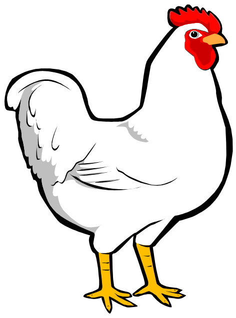
Animal & Plant Health Agency



SRUC

GB avian quarterly report

Disease surveillance and emerging threats

Volume 25: Q1 – January to March 2021

Highlights

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the first quarter of 2021, 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 4.1% increase in placings of broiler chicks from UK hatcheries during March 2021 compared with March 2020 (Figure 1), at 97.0 million chicks, representing an average of 23.4 million chicks per week for the quarter.

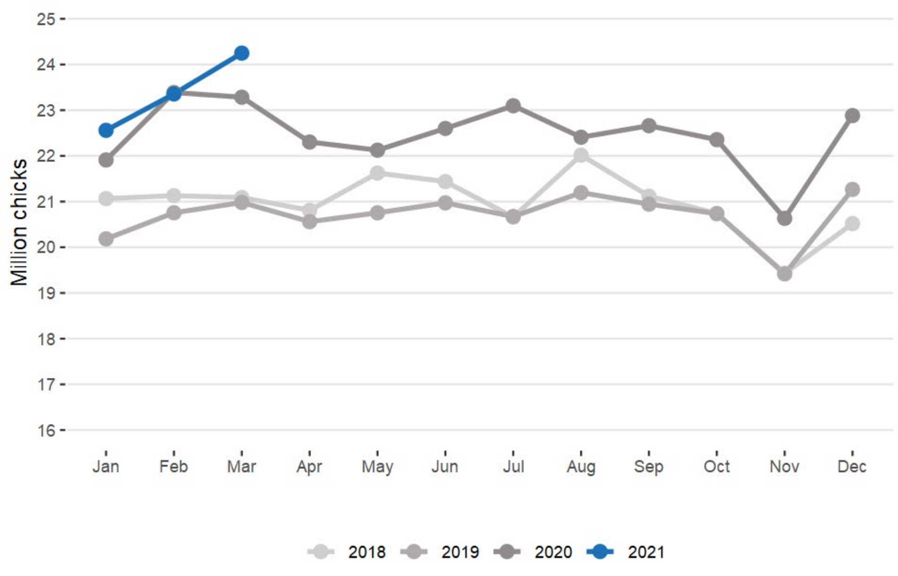

Figure 1 Average number of broiler chicks placed per week in the UK from UK hatcheries

Turkeys

There was an increase of 14% in the number of turkey poults placed during March 2021 compared with March 2020 (Figure 2), at 1.0 million, representing an average of 0.2 million poults placed per week for the quarter.

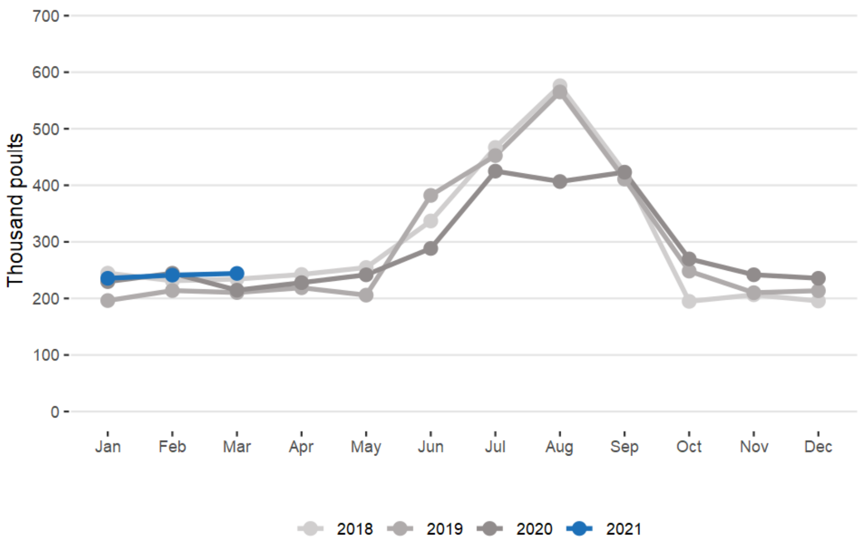

Figure 2 Average number of turkey poults placed per week in the UK by UK hatcheries

