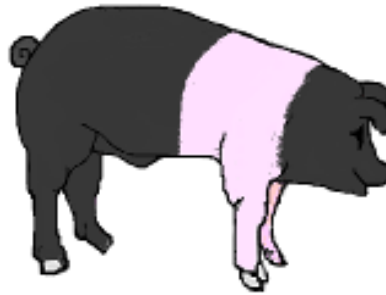




Animal &
Plant Health
Agency



Great Britain pig quarterly report: disease surveillance and emerging threats

Volume 25: Quarter 3 – July to September 2021

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the third quarter of 2021, July to September. It contains analyses carried out on disease data gathered from APHA, Scotland's Rural College (SRUC) Veterinary Services and partner post-mortem providers and intelligence gathered through the Pig Expert Group networks.

In addition, links to other sources of information including reports from other parts of the APHA and Defra agencies are included. A full explanation of [how data is analysed](#) is provided in the annexe available on GOV.UK.

Pig disease surveillance dashboard outputs

Diagnoses made in the third 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 3 of 2021 and quarter 3 of 2020

15 most frequent diagnoses quarter 3 of 2021 (total 291)	15 most frequent diagnoses quarter 3 of 2020 (total 270)
1. Salmonellosis - Typhimurium	1. Streptococcus suis
2. Colibacillosis - enteric	2. PRRS - pneumonia
3. Porcine reproductive and respiratory syndrome (PRRS) - pneumonia	3. PRRS - systemic
4. Rotavirus	4. Rotavirus
5. Streptococcus suis	5. Salmonellosis - Typhimurium
6. Brachyspira pilosicoli	6. Actinobacillus pleuropneumoniae
7. Lawsonia sp. associated disease	7. Brachyspira pilosicoli
8. PRRS - systemic	8. Colibacillosis - enteric
9. Colibacillosis - oedema disease	9. Mycoplasma hyopneumoniae pneumonia
10. Salmonellosis - other	10. Streptococcal meningitis
11. Erysipelas	11. Pasteurella multocida pneumonia
12. Pasteurella multocida pneumonia	12. Swine dysentery - B. hyodysenteriae
13. Actinobacillus pleuropneumoniae	13. Coccidiosis
14. Swine influenza	14. Lawsonia sp. associated disease
15. Intestinal torsion	15. Salmonellosis - ST-like variants

Note: that further diagnoses may be added for records for submissions made in quarter 3 of 2021 which are finalised at a later date.

Figures 1a to 1d: summary data for 424 submission records in Quarter 3 of 2021 (456 in Quarter 3 of 2020)

Figure 1a: pig age

Age Category	
Adult	63
Mixed	9
Neonatal	24
Postwean	218
Prewean	34
Unknown/other	76

Figure 1b: submission type

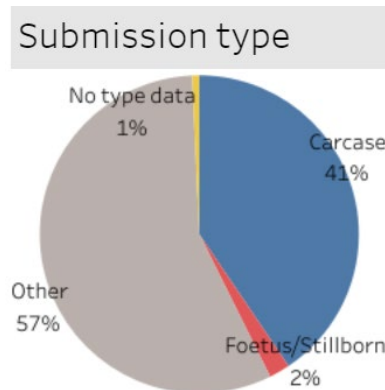


Figure 1c: disease syndrome

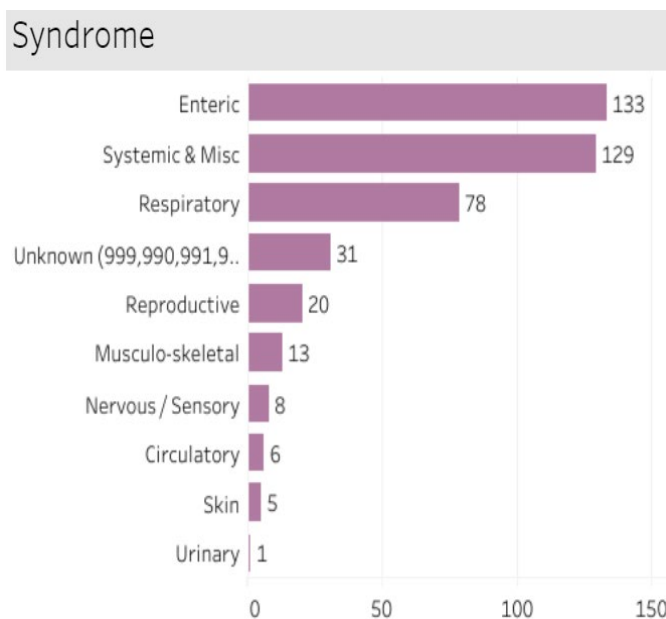
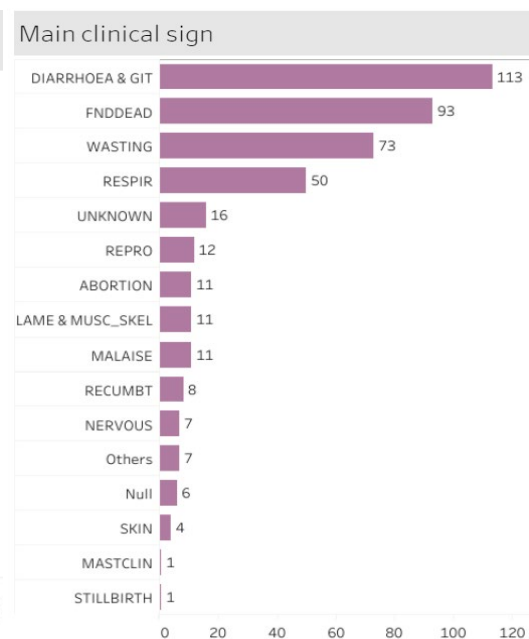


Figure 1d: main clinical sign reported



These diagnostic submissions are voluntary and subject to several sources of bias. The profile of submissions for the third quarter of this year differs from that of the previous quarter (quarter 2 of 2021) in that diarrhoea and gastro-intestinal signs and enteric disease syndrome are the most frequent clinical signs and disease syndrome respectively, rather than respiratory signs and respiratory disease syndrome in quarter 2 of 2021.

The previous quarter's data was influenced in part by an increase in swine influenza.

This quarter's data reflects a return to enteric disease as the dominant syndrome investigated in diagnostic submissions.

Total Great Britain diagnostic submissions for the quarter (354) were lower than the total for the same quarter in 2020 (386) due to a reduction in non-carcase submissions to SRUC.

However, it was higher than the average (284) for this quarter for 2017 to 2019 (range from 262 to 324) mainly reflecting higher non-carcase submissions to APHA and SRUC this quarter compared to the same period in previous years.

