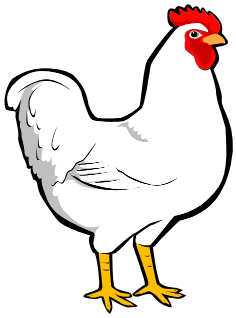
Animal & Plant Health Agency



SRUC

Great Britain avian quarterly report: disease surveillance and emerging threats

Volume 28: Quarter 3 – July to September 2022

Highlights

- **Update on HPAI in the UK and Europe – page 3**
- **Streptococcus gallolyticus septicaemia in goslings – page 10**
- **Turkey hepatitis caused by reovirus reported in the USA – page 14**

Contents

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the third quarter of 2022, July to September. It contains analyses carried out on disease data gathered from the Animal and Plant Health Agency (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

The UK broiler chick placements were 4% higher, at 94.5 million chicks, in September 2022 than September 2021. On average, 22.9 million chicks were placed each week in the quarter (Figure 1).

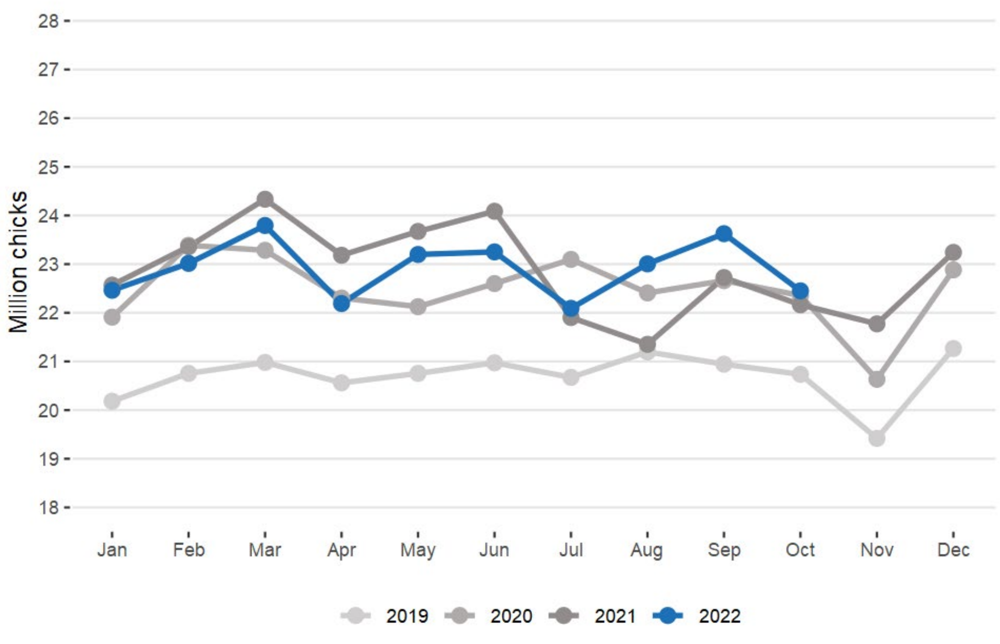

Figure 1: average number of broiler chicks placed in the UK per week by UK hatcheries

Turkeys

There was a decrease of 6.3% in turkey chick placements in September 2022 from September 2021, with 1.5 million poults placed in September 2022. On average, 0.4 million poults were placed each week in the quarter (Figure 2).

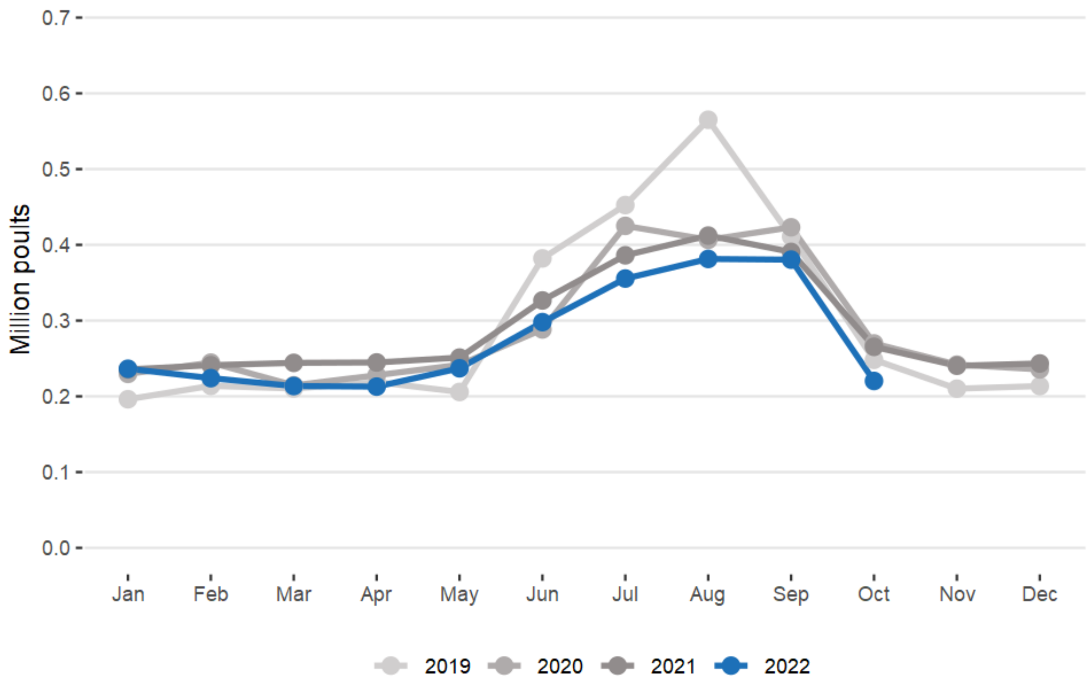

Figure 2: average number of turkey poults placed in the UK per week by UK hatcheries

Layers

Commercial layer chick placements were 3.75% lower in September 2022 compared to September 2021. On average, 0.6 million chicks were placed each week in the quarter (Figure 3).