Layers

The number of layer chicks placed during March 2021 was 10.0% higher than for March 2020, at 3.1 million chicks (Figure 3). UK packing station egg throughput in Q1-2021, at 7.9 million cases, was 1.1% higher than in Q1-2020 and 1.4% lower than Q4-2020. Free range eggs accounted for 57.0% of eggs packed in Q1-2021, compared with 51.6% in Q1-2020. Free range egg output during Q1-2021 exceeded enriched colony system output by 50.8%, a greater difference compared to the previous quarter. Barn and organic production remained at low levels although organic production has increased slightly. Average UK farm gate prices for eggs in Q1-2021 were 0.8% higher than the preceding quarter, and 15.4% higher than Q1-2020.

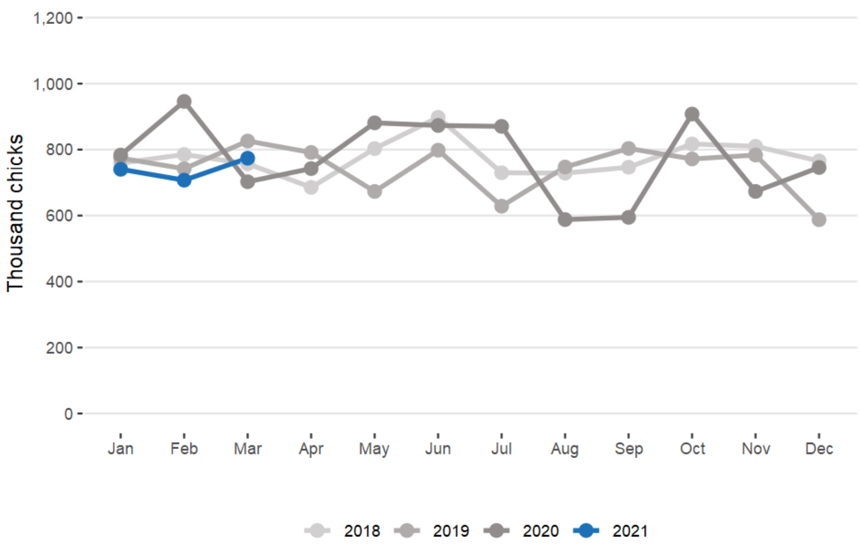

Figure 3 Average number of layer chicks placed per week in the UK by UK hatcheries

The poultry industry statistics are available online at:

Poultry and poultry meat statistics:

Monthly statistics on the activity of UK hatcheries and UK poultry slaughterhouses (data for March 2021) - GOV.UK (www.gov.uk) [accessed 11 May 2021]

Egg statistics:

Defra Egg Statistical Notice (publishing.service.gov.uk) [accessed 11 May 2021]

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

Several outbreaks of Highly Pathogenic Avian Influenza (HPAI) were confirmed in the UK during Q1-2021; there were five outbreaks of HPAI H5N8 in poultry, one outbreak in captive birds (other than poultry) and one case of HPAI H5N1 in poultry (gamebirds).

Situation update to 17 May 2021

At the time of writing there have been 24 outbreaks of HPAI in poultry and/or captive birds in the UK since November 2020, of which 22 have been H5N8 and two have been H5N1. The first case in the UK was confirmed on 3 November in broiler breeder chickens, and other cases have been confirmed in commercial layer and broiler chickens, rearing turkeys, ducks, gamebirds, backyard poultry and captive birds other than poultry (three cases). All outbreaks have been reported to the OIE and where disease was confirmed, measures were put in place in accordance with Council Directive 2005/94/EC.

The outbreaks are summarised in the International Disease Monitoring (IDM) Updated Outbreak Assessment dated 17 May 2021:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/987350/Updated_Outbreak_Assessment_23_HPAI_in_UK_and_Europe.pdf

There have also been 320 cases of HPAI in wild birds in the UK, comprising 292 cases of HPAI H5N8, 15 of HPAI H5N1, six of HPAI H5N5, one of H5N3 and six awaiting full typing (H5Nx) The largest number of cases (177) have been in mute swans (*Cygnus olor*), followed by other swan species and geese. Eleven cases have been identified in raptors. Only two cases have been identified in ducks, one each in a common shelduck (*Tadorna tadorna*) and a Eurasian wigeon (*Mareca penelope*). In contrast, in mainland Europe there have been larger numbers of confirmed cases in barnacle geese (*Branta leucopsis*) and greylag geese (*Anser anser*), particularly early in the course of the outbreaks.

