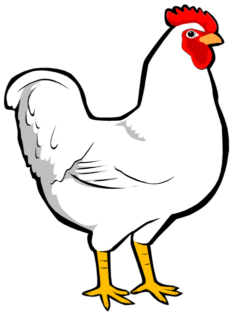
Animal & Plant Health Agency



SRUC

GB avian quarterly report

Disease surveillance and emerging threats

Volume 24: Q1 – January-March 2020

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the first quarter of 2020, January to March. 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

https://www.gov.uk/government/publications/information-on-data-analysis

Issues & Trends

Industry trends – chick and poult placings

Broilers

There was a 3.0% increase in placings of broiler chicks from UK hatcheries during March 2020 compared with March 2019 (Figure 1), at 86.4 million chicks, representing an average of 21.4 million chicks per week for the quarter. The number of placings remains at a historically high level.

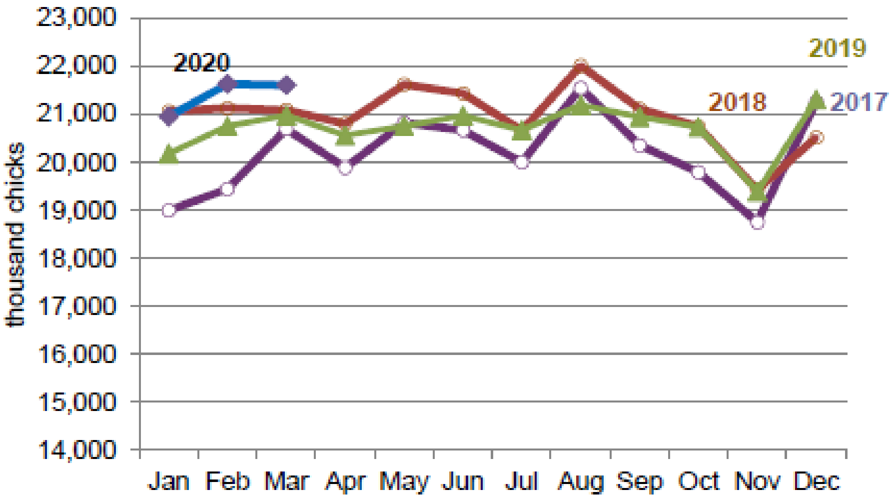

Figure 1: Average number of broiler chicks placed per week from UK hatcheries

Turkeys

There was an increase of 2.0% in the number of turkey poults placed during March 2020 compared with March 2019 (Figure 2), at 0.9 million, representing an average of 0.2 million poults placed per week for the quarter, similar to recent years.

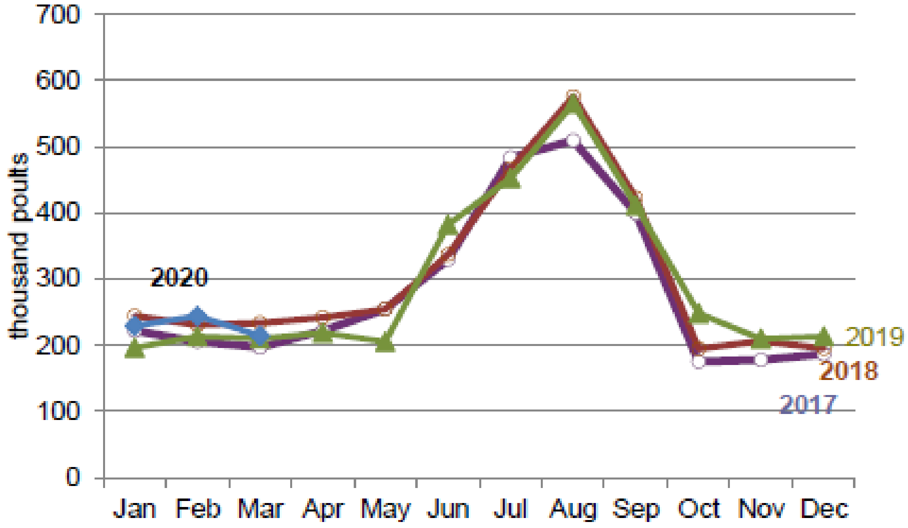

Figure 2: Average number of turkey poults placed per week in the UK by UK hatcheries