Carcases represented a similar proportion of total submissions in quarter 3 of 2021 (41%) as in quarter 3 of 2020 (39%). The number of diagnoses made in quarter 3 of 2021 was higher than in quarter 3 of 2020 despite the lower number of submissions.

Salmonellosis due to *Salmonella* Typhimurium and enteric colibacillosis were the 2 most frequent diagnoses, which is likely due to increased diagnostic trends in these 2 diseases during quarter 3 of 2021 which is discussed on page 9.

Four of the five most common diagnoses in quarter 3 of 2021 were also in the top 5 diagnoses in quarter 3 of 2020 (See table 1).

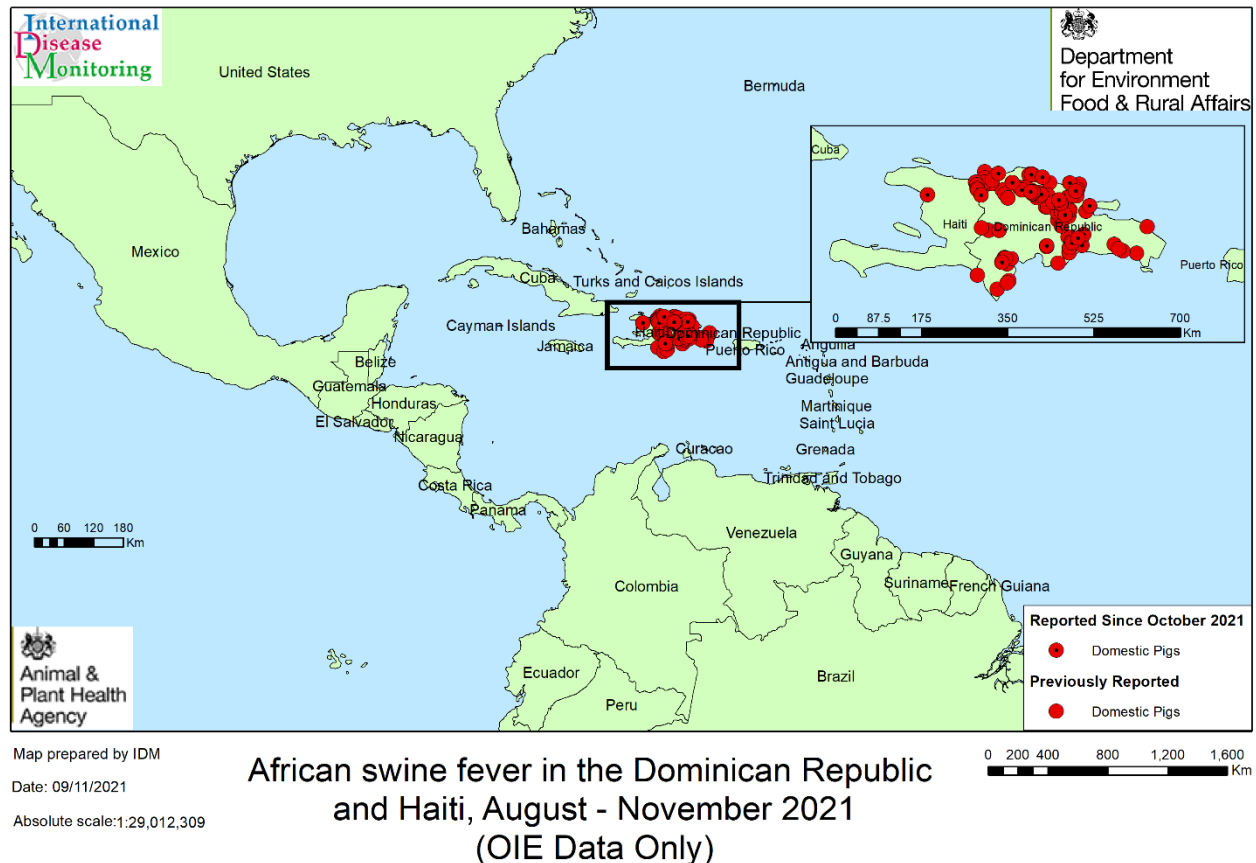
New and re-emerging diseases and threats

African swine fever summary

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

Updates on [the ASF situation in the Caribbean](#) were issued in July and September 2021 and figure 2 illustrates the situation.

Figure 2: ASF cases in domestic pigs in the Dominican Republic and Haiti August to November 2021 (mapped on 9 November 2021)



The spread of ASF to the Caribbean was described in our 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 been found in many areas across the Dominican Republic (See figure 2) and the report in September that ASF had spread to neighbouring Haiti was perhaps not unexpected particularly given the socio-economic difficulties and recent natural disasters.

A United States Department of Agriculture - Animal and Plant Health Inspection Service (USDA-APHIS) report indicated that the ASF virus (ASFV) is genotype 2 (Georgia 2007), the same as being found currently in mainland Europe and Asia.

Possible routes of introduction were identified by a technical mission of experts involving the World Organisation for Animal Health (OIE), the Food and Agriculture Organisation of the United Nations (FAO), the Inter-American Institute for Cooperation on Agriculture (IICA) and the International Regional Organisation for Agricultural Health (OIRSA).

These include improperly treated international waste (sea or air), illegal introduction of infected pig products by people in personal luggage or illegal importation of swine products from China (such products have apparently been identified at markets). The United States Department of Agriculture (USDA) continues to assist both countries with testing and expertise to support ASF control.

Updates on the [ASF situation in Europe](#) were issued in July, October, November 2021, and figure 3 shows reported cases.

ASF was reported in domestic pigs in Germany for the first time in mid-July when three outbreaks were confirmed on premises in Brandenburg state, close to the border with Poland. The virus was detected through testing of dead pigs as part of current routine surveillance for ASF and these premises were in areas in which infected wild boar had been found.

There was also westward spread of ASF with infection detected north of Dresden in a wild boar in October in a new district of Saxony for the first time (70km west of previous reports).

This was detected in a wild boar that was shot, ASF surveillance in Germany requires hunted wild boar to be tested for ASF as well as those found dead.

Following the 3 outbreaks detected in July, no more domestic pig cases were found in Germany until a fourth outbreak of ASF was confirmed on 15 November in domestic pigs on a finishing farm in the previously unaffected eastern state of Mecklenburg-Vorpommern (also known as Mecklenburg-Western Pomerania) which borders Brandenburg state.

This outbreak represents a significant move of ASF into a new region in Germany, having been reported only in Brandenburg and Saxony previously, with the closest previous report approximately 150km away, in wild boar.