The most recent updated outbreak assessment, referred to above, reports that between 29 April and 17 May there were 148 outbreaks of HPAI in poultry in seven countries and 147 outbreaks in wild birds in 10 countries, predominantly in north-western Europe. The number of cases in wild birds has declined rapidly since the peak in early March. This is associated with the eastward migration of waterfowl, but some local spread in sedentary species (such as mute swans) has also occurred. The outbreaks of HPAI in poultry, captive birds and wild birds in Europe up to 17 May and the relation to wild bird migration flyways are shown in Figure 4.

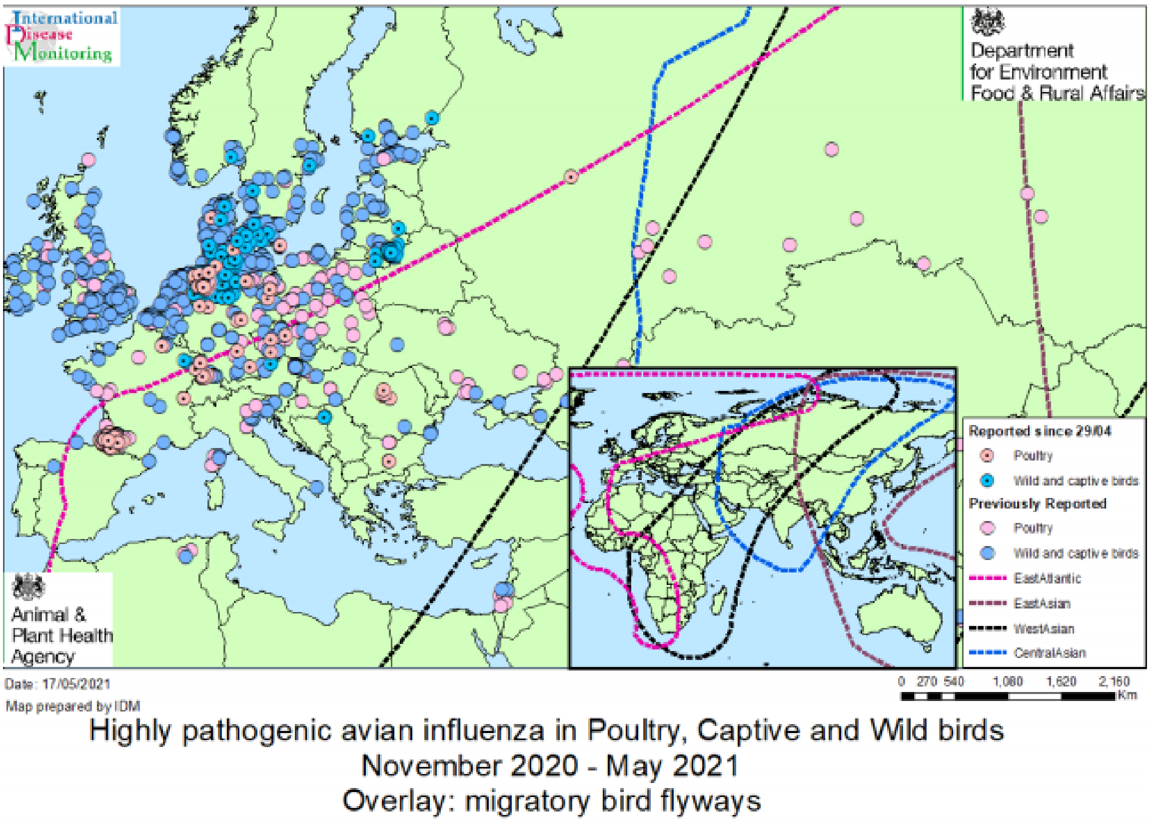

Figure 4 Outbreaks of highly avian pathogenic influenza (from OIE data) in poultry, captive and wild birds in Europe and western Asia between November 2020 and up to 17 May 2021. The migration flyways are shown as dotted lines, with the UK being in the East Atlantic flyway