Layers

The number of layer chicks placed during March 2020 was 15% lower than the corresponding figure for March 2019, at 2.8 million chicks (Figure 3). UK packing station egg throughput in Q1-2020*, at 7.8 million cases, was 1.0% lower than in Q1-2019 and 0.2% lower than Q4-2019, reflecting a small decrease in packing station throughput although it remains close to historically high levels. Free range eggs accounted for 51.6% of eggs packed in Q1-2020, compared with 52.1% in Q1-2019. Free range egg output during Q1-2020 exceeded enriched colony system output by 21.2%. Barn and organic production remained at low levels, although there was a 25.5% increase in barn egg output compared to the previous quarter. Average UK farm gate prices for eggs in Q1-2020 were 4.0% higher than the preceding quarter, and 9.0% higher than Q1-2019.

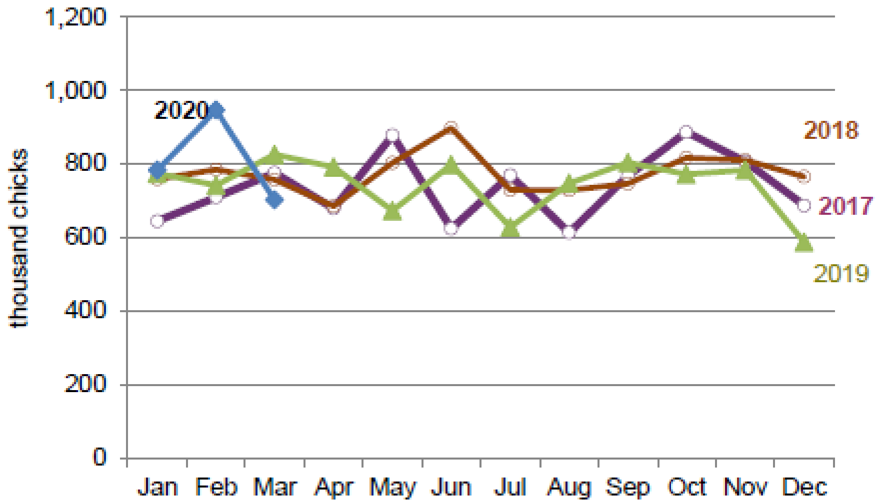

Figure 3: Average number of layer chicks placed per week in the UK by UK hatcheries

The poultry industry statistics are available online at:

Poultry and poultry meat statistics:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/879535/poultry-statsnotice-16apr20.pdf [accessed 4 May 2020]

Egg statistics:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/882166/eggs-statsnotice-30apr20.pdf [accessed 4 May 2020]

*The following note accompanies the egg statistics: "Our survey response was lower than usual at 70% for egg processors and 59% for egg packers, which may be due to the effects of Covid-19. We estimated for non-responders based on the responses received and the companies previous quarter's response. As the full effects of Covid-19 were only present at the end of the reviewed quarter, it is believed there will only be a minor effect on this reviewed period."

New and re-emerging diseases and threats

Please refer to the annex on GOV.UK for more information on the data and analysis.

Highly Pathogenic Avian influenza (HPAI) in Europe

There were no outbreaks of Highly Pathogenic Avian Influenza (HPAI) in poultry in the UK during Q1-2020 and no detections in wild birds in the UK.

Two hundred and eighteen outbreaks of **H5N8 HPAI** have been reported in EU countries from 31 December 2019 to 21 April 2020, in central and Eastern Europe, as summarised in the updated outbreak assessments dated between 7 January and 21 April 2020 at https://www.gov.uk/government/publications/avian-influenza-bird-flu-in-europe

The numbers of outbreaks by country reported in these assessments have been 163 in Hungary, 34 in Poland, seven each in Germany and Bulgaria, three in Slovakia (including one in captive birds) and two each in Romania and the Czech Republic. Outbreaks have affected turkeys, laying hens, ducks, geese and backyard and various captive birds. These figures include three confirmations in wild birds; a goshawk (*Accipiter gentilis*) in Poland, a buzzard (*Buteo buteo*) in Germany and a white-fronted goose (*Anser albifrons*) in Germany. All of these outbreaks have been reported as H5N8 HPAI except for two in Bulgaria for which preliminary sequence analysis has demonstrated H5N2 and suggests a re-assortment between H5N8 and a non-notifiable H6N2 (as indicated in the updated situation assessment dated 3 April: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878244/hpai-europe-update14-2020.pdf