During this quarter 213 million dozens were packed in UK egg packing stations. This was 9.6% lower than Quarter 3 of 2021, and 4.1% lower than the previous quarter. This quarter 62% of eggs were free range, 30% were from hens in enriched colony systems, and 4% were barn eggs. The number of barn eggs this quarter was approximately double the number in same quarter in 2021. This is likely due to the avian influenza outbreak, although the housing order was lifted on 31 March and eggs no longer had to be relabeled as barn eggs from 2 May.

The average UK farm-gate egg price this quarter was 95.6 pence per dozen. This is 7.7% higher than Quarter 3 of 2021 and 0.9% higher than the previous quarter.

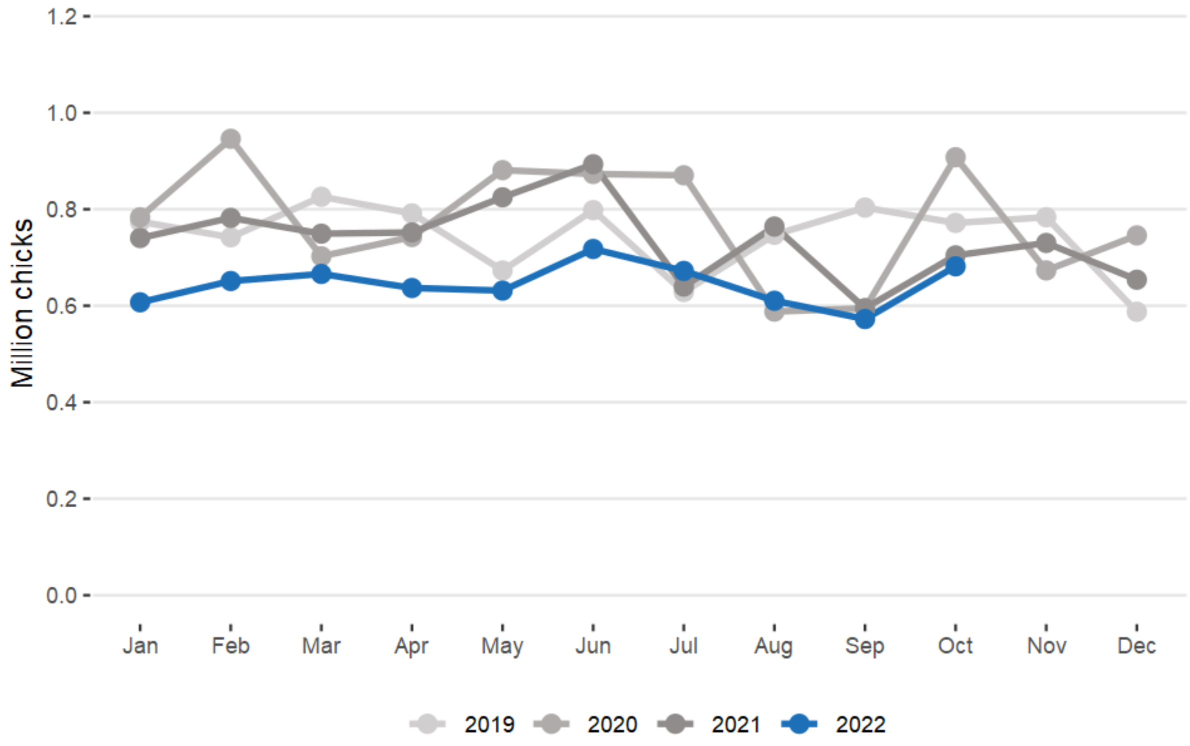

Figure 3: average number of layer chicks placed in the UK per week by UK hatcheries

Poultry industry statistics

The poultry industry statistics and the egg statistics are available on GOV.UK.

New and re-emerging diseases and threats

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

Highly Pathogenic Avian influenza (HPAI) in the UK and Europe

Outbreaks of highly pathogenic avian influenza (HPAI) were confirmed in poultry, captive birds and wild birds in the UK and elsewhere in Europe during Quarter 3 of 2022.

UK situation update

HPAI H5N1 continued in bird populations in GB over this quarter. For administrative purposes the 2021/2022 HPAI season ended on 30 September.

Since the first detection of HPAI H5N1 on 15 October 2021 there have been 152 infected premises across GB in the 2021-2022 HPAI season. Of these, 134 have occurred in England, 11 in Scotland and 7 in Wales (Figure 4). Additionally, there have been six outbreaks in Northern Ireland. The outbreaks in poultry have included commercial laying hens, turkeys and ducks, breeder flocks, smallholder poultry and gamebirds.

The outbreaks are summarised in the updated outbreak assessment dated 14 October 2022.

