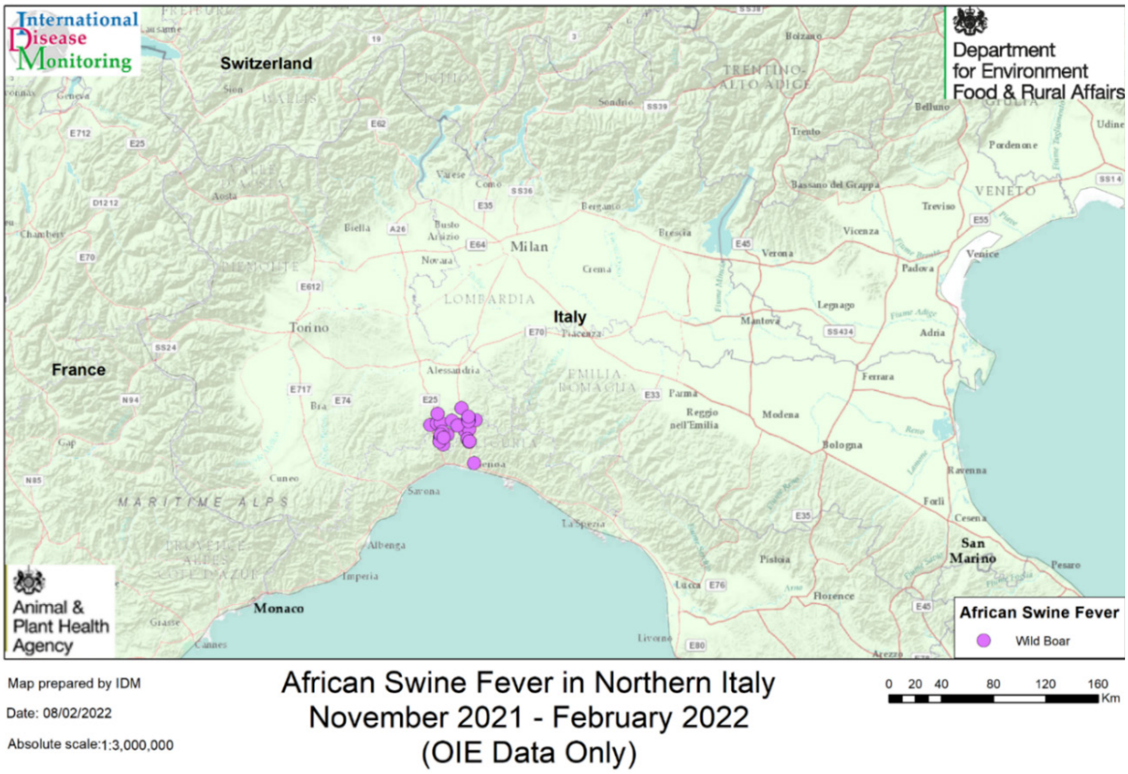
African swine fever summary

[Updated assessments continue to be published on African swine fever (ASF)] on GOV.UK.

Updates on the [ASF situation in Europe] were issued in October and November 2021,and January 2022. Figure 4 shows reported cases to 8 February 2022.

Italy reported detection of ASF genotype 2 for the first time on 7 January 2022. ASF was confirmed in a wild boar found dead in north-west Italy in the Municipality of Ovada in the province of Alessandria (Piedmont Region) in mainland Italy (Figure 3). A separate strain of ASF (genotype 1) has been endemic on the Italian island of Sardinia since 1978.

Figure 3: ASF reports in mainland Italy, November 2021 to February 2022 (mapped 8 February 2022)



The ASF wild boar case detected in Italy was over 800 km from the nearest outbreak location (wild boar) in Eastern Germany and over 1,000 km from the nearest wild boar cases in Hungary and Slovakia.

Further wild boar carcases found in Piedmont and in Isola del Cantone in the province of Genoa are being tested and 29 ASF positive wild boar were detected to 8 February 2022. Wild boar are also being tested outside the infected area including in a 10km buffer zone in which no positive cases had been detected to 8 February 2022.

Human-mediated spread is considered the most likely means of introduction. There is a large commercial port in the province of Genoa.

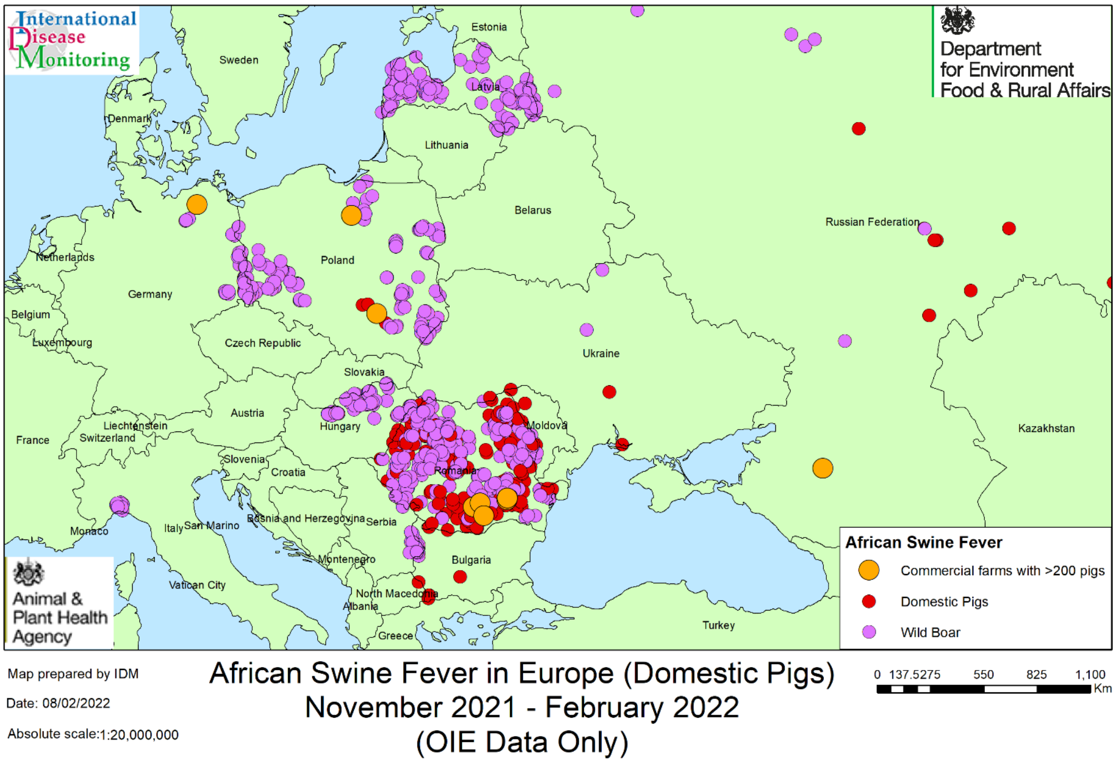
Hunting and tourism have been banned in the area designated as infected which is mountainous with a significant wild boar population and also contains highways to other countries. This infected area contains around 8,000 domestic pigs which are likely to be removed to prevent them becoming infected (Infopork, 2022).

North Macedonia reported ASF in domestic pigs for the first time; a backyard farm was affected in the east of the country close to the Bulgarian border. Contact with infected wild boar is suspected to be the most likely source of infection. Protection and surveillance zones were established on 7 January and a stamping out policy was carried out among all pig holdings in the 3km area on 10 January 2022.

In Germany, the disease control zones around an isolated domestic pig case in Mecklenberg-Western Pomerania have now been lifted following successful disease control measures. Reports of ASF in wild boar continue, the majority in Saxony and Brandenburg, with 3 cases in Mecklenburg-Western Pomerania. Details of the intensive control measures being implemented are included in the IDM updates.

In early January, Germany reported ASF detection in a wild boar in Saxony that required the enlargement of the ASF restricted zones there.

Figure 4: ASF reports in Europe for November 2021 to February 2022 (mapped 8 February 2022)



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

Updates on the [ASF situation in Asia] were issued in December 2021 and January 2022. Figure 5 illustrates outbreaks reported to February 2022.

On 14 January 2022, the World Organisation for Animal Health (OIE) reported the first confirmed case of ASF in Thailand in a small group of pet pigs which died in Bangkok in early December. The virus was detected in one of the group following diagnostic investigation by a university veterinary department.

Active surveillance of pigs and slaughterhouses in nearby Nakhon Pathom province by the Department of Livestock Development (DLD) has been conducted following detection of ASF in a pork product exported to Chinese Taipei originating from the region. To date, one ASF-positive surface swab sample from a slaughterhouse has been confirmed. Authorities in Thailand suspended exports of live pigs until April 2022.

