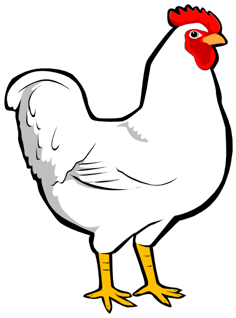
Animal & Plant Health Agency



SRUC

Great Britain avian quarterly report: disease surveillance and emerging threats

Volume 25: Quarter 3 – July to September 2021

Highlights

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- **Detection and characterisation of infectious bronchitis virus – page 12**
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Editor: David Welchman
Telephone: 02080 267640
Email: david.welchman@apha.gov.uk

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 Avian Expert Group.

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 Annex available on GOV.UK.

Issues and trends

Industry trends: chick and poult placings

Broilers

There was a 2.4% decrease in placings of broiler chicks from UK hatcheries during September 2021 compared with September 2020 (see Figure 1), at 88.5 million chicks, representing an average of 21.8 million chicks per week for the quarter.

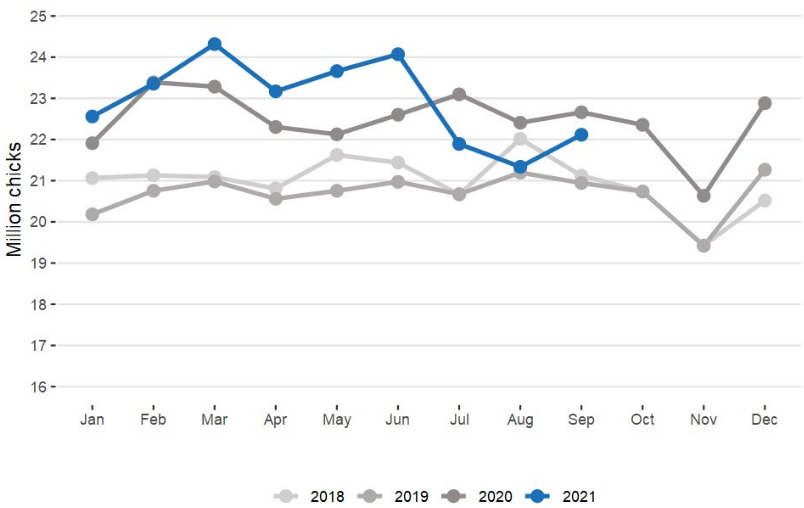


Figure 1: average number of broiler chicks placed per week in the UK by UK hatcheries

Turkeys

There was a decrease of 7.7% in the number of turkey poults placed during September 2021 compared with September 2020 (see Figure 2), at 1.6 million, representing an average of 0.39 million poults placed per week for the quarter.

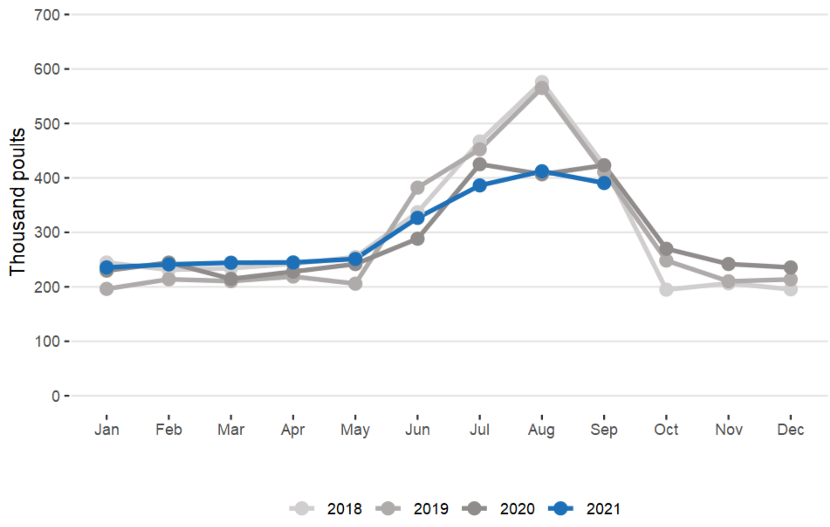


Figure 2: average number of turkey poults placed per week in the UK by UK hatcheries

Layers

The number of layer chicks placed during September 2021 was the same as for September 2020, at 2.4 million chicks (see Figure 3). UK packing station egg throughput in quarter 3 of 2021, at 7.9 million cases, was 1.7% higher than in quarter 3 of 2020 and 0.9% lower than quarter 2 of 2021. Free range eggs accounted for 62.2% of eggs packed in quarter 3 of 2021, compared with 55.4% in quarter 3 of 2020.

Free range egg output during quarter 3 of 2021 exceeded enriched colony system output by 91,0%, a greater difference compared to the previous quarter.

Barn and organic production remained at low levels. Average UK farm gate prices for eggs in quarter 3 of 2021 were 1.3% higher than the preceding quarter, and 11% higher than quarter 3 of 2020.