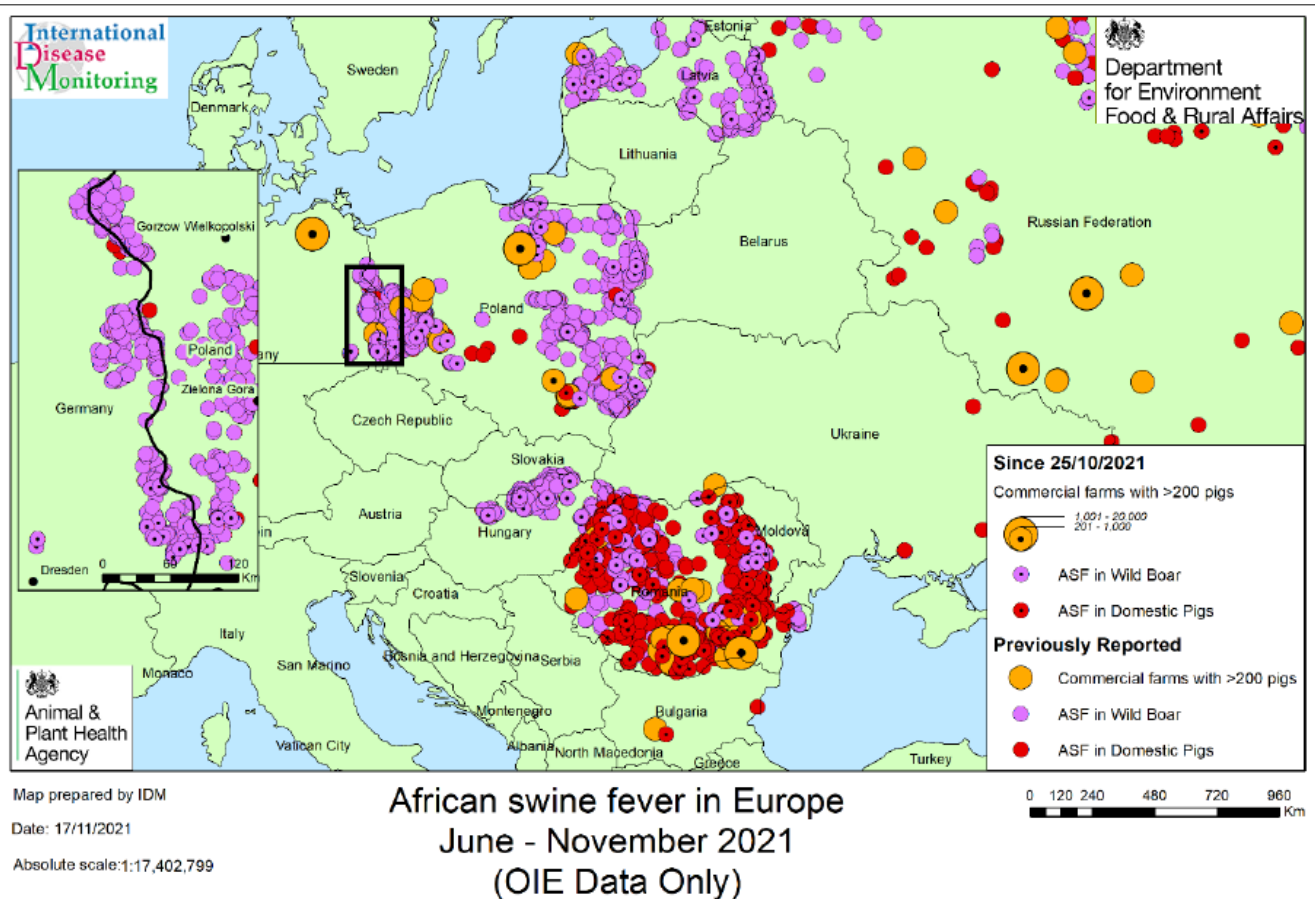
This farm had 4,038 finisher pigs, of which 45 showed suspicious clinical signs and died and were confirmed positive for ASF virus. Active surveillance is in place in wild boar in the area. No ASF cases had been previously reported, although following ASF detection on this farm, ASF has been detected in wild boar around 60km away in the state of Mecklenburg-Vorpommern.

ASF continues to be reported in wild boar across the eastern German states of Brandenburg and Saxony. The reports from the International Disease Monitoring team provide full details of the control measures being implemented in Germany which, in addition to the intensive ASF surveillance, extension of permanent fencing, includes:

- no feeding of pigs with material from areas where ASF has been detected (unless heat-treated or stored for six months)
- purchase by the state of backyard pigs if farmers agree to not to keep pigs for 2 years, prohibition of events with pigs
- work to identify pig owners who hunt in order to increase controls on their holdings

In addition, hunters search for wild boar carcasses using trained dogs, there are sites for safe disposal of carcasses, hunting has been intensified, and no wild boar meat can leave infected zones.

Figure 3: ASF reports in Europe for August to November 2021 (mapped 9 November 2021)



The highest numbers of ASF outbreaks in domestic pigs were reported in Romania, Poland and Russia and cases of ASF in wild boar continue to be reported across most of the previously affected countries in Europe with Hungary, Poland and Romania reporting the highest numbers (See figure 3).