Thailand had not reported the presence of ASF in its pigs to OIE prior to this detection although neighbouring countries in the region were affected with outbreaks at their borders and two countries reported detection of the ASF virus in pork product and a batch of live pigs imported from Thailand.

Since the previous IDM update in May 2021, further outbreaks in domestic pigs were reported in China, Hong Kong, India, Indonesia, Myanmar, Philippines and South Korea.

Since May 2021, pig movement in China has been restricted by dividing the country into 5 regions, allowing movement within these regions. Within the regions, ASF-free zones have been created and only pigs from free zones, breeding pigs and piglets are allowed to move beyond their respective regions.

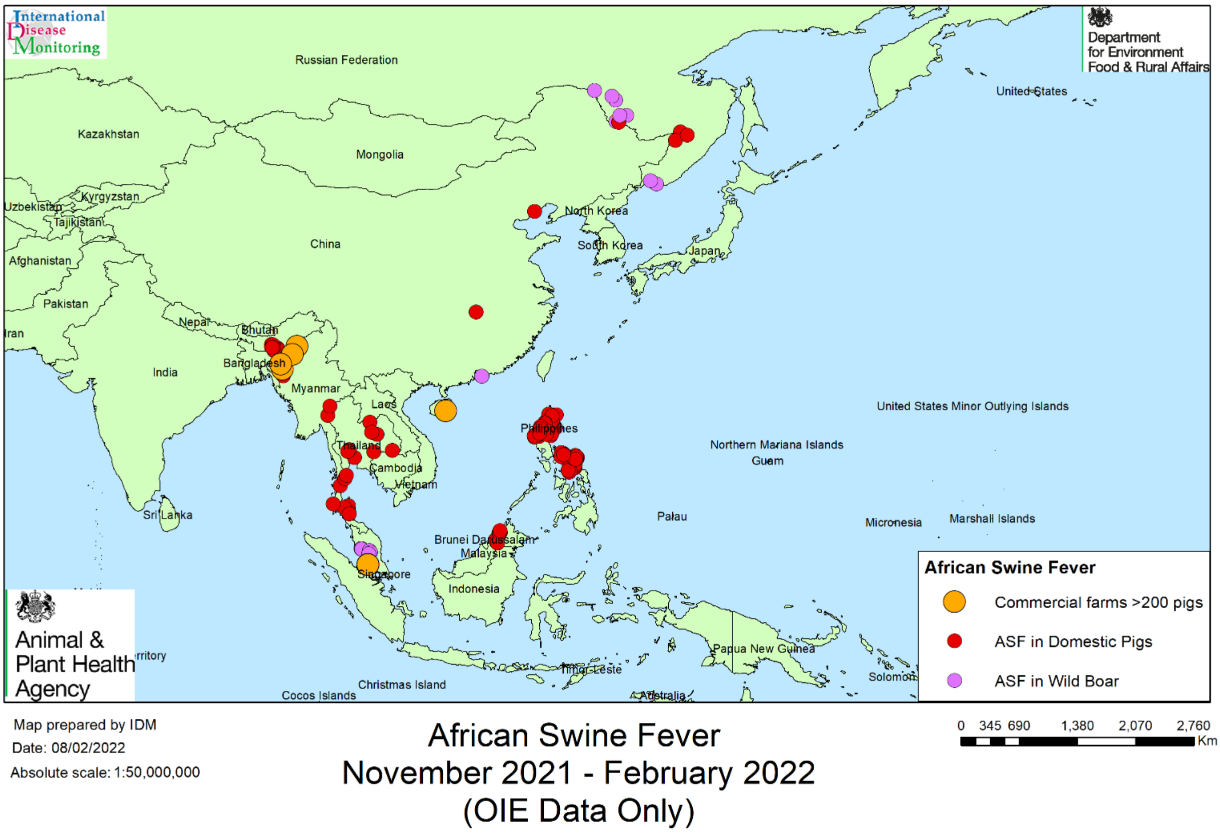
On 21 December, the Chinese Ministry of Agriculture and Rural Affairs (MARA) announced a plan to organise a 3-month action to strengthen slaughter industry supervision and make improvements to the slaughter process to ensure the safety of meat products.

In May 2021, ASF was reported in Bhutan for the first time in Chhukha district which borders West Bengal State of India. The virus has been detected in over 2000 scavenging, stray pigs which move in an uncontrolled manner across the Bhutan-India border. Malaysia had further ASF outbreaks in domestic pigs (commercial and backyard herds) and wild boar on the island of Borneo.

The first case of ASF in peninsular Malaysia was confirmed in wild boar in December 2021 and further mortality involving wild boar due to ASF was subsequently reported. An epidemiological investigation is ongoing to identify the source of infection on the peninsula and surveillance continues to be conducted across the whole country.

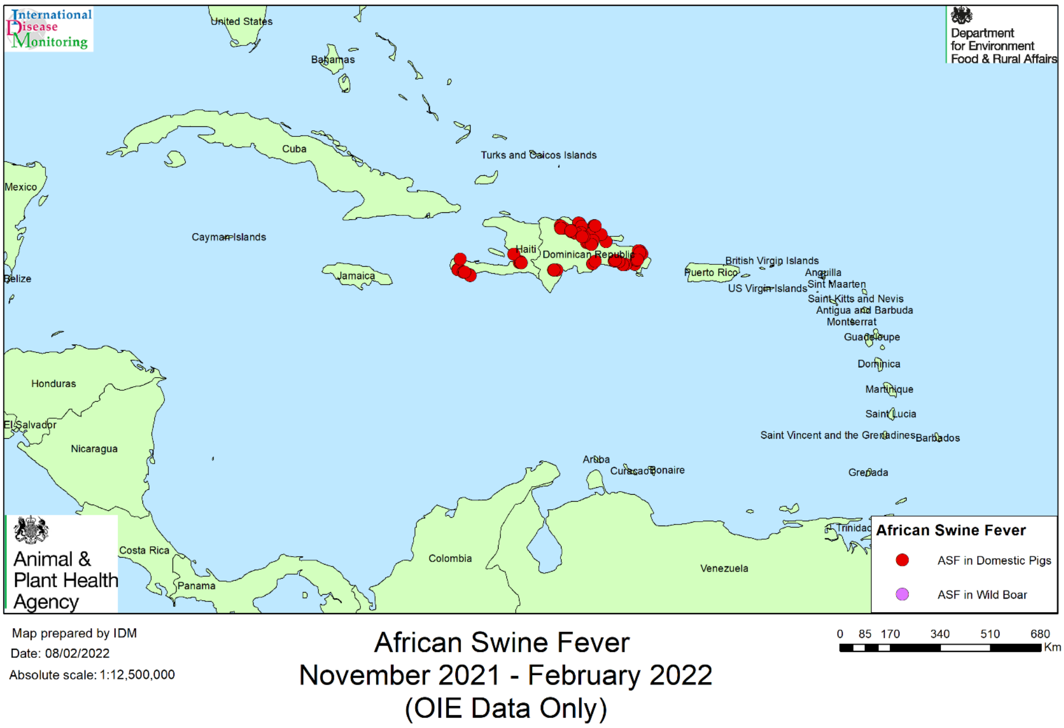
No further outbreaks of ASF have been reported to OIE by some previously infected countries since May 2021, including Cambodia, Mongolia, North Korea and Timor-Leste, however it is suspected that the virus still circulates in these areas. Field trials of ASF vaccine trials are ongoing in the Philippines, Vietnam and China.

Figure 5: ASF cases reported in Asia from November 2021 to February 2022 (mapped on 8 February 2022)



No new updates on the ASF situation in the Caribbean were issued by IDM since the previous IDM report in September 2021. Figure 6 illustrates the situation to 8 February 2022.

Figure 6: ASF cases in domestic pigs in the Dominican Republic and Haiti November 2021 to February 2022 (mapped on 8 February 2021)



The spread of ASF to the Caribbean was described in the quarter 2 report (APHA, 2021a), it was first detected in the Dominican Republic in July 2021 with infection thought to have been present for several months.

ASF has since been found in many areas across the Dominican Republic (See figure 2) and spread to neighbouring Haiti in September 2021 with the first outbreak found on a farm in the south-east of Haiti, very close to the border with the Dominican Republic.

The ASF virus (ASFV) involved is genotype 2 (Georgia 2007), the same as that currently found in mainland Europe and Asia.

The virus has also been reported in the west, north and north-east of Haiti, as well as in and around the capital Port-au-Prince, making it likely that ASF is widespread across the country. Backyard pig farming is common with minimal biosecurity, and it is these smaller herds that have been most affected in both Haiti and the Dominican Republic.