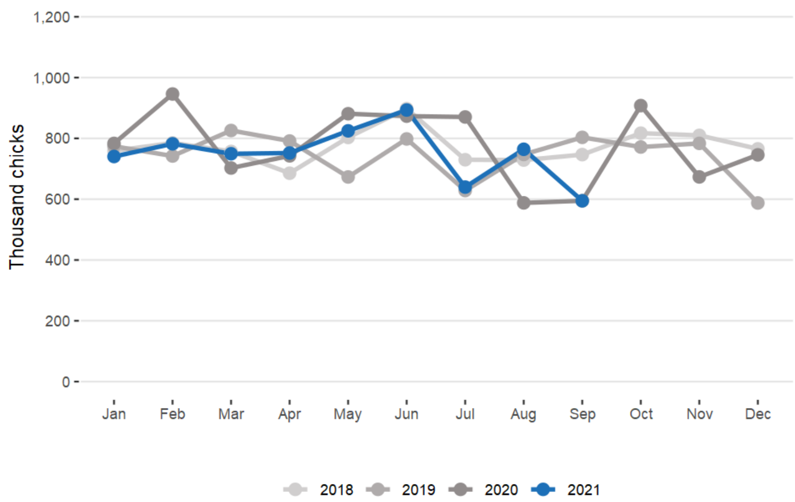


Figure 3: average number of layer chicks placed per week in the UK by UK hatcheries

Poultry industry statistics

The following poultry industry statistics are available on GOV.UK:

- Poultry and poultry meat statistics
- Egg statistics

New and re-emerging diseases and threats

Highly Pathogenic Avian influenza (HPAI) in Europe

No outbreaks of highly pathogenic avian influenza (HPAI) were confirmed in poultry or captive birds in the UK during quarter 3 of 2021 but outbreaks of HPAI H5N8 have continued in poultry elsewhere in Europe. In quarter 4, HPAI H5N1 was detected in swans and captive birds in Great Britain on 15 October, after which further detections have been confirmed in Great Britain.

UK situation update to 22 November 2021

Up to 22 November there have been 15 outbreaks of HPAI in poultry or captive birds in the UK since the start of October 2021, all of which involved H5N1.

Following five detections in captive birds and small or backyard chicken or mixed species flocks, the first case in a commercial flock (turkeys) was detected on 12 November. Further outbreaks confirmed in commercial birds have been in turkeys and free-range layer chickens.

The outbreaks are summarised in the updated outbreak assessment on GOV.UK (Published on 22 November 2021).

Up to 22 November there have also been 144 wild birds of 15 species in which HPAI has been detected, from 36 locations in 26 counties in England, Wales and Scotland**.** All of these have either been identified as HPAI H5N1 or, in five cases, the neuraminidase (N) genotype has yet to be identified (H5Nx).

The largest number of cases has been 67 in mute swans (*Cygnus olor*), followed by 13 in Whooper swans (*Cygnus cygnus*) and ten in Canada geese (*Branta canadensis*).

Five cases have been identified in different species of raptor. Only three cases have been identified in ducks, two in mallard (*Anas platyrhynchos*) and one in an unidentified duck.

The outbreaks of HPAI in poultry, captive birds and wild birds in Europe up to 22 November and the relation to wild bird migration flyways are shown in Figure 4.

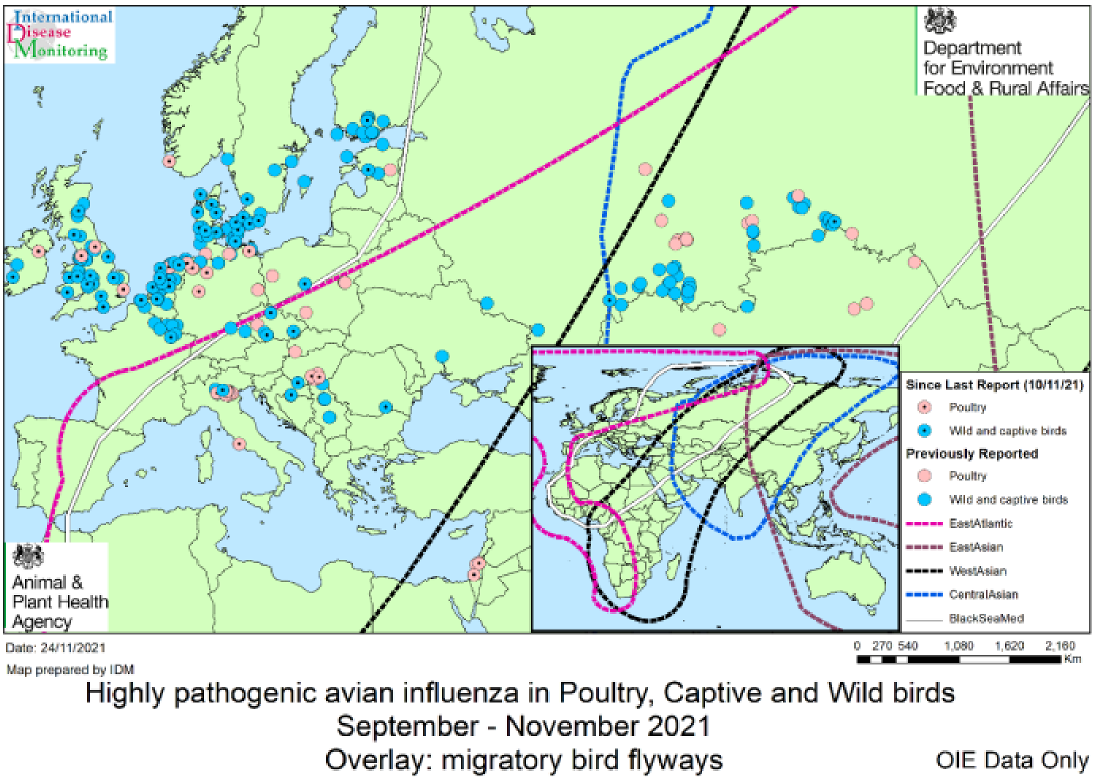


Figure 4: outbreaks of highly pathogenic avian influenza (from OIE data) in poultry, captive and wild birds across Europe, September to November 2021. Symbols with a central dot are those reported since 10 November 2021 and show the recent emergence of new outbreaks. The migration flyways are shown as dotted lines, with the UK being in the East Atlantic flyway