The virus strain in the first 32 outbreaks (up to 13 February) was reported to differ from previous viruses that have circulated in Europe (including previous H5N8 strains) and phylogenetic analysis suggested a reassortant Low Pathogenicity Avian Influenza (LPAI) strain which may have emerged in wild birds (waders and ducks) in Russia. There is also similarity with H5N8 strains identified in Nigeria in 2019.
https://ec.europa.eu/food/sites/food/files/animals/docs/reg-com_ahw_20200213_hpai_eur.pdf

https://ec.europa.eu/food/sites/food/files/animals/docs/reg-com_ahw_20200116_hpai_eur.pdf

The origin of the outbreaks in Europe is believed to be spread from wild birds. There are no molecular markers to indicate increased human pathogenicity. Mortality has been the principal clinical sign described in turkeys and in other domestic bird species. Measures have been implemented in accordance with Council Directive 2005/94/EC, including culling of birds, and disposal of their carcasses at all affected premises. Summaries of the outbreaks in the different countries up to February are given in the regulatory committee presentations at:
https://ec.europa.eu/food/animals/health/regulatory_committee/presentations_en.

A further update on the outbreaks in Europe will be given in the next quarterly report.

The Updated Situation Assessment (#15) produced by the Defra/APHA International Disease Monitoring team, dated 21 April 2020 is available at:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/880858/hpai-europe-update15-2020.pdf and concludes that “the risk of HPAI incursion in wild birds in the UK should be decreasing and is still considered to be **LOW** (i.e. no change at present). Further, the geospatial mapping of the wild bird cases is in direct contrast to previous years where greater infection presence correlated with more poultry incursions in the Baltic/north European region. We are monitoring this very closely.” “The overall risk of infection of poultry in the UK remains low, but the risk of introduction to individual premises depends upon the level of biosecurity implemented on farm to prevent direct or indirect contact with wild birds. It should be noted that the virus could potentially survive on pasture in wild bird faeces for several weeks at ambient temperatures at this time of year, emphasising the importance of these measures. We recommend biosecurity measures should be maintained. We are keeping this under review.” “We recommend that all poultry keepers stay vigilant and make themselves aware of the latest information on www.gov.uk, particularly about recommendations for biosecurity and how to register their flocks.”

Low Pathogenicity Avian Influenza in the UK and Europe

No further outbreaks of **notifiable** Low Pathogenicity Avian Influenza (LPAI) were identified in Q1-2020 in the UK after the outbreak of H5N3 LPAI in a chicken flock in Eastern England in December 2019 as described in:
https://www.gov.uk/government/news/avian-influenza-bird-flu-identified-in-suffolk

(accessed 18 February 2020). The 1km Restricted Zone around this outbreak was lifted on 8 January 2020.

There are also unpublished reports of **non-notifiable** LPAI (not H5 or H7) cases in the UK and EU countries during Q4-2019 and Q1-2020, including two detected as “Testing To Exclude” (TTE) cases summarised in the previous quarterly report (APHA 2019a). The findings in these two cases of H6N5 LPAI were summarised in APHA (2020a); both were diagnosed in November 2019 in England, one in turkeys with a slightly increased mortality and the other on an unrelated breeding chicken unit with reduced egg production. A further TTE case is summarised in Table 1. The detection of non-notifiable LPAI subtypes does not affect the UK’s OIE country freedom for avian influenza.