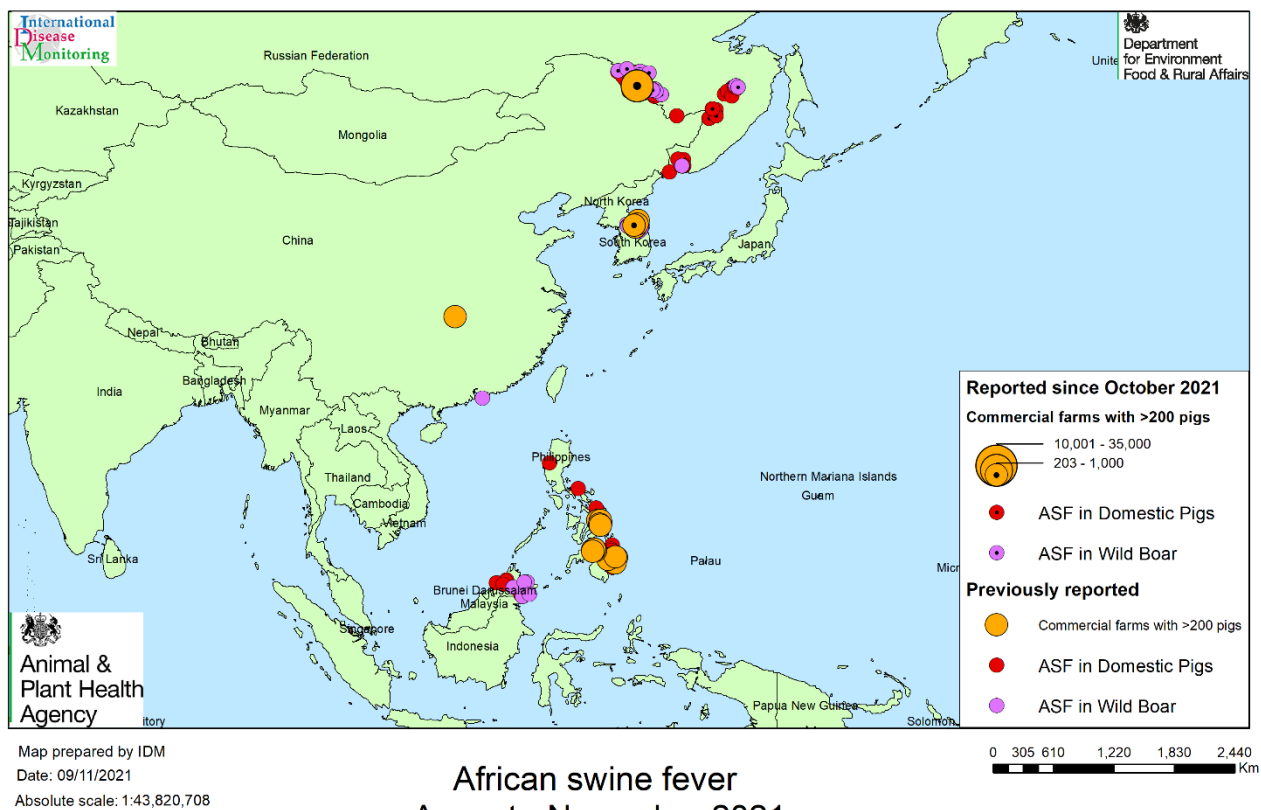
In Romania, the majority of domestic pig cases are on holdings with less than 50 pigs. Holdings with pigs in Romania are now required to have an annual inspection and advice on biosecurity measures is being provided to small farmers by veterinarians. The whole of Romania is in Zone III of ASF restrictions, and no pork products can be exported from the region.

The [current map and information about the zones](#) are available on the EU website.

There have been no more updates on the [ASF situation in Asia](#) since the one issued by The International Disease Monitoring (IDM) team in May 2021.

Figure 4 was provided by IDM and illustrates outbreaks reported from August to November 2021. ASF is suspected to be under-reported in some countries in this region and, even though there are significant wild boar populations, reports in wild boar remain very low apart from in South Korea.

Figure 4: ASF cases reported in Asia from August to November 2021 (mapped on 9 November 2021)



In 2020, attenuated genotype 2 ASFV strains were reported in domestic pigs in several provinces in China and was described in the quarter 4 of 2020 report (APHA, 2020). A surprising new development is the detection of genotype 1 ASFV strains in China causing chronic infection.

Researchers in China investigating genotype 2 strains which have become less virulent reported detection of genotype 1 ASFV strains on pig farms in Henan and Shandong provinces (Sun and others, 2021). Until this report, the ASFV detected in China has been Georgia-07-like genotype 2 ASFV which has been prevalent in China since 2018.

Animal challenge experiments with one of these strains (SD/DY-I/21) showed it to be of low virulence (chronic disease involving necrotic skin lesions and joint swelling) but able to transmit effectively between pigs.

Phylogenetic analysis of the whole genome sequences of the genotype 1 strains have detected similarities to past low virulence genotype 1 ASFV isolated in Portugal in 1968 and 1988 but these strains from China have diverged quite significantly.

It is not currently known how these strains arrived in China, illegal use of ASFV genotype 1 strains to attempt vaccination, infected pig and wild boar products and laboratory escape of virus are amongst possibilities. The risk pathways for introduction of ASF into the UK are not changed.

However, the presence of these less virulent ASFV strains of both genotype 1 and 2 adds to the difficulty in controlling ASF in China, and elsewhere if they spread. They increase the risk of more pigs with ASF going undetected and more infected meat reaching the food chain, and they also delay reporting disease outbreaks as mortality and clinical signs are less dramatic.

On a positive note, field trials of ASF vaccines are in progress in China, Philippines and Vietnam. A USDA ASF vaccine is being trialled in Vietnam; this is a live attenuated vaccine with a deleted gene, ASFv-G- Δ I177L.

The European Food Safety Agency Scientific Opinion (EFSA, 2021) was published on the ability of different matrices to transmit ASF virus, in particular, feed and feed ingredients, bedding materials and empty live pig transport vehicles returning from ASF-affected areas.

There have been other publications complementing this assessing the risk of ASF risk from feed and feed ingredients from Canada (Calvin and others, 2021) and the United States (Schambow and others, 2021).

Global disease reports produced monthly by the US Swine Health Information Center are also a good source of information and these can be viewed and received by email by signing up on the [Center 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 and access to the [news page and activities](#) on the GARA website.

A good overview and update on the [global ASF situation](#) given by Professor Sánchez-Vizcaino, an OIE expert on ASF is available on YouTube.

A review of the use of 'testing to exclude' (TTE) for avian notifiable disease was published (Reid and others, 2021) and is an example of how such an approach can be used, the attenuated ASFV strains in Asia strengthening the case for TTE for swine fevers.

A review of ASF and disinfection to control ASF from a UK perspective was published (Wales and Davies, 2021). This is a comprehensive paper with key information distilled into tables, including one giving estimated efficacy for selected Defra-approved disinfectants against ASF virus.

A recent literature review, not specific to ASF but particularly relevant to notifiable diseases of livestock, was published on the factors that influence disease reporting by farmers in passive surveillance systems (Gates and others, 2021).

The factors identified in the review included uncertainty on what warrants reporting, concern about the consequences of reporting, negativity about the effectiveness of any response, lack of trust for animal health authorities, insufficient compensation or incentives, and poor awareness of the processes involved in reporting.

The relative roles of these different factors are likely to vary greatly by country, region, type of farm and farmer.

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 1,250 diagnostic submissions tested under Agriculture and Horticulture Development Board (AHDB) Pork funding from June 2013 to September 2021.

The Pig Health and Welfare Council pig health sub-group substantially updated the industry PED contingency control plan, and a desktop PED exercise 'Exercise Avon' was held to test this in October 2021.

In 2 parts, this first tested the reporting and sharing of information about a suspect (then confirmed) PED case, and completion of an epidemiological questionnaire. It then dealt with actions following confirmation of PED, limited to tracings, control procedures and communications.

The lessons learnt will be reviewed and further training for veterinarians is planned in 2022. Further [information on PED](#) is available on the AHDB's website.