European poultry and wildlife update and UK wildlife update 22 November 2021

The latest updated outbreak assessment dated 22 November, referred to above, reports that 207 outbreaks of HPAI have been reported in poultry or wild birds in 17 European countries (excluding UK), according to World Organisation for Animal Health (OIE) data, although the situation is changing rapidly. The strains have been identified as H5N1 and H5N8 in poultry and wild birds and one case of H5N2 in wild birds.

The total includes 72 H5N1 outbreaks in Italy although this is a different strain from that currently affecting the UK and northern Europe and is of African origin. The number of HPAI events in Europe each week from October to 22 November is shown in Figure 5 below.

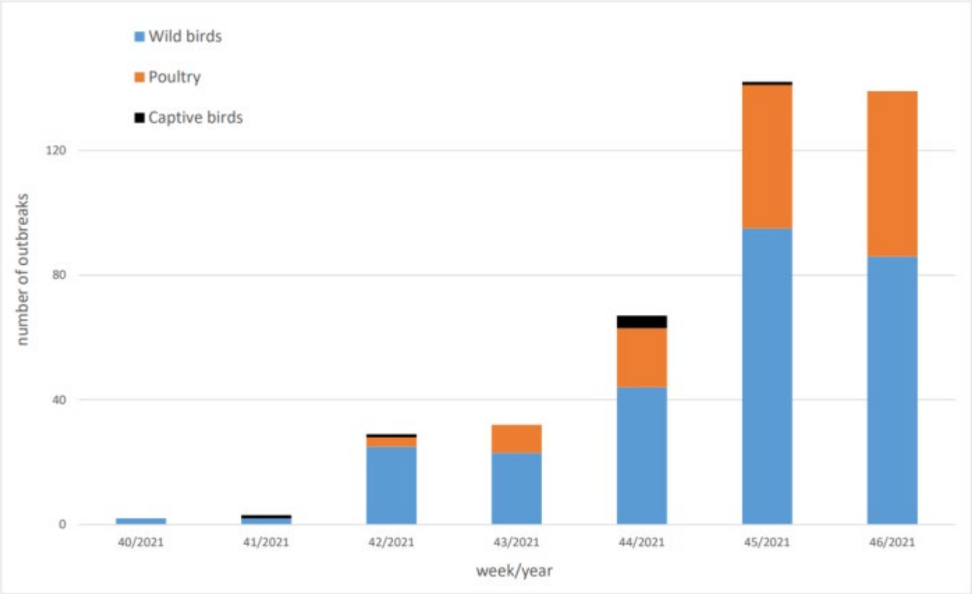


Figure 5: Number of HPAI events in Europe each week from October 2021 to 22 November 2021

EFSA report

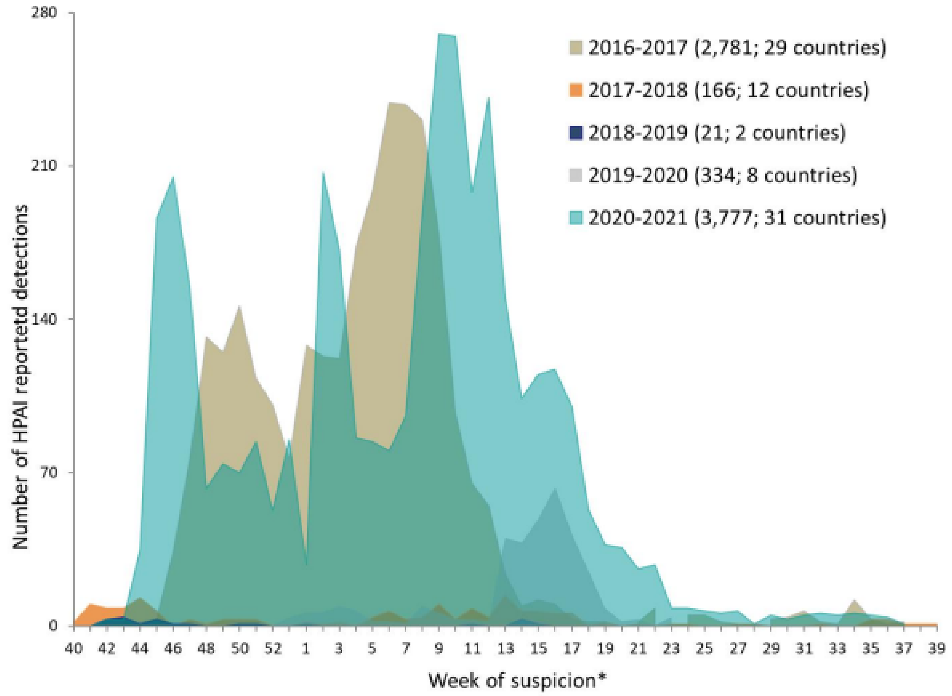
Information in the most recent European Food Safety Authority (EFSA) report dated 29 September 2021 indicates that between 15 May and 15 September in Europe (including the UK) there were 51 HPAI outbreaks in poultry (the majority being in Kosovo and Poland), 90 outbreaks in wild birds and 20 in captive birds.