LPAI in the Netherlands 2006-2016

A recent report described the analysis of data on LPAI in the Netherlands from 2006 to 2016 (Bergervoet and others 2019). There were 221 detections of LPAI virus on 152 poultry farms, 76 per cent of which were chicken farms (mostly with free range birds), 15 per cent were turkey farms and 6 per cent were duck farms. There was variation between different species in the Haemagglutinin (H) and Neuraminidase (N) subtypes detected, and the subtypes found most frequently in wild birds and poultry differed. Haemagglutinin subtypes 1-11 were detected in poultry whereas H13 and H16 were only detected in gulls. Neuraminidase subtypes N1 to N5 and N7 to N9 were detected in poultry. The seasonal detection of LPAI viruses through the year varied with the type of bird, for example most detections in mallard (*Anas platyrhynchos*) and other wild ducks were between August and December, whereas LPAI was detected in chickens and turkeys throughout the year but with an increased incidence in chickens in March. Most poultry viruses were genetically related to locally circulating wild bird viruses, particularly those detected in mallards, but it was not established whether the subtypes were transmitted to poultry directly from mallards or via another, unidentified intermediate host.

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

The scheme started in May 2014 (Gibbens and others 2014) and is ongoing (http://apha.defra.gov.uk/vet-gateway/tte/nad.htm; accessed 13 May 2020). There was one exclusion testing investigation during Q1-2020 (Table 1). The scheme is very valuable in enabling possible LPAI to be investigated where it is considered to be a differential diagnosis for the clinical signs seen in birds on a site. The scheme currently only applies to chickens and turkeys.

Species and purpose (where information available)	Clinical details	Cloacal and oropharyngeal swabs taken	Results	Outcome
Chickens – broiler breeders	Reduced egg production, pale eggs, reduced feed intake.	Yes	Positive M-gene (AI virus) PCR results	Escalated to avian notifiable disease investigation (**non-notifiable** H10N4 LPAI)

Table 1: Summary of findings from the Notifiable Avian Disease Exclusion Testing Scheme during Q1-2020

Differential diagnosis of negated notifiable disease report cases in GB

This scheme was introduced in autumn 2018 to offer differential diagnostic testing through APHA and its partners in cases where suspicion of Notifiable Avian Disease (NAD) has been reported and are subsequently negated on either clinical grounds or by laboratory testing. The scheme is also available for TTE cases referred to above where NAD has been ruled out by laboratory testing. The scheme is described in more detail by Welchman and others (2019).

A differential diagnostic investigation was undertaken on three negated notifiable disease report cases in Q1-2020; one relating to chickens in which non-notifiable H6N1 LPAI was detected, one relating to increased mortality in broilers where colisepticaemia was implicated, and one relating to reduced egg production, cracked eggs and ataxia in breeding gamebirds where a nutritional deficiency was implicated.

Pigeon paramyxovirus investigations

There were eight submissions of material tested for Pigeon Paramyxovirus-1 (pAAvV-1, formerly PPMV-1)) at APHA Weybridge during Q1-2020, including four from wild doves or pigeons found dead. The latter were in January (two submissions) and March (two submissions) and virus isolation was positive in one of the submissions from January. PAAvV-1 was not detected in samples from any domestic or captive pigeons or doves during the quarter.

Other diseases

Adenoviral ventriculitis (gizzard erosion) in broilers

Gizzard erosions are recognised as common problem in the broiler sector. Usually, the more superficial lesions are caused by trauma to the superficial koilin layer in the gizzard as is commonly observed in broilers which are eating litter. However, nutritional issues, mycotoxins and, most importantly, adenoviral infections are also causes of gizzard erosions and ulcerations. Adenoviral infections of the gizzard are considered an opportunistic infection and usually only detected at post-mortem examination. However, they are often observed in birds which are below target weight suggesting that they can interfere with the optimum digestion and feed assimilation in affected birds resulting in a reduced growth rate. In addition, a small number of adenoviral gizzard infections result in secondary bacterial infections because the gizzard lining, normally an effective barrier to bacterial infections, is completely destroyed.

In the first quarter of 2020, an adenoviral challenge in the gizzard was detected by histopathology in 8.9 per cent of all submissions in which a diagnosis was reached (Table 2). This is the highest percentage since Q4 in 2017. There is no evidence that the pattern of submissions changed following the lockdown due to the COVID-19 pandemic and poultry veterinarians continued to regularly investigate problems as and when they arose; the reason for the increase in diagnoses is not known.