Unusual diagnoses or presentations

Disease due to *Clostridium difficile* in a piglet

Clostridium difficile enteritis was diagnosed in one neonatal piglet in a batch of three from an outdoor herd with ongoing problems of piglets with diarrhoea and wasting and mortality up to 16% in the first week of life. Disease due to *Cl. difficile* has been unusual in APHA submissions to date but is described as a more prominent cause of neonatal piglet disease in some other countries (Arruda, 2014).

Affected piglets were predominantly, although not exclusively, in gilt litters. Two submitted piglets had yellow liquid diarrhoea and mild acute enteritis with rotavirus being detected as the cause in one and the other pig being hypo-gammaglobulinaemic, with no enteropathogens detected. The third piglet was dehydrated and in poor body condition with an oedematous and friable colon.

Histopathology in this piglet revealed a moderate, acute, multifocal, erosive, fibrinosuppurative colitis associated with bacterial colonies, and mesocolic oedema. These lesions are unusual in piglet submissions to APHA and are described in disease due to *Clostridium difficile*. This prompted further testing and *Cl. difficile* toxin was detected by antigen enzyme-linked immunosorbent assay (ELISA).

These findings together with the histopathological lesions and negative results for other neonatal enteropathogens were consistent with a diagnosis of enteric disease due to *Cl. difficile* in this piglet, which can be associated with prior antimicrobial treatment although these pigs had not been treated.

Detection of *Cl. difficile* toxin alone is not sufficient evidence for a diagnosis. The zoonotic potential for *Cl. difficile* in pigs is uncertain, however the importance of good personal hygiene at all times, as recommended for other zoonotic pathogens in pigs such as *Salmonella* was advised.

Investigations in further piglets did not diagnose disease due to *Cl. difficile* however pneumonia due to a field strain of porcine reproductive and respiratory syndrome virus (PRRSV) was diagnosed in the second batch.

This, with further investigation, indicated PRRS to be underlying the disease issue, through infection of piglets and by affecting milk production in gilts leading to poor colostral antibody transfer in some piglets and predisposing them to neonatal disease, as seen in the piglets submitted. The case was included in the October 2021 Veterinary Record surveillance report (APHA, 2021b).

Changes in disease patterns and risk factors

Enteric diagnoses rise in quarter 3 of 2021

The diagnostic rates for disease due to *Escherichia coli* (See figure 5) and, to a lesser degree, salmonellosis (See figure 6) rose in quarter 3 of 2021, in both cases mainly due to increased enteric disease in post-weaned pigs.

Whilst this cannot be attributed directly to the situation on many pig farms where backlogs of pigs exist, the issues will make it more likely that measures usually taken to control enteric (and other) disease are being adversely impacted, for example managing pig flows, effective cleaning and disinfection, adequate turnaround times, and avoiding mixing pigs of different ages.

During quarter 3, some significant salmonellosis outbreaks in pigs were diagnosed where the disease risk may have been increased by the current situation and 2 such incidents were described in the Veterinary Record September 2021 surveillance report (APHA, 2021c).

Amongst possible factors predisposing to disease in these incidents, inadequate weaner holding pen management on the source farms was suspected to be an issue. Also, in one of the cases, routine management of farrowing arcs had not been followed and they had not been moved between litters for at least one batch.

In addition, anything that slows the establishment of normal drinking and eating in pigs which have just been weaned predisposes them to enteric disease, including swine influenza which was suspected to have been present earlier in one of the salmonellosis incidents described.

Where weaned litters are mixed and kept overnight prior to leaving their breeding farm, the holding pens, feeders and drinkers should be cleaned and disinfected and, ideally, moved to new ground between batches to avoid build-up of pathogens. One of the affected farms has since moved to single sourcing and receives piglets that are not held at the breeding unit after being weaned.

Advice on [control measures for salmonellosis in pigs](#) is provided on the APHA Vet Gateway.

Figure 5: Great Britain E. coli disease incidents in pigs as a percentage of diagnosable submissions

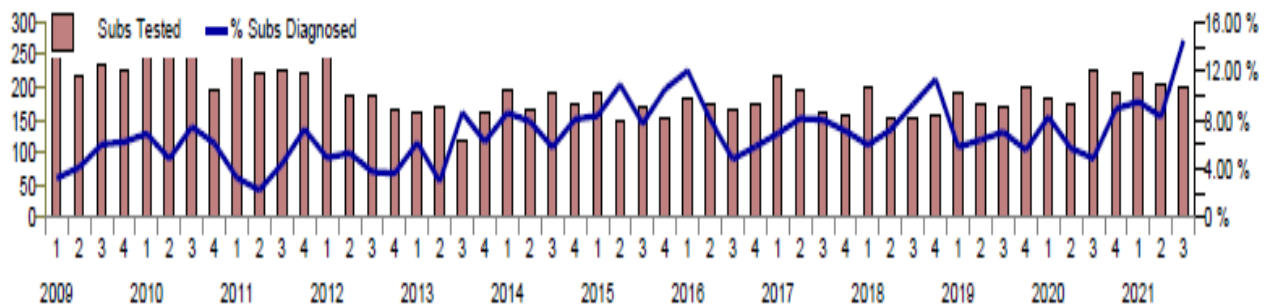
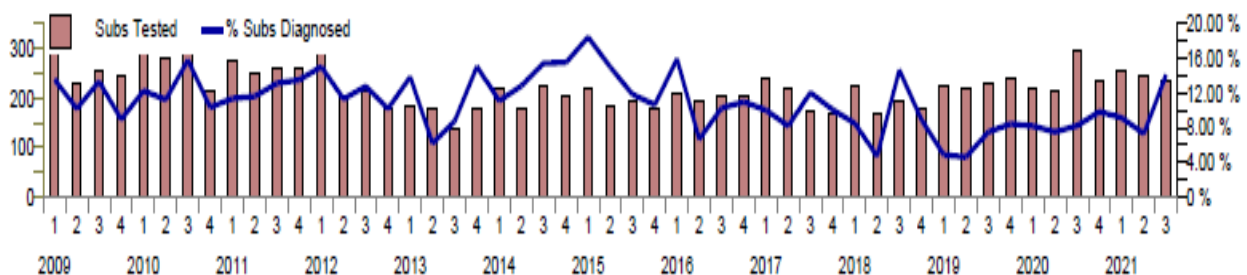


Figure 6: Great Britain incidents of salmonellosis in pigs as a percentage of diagnosable submissions



The [2020 edition of Salmonella in Livestock Production in Great Britain](#) has been published and, for the first time since 2014, the number of Salmonella Typhimurium isolations exceeded those of both monophasic Salmonella variants (4,5,12:i:- and 4,12:i:-) combined.