Between 15 May and 14 September, the principal wild bird species in which HPAI was detected (more than five detections) were barnacle goose (*Branta leucopsis*) (12), white tailed eagle (*Haliaeetus albicilla*) (9), common eider (*Somateria mollissima*) (7), European herring gull (*Larus argentatus*) (6), mute swan (*Cygnus olor*) (6) and mallard (*Anas platyrhynchos*) (5).

There was a concentration of reported cases along the North Sea coasts of the Netherlands, Germany and Denmark, and along the coasts of the Skagerrak (Norway and Sweden) and the Baltic Sea (Sweden, Finland, Estonia and Latvia).

The outbreaks in poultry and captive birds have comprised HPAI H5N8, whereas H5N1 and H5N8 have predominated in wild birds with a single detection of H5N2. As in the previous EFSA report, these subtypes all belong to clade 2.3.4.4b and the acquisition of different neuraminidase (N) subtypes has been the result of reassortments with other avian influenza viruses from different regions.

The weekly numbers of detections of HPAI across all avian species (poultry, captive birds and wild birds) in successive years, and the number of countries affected each year, are shown in figure 6 below, taken from the EFSA report.



*When the date of suspicion is not available then the date of confirmation is used to assign the week of suspicion.
United Kingdom data are from ADNS up to 31 December 2020. From 1 January 2021 onwards, the data source was ADNS for Northern Ireland and OIE WAHIS for Great Britain.
Data source: ADIS and OIE (data extraction carried on 20 September 2021).

Figure 6: number of detections of HPAI across all avian types (poultry, captive birds and wild birds) according to week of the year and the numbers of European countries affected in successive avian influenza seasons between 2016 to 2017 and 2020 to 2021 (1 October 2020 to 20 September 2021)

The EFSA report notes that "No human infection with avian influenza viruses, as currently detected in wild birds and poultry in Europe, has been identified in the EU or EEA countries during the period covered by this report or has been previously reported".

Conclusion

The updated outbreak assessment dated 22 November, referred to above, records that the risk of HPAI H5 incursion in wild birds has been elevated to very high as a country-wide assessment and that more cases will be detected in the next three months." The report concludes that:

Given the large poultry population, the proportion of which are outdoor and, in regions close to the high aggregations of wild waterfowl, we consider the risk of exposure of poultry across the whole of Great Britain to be medium (with low uncertainty) where good biosecurity is applied, to high (with low uncertainty) where there are substantial biosecurity breaches and poor biosecurity.

This is considering that an Avian Influenza Protection Zone (AIPZ) is in place, therefore personnel should be taking additional biosecurity measures. However, if stringent biosecurity is in place the risk would be low for such premises.

It is particularly important that stringent adherence to good biosecurity practices is not only maintained but also reviewed for further improvement. Particular attention should by now have already been addressed to reviewing contingency plans, maintenance checks and repairs on roofs and fabric of buildings.

Reinforcement of good biosecure behaviours and practices should now also be instilled into personnel to prevent disease being introduced to poultry and captive birds.

Special consideration should be made when bringing in equipment and materials such as bedding and outer packages which may have become contaminated following environmental exposure.

If you keep poultry (including game birds or as pets), you should follow our biosecurity best practice advice on GOV.UK. Remain vigilant for any signs of disease in your flock and report any suspicious clinical signs of avian influenza to the Animal and Plant Health Agency.

- In England contact 03000 200 301
- In Wales, contact 0300 303 8268
- In Scotland, contact your local Field Services Office

Further information is available including updated biosecurity advice for poultry keepers for England, for Wales on the Welsh Government's website and for Scotland on the Scottish Government's website.

The whole of England was declared an Avian Influenza Prevention Zone (AIPZ) on 3 November, requiring all keepers of poultry and captive birds to comply with minimum biosecurity measures as set out in Avian Influenza Prevention Zone Declaration document on GOV.UK.

This document includes a link to an interactive map of the control zones. An AIPZ also came into force across the rest of Great Britain on 3 November 2021, and in Northern Ireland on 17 November 2021.

In addition, from 29 November 2021 housing measures are in force across the UK. These measures are in addition to the AIPZ enhanced biosecurity requirements and mean that it is a legal requirement for all bird keepers across the UK (whether they have pet birds, commercial flocks or just a few birds in a backyard flock) to keep their birds indoors and to follow strict biosecurity measures to limit the spread of and eradicate the disease".

In terms of public health risk, The UK Health Security Agency (UKHSA) has said that avian influenza is primarily a disease of birds and the risk to the general public's health is very low.

The regional UKHSA health protection teams are working closely with Defra to monitor the situation and will be providing health advice to persons at the infected premises as a precaution.

The Food Standards Agency has said that on the basis of the current scientific evidence, avian influenza poses a very low food safety risk for UK consumers. Properly cooked poultry and poultry products, including eggs, are safe to eat.

Low Pathogenicity Avian Influenza

No outbreaks of notifiable Low Pathogenicity Avian Influenza (LPAI) were identified in the UK in quarter 3 of 2021.

The EFSA report does not refer to any cases of notifiable (H5 or H7) LPAI in Europe from May to September 2021. However, it indicates that the non-notifiable subtype H9N2 is endemic in Asia, the Middle East and Africa and five human cases of H9N2 have been reported during this period in China.