Year	Q1	Q2	Q3	Q4
2015	2.6%	3.0%	2.3%	5.5%
2016	5.9%	0.9%	4.3%	2.2%
2017	5.0%	1.3%	5.4%	11.6%
2018	3.1%	5.6%	5.7%	3.2%
2019	4.3%	1.8%	6.5%	3.9%
2020	8.9%			

Table 2: VIDA diagnoses of adenoviral ventriculitis (gizzard lesions) in broilers in Q1 to Q4, 2015-2020, as a percentage of all diagnoses reached in broilers in the quarter.

In Q1 2020, affected birds were between 12 and 29 days of age indicating that this infection is a particular problem during the growing phase of broilers. These diagnoses were based on histopathology as this allows a fast and reliable method for diagnosis (see Figure 4). In many cases only the gizzard was submitted and therefore there is no information on co-morbidity available.

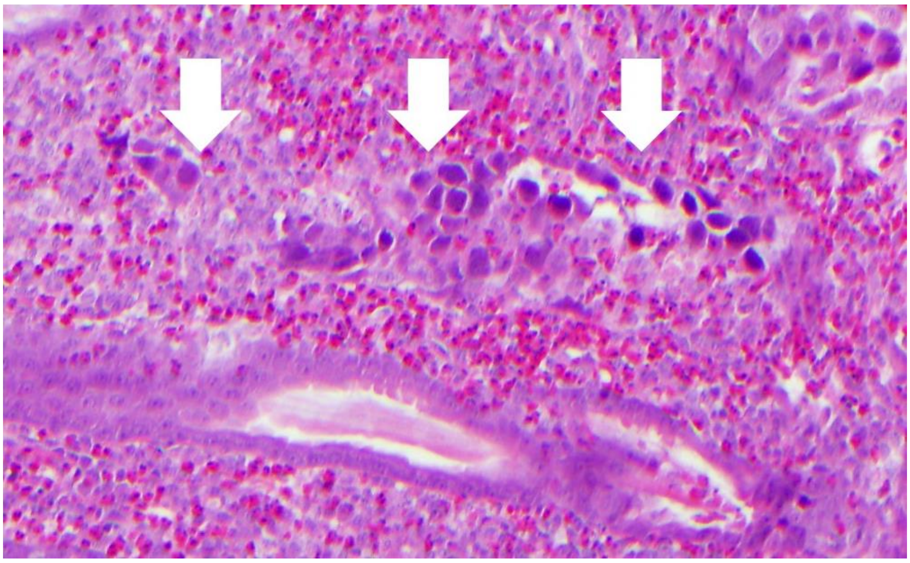

Figure 4: Histological image of adenoviral gizzard erosion in a 19-day-old broiler chicken. Note the large basophilic inclusion bodies in an affected gland (arrows) compared to an unaffected gland at the bottom of the photo (H&E, original magnification x200)

Gizzard erosions in broilers are generally thought to be caused by Fowl Adenovirus-1 (FAdV-1). A recent survey in slaughtered broilers in Iran confirmed this observation (Mirzazadeh and others 2019), though FAdV-8a and FadV-11 were also detected. There are no recent data on the cause of adenoviral ventriculitis in British broilers. An investigation into this condition in layer chickens showed that FadV-1 is the causative agent of this condition in the British layer sector (Grafl and others 2018) suggesting that this virus is the predominant virus circulating in Great Britain. However, detailed molecular analysis would be necessary to confirm which adenoviruses are present in British broilers. Whilst the recent spike in diagnoses of adenoviral ventriculitis is noticeable, and there has also been an increase in non-specific ventriculitis (Figure 5), it does not warrant further investigation at this stage. APHA continues to monitor the situation and further investigation will be undertaken if the increasing diagnostic trend continues.