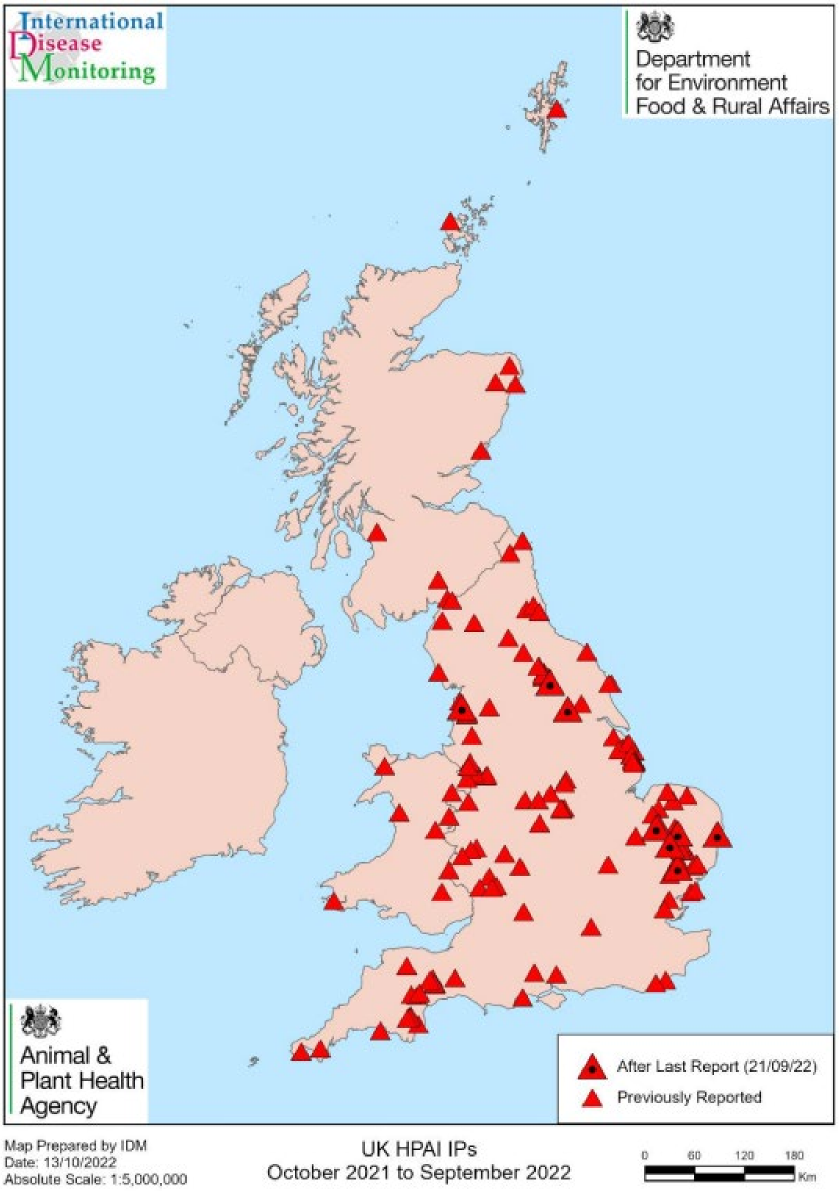

Figure 4: HPAI H5 outbreaks in domestic poultry and captive birds across Great Britain, October 2021 to 20 September 2022

Over the 2021 to 2022 HPAI season there have been 1727 positive wild bird findings. These were in 410 locations in GB and the Scottish Isles, across 83 counties, involving 59 different wild bird species. Most of the detections were in England.

HPAI H5N1 was maintained in breeding seabirds over the summer months in GB and north-west Europe. HPAI is not usually detected in wild birds in the summer months, and, also unlike previous years, cases of HPAI started to occur in domestic poultry and wild birds earlier in 2022. The earlier infection of domestic poultry may be due to spill-over of infection from breeding seabirds to resident wild water birds at inland sites, on to the domestic birds. Generally, the arrival of migratory waterfowl and increased wild bird population numbers are considered to further increase environmental infection pressure and infection spread.

European poultry and wildlife update

As in GB, wild bird detections continued across Europe over the summer months (Figure 5). The latest updated outbreak assessment dated 14 October, referred to above, details how most of the recent wild bird cases in Europe are in north-western Europe, along the English Channel through the northern coast of France and Belgium into the Netherlands, northern Germany and as far east as Germany. The presence of HPAI in wild birds in northern Europe is of concern as a potential source of infection for birds migrating west to GB.

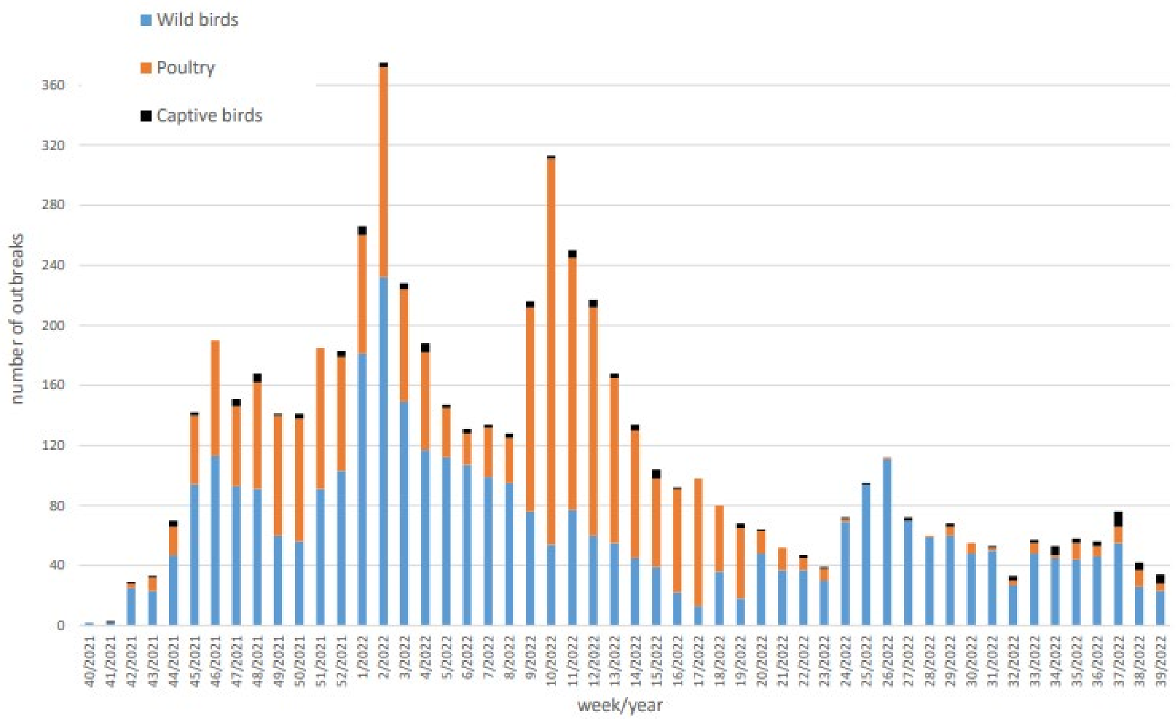

Figure 5: Number of HPAI positive events reported in poultry, captive and wild birds each week in Europe from October 2021 to 30 September 2022 (Istituto Zooprofilattico Sperimentale delie Venezie (IZSVe) 2022)

European Food Safety Authority (EFSA) report

Information in the most recent European Food Safety Authority (EFSA) report dated 28 September 2022 (EFSA, 2022) indicates that between 11 June and 9 September 2022 in Europe and other countries of interest (including the UK) there were 788 HPAI detections in poultry, and captive and wild birds. Most of these detections were in wild birds (710), the majority of which were in Germany (199). There were 56 poultry outbreaks, 15 of which were in France, 14 in the Netherlands and 10 in the UK.