The most common phage type of S.Typhimurium isolated from pigs in 2020 was U288 (43.4% of total S. Typhimurium isolations in pigs), followed by DT193. All typable isolations of both monophasic variants of S.Typhimurium from pigs in 2020 were phage type DT193.

Multidrug-resistant clinically relevant E. coli and Salmonella isolates were noted in some incidents which can limit the treatment options available to veterinarians dealing with such cases.

It is strongly recommended that diagnostic testing with antimicrobial sensitivity testing is undertaken in enteric disease outbreaks, especially where treatment failure is suspected to help protect pig health and monitor developments.

There is concern about the effect of the zinc oxide ban in mid-2022 on pig health and welfare, antimicrobial use and antimicrobial resistance. Several additional parameters will be monitored as part of scanning surveillance to detect whether there are changes in enteric disease in post-weaned pigs following cessation of zinc oxide use.

The UK Veterinary Antibiotic Resistance and Sales Surveillance (VARSS) Report 2020 (The Veterinary Medicines Directorate (VMD), 2021) has been published and provides data on the antimicrobial sensitivity of *E. coli* and *Salmonella* isolates from APHA diagnostic submissions from pigs during 2020.

The data does not indicate the prevalence of resistances in the national pig population, especially as the submissions are biased in nature and involve diseased rather than healthy pigs, however the trends in findings over consecutive years can be monitored.

Pig producers with antimicrobial use falling in the top 5 per cent for their holding type are now classed as persistently high users (PHU) and are required to implement an antibiotic reduction plan in conjunction with their vet (Pig World, 2021).

Submissions of pigs to APHA and partner PME providers are particularly encouraged from disease outbreaks which are unusual, severe or unresponsive to control measures.

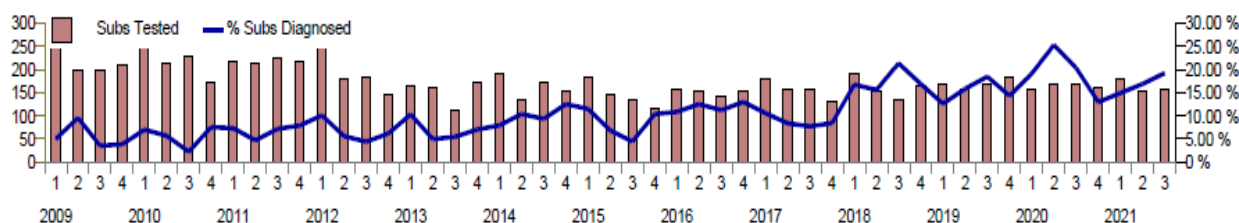
Antimicrobial use is a proxy measure of disease challenge and diagnostic investigations will be offered to a number of PHU pig units in England and Wales through their veterinarians under government funded pig scanning surveillance funding.

Vaccine-like porcine reproductive and respiratory syndrome virus (PRRSV) strains in Great Britain

The diagnostic rate for incidents of PRRS diagnosed through the Great Britain scanning surveillance network in quarter 3 of 2021 rose slightly from the previous quarter but remains lower than the peak seen in quarter 2 of 2020 (See figure 7). All PRRS incidents diagnosed in Great Britain in quarter 3 of 2021 involved PRRSV-1.

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

Figure 7: seasonality of British PRRS diagnoses as a percentage of diagnosable submissions



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

Any vaccine-like strains (called 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.

So far, analyses of strains from 2020 to 2021 show that in all except one, similarity between the ORF5 sequence and a vaccine has been mirrored by similarity in the nsp2 also, therefore presenting no evidence of recombination events. The one exception is being investigated by full genome sequencing.

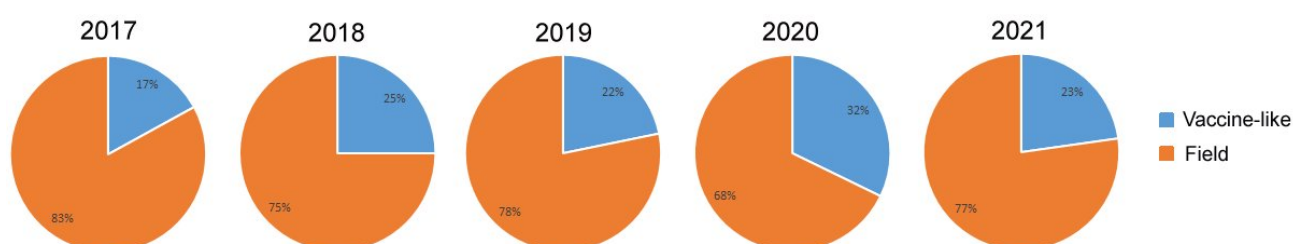
For 2 prior vaccine-like strains where a discrepancy between the nsp2 and ORF5 sequences was identified, further investigation indicated that one (which was a pooled sample) likely contained both a vaccine and field virus.

In the second case, full genome sequencing revealed a vaccine virus strain. The mismatched nsp2 sequence was likely to have been from a field virus present in the original sample.

The proportions of field and vaccine-like PRRSV strains detected by year for those that have been sequenced at APHA from 2017 to end of September 2021 are shown in figure 8.

These proportions are biased as the viruses sequenced at APHA represent a subset of the PRRSV present in the pig population, and diagnostic submissions are biased and not random. However the trend in these proportions is worth monitoring and, apart from in 2020 when a higher proportion were seen, the vaccine-like strains have represented 17 to 25% of those sequenced.

Figure 8: the proportion of vaccine-like and field PRRSV strains identified by year at APHA



Penicillin resistance in *Streptococcus suis* serotype 9

Penicillin-resistant *Streptococcus suis* serotype 9 was isolated from the lung of a weaned indoor 6 week old pig with wasting and diarrhoea that was submitted for culture.

As this is an uncommon resistance in APHA *S. suis* isolates and as only limited diagnostic testing was possible on the samples, diagnostic post-mortem examination under pig disease surveillance funding was offered to follow up this finding as this serotype was likely to have been secondary to other disease.

The minimum inhibitory concentration for penicillin for the serotype 9 isolate was 2 µg per ml confirming resistance (Clinical and Laboratory Standards Institute breakpoint indicating resistance is greater than or equal to 1.0 µg per ml). The isolate was still sensitive to some other antimicrobials but was resistant to tetracycline.

Penicillin resistance in *S. suis* is a rare finding in APHA *S. suis* isolates; the UK VARSS Report 2020 (VMD, 2021b) shows the most recent penicillin-resistant *S. suis* isolate at APHA was detected in 2018, this was a serotype 5 isolated from a case of abortion (APHA, 2018).