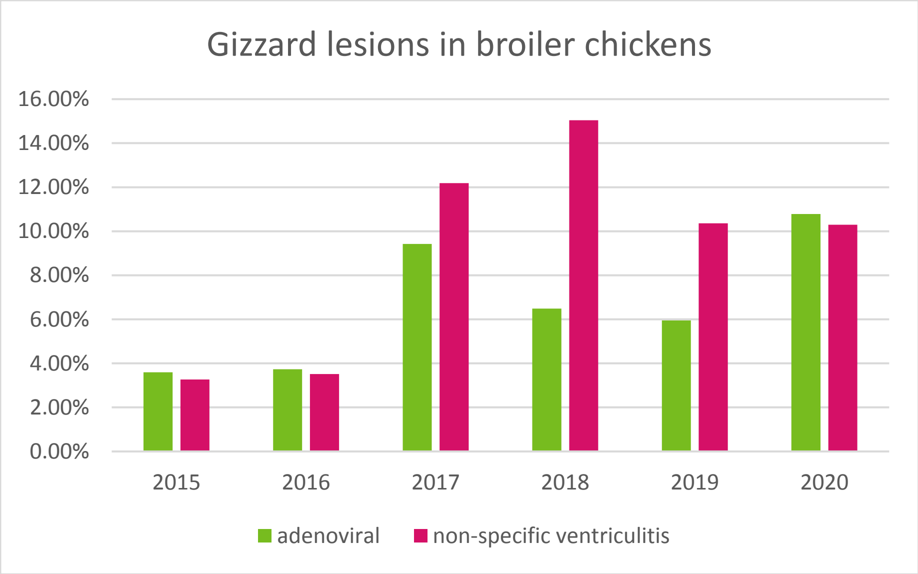

Figure 5: VIDA diagnoses of ventriculitis (gizzard lesions, both adenoviral and non-specific) as percentage of diagnoses reached per year (data for 2020 only include Q1).

Unusual diagnoses

Corneal oedema in newly hatched turkey poults

Cloudy eyes and mild exophthalmos was reported in newly hatched turkey poults. No hatchability or fertility issues were reported and the history of the parent flock was unknown. At post-mortem examination by the private practitioner, no other significant lesions were found. Three formalin-fixed heads were submitted to APHA to investigate the appearance of the eyes. In all samples received, the cornea of both eyes appeared opaque (Figure 6). Histopathology revealed a diffuse corneal oedema resulting in thickening of the cornea in association with a mild conjunctivitis characterised by a subtle and mild granulocytic epithelial transmigration. The latter was considered secondary to the swelling and thickening of the cornea, which very likely caused conjunctival trauma.

Congenital corneal oedema in poultry (turkeys and chickens) is seldom investigated and reports are based on anecdotal or casual observations rather than scientific investigations. Based on first principles, this condition is considered a developmental or hereditary pathology. Possible factors which may contribute to corneal oedema are genetics or problems in the breeder flock, particularly nutritional factors, and suboptimal incubation conditions. The latter include incorrect incubator temperature or humidity, and failure of the incubator turning mechanisms. In this case, no specific cause was identified. The problem only occurred in one batch of poults and did not recur in subsequent batches. Gross examination should be followed up by histopathology, with a thorough investigation of the hatchery conditions and the parent flock history to attempt identification of the possible cause and predisposing factors, and prevent recurrence.

This case was described in the APHA monthly surveillance report in the Veterinary Record (APHA 2020b).

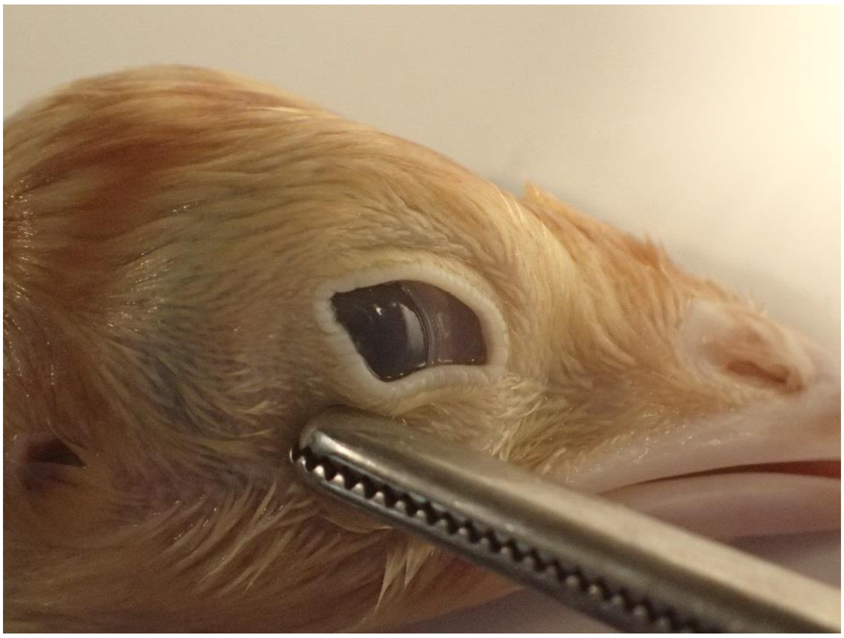

Figure 6: Corneal oedema in a newly hatched turkey poult. Slight opacity of the cornea can be seen in the image.