In October 2021, the Dominican government set out a project to help economic recovery of small producers affected by ASF, promoting repopulation with other species of animals, such as chickens and ruminants.

The continued detection of ASF in multiple countries across Asia and Oceania, Europe and in the Dominican Republic and Haiti indicates the wide global distribution of ASFV infection and highlights the risk for introduction of ASFV into the UK.

This is demonstrated by results from surveillance by Australia and the USA. Australia tested pork products seized at International Mail Centres in several cities and found ASF virus fragments in 24% and foot-and-mouth disease (FMD) virus fragments in 1% of products.

Seizures by the US Animal and Plant Health Inspection Service (APHIS) in New York City of pork, poultry, and ruminant products illegally imported from China, during the three months to December 2021, reached nearly one ton.

These findings emphasise the need to maintain border controls, high biosecurity standards and stop illegal practices (such as waste food feeding) to prevent introduction of ASF virus into pigs. Global disease reports produced monthly by the US Swine Health Information Center (SHIC) are also a good source of information and these can be viewed and received by email by signing up on the SHIC Website.

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 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 wild boar 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 products brought into the UK from affected countries as personal imports represent the most significant risk of introduction, the commercial trade of such products is not permitted from ASF-affected areas.

Pig keepers are reminded that it is illegal to feed pigs catering, kitchen or domestic waste or meat 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 suspect incidents of PED have been reported in England or Scotland since January 2018.

Enhanced surveillance for PED continues and diagnostic submissions from cases of diarrhoea in pigs (non-suspect) submitted to APHA are routinely tested by PCR for PED virus (PEDV) on a weekly basis. None have been positive for PED in over 1,310 diagnostic submissions tested under Agriculture and Horticulture Development Board (AHDB) Pork funding from June 2013 to September 2021.

A paper describing a method of forecasting the probability of PEDV infection in sow farms in US pig production companies was published (Paploski and others, 2021). Weekly predictions are provided for 2 weeks ahead. These dynamic forecasts take account of recent pig movements, current disease distribution, demographic and climatic data and environmental factors.

Jung and Saif (2021) described experimental infections with PEDV and/or porcine deltacoronavirus (PDCoV) in gnotobiotic piglets. Dually infected pigs did not suffer more clinical disease or faecal PEDV shedding compared with pigs with single PEDV or PDCoV-infected pigs, thus no increased severity of PED with PDCoV co-infection. Other observations indicated potential interference or inhibition of PDCoV replication in the gastrointestinal tract of pigs co-infected with PEDV.

Unusual diagnoses or presentations

Forelimb paresis due to porcine sapelovirus

Two 12-week-old pigs on an indoor rearing unit developed forelimb weakness then paresis. A lack of muscle tone was found in both forelimbs, with no flexor reflexes, while their hind limbs remained strong, and they were still able raise their hind ends. The pigs continued to eat and drink. They did not respond to penicillin and meloxicam treatment.

Brain and spinal cord histopathology revealed severe, acute to subacute, non-suppurative multifocal, necrotising, polio-rhombencephalitis, poliomyelitis and radiculitis, consistent with neurotropic virus infection. Lesions were more severe in the motor nuclei of the brainstem and spinal cord and other areas associated with motor control in the cerebellum.

This pattern of distribution and an absence of visible viral inclusion bodies was highly suggestive of porcine sapelovirus (PSV) infection which was confirmed by PCR in brain and spinal cord samples.

No teschovirus or astrovirus was detected in samples from either pig. Interestingly, forelimb paresis (Figure 7) has been noted to be a feature in previous PSV cases. This case is included in the February 2022 Veterinary Record APHA surveillance report.

Enteric infection with PSV, as with other enteroviruses, is thought to be fairly ubiquitous in pigs and porcine sapelovirus is considered to be widespread in pigs in Great Britain, although no recent surveillance of healthy pigs has been undertaken. Occasional episodes of nervous disease associated with PSV are diagnosed at APHA and some of these have been described (Schock and others, 2014; APHA, 2014; APHA, 2019).

Outbreaks are typically sporadic and affect pigs in the post-weaning period, usually with low morbidity. Virus, immunity, host and management factors that influence the outcome of infection and expression of nervous disease are poorly understood. Nervous disease due to neurotropic virus infection should be considered, especially where the signs are somewhat unusual and/or there is no response to antimicrobial treatment.

Figure 7: Forelimb paralysis in a previous case of viral encephalomyelitis

Salmonella septicaemia following vaccine administration error

Incorrect administration of a live attenuated *Salmonella* Typhimurium vaccine led to an adverse reaction in 6-day-old piglets. Approximately half the piglets received the vaccine orally according to the datasheet, but the other half accidentally received it by injection. The piglets had received no other vaccines or treatments. Within 24 hours of vaccination several litters became affected with 2 or 3 piglets per litter appearing lethargic and bloated and then dying or being found dead.

The sows of these litters remained healthy. Gross and microscopic findings in three piglets submitted for diagnostic investigation were consistent with a septicaemia with skin cyanosis, abdominal cavity fibrin strands, excess serous fluid in the thorax with fibrin strands, ecchymotic haemorrhages over the epicardium and, in one piglet, mild splenomegaly.

Bacteriology yielded heavy or pure growths of a group B *Salmonella* from one or more visceral sites in each of the pigs. The Salmonella was identified as *S*. Typhimurium phage type 9 which was histidine-adenine auxotrophic. The findings were consistent with septicaemia due to the *S*. Typhimurium vaccine strain.

Further information from the submitting veterinarian indicated that all the affected litters were treated with parenteral sulphonamides and deaths had ceased. This suspected adverse reaction was reported to the Veterinary Medicines Directorate and underlines the importance of training and use of standard operating procedures to avoid errors, especially where several vaccines are used in different aged pigs with differing requirements. This case was described in the December 2021 Veterinary Record surveillance report (APHA, 2022)

Preweaned pigs with porcine circovirus 2-associated disease

Severe immunosuppressive disease due to porcine circovirus 2 (PCV2) emerged in pigs globally from the late 1990s. Clinical signs were mainly wasting in pigs from 6 to 12-weeks-old and it was known as postweaning multisystemic wasting syndrome. Subsequently disease manifested in a greater variety of signs and in pigs of a wider age range. There was widespread use of vaccines in commercial herds since 2007 and this brought the disease under control.

However, the virus remains widespread and a threat to herds where vaccination issues arise, or which do not use PCV2 vaccines; those not vaccinating are mainly small pig herds.

A case of PCV2-associated disease (PCV2-D) was diagnosed at APHA in a small pig herd in Wales during quarter 4 of 2021 after 2 of 12 five-week-old unweaned piglets from a gilt litter were unexpectedly found dead over 48 hours. Post-mortem examination revealed an empty stomach, marked fluid effusions in abdominal and thoracic cavities, and oedema of the mesocolon (Figure 8). Histopathology revealed typical lymphoid lesions of PCV2-D which was confirmed by PCV2 immunohistochemistry (IHC).

It is uncommon to see PCV2-D before piglets are weaned and at this early age, however this has been a feature of PCV2-D diagnosed by APHA in some other unvaccinated small herds in past years. PCV2-D can vary in how it manifests clinically and may involve sudden deaths as in this case, or signs such as wasting, diarrhoea, jaundice (associated with hepatitis) or respiratory disease. Disease control includes use of PCV2 vaccine in growing and breeding pigs. There is useful information on information on PCV-D and vaccination of small herds on the NADIS website.