Information in the EFSA report dated 25 February indicates that between 26 November and 23 February there were 566 HPAI outbreaks in poultry in 18 countries in Europe (including the UK), of which 439 outbreaks were in France, the majority associated with foie gras production in ducks and geese. Between 8 December and 23 February there were 421 detections of HPAI in wild birds, most commonly swans, barnacle and greylag geese and also red knot (*Calidris canutus*). These outbreaks and detections have predominantly comprised HPAI H5N8, with much smaller numbers of H5N1, H5N5, H5N3, H5Nx and three cases of H5N4, the latter detected in Germany and Sweden. 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.

https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2021.6497

In February seven occupationally exposed workers at a poultry farm in Russia were found to be infected with H5N8 following an outbreak on the farm. They were reported as asymptomatic or with mild symptoms and no human-to-human transmission occurred. Public Health England has subsequently confirmed that the risk to public health is very low (H5N5, H5N1) to low (H5N8) for the three HPAI strains detected and characterised to date in GB, and the Food Standards Agency has stated that avian influenza does not pose a food safety risk for UK consumers.

https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2021.6497

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/987350/Updated_Outbreak_Assessment_23_HPAI_in_UK_and_Europe.pdf

The IDM Updated Outbreak Assessment dated 17 May, referred to above, notes that “The wild bird infection pressure is rapidly decreasing in the UK. The migratory wild waterfowl population is significantly reduced compared to the winter peaks, with the majority of migratory water bird species having now departed the UK; and the frequency of wild bird HPAI cases is now greatly reduced in the UK, compared to the autumn. Bridging species (sedentary birds) may still play a role in fomite spread, but this is also decreasing as environmental contamination decreases. Therefore, the risk of HPAI H5 incursion in wild birds remains at LOW. Although two sites with HPAI H5 positive wild birds were reported in April, compared to just one in March, the continued sporadic cases of HPAIV H5 in wild birds in March and April is consistent with a low risk of infection in wild birds in the UK. Given the continuing decrease in wild bird infection pressure, and the likely decreasing levels of environmental contamination, the risk of HPAI H5 exposure to poultry and captive birds across the whole GB is now reduced from medium to LOW (with HIGH uncertainty) where biosecurity is sub-optimal, and maintained at LOW (but now with MEDIUM uncertainty) where stringent biosecurity measures are applied”.

“If you keep poultry (including game birds or as pets), you should follow our biosecurity best practice advice, which can be found here: https://www.gov.uk/guidance/avian-influenza-bird-flu. Remain vigilant for any signs of disease in your flock and report any signs of avian influenza to Defra Rural Services Helpline on 03000 200 301. Further information is available here: https://www.gov.uk/guidance/avian-influenza-bird-flu including updated biosecurity advice for poultry keepers for England; https://gov.wales/avian-influenza for Wales and; http://gov.scot/avianinfluenza for Scotland”.

The Avian Influenza Protection Zone (AIPZ) introduced on 11 November 2020 was revoked on 15 May 2021 and the housing order was lifted on 31 March.

Low Pathogenicity Avian Influenza

One outbreak of **notifiable** Low Pathogenicity Avian Influenza (LPAI) H5N3 was identified in in the UK in March 2021 as summarised in Table 1 below.

EFSA reports that between 8 December and 23 February, outbreaks of notifiable LPAI H5 were reported in France (five outbreaks of H5N3 or H5Nx in mule ducks) and Belgium (H5Nx in chickens) and LPAI H7N7 was reported in geese in Italy.

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 25 May 2021). There was one exclusion testing investigation during Q1-2021 (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	Clinical details	Cloacal and oropharyngeal swabs taken	Result	Outcome
Turkeys	Electrical problem (power cut) followed by a slight drop in egg production. No significant mortality observed and no clinical suspicion of NAD reported by private veterinary surgeon	Yes	Positive m-gene (AI virus) PCR result	Notifiable avian disease (NAD) confirmed; LPAI H5N3 detected

Table 1: Summary of findings from the Notifiable Avian Disease Exclusion Testing Scheme during Q1-2021

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

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.

Since the start of the avian influenza 2020/21 outbreaks, APHA has carried out 11 DDNRC investigations (Table 2). Case material was received from all poultry and game bird sectors. So far, infectious and non-infectious causes have been identified as causes of disease issues which triggered the notifiable disease investigations (Table 3). To maintain confidentiality, further details have not been provided at this stage. Many of the investigations are still ongoing and involve 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 the field and private sector are encouraged to submit samples to this scheme.