Spirochaetal typhlitis in a young rhea

Three of a group of four rheas (*Rhea* species), placed at two months of age, died over an 18-week period. Two died in the first two weeks after arrival and no investigation was undertaken. The third bird died at about six months of age, after presenting with anorexia, malaise and two days of diarrhoea. The bird had initially recovered following treatment with benzimidazole and metronidazole. Post-mortem examination revealed severe caecal pathology (Figure 7) which was confirmed histologically as a severe fibrinonecrotising typhlitis and spirochaetes were observed. Following selective culture and sequencing, *Brachyspira alvinipulli* was identified in the caecum.

Severe intestinal spirochaetosis due to *B. hyodysenteriae* is a recognised cause of death in juvenile rheas (Hampson 2013) and two cases were described in the APHA surveillance report in May 2019 (APHA 2019b) and in the Q2-2019 quarterly report (APHA 2019c). However severe spirochaetal typhlitis associated with *B. alvinipulli* is not well documented in rheas, although *B. alvinipulli* is recognised as an uncommon pathogen of poultry and has been associated with severe typhlocolitis in laying geese (Nemes and others 2006). Wild ducks, other wild birds and rodents are known to be potential carriers of *Brachyspira* organisms, and it may be significant in this case that the rheas were sharing pasture with ducks. Investigations into spirochaetosis in rheas are ongoing to compile a case series and further diagnostic submissions are encouraged to investigate the disease in more detail.

Figure 7: Opened caecum of a young rhea showing severe changes due to typhlitis

Changes in disease patterns and risk factors

Investigation of pheasant coronavirus in China

Pheasant coronavirus (PhCoV) is an avian-specific gamma coronavirus related to infectious bronchitis virus of chickens (IBV) and can cause significant disease outbreaks in rearing and breeding pheasants (*Phasianus colchicus*). A recently published investigation (Han and others 2020) describes the *in vitro* and *in vivo* characteristics of PhCoVs isolated in China in 2016 and 2017, where this virus had not previously been recorded. The disease was characterised by respiratory signs, tracheitis and nephritis in commercial pheasants between the ages of 17 and 55 days. Mortality rates up to 50 per cent were reported, but were generally around 30 per cent. Phylogenetic analysis of PhCoV strains from two farms showed that the genome organisation was typical of avian gamma coronaviruses. The two Chinese PhCoV were closely related antigenically, but showed differences when compared with strains of IBV in chickens. Whilst experimental infection of chickens with the Chinese PhCoV did not result in any disease, the virus was pathogenic in experimentally infected pheasants where it induced upper respiratory disease and lesions in the kidneys. This difference in pathogenicity between chickens and pheasants was one of a number of criteria differentiating PhCoV and IBV strains. It is also noteworthy that the sequences of the newly described Chinese PhCoV were different from the British PhCoV sequences which were available for comparative analysis to the authors. However, the British PhCoV strains they used in the analysis all originated from outbreaks prior to 2000.

In Great Britain, a review of the VIDA data collected since 2011 shows that nephritis associated with PhCoV has been sporadically reported in rearing and breeding pheasants. However there is a need for more up-to-date data on British isolates. In addition, APHA was recently involved in an active surveillance project on respiratory disease in game birds as part of a British Veterinary Poultry Association (BVPA) survey. Initial analysis of the data collected in the survey revealed that 18 per cent of the pheasant submissions tested RT-PCR-positive for avian gamma coronavirus in oropharyngeal swabs (unpublished data). The full analysis of these data still has to be completed and results will be published in due course. Taking both the VIDA and the BVPA data together, it is evident that British pheasants can be infected with avian coronaviruses which can be associated both with nephritis and respiratory disease. It is currently uncertain whether the detection of gamma coronavirus in the respiratory tract of British pheasants can be followed later by the development of nephritis or whether different strains of virus are involved in the two disease presentations.