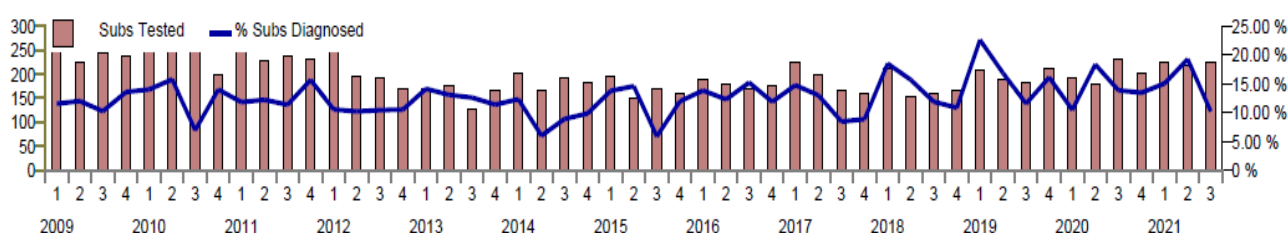
The report also shows that tetracycline resistance is common in clinical isolates of *S. suis*, with over 80 per cent being tetracycline-resistant in 2018 to 2020 data. *S. suis* is a potential zoonosis, hence there is interest from both pig health and welfare, and human health, perspectives.

In the UK, cases of *S. suis* in people are uncommon and no cases of *S. suis* in humans are mentioned in reports of animal-associated infections from 2019 to 2020 by Public Health England (PHE) in 2020. The APHA antimicrobial resistance lead reported the finding to the Veterinary Medicines Directorate (VMD).

Streptococcal disease is prominent amongst diagnoses made through the Great Britain scanning surveillance network (See table 1 and figure 8), most are due to *Streptococcus suis* with serotypes 1, 2, 7 and 14 being the main ones responsible for primary disease.

However, those and a range of other serotypes, are also found secondary to other causes of disease, in particular viral disease due to PRRSV, swine influenza virus and porcine circovirus 2.

Figure 8: seasonality of streptococcal disease diagnoses in Great Britain as a percentage of diagnosable submissions



Klebsiella pneumoniae septicaemia outbreaks in 2021

Four outbreaks of *Klebsiella pneumoniae* subsp. *pneumoniae* (Kpp) septicaemia were diagnosed during the warmer months of 2021: one in June, two in August and one in October.

There is a falling into the seasonal pattern which Kpp septicaemia outbreaks have shown since their emergence in 2011 and illustrated in figure 9 (Bidewell and others, 2018).

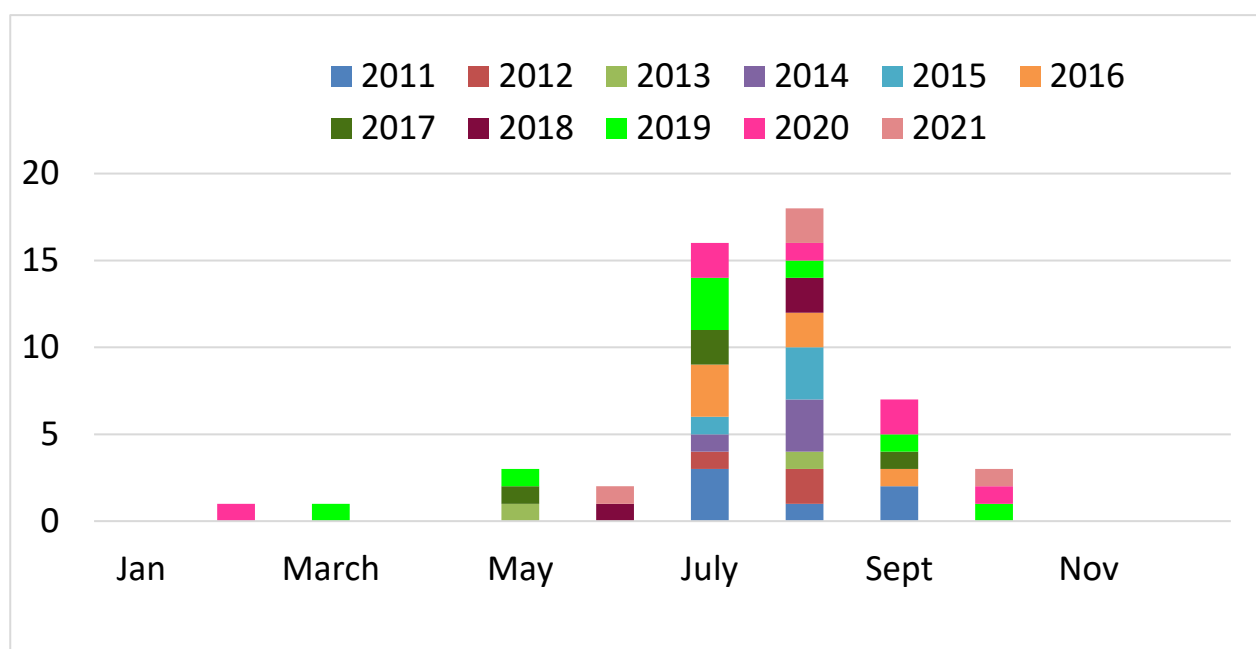
The outbreaks were all typical in presentation involving rapid deaths of well-grown pre-weaned piglets on outdoor farms and none of the Kpp isolates showed any unusual acquired antimicrobial resistance, noting that Kpp is innately resistant to penicillin's.

These outbreaks take the total so far identified to 53 outbreaks on 42 farms, 34 in East Anglia, 6 in North Yorkshire, and 1 each in Devon and Dorset. Thirty seven of the 42 farms are outdoor breeders.

Outbreaks have recurred in some herds with eight farms experiencing outbreaks in more than one year. Kpp isolates from 2021 are to be analysed but to date, all outbreaks except one have been found to be due Kpp sequence type ST25. The one exception was ST558 isolated once in 2017 on a farm which had previously had an outbreak due to ST25.

All outbreak isolates also carry a small 4kb plasmid which has, so far, been unique to ST25. An information note is available on [Klebsiella pneumoniae septicemia](#).

Figure 9: outbreaks of Kpp septicemia by month of diagnosis 2011 to 2021



Brachyspira hyodysenteriae and hampsonii surveillance findings

No GB diagnoses of swine dysentery have been recorded in VIDA from submissions in quarter 3 of 2021 at the time of writing and the annual diagnostic rate in 2021 (based on a 9 month period) is lower than in each of the years 2018 to 2020 (See figure 10), although diagnoses are being made in the current quarter (quarter 4 of 2021).

Where *B. hyodysenteriae* isolates are successfully obtained, they undergo whole genome sequencing (WGS) and antimicrobial sensitivity testing under APHA's pig disease and antimicrobial resistance surveillance projects, respectively.