	Negated on clinical grounds	Negated after lab investigation	Total
Broiler sector	1	2	3
Layer sector		3	3
Other poultry		1	1
Small flocks and backyard chickens	2		2
Game birds	2		2
Total	**5**	**6**	**11**

Table 2 Number of investigations of negated report cases by sector carried out by APHA during the avian influenza outbreaks 2020/21

	Infectious cause	Non - infectious cause	In progress	Total
Broiler sector	2		1	3
Layer sector	1	1	1	3
Other poultry			1	1
Small flocks and backyard chickens	1		1	2
Game birds		2		2
Total	**4**	**3**	**4**	**11**

Table 3 Results of the investigations of negated report cases during the avian influenza outbreaks 2020/21

Pigeon paramyxovirus investigations

Three submissions of material were tested for Pigeon Paramyxovirus-1 (pAAvV-1, formerly PPMV-1)) at APHA Weybridge during Q1-2021, two of which were from birds submitted as report cases in January and February and one was from a feral pigeon in February. PAAvV-1 was detected by PCR in swabs and/or tissue samples in all three submissions and virus was also isolated from all three.

Unusual diagnoses

Respiratory cryptosporidiosis

A fancy breed immature cockerel was submitted for post-mortem examination to investigate a grumbling problem of respiratory disease in a flock of 60 fancy breed chickens. The cockerel had been hatched on farm and was being reared with 10 other birds in a netted run. Clinical signs reported in affected birds included ocular discharge, sneezing/snicking, head shaking, gasping for breath and loss of weight. A total of four birds had been affected and one other had died after showing similar signs. Both young chicks and adult birds were affected. The problem appeared to start after the introduction of some purchased chicks in March 2020. Antibiotic treatment with tylosin had been effective in some birds. The flock was last wormed in August 2020. There had been no issues with egg shell quality or the viability of hatching eggs.

The bird was in thin condition with accumulation of mucoid material in the nasal cavity. Small discrete caseous nodules were scattered throughout the airsacs and over the peritoneum. Large plaques of yellow fibrin were present over the lungs accompanied by areas of irregular dark red congestion and consolidation throughout the lung parenchyma. Little feed content was present in the gastrointestinal tract and much of the small intestinal lumen was filled with bundles of ascarid worms.

A worm egg count on the caecal contents revealed 5,000 *Ascaridia* species, 2,700 *Heterakis* sp. and 1300 *Capillaria* sp. eggs per gram and also 605,000 coccidial oocysts per gram. Bacterial culture on the lungs and airsacs yielded growths of *Avibacterium gallinarum*, a likely opportunist pathogen. *Mycoplasma synoviae*, *iners*, *gallinarum* and *gallinaceum* were detected by denaturing gel gradient electrophoresis (DGGE) and PCR testing and the QX strain of infectious bronchitis virus was detected by PCR testing. Histopathological examination showed numerous cryptosporidium-like bodies lining the epithelial surfaces in the nasal chambers, trachea (Figure 5) and lungs, indicating severe respiratory cryptosporidiosis and fungal hyphae were also demonstrated within granulomas in the air sacs. *Cryptosporidium baileyi* is a recognised pathogen of the respiratory tract in chickens (MacDougald 2020) although not commonly identified. The severity of respiratory disease associated with *C. baileyi* would have been compounded by the bacterial, viral and fungal challenges detected, and the heavy worm burden was also likely to have increased the susceptibility to respiratory disease.

A review of worm control and treatment of the remaining birds in this group was recommended together with a re-assessment of the housing, and rotation of the outside run areas to help reduce the environmental contamination by parasites, including *Cryptosporidium* sp. Unlike *C. parvum*, *C. baileyi* is not considered zoonotic (MacDougald 2020).

This case was described in the APHA monthly disease surveillance report for March 2021 (APHA 2021).