Generally, the number of HPAI outbreaks decreased compared to the previous EFSA report, however the number of reported detections is high compared to previous years. Outbreaks in domestic poultry and wild birds in Russia and China were detected in regions spatially associated with key migration areas.

HPAI was detected in at least 63 wild bird species; 11 waterfowl species, 11 raptor species, 15 other wild bird species and at least 28 colony-breeding seabird species. Most reports between the end of April and June were in raptors and other wild bird species. So far, the current epidemic seems to be more extensive geographically than previous epidemics, with the northern limit from Iceland to Northern Norway and the southern limit in Portugal and Spain. The temporal pattern shows an increase in HPAI virus detections in wild birds since the previous reporting period. This is largely due to the increased detections in colony-breeding seabirds. The number of detections in waterfowls and raptors was lower.

Two red foxes in Belgium and Norway, and a harbour porpoise in Sweden were reported affected by HPAI A(H5N1) in EU countries. Several HPAI A(H5N1) mammalian cases were reported in North America, harbour seals and grey seals were the main species affected, with detections also in a bottlenose dolphin in the USA and an American black bear in Canada.

All the HPAI (H5Nx) viruses characterised since October 2021 in Europe belong to clade 2.3.4.4b. Based on the available genetic information, the A(H5N1) viruses detected in the summer months belong to seven genotypes, three of which were identified for the first time during this reporting period. One of these new genotypes, which resulted from reassortment events with viruses of the gull-adapted A(H13) subtype, has been extensively detected in European herring gulls in the Netherlands, Belgium and France, as well as in a fox in Belgium.

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

The EFSA report states that 'the risk of infection for the general population in the EU/EEA is assessed as low, and for occupationally exposed people low to medium with high uncertainty due to the high diversity of circulating avian influenza viruses in bird populations.'

‘Transmission events of A(H5) clade 2.3.4.4b viruses to humans in United Kingdom and USA, together with the increasing number of transmission events of A(H5) viruses to wild mammals reported from different European countries, underline the continuous risk of avian influenza virus transmission to humans, also in Europe, and that these viruses may adapt further to mammals.’

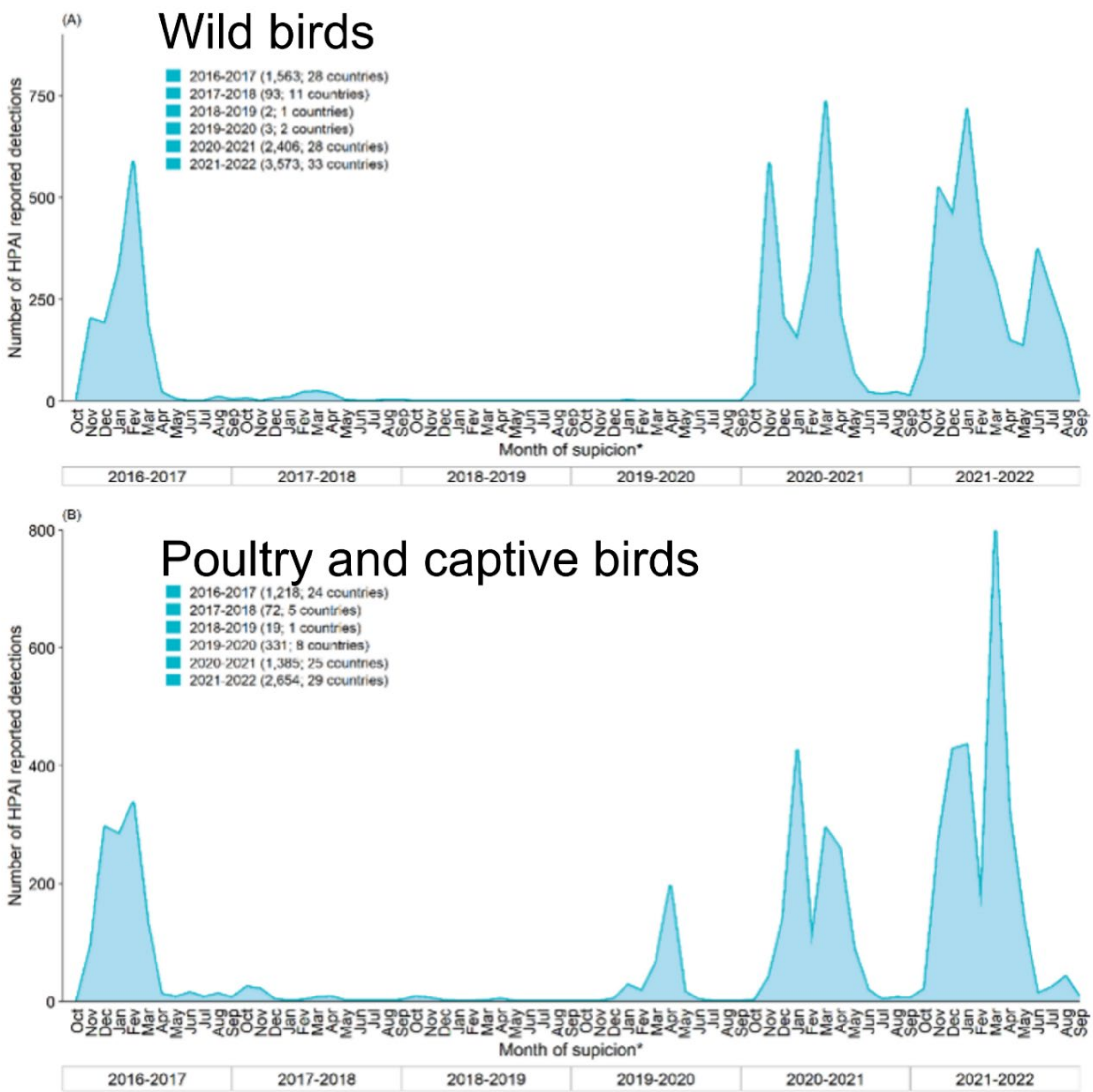

Figure 6: Distribution of total number of HPAI virus detections reported in Europe in the seasons 2016–2017, 2017–2018, 2018–2019, 2019–2020, 2020–2021 and of 2021–2022 by month of suspicion in (upper figure) wild birds and (lower figure) domestic birds