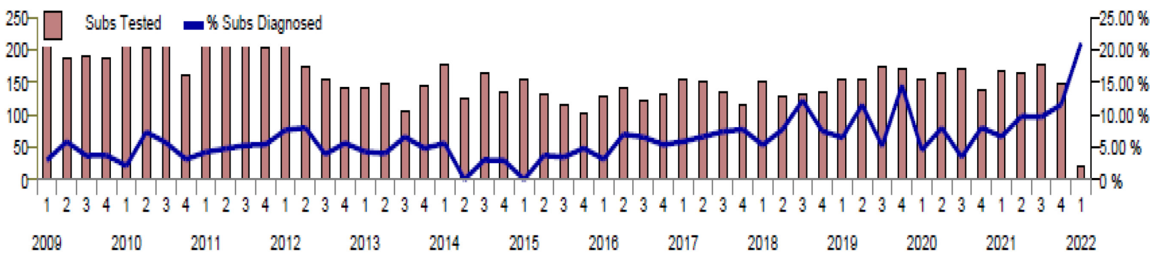
Figure 8: Oedema of the mesocolon in a case of PCV2-associated disease

Changes in disease patterns and risk factors

Enteric diagnoses in the fourth quarter of 2021

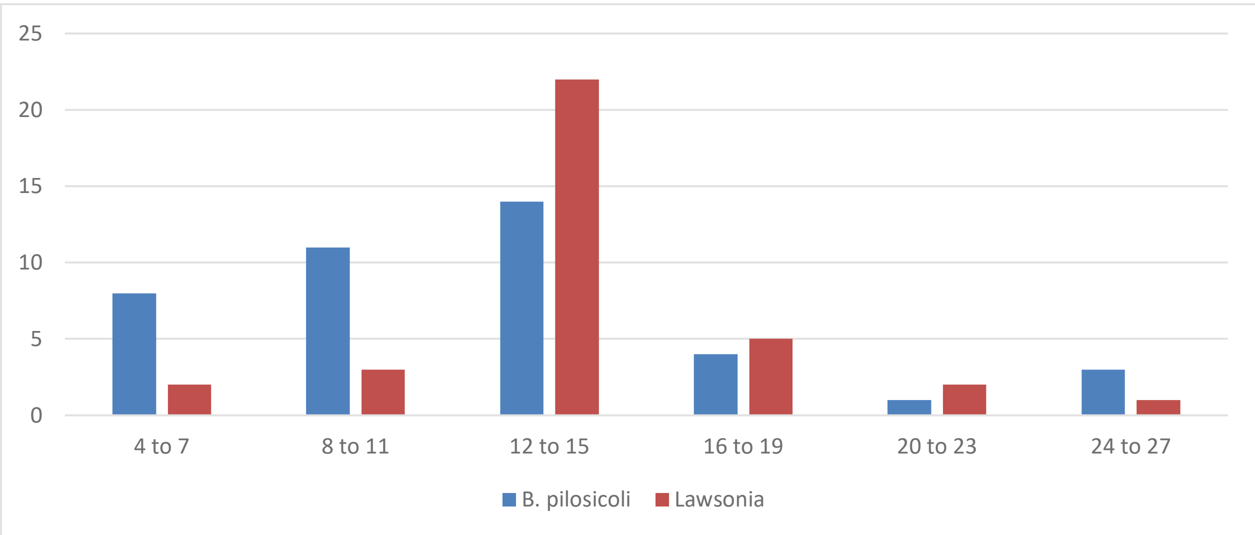
A range of changes in enteric disease trends were noted during this quarter. Increases in diagnoses of *Brachyspira pilosicoli* colitis and intestinal mesenteric torsion as a proportion of enteric syndrome diagnoses were found and there has been a rising trend in the diagnostic rate of *Lawsonia intracellularis* from quarter 1 of 2021 (Figure 9).

Figure 9: Seasonality of *Lawsonia*-associated disease incidents to 2021 as a percentage of diagnosable submissions to the Great Britain scanning surveillance network



Almost all diagnoses of *B. pilosicoli* and *Lawsonia*-associated disease were made in postweaned pigs and, where a specific age was provided by the submitting veterinarian, the age profile for each of these diagnoses in 2021 is shown in Figure 10.

Figure 10: *B. pilosicoli* and *Lawsonia*-associated diagnoses in post-weaned pigs in 2021 by age (week category, when given) recorded by the Great Britain scanning surveillance network



The primary clinical sign reported was diarrhoea in 71% of *B. pilosicoli* and 76% of *Lawsonia* diagnoses and, in both, wasting was the next most frequent sign. Several cases of *Lawsonia*-associated disease in unusually young pigs (4 and 5 weeks of age) were highlighted in the quarter 1 2021 report (APHA, 2021b).

However, Figure 10 shows that most cases in 2021 were diagnosed in pigs within the expected age range of 12 to 15 weeks. Diagnoses of Lawsonia-associated disease recorded in the Veterinary Investigation Diagnosis Analysis (VIDA) database rose in 2016-17 and since then have remained higher than in 2014 to 2015 (Figure 9).

The increased trend of *Lawsonia*-associated disease in 2017 prompted a Pig Veterinary Society member survey which suggested a number of different reasons may account for the increase, some of which are likely to remain relevant. A [report of the survey findings]is available on the national web archive's website.

The rise in the diagnostic rate of disease due to *E. coli* and salmonellosis described in the quarter 3 of 2021 report stabilised in quarter 4 of 2021 and did not continue (Figures 11 and 12) although for both, the rate remained near to the higher level reached in quarter 3. Salmonellosis diagnoses involved mainly *Salmonella* Typhmurium (ST) (64% salmonellosis diagnoses in 2021) with some monophasic *Salmonella* Typhimurium-like variants (8%), although the contribution of monophasic variants has reduced.

There was an increase in the diagnostic rate of incidents caused by non-ST serotypes including *S*. Derby, *S*. Newport and *S*. Rissen which represented 28% of salmonellosis diagnoses: fewer of these involved multidrug resistant isolates. Advice on [control measures for salmonellosis in pigs] is provided on the APHA Vet Gateway.

Figure 11: Seasonality of *E. coli* disease incidents in pigs to 2021 as a percentage of diagnosable submissions to the Great Britain scanning surveillance network

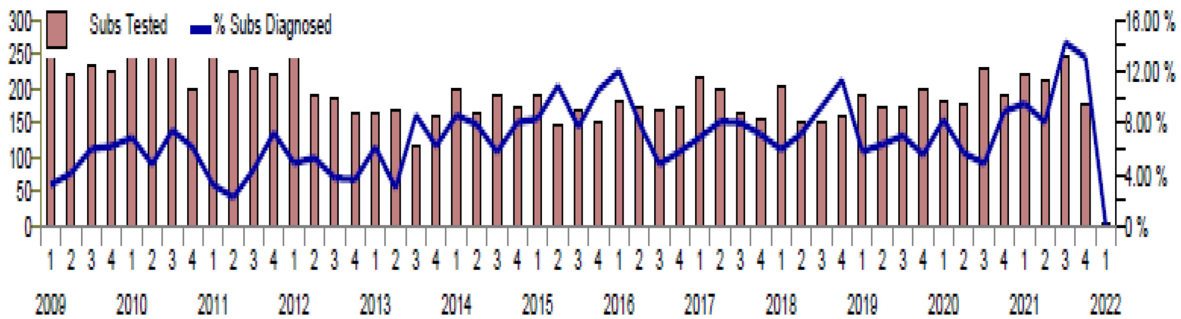
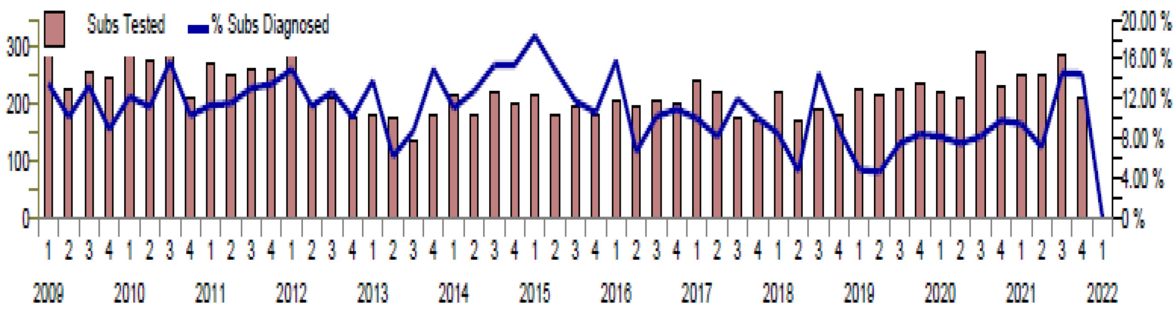
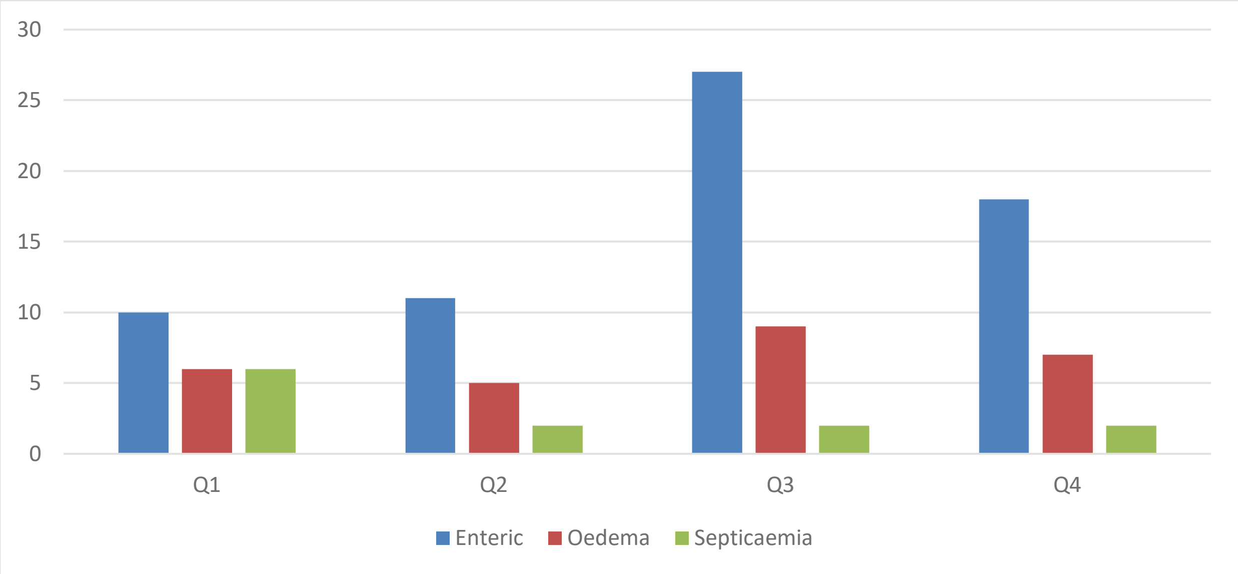