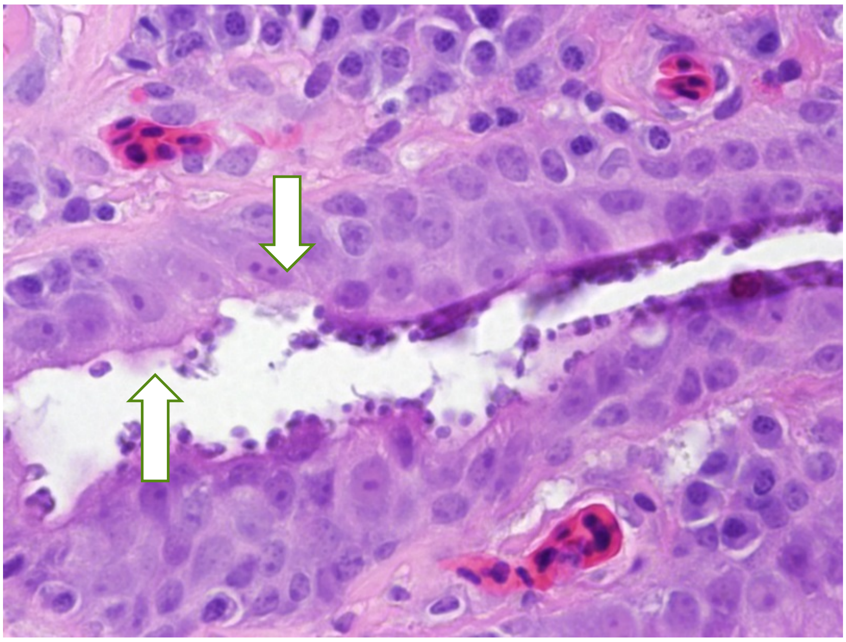

Figure 5 Histological image of the tracheal epithelium of a chicken showing cryptosporidium-like bodies (arrows) lining the mucosal surface

Changes in disease patterns and risk factors

Health conditions of backyard poultry seen by UK small animal practices

Backyard poultry consultations by small animal veterinary practices in the UK were analysed over a five-year period from April 2014 to 2019 (Singleton and others 2021). The majority (84.5 per cent) of electronic health records (EHRs) from the consultations involved chickens. The commonest clinical sign reported was wasting (reported in 16.6% of EHRs) followed by respiratory signs (13.6% of EHRs). Respiratory signs were significantly associated with antimicrobial prescription ($P<0.001$). Identifying the cause of the respiratory signs was not addressed in the paper.

The importance of respiratory signs was consistent with the findings of the GB avian disease surveillance dashboard of small chicken flocks, based on VIDA diagnoses from 2007 onwards:
https://public.tableau.com/profile/siu.apha#!/vizhome/AvianDashboard/Overview.

Respiratory disease is the third most common primary clinical sign recorded in the dashboard (after found dead and wasting). The most frequently identified causes of the respiratory signs are infectious laryngotracheitis (ILT), infectious bronchitis (IB) and *Mycoplasma gallisepticum* (Mg). Published surveys elsewhere have also shown the importance of respiratory disease in small poultry flocks, such as in Ontario, Canada where mixed respiratory infection was the commonest infectious cause of clinical signs or death, often involving Mg. (Brochu and others 2019).

Mycoplasma gallisepticum

An example of respiratory disease due to Mg was an outbreak investigated by APHA in a small backyard flock of 30 hens. Birds had been purchased from four different sources two months previously. After the birds were mixed a number developed nasal or eye discharges, head shaking, rattles and coughing. External examination of an affected bird showed swelling below the right eye due to sinus enlargement and post-mortem examination demonstrated a large inspissated plug of caseous material in the sinus, together with a smaller amount in the left sinus. The findings were typical of Mg infection, which was confirmed by DGGE-PCR testing. The organism was likely to have been introduced to the flock with the purchased birds.

This case was reported in the APHA monthly disease surveillance report for March 2021 in the Vet Record (APHA 2021).

A recently published survey of Mg in commercial poultry in the Netherlands has shown a declining prevalence from 2001 to 2018, as a result of control measures including culling of positive breeder flocks, compulsory monitoring of all commercial chicken and turkey flocks except broilers and vaccination of layer pullets entering infected multi-age layer flocks (ter Veen and others 2021). No Mg was detected in breeding flocks in 2018 suggesting eradication from breeding poultry, thus minimising vertical transmission of Mg, and horizontal transmission was therefore considered the principal route of entry of Mg into commercial flocks. Thirty-one isolates of Mg from various types of poultry including backyard underwent multilocus sequence typing (MLST) which revealed 21 sequence types (STs) in six clonal complexes (CCs). Similar STs were found in commercial flocks and backyard birds, suggesting the latter may have been a reservoir of infection for commercial and breeding poultry, and illustrated the importance of isolation of commercial from backyard birds. MLST investigations have not yet been undertaken in relation to UK poultry and it is not known whether the STs in commercial and backyard poultry are related, but it is likely that similar principles will apply as in the Netherlands. As indicated above, Mg remains relatively common in backyard poultry in the UK.