The report warns that 'the long duration of the AI risk period could represent a challenge for the sustainability of reinforced biosecurity measures. The persistent presence of HPAI A(H5) viruses in wild birds and the environment, and the possible reduction of biosecurity compliance might increase the risk of avian influenza incursions with the potential further spread between establishments, primarily in areas with high poultry densities.'

Conclusion

The EFSA report referred to above, advised that as autumn migration takes place and the number of migratory wild birds, particularly waterbirds, wintering in European countries increases, it cannot be excluded that they will be at higher risk of HPAI virus infection than in previous years due to the observed persistence of HPAI virus in wild birds in Europe.

At the time of the 14 October 2022 updated outbreak assessment for HPAI in the UK and Europe, the risk of HPAI H5 infection in wild birds in GB was high with low uncertainty. The risk of exposure of poultry across GB where biosecurity is suboptimal was high with low uncertainty, and the risk to poultry in GB where biosecurity is stringent was medium with high uncertainty.

The update advised that it is imperative that biosecurity is maintained to the highest extent possible to mitigate against the ongoing risk of infection posed by wild birds across the UK. The ongoing wild bird infection pressure will likely expose any weaknesses that exist, even where biosecurity is good.

Low Pathogenicity Avian Influenza

There were no outbreaks of notifiable low pathogenicity avian influenza (LPAI) this quarter.

There are no records of notifiable LPAI in the EFSA report. The non-notifiable subtype H9N2 remains endemic in Asia, the Middle East and Africa. Two human cases of H9N2 have been reported during the period of the EFSA report, 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. APHA Vet Gateway: Testing for exclusion of notifiable avian diseases (defra.gov.uk).

One exclusion testing investigation was undertaken during quarter 3 of 2022, as summarised in Table 1.

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 (Reid and others 2021).

Table 1: Summary of findings from the Notifiable Avian Disease Exclusion Testing Scheme during quarter 3 of 2022

Species	Clinical details	Cloacal and oropharyngeal swabs taken	Result	Outcome
Chickens	Drop in egg production in 2 of 6 houses over a week. Farm was in an AI protection zone.	Yes	Negative M-gene (AI virus) PCR results	Avian notifiable disease excluded

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.

Differential diagnostic 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 present with clinical signs suspicious of NAD. When sudden mortality and other clinical signs of NAD affect commercial and small flock birds, there may be significant welfare implications as well as a marked economic impact, warranting further investigation.

Differential diagnostic investigations were undertaken on three NAD report cases negated during Quarter 3.

Two of these report cases, one negated on clinical grounds and the other one after laboratory testing, were diagnosed as Marek's disease following further investigation with histopathology. One of these cases is described in more detail on page 133.

Disease in a third report case that was negated after laboratory investigation was found to be due to right sided heart failure and anaemia. Red mite was identified as the primary problem and preventative measures were recommended.

Colleagues in private veterinary practice are encouraged to use this scheme for differential diagnosis of negated NAD report cases.

Pigeon paramyxovirus investigations

There was one submission of material tested for Pigeon Paramyxovirus-1 (PAAvV-1, formerly PPMV-1) during Quarter 3 of 2022. This was a report case in a pigeon and PAAvV-1 was detected in cloacal swabs and tissue samples from a submitted carcass.

Unusual diagnoses

Streptococcus gallolyticus subspecies pasteurianus septicaemia

Four two-week-old goslings were submitted to APHA Starcross Veterinary Investigation Centre (VIC) to determine the cause of their sudden death. Six from a group of 130 died over a 48-hour period, and the submission was made after avian notifiable disease was ruled out by APHA. The birds had been housed since arrival on the farm at two-days-old.

Gross findings consisted of poor body condition; mottled, friable livers and haemorrhages on the intestinal mucosa. In one bird there was liquid faeces, lung congestion, splenomegaly and pale kidneys. Aerobic cultures isolated *Streptococcus gallolyticus* subsp*. pasteurianus* in heavy pure and mixed growths from multiple systemic sites, confirming a diagnosis of septicaemia due to this pathogen. Antimicrobial sensitivity testing showed *in vitro* resistance to tetracycline/doxycycline.

S. gallolyticus has been isolated sporadically as the cause of disease in birds at APHA, with six cases diagnosed in ducks and geese in the VIDA database since 2014. APHA described the first case of this organism causing disease in goslings in 2008 (Barnett and others 2008).

This case was described in the APHA monthly surveillance report, July 2022, in the Veterinary Record (APHA 2022b).

Avian mycobacteriosis

Two chickens presented with lethargy and weight loss. The chickens were part of a flock of 30 birds, which consisted of homebred hens and Silkies. One of the affected chickens responded to treatment with doxycycline. The other, a Silkie chicken, died. The private veterinarian undertook a postmortem examination and identified yellow nodules in the liver and mesentery. Fixed samples were submitted to APHA Penrith VIC. Histopathological examination detected chronic multifocal granulomatous hepatitis with intralesional acid-fast bacteria (Figure 7). This is consistent with avian mycobacteriosis.

Avian mycobacteriosis is caused primarily by *Mycobacterium avium* subspecies *avium*, although *M. intracellulare* and *M. genavense* can also cause the disease. *M. avium* can survive in the soil for several years, and within poultry litter for several months. Therefore, in addition to infected birds and contaminated fomites, the environment can be a source of infection to other poultry, and consideration must be given to this when advising on preventing spread ofinfection. Mycobacteria are slow to divide, and avian mycobacteriosis tends to be a chronic disease with clinical signs developing slowly over weeks or months.