Figure 12: Seasonality of incidents of salmonellosis in pigs to 2021 as a percentage of diagnosable submissions to the Great Britain scanning surveillance network



The increase in *E. coli* disease in the last 6 months of 2021 has mainly been due to an increase in the number of enteric colibacillosis diagnoses (Figure 13) with a slight increase in oedema disease cases.

Figure 13: Diagnoses of different disease manifestations due to *E. coli* in each quarter of 2021 recorded by the Great Britain scanning surveillance network



Most enteric colibacillosis and salmonellosis diagnoses in 2021 were made in postweaned pigs and, where a specific age was provided by the submitting veterinarian, the age profile for diagnoses in 2021 for each of these diagnoses is shown in Figure 14.

This confirms that post-weaned pigs are affected earlier and with a more limited age range with these diseases compared to *B. pilosicoli* and *Lawsonia* diagnoses illustrated in Figure 10.

Figure 14: Enteric colibacillosis and salmonellosis diagnoses in post-weaned pigs by age (week category, when given) in 2021 cases recorded by the Great Britain scanning surveillance network

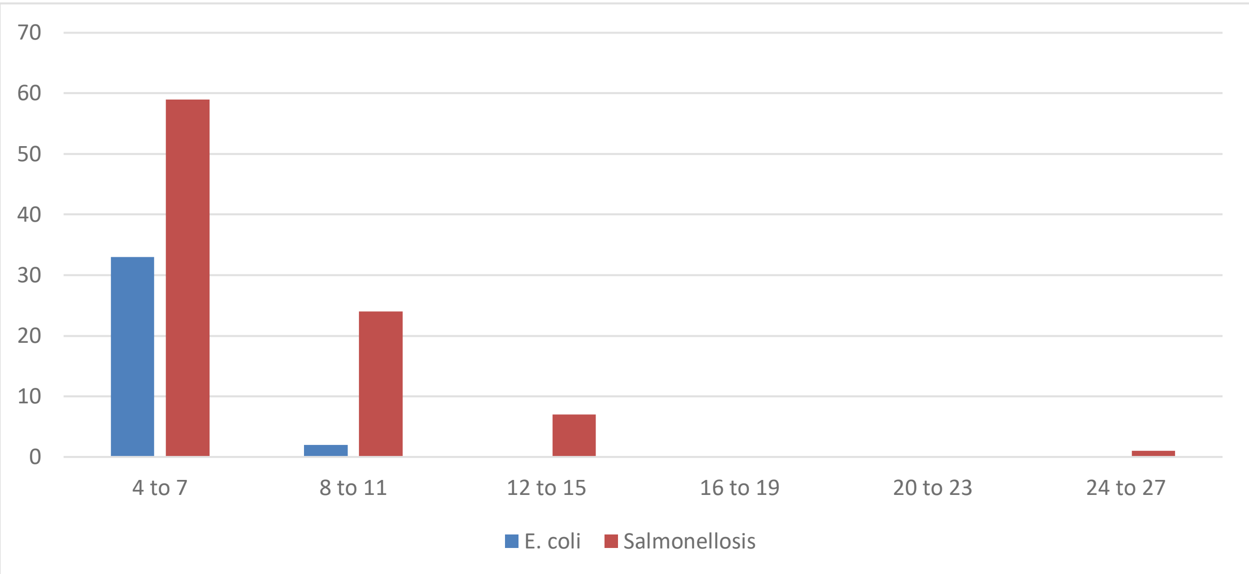
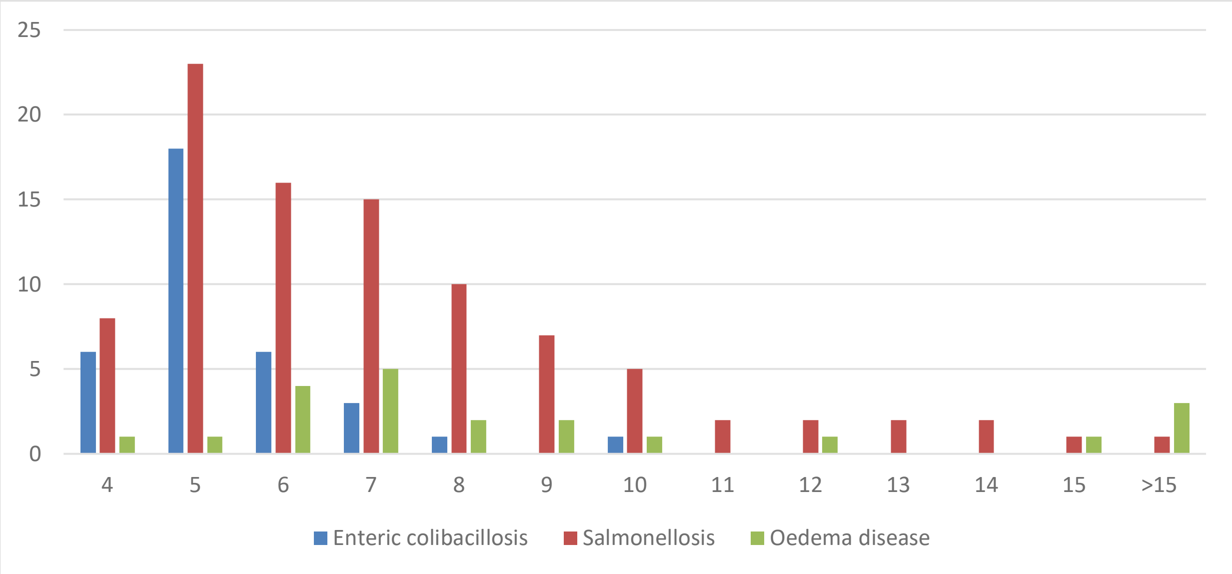


Figure 15 breaks down the age profile for post-weaned pigs diagnosed with enteric colibacillosis and salmonellosis in more detail, for cases where a specific age was provided, and oedema disease cases are also included. This confirms that a high proportion of cases for all three diseases occur within the first 4 weeks after weaning.

Figure 15: Diagnoses of enteric colibacillosis, oedema disease and salmonellosis in post weaned pigs by age (weeks when given) in 2021 cases recorded by the Great Britain scanning surveillance network



A few cases of oedema disease have been encountered in pigs of finisher age, mainly within smaller herds, and one of these was described in the August 2021 Veterinary Record surveillance report (APHA, 2021c).

In commercial pig herds, oedema disease is more commonly diagnosed in rapidly growing pigs after weaning to around eight weeks of age. Where APHA has diagnosed oedema in older pigs in small herds there has been a history of recent introduction of the pigs to the premises which, especially if accompanied by a change in diet, may have played a role in development of disease.

On pig farms where backlogs of pigs exist, enteric and other diseases may be exacerbated as measures usually taken to control disease may be adversely impacted, for example, managing pig flows, vaccination timing, effective cleaning and disinfection, adequate turnaround times, and avoiding mixing pigs of different ages.

In preparation for the zinc oxide ban from mid-2022, and to provide advice to mitigate adverse effects on pig health and welfare, antimicrobial use and antimicrobial resistance, AHDB Pork held a webinar on Managing without zinc. This emphasised that there is no single solution that addresses the impact of removing zinc oxide from pig diets and each farm requires a customised approach.

Strategies were described to optimise gut health including dietary modification, managing weaned pigs optimally, acidifying the water supply and other approaches.

A recent webinar was also held in the US discussing enteric colibacillosis in weaner pigs.