Avian notifiable disease exclusion testing scheme ('Testing To Exclude', TTE, Testing For Exclusion) in Great Britain

The scheme started in May 2014 (Gibbens and others 2014) and is ongoing: testing for exclusion of notifiable avian diseases on the APHA Vet Gateway.

There were no exclusion testing investigations undertaken during Quarter 3 of 2021. The scheme is very valuable in enabling possible LPAI to be investigated in situations where it is considered to be a differential diagnosis for the clinical signs seen in birds in a flock. The scheme currently only applies to chickens and turkeys.

The first six years of the scheme were reviewed by Scott and others (2021a and b).

Differential diagnosis of negated notifiable disease report (DDNRC) cases in Great Britain

This scheme was introduced in autumn 2018 to offer differential diagnostic testing through the avian scanning surveillance project at APHA and its partners in cases where suspicion of Notifiable Avian Disease (NAD) has been reported and subsequently negated on either clinical grounds or by laboratory testing.

Testing is also available for TTE cases if NAD has been ruled out by laboratory testing. The scheme is described in more detail by Welchman and others (2019).

The scheme is important because it gives a better insight into disease outbreaks in both poultry and gamebirds which may present with clinical signs suspicious of NAD. When sudden mortality and other clinical signs of NAD affect commercial and back yard birds, there may be significant welfare implications as well as a marked economic impact, warranting further investigation.

Differential diagnostic investigations were undertaken on two cases negated during quarter 3, one in game birds and one in a broiler flock. The high mortality in the game birds was due to non-infectious causes whereas the broiler investigation is still ongoing and involves screening for potential new and emerging pathogens as part of the investigation.

This requires detailed molecular analyses and evaluation of findings in the context of the pathology observed.

Colleagues in private veterinary practice are encouraged to submit samples to this scheme.

Pigeon paramyxovirus investigations

There were seven submissions of material were tested for Pigeon Paramyxovirus-1 (pAAvV-1, formerly PPMV-1)) as report cases at APHA Weybridge during quarter 3 of 2021, from birds submitted in July (three submissions) and August (four submissions). PAAvV-1 was detected by PCR and culture from swabs and tissue samples from three cases and by PCR alone, in the brain, from a fourth case.

Unusual diagnoses

Pendulous crops in replacement layers

Seven layer replacement chickens aged nine weeks and raised in enriched cages were submitted for post-mortem examination to investigate an outbreak of pendulous crops affecting approximately 100 out 5,000 chickens over the previous 10 days. Affected birds first developed very large soft crops (Figure 7) without any associated unpleasant smell, then lost condition before some of them died.

The general feed intake of the birds was good, and they appeared otherwise clinically unremarkable though growth appeared to have become uneven. The birds had quite recently been changed to grower feed.

Figure 7: pendulous crop in a replacement layer chicken

Post-mortem examination identified that one bird that had died was emaciated, and others submitted were in fair to slightly poor body condition. Findings were consistent between birds and included markedly expanded crops filled with food (non-digested corn and mash).

There was no smell to the contents and the crop mucosa was unremarkable. The proventriculus in all birds was empty with slightly prominent glands and the gizzards contained unremarkable ingesta. There was no indication of any obstruction. There were also no obvious significant histopathological changes.

The cause of outbreaks of pendulous crops without obstructions tends to be poorly characterised. Speculations were particularly focussed on potential feed-related issues possibly influencing crop, proventriculus and gizzard development and outbreaks can occur following factors such as an interrupted feed supply.

Affected birds were culled without further investigation and the losses appeared to stop. Outbreaks of pendulous crops are very occasionally reported to APHA and tend to be frustrating to investigate as no obvious causes can be identified.

This case was described in the APHA monthly surveillance report, July 2021, in the Veterinary Record (APHA 2021a).

Coronavirus nephritis in pheasant poults

A low and lingering mortality rate was reported in seven-week-old pheasant poults that had recently been transferred to release pens. The birds were reported to have loose droppings prior to being found dead.

Post-mortem examination by the practitioner revealed urate deposits over the viscera (visceral gout) and enlarged and pale kidneys. Formalin-fixed kidney samples were submitted to the APHA Lasswade pathology laboratory to investigate a potential coronavirus nephritis.