Disease due to avian mycobacteriosis is sporadic. In the past five years (2017-2022) an average of five cases have been recorded each year in chickens and other poultry on VIDA. *M. avium* is potentially zoonotic, although most human cases are considered not to arise from bird-to-human contact (Collett and others 2020).

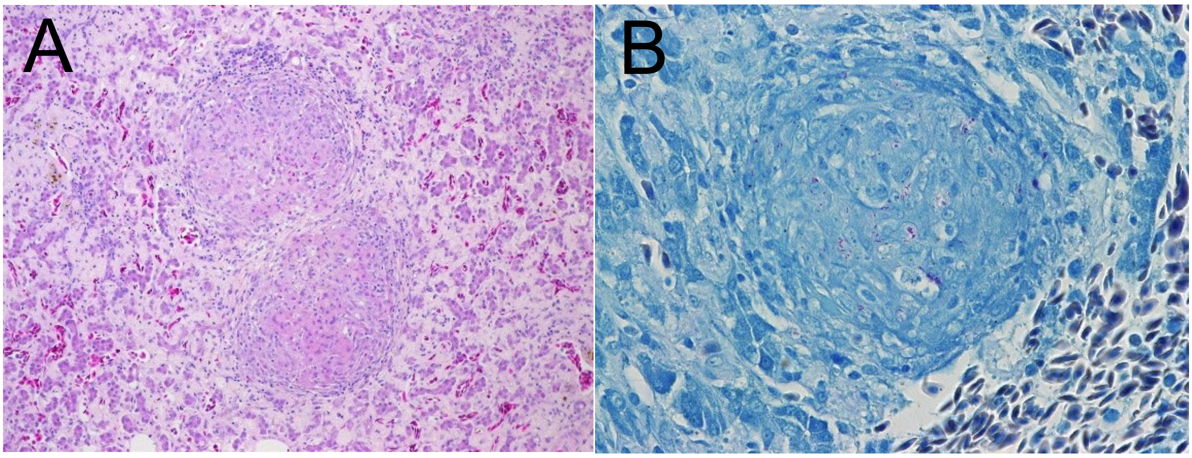

Figure 7: Avian mycobacteriosis detected in a chicken. A) Two well-delineated granulomata in the liver. Note the predominantly histiocytic response and the lack of necrosis (Original magnification x200, H&E). B) Acid fast bacteria detected in one of those granulomas (Original magnification x 400, Ziehl-Neelsen stain).

This case was described in the APHA monthly surveillance report, July 2022, in the Veterinary Record (APHA 2022b).

Fowl pox in a hen

A hen from a smallholder flock presented with lethargy, unilateral periorbital swelling, an empty crop, and a large oral plaque (Figure 8). Other birds in the group presented with blisters on the comb. The bird was euthanised and the beak was submitted to APHA Lasswade to investigate a possible diagnosis of fowl pox. Histopathology revealed a severe, multifocal, necrotising, and proliferative stomatitis with inclusion bodies consistent with avian pox infection.

Avian pox is caused by viruses in the genus *Avipoxvirus*. Avian pox viruses can affect a range of avian species. The viruses are split into clades which tend to be host-specific. The viruses within the clade that typically affect chickens are known collectively as fowl pox. APHA regularly diagnoses a small number of cases of avian pox, mostly involving wild birds and chickens from small flocks. Avian pox cases are also occasionally diagnosed in gamebirds.

Clinical signs of avian pox vary and are related to the location and extent of the lesions and any secondary infections. Commonly, lesions can be detected on the skin of the head, in particular the wattles, combs and around the eyes, as well as in the oral mucosa, and sometimes the oesophagus and upper airways. In many cases, the infection is localised and self-healing. In the most severe cases, the lesions result in reduced feeding, weight loss and respiratory signs and ultimately in death. The disease can be economically significant as it can cause a drop in egg production, reduced weight gain and unexpected mortality.

Figure 8: Large oral lesion confirmed as fowl pox (picture kindly provided by Henrietta Kodilinye-Sims, Surrey Poultry Vet)

Lesions of avian pox are not pathognomonic. Depending on the localisation of the lesions and the clinical presentation, the differential diagnoses for avian pox in chickens include infectious laryngotracheitis, squamous cell carcinoma, and trauma to the skin or mucosa. In other species, trichomonosis and oral capillariasis are differentials. Therefore, histopathology is necessary to diagnose fowl pox. Currently APHA does not offer molecular testing for avian pox, however a national reference laboratory is being established and the APHA Avian Expert Group would be interested to hear of any suspect cases.

Vaccination is available and can be used following the detection of fowl pox in a flock; however, outbreaks have been reported to occur despite vaccination (Chacón and others 2022). Avian pox viruses can survive in the environment and thorough cleaning and disinfection of housing is important to help limit a disease outbreak. Chambers and others (2009) have published a paper that identified a range of disinfectants that are effective in laboratory conditions. Disinfectants are less effective if areas are soiled and cleaning to a high standard is important to ensure that the subsequent disinfection is as effective as possible.

This case was described in the APHA monthly surveillance report, August 2022, in the Veterinary Record (APHA 2022a).

Marek’s disease in two hens investigated as a DDNRC case

Two smallholder hens were examined under the DDNRC scheme. The two Cream Legbar hens had been purchased two years previously, and were the only poultry kept.

The first clinical sign noted was pale combs without any change to feed and water intake. The next morning the birds would not leave their coop and did not feed. The private veterinarian identified blue-white combs and wattles and acute respiratory distress with open-mouthed breathing. Both hens had evidence of diarrhoea with dirty feathers around the cloaca. One bird died, and the other was euthanised on welfare grounds.

As the clinical signs raised suspicion of NAD, the private veterinarian reported the case to APHA. NAD were ruled out by laboratory testing for both avian influenza and Newcastle disease. This qualified the case for the DDNRC scheme. Gross pathology included lesions consistent with chronic egg peritonitis (Figure 9), splenomegaly and pulmonary congestion.