Intestinal torsions were diagnosed in 32 incidents in 2021 carcase submissions; half in adult pigs, and half in post-weaned pigs. Almost all adult cases of intestinal torsion were in pigs kept outdoors and, where the ages were provided, nearly half the diagnoses in adult pigs were in replacement gilts less than one year of age. Typical examples on three separate farms are described below.

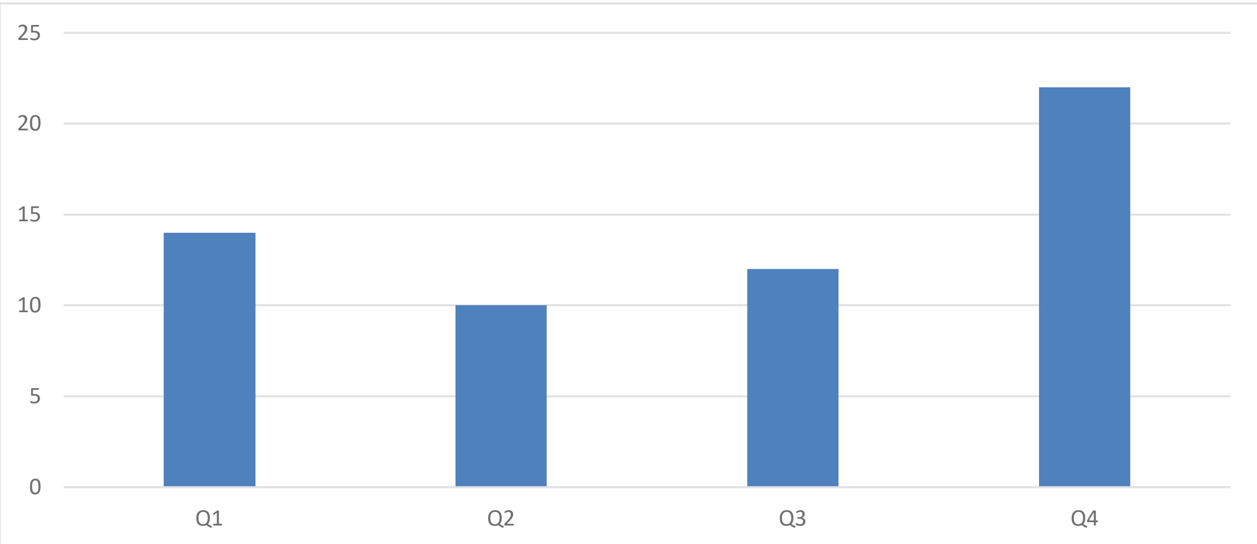
Mesenteric torsion was found in a 32-week-old gilt which was off her feed and died overnight on an outdoor weaner-producer on which around 15% of replacement gilts in 2 batches over 4 weeks had been found dead. Affected gilts were in training or synchronisation pens. There were a few stones with sand in the stomach and a loop of colon was filled with sand.

A first parity sow was submitted to investigate the acute deaths of three sows in one week in the batch which had farrowed 2 weeks earlier on an outdoor weaner producer unit. Sows were fed once a day and no recent changes were reported in the feeding regime. A mesenteric torsion was identified with an excessive quantity of stones in the stomach, caecum and colon.

In another submission, a 3-year-old pregnant sow was found dead on an outdoor breeding unit on which 4 sows had died in the previous 2 weeks. A splenic torsion had been found in one of these when submitted for post-mortem examination. The sows were known to eat a lot of sand and stones on the unit and their ration was increased to try and address this.

A 360-degree torsion of the intestinal mesentery was identified as the cause of death and an excessive quantity of sand was present in the colon as a likely predisposing factor in this sow.

Figure 16: Diagnoses of torsion of the intestine in adult pigs by quarter from 2011 to 2021 inclusive recorded by the Great Britain scanning surveillance network



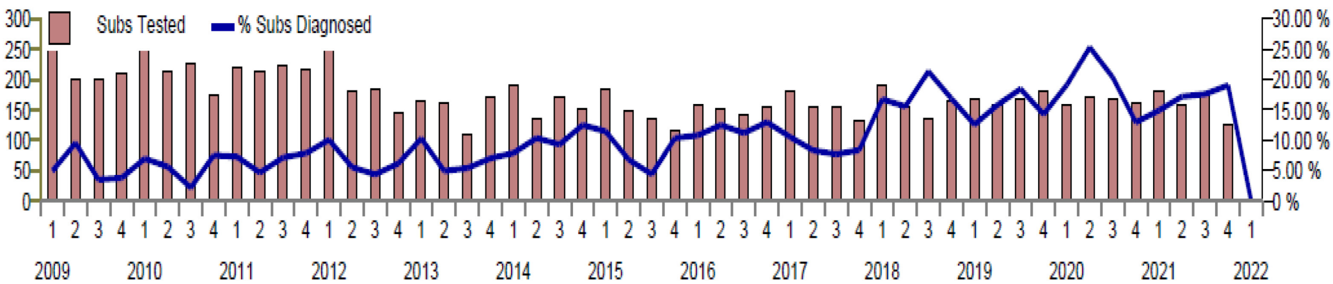
Intestinal torsion diagnoses in adult pigs recorded from 2011 to 2021 illustrated by quarter in Figure 16 show that diagnoses are made through the year, with a tendency for more to be recorded in the cooler, wetter months.

A number of factors predispose to mesenteric torsions in outdoor gilts and sows, including ingestion and accumulation of stones, sand and gravel in the large intestine, excessive exercise or boisterous movement after consuming feed, disruption to usual feeding patterns or feeding at irregular intervals, crowding or competition for feed or issues with feeder calibration affecting feed access and leading to pigs rapidly ingesting more than their share. The use of highly fermentable ration ingredients that produce excessive amounts of gas in the stomach or colon is another recognised risk factor for pigs of all ages.

Porcine reproductive and respiratory syndrome diagnoses

The diagnostic rate for incidents of porcine reproductive and respiratory syndrome (PRRS) diagnosed through the Great Britain scanning surveillance network in quarter 4 of 2021 rose again slightly from the previous quarter but remains lower than the peak seen in quarter 2 of 2020 (Figure 17). All PRRS incidents diagnosed in Great Britain in quarter 4 of 2021 involved PRRS virus-1 (PRRSV-1).

Figure 17: Seasonality of incidents of PRRS in pigs to 2021 as a percentage of diagnosable submissions to the Great Britain scanning surveillance network

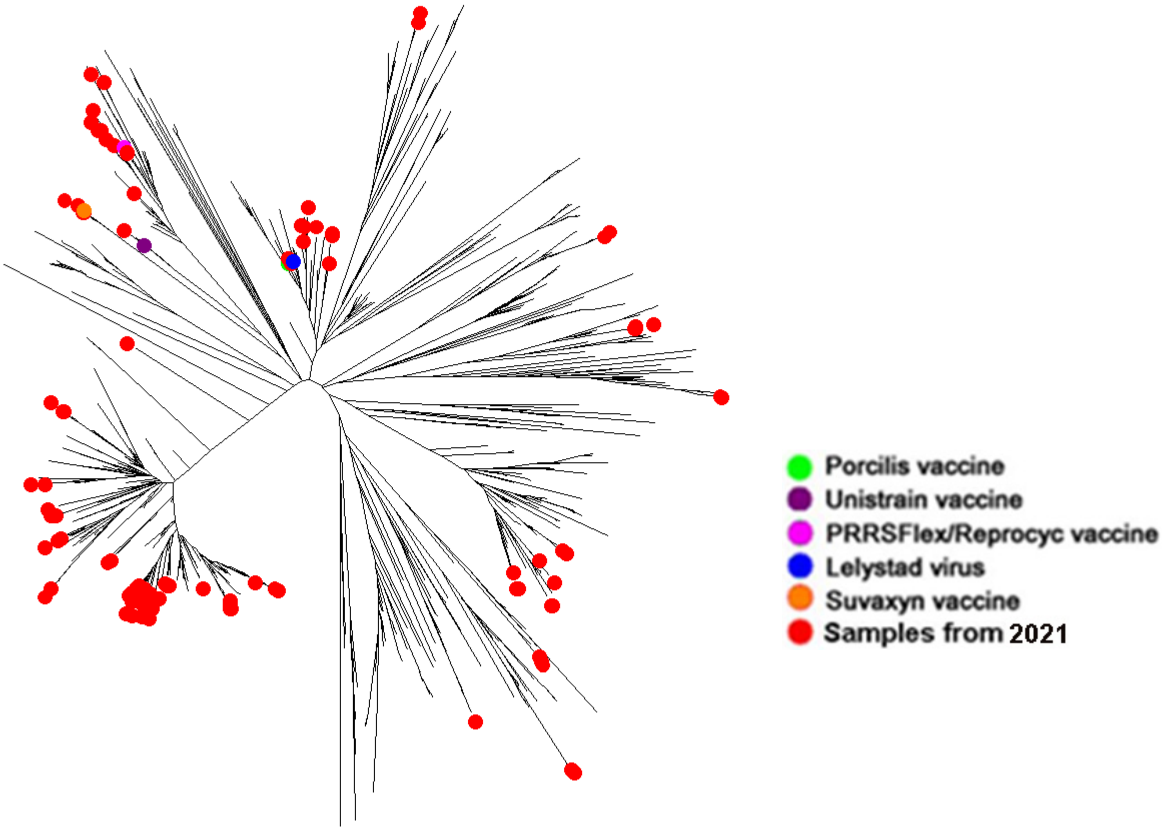


PRRSV-2 has not been detected in pigs in Great Britain and is now immediately reportable to APHA with premises details.