A further recent publication reported Minimal Inhibitory Concentrations (MICs) of seven antimicrobials to Mg and *M. synoviae* across Europe, including GB in 2014-2016 (de Jong and others 2021). Although relatively high MIC values were demonstrated, no epidemiological cut-off values or clinical breakpoints were established that confirmed the presence of antimicrobial resistance. Relatively high MIC values were demonstrated for enrofloxacin and it is of concern that rapid development of enrofloxacin resistance has previously been demonstrated for Mg, and that fluoroquinolones, critically important antimicrobials, were commonly used for treatment of backyard chickens in the study by Singleton and others (2021) described above.

Defra, Welsh and Scottish Governments have announced new disease reporting requirements to Government that were introduced to comply with the EU's Animal Health Regulation. A requirement to report avian mycoplasmosis (defined as *Mycoplasma gallisepticum* and *M. meleagridis* in domestic fowl and turkeys) following analysis of a sample from a bird or bird carcase has come into force in England from 21 April 2021, under The Specified Diseases (Notification and Control) (Amendment, etc.) (England) Order 2021 (Defra, 2021). Similar legislation has been introduced in Scotland and Wales.

Horizon scanning

Chicken Anaemia Virus

Chicken Anaemia is a disease of chickens which occurs worldwide. It is caused by the Chicken Anaemia Virus (CAV), sometimes also referred to as Chicken Infectious Anaemia Virus (CIAV) and belongs to the genus Gyrovirus. The virus has circular, single-stranded DNA which encodes for three viral proteins (VP). The virus infects cells of the haemopoietic and immune systems. In younger birds, this can result in severe clinical disease with anaemia, widespread haemorrhages and thymic atrophy. Older birds are usually more resistant to infection although the immunosuppressive effect can result in increased numbers of secondary infections. The virus can spread vertically and horizontally and result in significant economic losses. In commercial poultry, vaccines are widely used in breeder flocks.

Historically, it has been shown that strains from all over the world have the same serotype. However, genetic differences have been detected and, with the help of monoclonal antibodies, some differences in antigenicity are suspected. Full genetic sequence analysis of 121 CAV strains (Li and others 2017) identified six groups of viruses and highlighted the potential for recombination. To further investigate this topic, Italian researchers investigated the genetic make-up of CAV detected in broiler breeders, broilers and backyard chickens from Italy (Quaglia and others 2021). Samples included environmental samples and feathers from farms without overt disease and, in one instance, from the spleen of diseased birds with gangrenous cellulitis. Only the broiler breeder farms were vaccinated. Overall, 25 strains from five Italian regions were detected and 11 of those strains were fully sequenced. Based on the sequence analysis of the capsid protein VP1 and comparing those sequences with the reference sequences available, the Italian strains fell into genotype II (10 strains), IIIa (11 strains) and IIIb (4 strains). The sample from the diseased birds clustered with other IIIa strains. Only one of the backyard chicken holdings was positive and it clustered with genotype II.

The four IIIb strains clustered most closely with published live attenuated vaccine strains. One of those strains was detected from a broiler breeder farm and the other three strains were derived from environmental samples from broiler farms. Some amino acid variability was observed which suggested variable virulence, but this was not further investigated. Whole genome sequencing showed that VP2 and VP3 were highly conserved. Analysis showed no evidence that recombination was occurring. Overall, there was some heterogeneity in Italian CAV strains and there was some suggestion that vaccine-derived virus is circulating.