Histopathology confirmed chronic egg peritonitis with evidence of internal laying within the peritoneal exudate. However, the more significant finding was an underlying pleomorphic lymphoma in all the examined tissues. The character and localisation of the infiltrates were typical of Marek’s disease. In addition to the more chronic inflammatory lesions, there was acute inflammation in the lung, spleen and ovary. These lesions were consistent with terminal septicaemia. There was also evidence of right sided heart failure, likely secondary to increased peripheral resistance due to the chronic peritonitis.

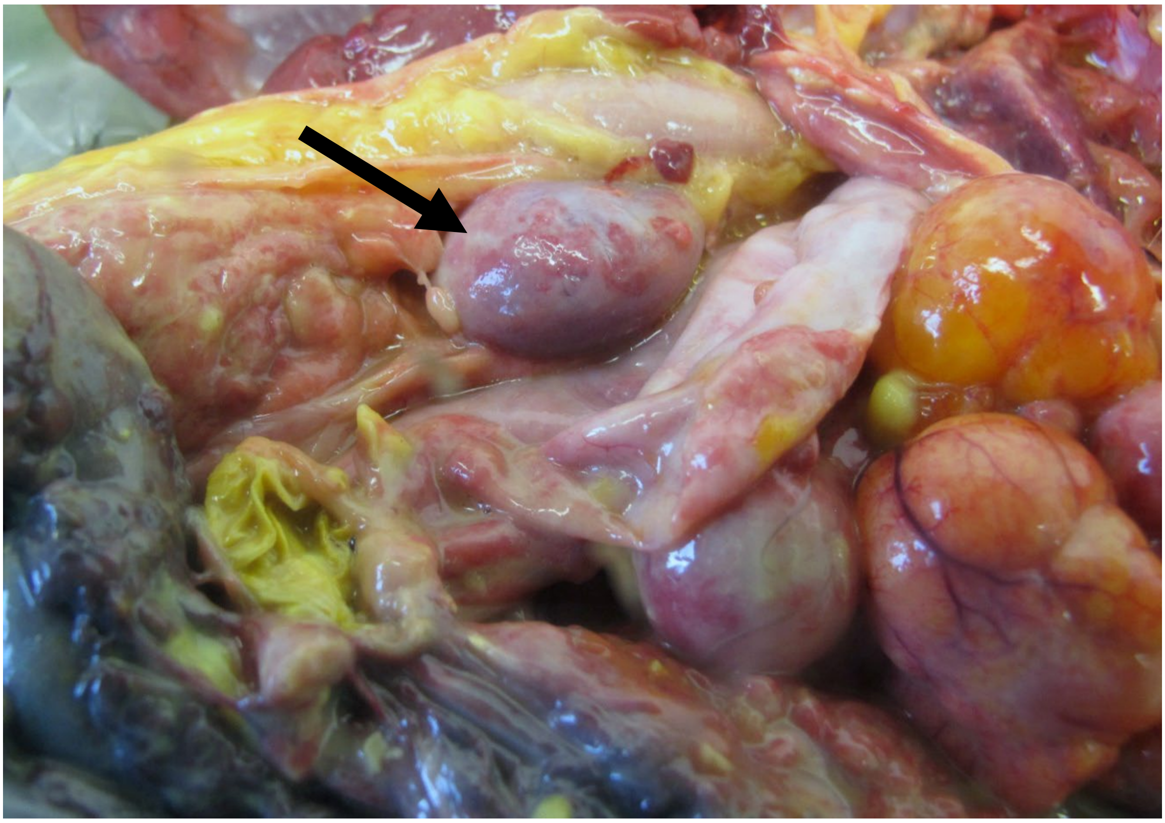

Figure 9: Enlarged spleen (arrowed) and chronic egg peritonitis in a hen with Marek's disease. Note the abundant cream-coloured exudate and congealing ovarian follicles consistent with egg peritonitis and the multifocal, flesh-coloured thickening of the splenic capsule (arrow).

This submission is a good example of use of the DDNRC scheme to investigate clinical signs and/or pathology that resemble NAD. If private veterinarians have a negated NAD report, please contact the veterinary lead of the APHA Avian Expert Group via SIU@apha.gov.uk. In addition, please consider submitting typically affected birds for postmortem examination to the designated APHA VIC or partner PME provider after NAD has been ruled out.

This case was described in the APHA monthly surveillance report, September 2022, in the Veterinary Record (APHA 2022c).

Horizon scanning

Turkey hepatitis caused by reovirus reported in the USA

Reovirus infections of turkeys can cause lameness and contribute to enteric disease, specifically poult enteritis complex. The reoviruses associated with intestinal disease are conventionally referred to as turkey enteritis reovirus (TERV). Turkey arthritis reovirus (TARV) can cause tenosynovitis and hence lameness, but like TERV can also infect the intestinal tract.

In 2019, Kumar and others (2022) observed several cases of multifocal necrotising splenitis and hepatitis in one- to seven-week-old turkeys in rear presenting with five percent mortality and isolated reovirus. To confirm Koch's postulate, the research group carried out experimental infections with the virus isolates in one-week-old turkey poults. Groups of turkeys were infected with two of the reovirus isolates from the hepatitis and splenitis cases, provisionally named turkey hepatitis reovirus (THRV) 1 and 2. In addition, separate groups of poults were infected with each of five TARVs including the reference strain TARV O'Neil, or one of two TERVs via the oral route. Virus was detected in the duodenum, jejunum, caecum and bursa of all infected birds. Virus was also detected in the spleen, liver and tendons of birds inoculated with THRV, TARV and TERV2. No systemic spread was detected in poults inoculated with TERV1. Under these experimental conditions, only poults inoculated with THRV2 showed clinical signs of weakness and lethargy. These affected poults showed multiple white foci in the liver variably associated with hepatosplenomegaly or splenomegaly. Histopathology confirmed a multifocal necrotising hepatitis in THRV2 infected poults, but not in any of the other inoculated birds even though virus was detected. Tenosynovitis was detected in all poults apart from the birds inoculated with TERV1 and the negative control birds. In poults inoculated with the reference strain TARV O'Neil, mild epicarditis could be detected. This was not a feature of the poults inoculated with any of the other viral strains. No microscopic lesions were detected in the intestine or spleen in any of the infected or control poults.