In each PCR-positive diagnostic submission to APHA, one sample is sequenced under pig disease surveillance funding to support surveillance of PRRSV diversity.

Any vaccine-like strains (identified as vaccine-like based on at least 99% homology similarity of ORF5 sequence to one of the vaccine virus strains) detected are analysed further by sequencing a portion of the non-structural protein 2 gene (nsp2). Vaccine-like strains representing all four licensed vaccines in UK have been detected in 2020 and 2021.

Figure 18: Phylogenetic tree based on ORF-5 gene sequences of PRRSV strains detected in pigs in Great Britain in 2021 (123 submissions)



The phylogenetic tree for 2021 PRRSV strains is shown in Figure 18 and demonstrates the increasing diversity. The sequencing provided no evidence for introduction of new strains from outside the clusters seen in Great Britain. The increasing diversity reflects evolving resident strains in multiple clusters.

Streptococcus suis serotypes in 2021

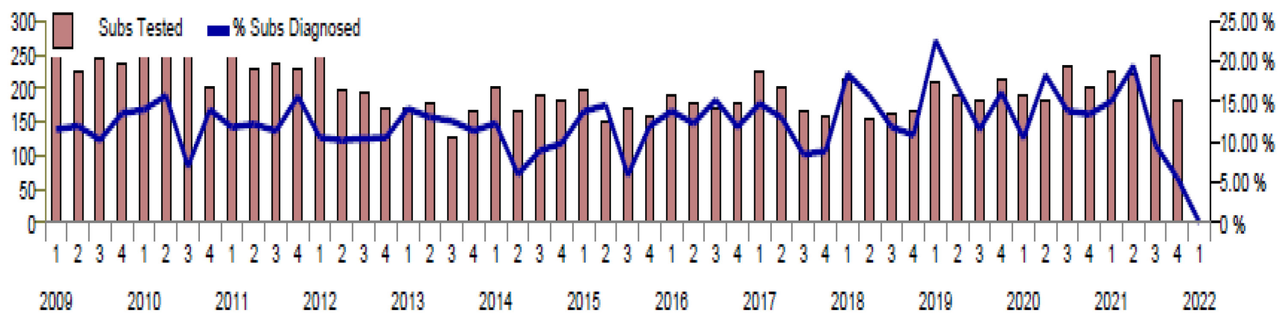
Streptococcal disease is usually one of the most frequent diagnoses made through the Great Britain scanning surveillance network, although diagnoses were reduced in quarter 4 of 2021 (Table 1 and Figure 19).

Table 2 shows the *Streptococcus suis* serotypes identified and those detected most frequently (1, 2, 7 and 14) are also the serotypes which are mainly found causing primary disease. However, those four serotypes and a range of others are also found secondary to other causes of disease, in pa rticular viral disease due to PRRSV, swine influenza virus and porcine circovirus 2.

Table 2: *Streptococcus suis* serotypes identified through Great Britain scanning surveillance network submissions in quarter 4 of 2021 and the whole of 2021

Streptococcus suis serotypes	*S. suis* isolates in quarter 4 of 2021	*S. suis* isolates in the whole year 2021
1	3	16
2	4	32
3	1	6
4	0	3
5	0	2
7	0	22
8	1	5
9	0	5
10	0	1
11	1	1
13	0	2
14	0	8
16	0	1
21	1	1
24	0	1
33	0	1
34	0	1
NT	1	7
Total *S. suis* isolates	12	115

Figure 19: seasonality of streptococcal disease diagnoses as a percentage of diagnosable submissions to the Great Britain scanning surveillance network



Brachyspira hyodysenteriae surveillance findings

The number of diagnoses of swine dysentery recorded in VIDA from submissions in 2021 at the time of writing and the annual diagnostic rate in 2021 are both lower than in each of the years 2018 to 2020 (Figure 20). Nevertheless, 11 diagnoses were made in 2021 and these are shown by quarter with their multi-locus sequence type (MLST) in table 3.

Where *B. hyodysenteriae* isolates are successfully obtained, they undergo whole genome sequencing (WGS) and antimicrobial sensitivity minimum inhibitory concentration testing under APHA's pig disease and antimicrobial resistance surveillance projects respectively. No isolates tested in quarter 4 of 2021 showing clinical resistance to tiamulin were identified.

Clinical resistance to tiamulin was detected in the *B. hyodysenteriae* of multi-locus sequence type (MLST) 251 derived from one farm during the whole of 2021, testing in 2020 had already identified the presence of clinically resistant *B. hyodysenteriae* on this farm. The MIC values for the isolates from this farm were also at or above clinical breakpoint for other licensed antimicrobials tested. This multi-drug resistance is an unusual finding in recent years and severely limits treatment options.

Control in some previous situations where resistant *B. hyodysenteriae* isolates have been detected has been by depopulation to prevent persistence of a resistant strain.

An APHA presentation on *Brachyspira* whole genome sequencing was given at the Pig Veterinary Society November 2021 conference alongside a presentation on veterinary field experiences with *Brachyspira*, both of which are available to members on the PVS website.

Figure 20: Annual swine dysentery incidents as a percentage of diagnosable submissions to the Great Britain scanning surveillance network from 2009 to 2021

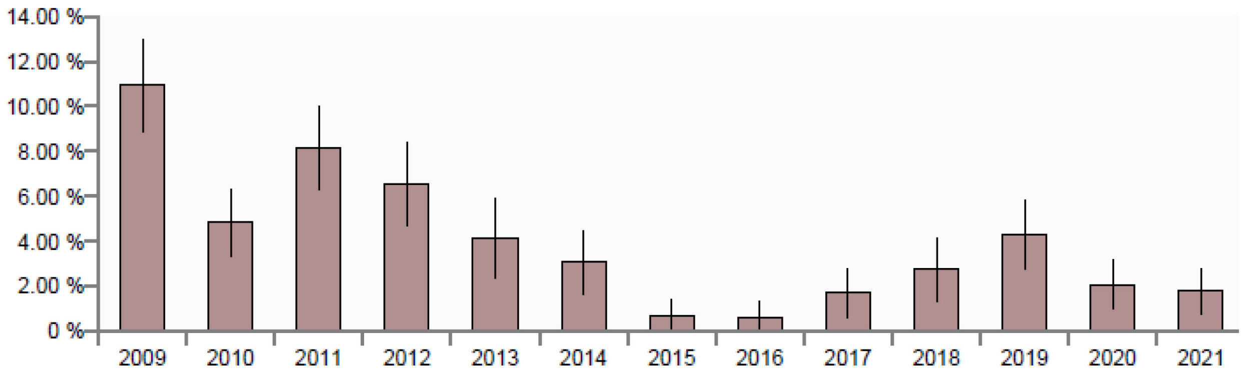


Table 3: The multi-locus sequence type (MLST) of *B. hyodysenteriae* detected in 2021 by quarter in diagnostic submissions to the Great Britain scanning surveillance network

Quarter 2021	MLST identified	County where sampled pigs were kept
1	PCR positive, not isolated	Not given
1	251	North Yorkshire
1	251	North Yorkshire
2	240	North Yorkshire
2	242	West Yorkshire
2	52	Devon
2	52	Dorset
3	52	Devon
4	52	Devon
4	52	Devon
4	new	Scottish Borders

Two other *B. hyodysenteriae isolates were* sequenced which were obtained from pigs showing no signs, and thus are not recorded as diagnoses in VIDA. These were from North Yorkshire (partial ST251) and from Perthshire (ST266).

The 2021 *B. hyodysenteriae* ST52 isolates were found to be 'atypical' in that they gave anomalous results in the 23S rRNA PCR and were not identified as *B. hyodysenteriae*. All were strongly haemolytic and were confirmed as *B. hyodysenteriae* by whole genome sequencing. This has been noted occasionally previously (APHA, 2017), and whilst ST52 represents most of the isolates giving this anomalous result, it is not restricted to this sequence type.