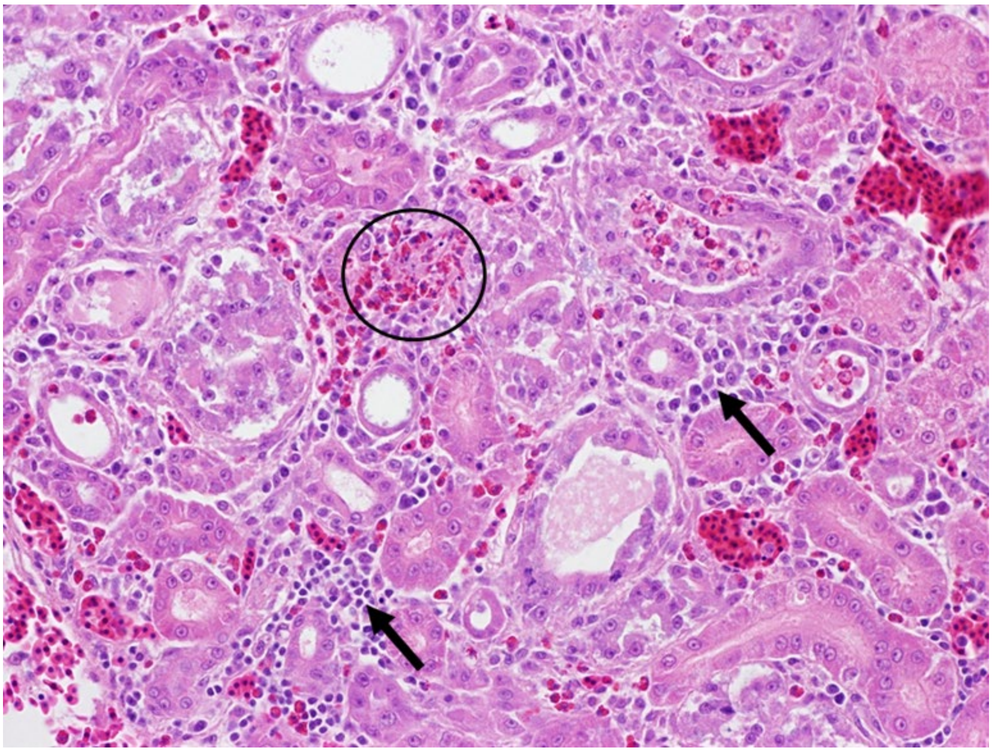


Figure 8: histological image of kidney from a coronavirus-positive pheasant showing the interstitial mononuclear infiltrate (arrows) and tubular necrosis (encircled). Haematoxylin and eosin, magnification x200

Histopathology revealed an acute to subacute tubular nephritis in all samples. This was characterised by multifocal necrosis of tubular epithelial cells in the medulla with a multifocal granulocytic infiltration in the surrounding interstitium. In some areas, there was also mononuclear infiltration of the interstitium (Figure 8) and a few urate deposits.

PCR testing for infectious bronchitis virus (IBV) on additional frozen kidney samples submitted from the birds gave a positive result, although the strain could not be identified by S1 genotype sequencing.

The positive PCR result confirmed the presence of an IBV-like coronavirus in these pheasants and the diagnosis of coronavirus nephritis. It is not unusual for coronaviruses from nephritis cases in pheasants to remain unidentified by sequencing, as pheasant-adapted strains are not yet fully characterised.

Since its first description in the 1980s (Lister and others 1985), coronavirus nephritis has mainly been recognised in breeding pheasants and less often in younger poults. The source of the virus was not established in this case, but disease may have been precipitated by moving the birds into release pens.

There was no history of respiratory disease in the birds; IBV is also associated with respiratory disease in pheasants (Cavanagh and others 2002) but it is uncertain whether the strains are the same as those causing nephritis.

This case was described in the APHA monthly surveillance report, August 2021, in the Veterinary Record (APHA 2021b).

Changes in disease patterns and risk factors

Detection and characterisation of infectious bronchitis virus

As described in the previous quarterly report (APHA 2021c), infectious bronchitis virus (IBV) is a common and important cause of disease in small and backyard chicken flocks, as well as in commercial flocks.

Strains of IBV detected by APHA in small and backyard flocks during quarter 3 of 2021 have included Arkansas-type and Italy 02-type variants of IBV. The Massachusetts and 4/91 (793/B) variants have been detected in commercial flocks. The number of different variants detected reflects the inherent variability of IBV.

Identification of the IBV variant in many laboratories is reliant on RT-PCR testing followed by sequencing of part of the S1 gene of IBV, however no standardised protocol is used by different laboratories.

A recent review (Tucciarone and others 2021) compared three different published test methodologies (assays) in detecting four commercial vaccine strains of IBV: Massachusetts, 793/B, QX and Israel variant 2, using manual and automated analyses.

The three test methodologies were consistent in their ability to detect strains of IBV, but one method failed to detect the QX variant. This may have been a result of the affinity of the primers used in this method.

However, the reliability of the three assays in detecting variants when present as co-infections varied, depending on the relative concentration of the two variants present, indicating that greater accuracy in detecting co-infections is achieved by using more than one assay type. There was very close agreement between the results of manual and automated analyses of the findings.

The authors noted that the inability to detect a sequence can have serious effects and can hamper the control of disease outbreaks. The efficacy of the different assays was determined by factors including the variability of the target region of the IBV S1 gene, primer design and the affinity of the primer for different strains, it is therefore important to keep the assay up to date to detect emergent strains.

The findings of the study confirmed the difficulty that exists in correctly identifying IBV variants especially when more than one variant is present. The APHA is currently revising its methodology to detect the full range of strains likely to be encountered in Great Britain as well as emergent strains.

Horizon scanning

Characterisation of *Escherichia coli* strains isolated from Japanese broilers

Colibacillosis is a worldwide disease in broiler chickens and has severe welfare and economic implications. The disease is caused by avian pathogenic *E. coli* (APEC).

In broilers, APEC usually causes a systemic bacterial infection which presents as fulminant or acute septicaemia or polyserositis, with pericarditis and perihepatitis being the most commonly detected lesions. APEC comprise a large number of different strains which cause disease and are different from avian faecal *E. coli* (AFEC) which are strains found in the intestine in clinically healthy chickens.

The classification of APEC strains is complicated because there is not one single characteristic which would describe all the strains and the strains are constantly evolving. APEC have been classified based on their O:H serotype, sequence type (ST) based on their molecular makeup, virulence based on the chicken embryo lethality assay and other characteristics such as antimicrobial resistance patterns.

To investigate the disease status in their country, Japanese veterinary researchers have investigated the characteristics of *E. coli* strains in broilers (Fujimoto, Inoue and others 2021). Sixty-seven strains from five farms were collected at the slaughterhouse from the livers of broilers affected with perihepatitis and pericarditis.