Three isolates have been detected showing clinical resistance to tiamulin in 2020 and 2021, all were found to be from same farm and WGS identified them all as sequence type (ST) 251 and one of these was mentioned in the quarter 3 of 2020 report (APHA, 2020). Prior to this, the most recent tiamulin-resistant *B. hyodysenteriae* isolate was in 2016

The MIC values for the isolates from this farm were also at or above clinical breakpoint for other licensed antimicrobials tested. This is an unusual finding in recent years and severely limits treatment options, control in some previous situations where *B. hyodysenteriae* isolates have been detected has been by depopulation to prevent persistence of a resistant strain.

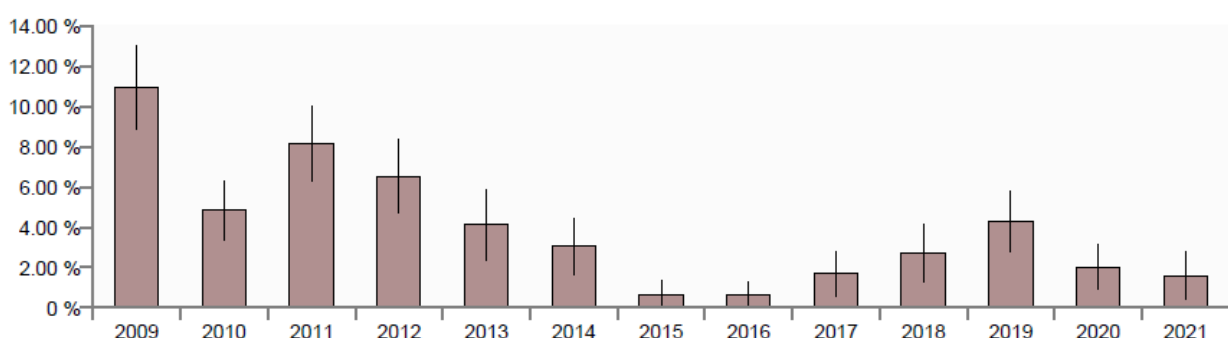
This also emphasises the importance of alternative interventions (such as, all-in and all-out management systems, cleaning and disinfection as well as partial and total depopulation leading to eradication) for control of swine dysentery to prevent the development of wider antimicrobial resistance and spread of resistant *B. hyodysenteriae*.

During the first 9 months of 2021, WGS has identified isolates of 5 different multi-locus sequence types (MLST), namely ST52, ST240, ST242, ST251 and ST266. All of these ST were identified in at least one previous year, none are new in 2021. The ST52 isolates were from smaller pig herds in which this ST is more common.

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

The [B. hyodysenteriae MLST dashboard](#) provides more information about sequence types detected over time and in different counties with the antimicrobial resistance gene profiles.

Figure 10: annual swine dysentery incidents in Great Britain as a percentage of diagnosable submissions



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](#)

Brachyspira hampsonii isolates were obtained from faecal samples from healthy pigs sampled for monitoring purposes on three linked units in England.

Sequencing shows the isolates from these differ from the *B. hampsonii* detected in finishers showing loose faeces during quarter 2 of 2019 (APHA, 2019) and from a *B. hampsonii* detected in a captive rhea in 2019.

The *B. hampsonii* isolates show susceptibility to all the antimicrobials tested by MIC testing and do not possess any genes or single nucleotide polymorphisms known to be associated with antimicrobial resistance in *Brachyspira hyodysenteriae*.

Horizon scanning

Canine parvovirus (CPV) 2 spillover to pigs in the USA

The US Swine Health Information Centre (SHIC) described an investigation that has begun into canine parvovirus 2 (CPV2) in pigs following identification of this virus by metagenomic sequencing on archived lung of a pig submitted for diagnostic investigation (SHIC, 2021).

CPV emerged as a cause of severe enteritis in dogs in the late 1970s following a spillover event from feline panleukopenia virus (FPV) from cats, demonstrating its potential for a change of host.

In the light of this precedent, detection of the virus incidentally in the one pig prompted SHIC to initiate a study into the degree of spill-over of the virus from dogs to pigs and investigate its pathogenesis in pigs through experimental infection studies and inform the need for further actions in relation to pig health.

Porcine astrovirus type 3-associated polioencephalomyelitis in swine

A publication from US authors (Ferreira and others, 2021) describes the first experimental infection of pigs with porcine astrovirus type 3 (PoAstV3) and reproduction of central nervous system (CNS) disease similar to that found in field cases of natural infection.

Several publications have identified PoAstV3, an emerging virus in the family Astroviridae, in association with polioencephalomyelitis or encephalitis (Ferreira and others, 2020). In this study pigs were infected with PoAstV3 using CNS tissue homogenate.

A proportion of the pigs developed nervous signs including ataxia, tetraparesis, and lateral recumbency. Histopathology with in situ hybridisation and virology (electron microscopy and RT-qPCR) confirmed lesions consistent with those described in field cases and association of those lesions with the presence of PoAstV3 RNA in all the pigs which were inoculated.

Neuropathological lesions included perivascular lymphoplasmacytic cuffing, multifocal areas of gliosis with neuronal necrosis and radiculoneuritis.

Guidance on sampling neurological cases has been provided to vets within APHA and its post-mortem provider partners to ensure that suitable material is available for further investigation if polioencephalomyelitis or encephalitis, which may be of viral aetiology, is detected in diagnostic submissions.

Shedding and transmission routes of porcine haemotrophic mycoplasmas

An interesting publication looking at different potential routes of transmission of porcine haemotrophic mycoplasmas concluded that blood-independent transmission routes are probably of minor relevance under field conditions (Ade and others, 2021) compared to known routes, particularly horizontal transmission of *Mycoplasma suis* through transfer of blood (for example, fights, management interventions, needle sharing and biting arthropods) as well as recognition that vertical transmission can occur.

The study involved oral inoculation of experimental pigs with *M. suis*, with none of the inoculated pigs becoming infected, as well as qPCR testing of urine, nasal, saliva and semen samples from commercial pigs.

M. suis and 'Candidatus *Mycoplasma haemosuis*' were not detected in any of these samples. Strategies to control haemotrophic mycoplasmas in pigs based on prevention of transfer of blood between pigs remain appropriate.

Atypical porcine pestivirus information

The US SHIC have published an updated factsheet on atypical porcine pestivirus (APPV, SHIC 2021b).

This is complemented by a review by Stenberg and others (2020) on current knowledge of congenital tremor (CT) type A-II in piglets for which, currently, APPV is the only virus that has been proven to be causative, although the possibility that other pathogens could be involved remains.

APPV has been found in cases of CT type A-II in submissions to APHA as reported previously (Williamson and others, 2017).

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