The MLST ST52 is a large diverse group detected from various counties and regions of Great Britain from 2006 to 2021 and the isolates are often from small pig herds. Phylogenetic analysis of the atypical ST 52 isolates indicates they are closely related to each other. They are being investigated further.

This highlights the importance and benefit of culturing for *Brachyspira* species in addition to PCR testing. This dual approach to testing allows prompt diagnosis whilst also yielding an isolate for confirmation of species and MLST, and for antimicrobial sensitivity testing. It also facilitates detection of atypical isolates and new or emerging species or strains with altered characteristics.

The B. hyodysenteriae MLST dashboard provides more information about sequence types detected over time and in different counties, with their antimicrobial resistance gene profiles.

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

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

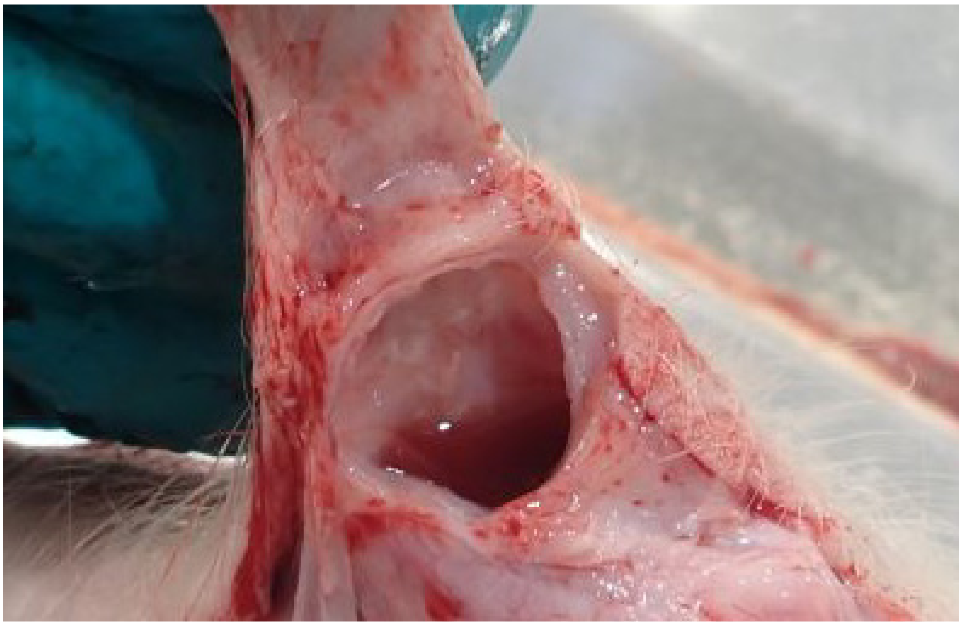
Mycoplasma hyosynoviae detection in bursitis cases

Eleven-week-old pigs were submitted to the Thirsk Veterinary Investigation Centre to investigate swollen joints. Adventitious bursae containing red fluid with fibrous strands (Figure 21) were found over the olecranon in 2 pigs, and the plantar aspect of the hocks in the other, without evidence of joint pathology. One was associated with a fibrous pad and extended to the periosteum of the olecranon. Interestingly, *Mycoplasma hyosynoviae* was detected in pooled bursal swabs from one of two pigs tested although histopathology was inconclusive.

Bursitis development is primarily associated with hard flooring with body weight, depth of subcutaneous fat, breed and skin thickness as factors influencing its development. The pathogenesis of *M. hyosynoviae* within bursitis lesions could be due to an out-pocketing of the joint capsule infected with *M. hyosynoviae* to form the bursa, or the *M. hyosynoviae* settling out in the synovial membrane lining of inflamed bursae: the latter is considered more likely. PRRS and swine influenza were also diagnosed in the pigs and increased recumbency due to lethargy could be another risk factor.

This is the second time *M. hyosynoviae* has been detected in such lesions in an APHA submission. The previous case was in 2019 in a 15-week-old pig with adventitial bursae containing red fluid over the olecranon on both sides, with multiple irregular globular to stellate fibrous growths. *Mycoplasma hyosynoviae* was detected and histopathology detected a non-specific marked, chronic, fibrosing bursitis.

Figure 21: Bursitis lesion in which *Mycoplasma hyosynoviae* was detected



Apparent treatment failure in piglets with coccidiosis

Coccidiosis was diagnosed in 12-day-old diarrhoeic and wasted piglets on an outdoor weaner-producer breeding unit with a problem of diarrhoea and deaths in that batch of piglets. Around a third had diarrhoea and 11% had died. No disease was reported in adult pigs. The piglets had not received antibiotic treatment or vaccines but were treated with toltrazuril by injection, at two days of age, to prevent coccidiosis.

Although no oocysts were detected by faecal flotation, a diagnosis of coccidiosis due to *Cystoisospora* species was confirmed by histopathological examination of the small and large intestines in the submitted pigs. No other enteropathogens of preweaned pigs were detected.

Apparent treatment failure does not necessarily equate with the presence of resistance and investigation may reveal other causes, for example, treating at the wrong time, underdosing, or disease being caused by something other than coccidiosis.

In this case, investigation by the submitting veterinarian found that the piglets were being under-dosed due to faulty equipment and measures were taken to rectify this and solve the problem. Improved hygiene measures and inactivation of infectious oocysts with suitable disinfectants are also important control measures for coccidiosis (Hinney and others, 2020)

Horizon scanning

Porcine circovirus 2e genotype detected in Italy

A publication from Italy reported the detection of a genotype of PCV2 (2e) that has not previously been reported in Europe but is present in Asia and North America (Franzo and others, 2022). Several variants of PCV2 are recognised and are classified into several genotypes. Three genotypes (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. The mode of transmission of PCV2e to the farm in Italy is uncertain as no clear links have been identified with regions of PCV-2e circulation. It is possible that this genotype is more widespread but unrecognised due to lack of surveillance or under-reporting.

The PCV2e was detected in one farm in sows with no clinical evidence of PCV2-associated disease. There was persistent subclinical evidence of PCV-2e on the farm and there was concurrent PCV2d. APHA regularly genotypes cases of PCV2-associated disease and a shift from PCV2b to 2d was detected in recent years (Grierson et al., 2017).

Continued monitoring will help evaluate the efficacy of current vaccines to PCV2e if it is detected. Genotyping of PCV2 detected in non-disease associated samples from, for example, the slaughter pig 2019 serum archive, is being considered.

Porcine respirovirus 1 prevalence in Poland

Porcine respirovirus (PRV1), also known as porcine parainfluenza virus 1, is a paramyxovirus for which the clinical relevance to pig health is poorly understood. The virus has been reported as present by countries in Asia, Europe and the USA in healthy pigs, and in pigs with respiratory clinical signs.

Experimental infections (Welch and others, 2021) showed no significant respiratory disease in conventional and caesarean derived and colostrum deprived piglets, despite high replication suggesting that PRV1 infection alone may not be clinically significant.

Woźniak and others (2022) published an assessment of the prevalence of PRV1 in Poland in which nasal swabs and oral fluids from pigs on 30 farms were tested by RT real-time PCR for PRV1, swine influenza A virus (SwIAV) and PRRSV.

The virus was found to be highly prevalent (76.7% farms positive) and supported previous studies suggesting that PRV1 infection occurs mainly in young post-weaned pigs. Coinfection with SwIAV and PRRSV were detected in 23.5% and 11.8% of PRV1-positive nasal swab pools from diseased pens, respectively. PRV1 was also detected in pigs with respiratory signs that were negative for PRRSV and SwIAV: the paper did not indicate whether other respiratory pathogens were present in these pigs.

Swine vesicular cases of undetermined aetiology investigated by SHIC

The November 2021 report from SHIC in the USA described a comprehensive investigation by Iowa State University (ISU) College of Veterinary Medicine into vesicular disease affecting the snout of pigs on multiple farms in Iowa and Minnesota during the first 4 months of 2021. All cases were negative for known causes of vesicular disease including foot-and-mouth disease virus (FMDV), Senecavirus A (SVA), swine vesicular disease virus (SVDV), vesicular stomatitis virus (VSV) and vesicular exanthema of swine virus (VESV) and no other viral or bacterial causes were identified.

The absence of an infectious causative agent being found in these vesicular cases raises the possibility that non-infectious factors may be involved. Protocols and methodology have been established for investigation of further cases, in the UK as in the USA, any vesicular disease must be reported and investigated to rule out involvement of notifiable vesicular disease (known as foreign animal disease in the USA) prior to progressing any other investigations.

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