The serotype was determined by PCR and revealed that seven strains were O78 (10.4%) whilst the other strains could not be classified based on their O:H type. After initial isolation, the strains were characterised using multiple PCRs for eight virulence factors (*astA*, *iss*, *irp2*, *papC*, *iucD*, *tsh*, *vat* and *cvi/cva*).

Based on the combination of the virulence genes, the isolates were classified into groups A to M and used in a chicken embryo lethality assay. Of the 67 strains, two did not harbour any of the virulence genes and did not cause death of the embryos.

Similar to studies from across the world, all the other strains contained the virulence factors *iss* which is responsible for serum survival and *iucD* which is involved in iron acquisition and further supported the hypothesis that these two genes are important virulence factors of APEC in broilers.

However, 42 strains caused a mortality rate above 30% which was considered significant. Interestingly, 25 strains resulted in a mortality rate below 30% despite being isolated from cases of colibacillosis and despite possessing multiple virulence factors including *iss* and *iucD*.

Statistical analysis carried out to determine the association between the various virulence genes and lethality for chicken embryos showed that *vat*, *papC* and *irp2* were positively associated. Overall, these findings confirm again the difficulty of characterising APECs in a simplified but comprehensive manner.

Over the years, colibacillosis has been regularly diagnosed in British broilers (Table 1), most commonly under 10 days of age (Table 2). The recorded percentage of colisepticaemia diagnoses by APHA has reduced in recent years due to the policy of reducing the use of antimicrobials, particularly during the brooding period and therefore the reduced use of our laboratories.

However, discussion with private poultry practitioners indicates that colibacillosis remains a problem for the industry. Recently, APHA has increased its surveillance activity with particular reference to APEC and it is planned to report the data in due course.

Table 1: Disease due to clinical *E. coli* infections in broilers diagnosed by APHA and partners as a percentage of total diagnoses made, for the years 2016 to 2021

Diagnosis	2016	2017	2018	2019	2020	2021*	Total
Colisepticaemia	21.6%	9.9%	2.1%	1.7%	1.8%	2.1%	6.9%
Other diagnosis	78.4%	90.1%	97.9%	98.3%	98.2%	97.9%	93.1%
Total	100.0 %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* data from Quarters1, 2 and 3

Table 2: Disease due to clinical *E. coli* infection in broilers diagnosed by APHA and partners, by age category, as a percentage of total diagnoses made, for the years 2016 to 2021

Diagnosis	Less than 10 days	11 to 20 days	More than 21 days	Not recorded	Total
Colisepticaemia	39.3%	3.0%	1.4%	3.4%	6.9%
Other diagnosis	60.7%	97.0%	98.6%	96.6%	93.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Novel Astroviruses detected in Asia

Chicken astroviruses (Avastroviruses) are small, single stranded, unenveloped RNA viruses with a star-like morphology due to the arrangement of their capsid protein. These viruses can cause hepatitis and renal disease which usually presents as gout and enteric infections in a variety of avian species (Smyth 2017, Chu Daniel and others 2012 El Taweel and others 2020 and Fernández-Correa and others 2019).

In chickens, two distinct viruses are recognised: Chicken Astrovirus (CAstV) and Avian Nephritis Virus (ANV). CAstV is classified according to its capsid sero /genotype into A and B with further subdivision of each group denoted by lower case Roman numerals (i, ii, iii, iv.). CAstV can cause enteritis which has been associated with runting/stunting syndrome (RSS), gout due to renal infection and white chick disease, a disease detected in hatcheries.

All these conditions, particularly RSS, have significant welfare and economic implications. Recently, two publications from Asia report the identification of novel Avastroviruses, one from China and one from Malaysia.

The Chinese CAstV was detected in the Guangdong province (Yin and others 2021) during an investigation into growth problems and unevenness in six broiler flocks. Investigation included the screening by PCRs and RT-PCRs for viruses from homogenised intestine and kidney from one day old chicks.

This detected CAstV but avian nephritis virus, infectious bronchitis virus (IBV), fowl adenovirus Group I, Newcastle disease virus, chicken parvovirus, reovirus, and rotavirus were not detected.

Twenty of the 36 clinical samples were positive for CAstV by RT-PCR combined with sequencing and virus isolation in cell culture. One of the strains (GD202013) was further characterised and compared to 24 international reference strains available in the general database.

Whole genome sequencing showed it was most similar to a strain belonging to subgroup Bii detected in 2011 in the US, with the determinant of the sero/genotype (ORF2) being 94.8% similar.

Similar strains have since been detected in other parts of China (Xue and others 2020; Zhao and others 2020). Unfortunately, isolates previously discovered in China were not included in the molecular analysis carried out by Yin and his colleagues.

Pathogenicity studies on chicken embryos with the Guangdong isolate showed zero hatchability, embryonic growth retardation, hepatomegaly, renomegaly and dilated, gas and liquid filled intestines. Necrosis and inflammatory lesions were detected by histopathology in the liver and kidney of affected chicken embryos.

Similarly, three Malaysian CAstV were investigated using molecular techniques as well as carrying out pathogenicity and transmission studies in specific pathogen-free chicks with one of the isolates. The strains derived from homogenised intestine and kidney of broilers affected with unevenness and renal disease which tested negative for a variety of other viruses.

Genetic analysis showed that all three Malaysian CAstV were homologous, but distinct from those previously described in other parts of the world.