Currently, there is no evidence that British PhCoVs are infecting other avian species. In particular, PhCoVs have not been detected in British poultry through APHA’s passive surveillance, which includes examination of field samples from chickens for IBV by RT-PCR testing and S1 genotyping (APHA 2019a). In addition, no evidence was found of coronavirus infections in British partridges (*Alectoris rufa*) in the BVPA survey although they are frequently raised on the same premises as pheasants and therefore likely to be exposed to PhCoV.

The recent publication on the characterisation of Chinese PhCoV illustrates the importance of maintaining surveillance capability in the UK to detect potentially emerging new strains of avian coronavirus in both poultry and gamebirds.

Routes of transmission of *Mycoplasma synoviae* in chickens

Mycoplasma synoviae is recognised as contributing to several disease issues in poultry including infectious synovitis, airsacculitis and respiratory disease, and eggshell apex abnormality. The contribution and importance of both horizontal and vertical transmission of infection is well established. An example of disease associated with *M. synoviae* during Q1-2020 was its detection by DGGE and PCR in four- to five-week-old broiler chickens with severe airsacculitis and sinusitis in a small flock.

A recent paper (ter Veen and others 2020) has examined the relative contribution of vertical, within-farm and between-farm transmission of *M. synoviae* in layer pullet flocks in the Netherlands. The analysis was based on testing bloods collected from 311 pullet flocks at 15 to 17 weeks of age and from the corresponding parent flocks, using samples collected for the compulsory Dutch *M. gallisepticum* monitoring programme. Serological testing for *M. synoviae* was undertaken using the rapid plate agglutination test which showed that 55 per cent of the layer pullet flocks were seropositive. Analysis of the data showed that the most important route of transmission for *M. synoviae* was vertical from the parent flock, followed by within-farm transmission. No increased risk of horizontal between-farm transmission was demonstrated in relation to the density of poultry flocks. This is the first time that the relative importance of vertical and horizontal transmission of *M. synoviae* has been quantified; the results confirm the importance of controlling *M. synoviae* within parent flocks and are applicable to the transmission and control of *M. gallisepticum*.

Horizon scanning

COVID-19 and commercial poultry

The newly emerged pathogen SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus-2) is a beta coronavirus which can cause severe disease in people and has resulted in the COVID-19 pandemic. The virus is thought to have originated from animals and current evidence indicates it is not associated with poultry or poultry products. Nevertheless it is important to determine if commercial poultry are susceptible to infection.

Whilst this pathogen has only been recognised since the end of 2019, experimental infections have already been carried out in several animal species. The first published data came from China and described the experimental infection of chickens and ducks with the Chinese strain of SARS-CoV-2 by the intranasal route (Shi and others 2020). No virus was detected in either chickens or ducks by RT-PCR or virus isolation within the first 14 days post-infection in oropharyngeal or cloacal swabs, although infection was reproduced in ferrets using a similar protocol. In addition, there was no evidence of a serological response in either the chickens or the ducks. The authors therefore concluded that neither chickens nor ducks were susceptible to infection with SARS-CoV-2. Similar experimental infections of various animal species were carried out at the Friedrich-Loeffler-Institute in Germany. An initial press release states that chickens were not susceptible to SARS-CoV-2 infections under experimental conditions.

There are many other coronaviruses affecting people and animals, including coronaviruses of birds. To clarify the situation and avoid any misconception, the American Association of Avian Pathologists (AAAP) has published a position paper on its website (Jackwood 2020). It is important to note that the infectious bronchitis virus of chickens which has been circulating in poultry for many years is a gamma coronavirus and does not pose a threat to people. In addition, detailed analysis of the diagnostic test used to detect infectious bronchitis virus and associated coronaviruses used by APHA (data not shown) confirmed that the RT-PCR is specific for avian coronaviruses and would not detect SARS-CoV-2.

APHA has continued its endemic and new and emerging disease surveillance throughout the pandemic and is actively supporting poultry veterinarians in their work during these difficult times.

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