Similar work was carried out by researchers in China (Li and others 2021). In contrast to the Italian group, they concentrated on the characterisation of CAV strains from the livers of clinically affected commercial chickens. They sequenced VP1 and carried out pathogenicity studies on two isolates. Thirty-five out of 65 samples from suspect cases of chicken anaemia were PCR-positive and *in vitro* virus isolation was successful in 30 of those samples. VP1 analysis showed no deletion or additions as well as a high degree of nucleotide similarity between them and 55 already published strains. Similar to other studies, some variation in the predicted amino acid sequence was detected. Two of the newly characterised Chinese strains from two different subgroups with very different amino acid sequences were used to compare their pathogenicity with a well characterised reference strain. The experimental infections resulted in thymic atrophy and bone marrow lesions in all infected chickens. In contrast to the reference strain and the phosphate-buffered saline injected chickens which all survived the 28 day experiment, the two Chinese field strains resulted in 30% and 20% mortality. In addition, thymic atrophy, bone marrow hypoplasia and reduction in haematocrit were more severe and took longer to resolve in chickens infected with the field strains. These data showed that the field strains were more virulent than the reference strain, but there was not enough evidence to determine if the differences in VP1 amino acid sequence accounted for the increased pathogenicity.

In the UK, commercial breeding chickens are usually vaccinated against CAV and APHA is very seldom asked to investigate clinical cases of chicken anaemia and the diagnosis is not often confirmed. The last case of thymic atrophy typical of CAV was recorded in 2018.

Reoviruses and Neoreoviruses detected in pheasants

There are numerous avian reoviruses (ARVs; genus *Orthoreovirus*), some of which result in severe disease whereas others are thought to be harmless. In gallinaceous birds, these viruses are known to cause tenosynovitis, myocarditis and have been associated with enteric conditions. Most of our knowledge is based on research in chickens and turkeys. There is little known about reoviruses in game birds.

During their research into diseases in reared pheasants, a group of Hungarian veterinary scientists isolated a strain of reovirus Reo/HUN/Pheasant/216/2015 from the pooled faeces of seven-week-old pheasants with enteric disease (Farkas and others 2021). A Group A Rotavirus was also detected in these pheasants. A second reovirus isolate D1996/2/1 derived from a breeding farm with increased mortality in birds less than 28 days of age presenting with gizzard erosions and internal bleeding. No other pathogens were detected in those birds, in particular no adenoviruses which are a potential cause of gizzard erosion. ARVs have 10 segments of double-stranded RNA and their genetic arrangement is complex. Sequence analysis of all these segments of strain Reo/HUN/Pheasant/216/2015 showed nine segments to cluster together with ARVs from published chicken and turkey strains and the only other known pheasant strain. However, one of the segments (μB) was quite different from that detected in other gallinaceous birds. In contrast, strain D1996/2/1 showed low similarity with other ARVs and was most similar to the previously unclassified group of reoviruses which contains viruses derived from a variety of wild animals. Phylogenetic analysis showed this Hungarian strain to be only distantly related to other avian ARVs. Based on these observations, strain D1996/2/1 was classified as a *Neoreovirus*. This newly created group contains viruses from a bulbul (a songbird), Steller's sea lion and a psittacine. Overall, the two newly described Hungarian strains and the only other published pheasant strain from the USA were all from different genotypes indicating a high diversity of reoviruses which are able to infect pheasants. Based on the data available, it was not possible to determine if the viruses caused the disease problems observed.

A reovirus was isolated from joint tissues in a case of tenosynovitis in lame pheasants and staphylococci were isolated from affected birds from the same flock (Curtis and others 1992). The APHA has investigated 21 cases with a clinical history of lameness or musculoskeletal signs in game birds in the last 10 years, including eight cases of tenosynovitis/septic arthritis, but there were no records of reoviral tenosynovitis in this time. Most commonly, the lameness in the submitted pheasants is due to systemic conditions; most of the eight cases of tenosynovitis/septic arthritis were attributed to staphylococcal infections (Curtis and others 1992). In other species, reoviral infections have been associated with runting and stunting as well as enteric conditions (reviewed in the previous quarterly report, APHA 2020). A survey of British game birds in the 1980s detected reovirus in only one intestinal sample during a period of three years but its clinical significance was uncertain (Gough and others 1990). At APHA, abnormal faeces and enteric conditions are frequently investigated in game birds with rotavirus, spironucleosis, coccidiosis and salmonellosis being the most common diagnoses. In cases in which no pathogen is detected, changes in management or sudden weather changes are often implicated. Based on previous knowledge and our current surveillance activity, there is no suggestion that reoviruses and neoreoviruses are currently a common problem in British gamebirds.

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