Based on this observation, the authors propose classifying them into a new capsid genotype Bv. The US strains used in the Chinese study as well as other Bii Chinese strains were included in the Malaysian study, but the Guangdong isolate (GD20213) was not included.

The pathogenicity studies carried out with one of the isolates resulted in growth retardation of 17.5% in infected chicks and 18.63% in sentinel chicks by 15 days post infection.

In this serial study, the main lesions were distended intestines with cystic crypts and renomegaly. Despite marked gout in birds six and nine days post-infection, no mortality was observed. Both studies confirm the presence of CAstV in Asia and demonstrate that the new strains discovered can cause disease.

It is well known that CAstVs are circulating in the United Kingdom (Todd and others 2009 and Smyth and others 2009). Unevenness, runting and stunting are common problems reported in British broilers although the aetiological agent is seldom investigated further.

Using electron microscopy, small viral particles which may be astroviruses are sometimes detected in faeces from runted broilers submitted to APHA.

However, no investigations to further characterise the virus are carried out as the numbers are small.

References

- APHA (2021a) Disease surveillance in England and Wales, July 2021. Vet Record 189, 104
- APHA (2021b) Disease surveillance in England and Wales, August 2021. Vet Record 189, 191
- APHA (2021c) Great Britain Avian quarterly report – Disease surveillance and emerging threats, vol 25, Quarter 2 (April to June 2021)
- Cavanagh, D., Mawditt, K., Welchman, D., Britton, P. and Gough, R.E. (2002) Coronaviruses from pheasants (*Phasianus colchicus*) are genetically closely related to coronaviruses of domestic fowl (infectious bronchitis virus) and turkeys. *Avian Pathology* 31, 81-93
- Chu Daniel, K W, Leung Connie, Y H, Perera Harsha, K K, Ng Erica, M, Gilbert, M, Joyner Priscilla, H, Grioni, A, Ades, G, Guan, Y, Peiris Joseph, S M and Poon Leo, L M. A Novel Group of Avian Astroviruses in Wild Aquatic Birds. *J. Virol.* 2012; 86: 13772-13778

- El Taweel, A, Kandeil, A, Barakat, A, Alfaroq Rabiee, O, Kayali, G and Ali, M A. Diversity of Astroviruses Circulating in Humans, Bats, and Wild Birds in Egypt. *Viruses* 2020; 12: 485

- Fernández-Correa, I, Truchado, D A, Gomez-Lucia, E, Doménech, A, Pérez-Tris, J, Schmidt-Chanasit, J, Cadar, D, and Benítez, L. A novel group of avian astroviruses from Neotropical passerine birds broaden the diversity and host range of Astroviridae. *Scientific reports* 2019; 9: 9513

- Fujimoto, Y. and others (2021). Virulence-Associated Gene Profiles of Escherichia Coli Isolated from Chickens with Colibacillosis in Japan and Their Correlation with Pathogenicity in Chicken Embryos. *Avian Diseases* 65(3): 401-405. https://doi.org/10.1637/0005-2086-65.3.401

- Gibbens, N., Brown, I.H. and Irvine, R.M. (2014) Testing for exclusion of notifiable avian disease. *Veterinary Record* 174, 534 to 535

- Lister, S.A., Beer, J.V., Gough, R.E., Holmes, R.G., Jones, J.M.W. and Orton, R.G (1985) Outbreaks of nephritis in pheasants (*Phasianus colchicus*) with a possible coronavirus aetiology. *Vet Record* 117, 612-613
- Scott, R., Brookes, S., Hansen, R., Welchman, D., Irvine, R. and Brown, I. (2021a) Testing for exclusion of avian notifiable disease: six-year review. *Vet Record* 189, 193-195
- Scott, M.R., Brookes, S.M., Hansen, R.D.E., Brown, I.H., Irvine, R.M. and Welchman, D. (2021b) Testing to exclude notifiable disease in birds in Great Britain. *Vet Record* 189, 207

- Smyth, V J. A Review of the Strain Diversity and Pathogenesis of Chicken Astrovirus. *Viruses* 2017; 9:

- Smyth, V J, Jewhurst, H L, Adair, B M, Todd, D. Detection of chicken astrovirus by reverse transcriptase-polymerase chain reaction. *Avian pathology : journal of the W.V.P.A* 2009; 38: 293-299

- Tucciarone, C.M., Franzo, g., Legnardi, M., Fortin, A. and four others (2021) Effect of assay choice, viral concentration and operator interpretation on infectious bronchitis virus detection and characterization. *Avian Pathology* 50, 357-365

- Welchman, D., Hansen, R. and Schock, A. (2019). Differential diagnosis of negated avian notifiable disease cases in Great Britain. *Veterinary Record* 184, 276, http://dx.doi.org/10.1136/vr.l938

- Xue, J, Han, T, Zhao, Y, Yang and H, Zhang, G. Complete genome sequence and phylogenetic analysis of novel avastroviruses circulating in China from 2016 to 2018. *Virus Res.* 2020; 278: 197858

- Yin, L, Zhou, Q, Mai, K, Huang, J, Yan, Z, Wei, X, Shen, H, Li, Q, Chen, L and Zhou, Q. Isolation and characterization of a novel chicken astrovirus in China. *Poult. Sci.* 2021; 100: 101363

- Zhao, W, Wu, Z, Yao, Y, Qin, A and Qian, K. The Isolation and Molecular Characterization of an Astrovirus From "Yellow" Chickens, China. *Frontiers in veterinary science* 2020; 7: 581862

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