This data confirms the intestinal tropism of TERV, THRV and TARV. It also demonstrates a tropism for the tendons in all but one of the viruses (TERV1). However, only THRV2 caused hepatitis confirming the initial hypothesis that some viruses can cause a syndrome characterised by tenosynovitis and hepatitis in turkey poults. In addition, mild epicarditis is a feature of some strains of TARV. APHA receives numerous turkey submissions for endemic disease surveillance each year, but no cases of viral arthritis/tenosynovitis have been recorded in the last seven years. Whilst multifocal necrotising hepatitis associated with bacterial infections or histomonosis has been recorded during this period, there are no cases in which the cause or character of the hepatitis was unexplained. Private veterinarians suspecting reoviral infection in turkey poults, particularly where hepatic lesions are detected, are encouraged to contact the Avian Expert Group veterinary lead.

Emergence of mosquito-borne Tembusu virus in Chinese chickens

Tembusu virus (TMUV) is a *Flavivirus*. Since 2010 duck TMUVs (DTMUVs) have caused outbreaks in ducks in China, Malaysia and Thailand. The outbreaks have been characterised by severe egg drop, encephalitis and stunted growth. DTMUVs are mainly transmitted by mosquitos, although spread by direct-contact and aerosol transmission among ducks have also been reported. DTMUVs are not typically associated with outbreaks in chickens, although they are a recognised host species.

In 2021, outbreaks of stunted growth, diarrhoea and egg drop were seen in Shandong and Guangxi, China. Yan and others (2022) identified TMUV by reverse transcription Polymerase Chain Reaction (RT-PCR). Affected chickens had swollen and congested spleens, and haemorrhages of the ovarian follicles. Viruses named SD2021 and GX2021, were isolated from tissues including liver, spleen, lung and kidney. The embryos used for virus isolation died 2-6 days after inoculation, suggesting that the virus is virulent to chicken embryos. Sequencing and phylogenetic analysis shows that TMUVs are divided into two distinct lineages, duck-derived TMUVs and mosquito-origin TMUV. The two viruses from the chickens were within the mosquito-origin lineage and so were distinct from the DTMUVs circulating in ducks in China.

Yan and others (2022) evaluated the pathogenicity and transmissibility of the viruses experimentally. Three-week-old chickens were successfully infected with SD2021 by intranasal and intramuscular routes. Both groups had appetite loss, neurological signs and diarrhoea. Three chickens, euthanised at 4 days post inoculation (dpi), had swollen spleens. Viraemia and seroconversion were confirmed in both groups. Contact spread of virus was assessed by housing uninoculated chickens with both infected groups. No virus was detected in these in-contact birds, and none seroconverted. Efficacy of a licensed live-attenuated DTMUV vaccine against these viruses was assessed. Vaccinated and unvaccinated chickens were inoculated with TMUV SD2021. At 4 dpi no virus was isolated from vaccinated chickens, compared to successful virus isolation from multiple tissues from unvaccinated chickens. This indicated vaccine efficacy.

Overall, Yan and others (2022) demonstrated that TMUV has adapted to chickens, but did not show onward transmission through direct contact. Tembusu and Tembusu-related viruses are transmitted by a variety of mosquito species, including *Culex pipiens* and *Aedes albopictus* (Guo and others 2020; Yurayart and others 2021), the former being a common mosquito in the UK and the latter an invasive species identified in France, the Netherlands and Belgium. The detection of *Aedes albopictus* in northern Europe, alongside climate change (Metelmann and others 2019), indicates that this virus could be carried into and sustained in the UK. Incursion of this group of viruses is currently considered to be very unlikely. We nevertheless would like to hear of any cases where there is no clear cause of stunted growth in rear or diarrhoea and egg drop in older birds particularly in ducks.

References

APHA (2022a) Disease surveillance in England and Wales, August 2022. Veterinary Record 191, 205-208

APHA (2022b) Disease surveillance in England and Wales, July 2022. Veterinary Record 191, 111-115

APHA (2022c) Disease surveillance in England and Wales, September 2022. Veterinary Record 191, 290-293

BARNETT, J., AINSWORTH, H., BOON, J. D. & TWOMEY, D. F. (2008) Streptococcus gallolyticus subsp. pasteurianus septicaemia in goslings. Vet J 176, 251-253

CHACÓN, R. D., ASTOLFI-FERREIRA, C. S., PEREIRA, P. C., ASSAYAG, M. S., JR., CAMPOS-SALAZAR, A. B., DE LA TORRE, D., SÁ, L. R. M., ALMEIDA, S. R. Y., RICI, R. E. G. & FERREIRA, A. J. P. (2022) Outbreaks of Avipoxvirus Clade E in Vaccinated Broiler Breeders with Exacerbated Beak Injuries and Sex Differences in Severity. Viruses 14

CHAMBERS, A. E., DIXON, M. M. & HARVEY, S. P. (2009) Studies of the suitability of fowlpox as a decontamination and thermal stability simulant for variola major. Int J Microbiol 2009, 158749

COLLETT, S. R., SMITH, J. A., BOULIANNE, M., OWEN, R. L., GINGERICH, E., SINGER, R. S., JOHNSON, T. J., HOFACRE, C. L., BERGHAUS, R. D. & STEWART-BROWN, B. (2020) Principles of Disease Prevention, Diagnosis, and Control. In Diseases of Poultry. pp 1-78

EUROPEAN FOOD SAFETY AUTHORITY, EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL, EUROPEAN UNION REFERENCE LABORATORY FOR AVIAN INFLUENZA, ADLHOCH, C., FUSARO, A., GONZALES, J. L., KUIKEN, T., MARANGON, S., NIQUEUX, É., STAUBACH, C., TERREGINO, C., GUAJARDO, I. M., CHUZHAKINA, K. & BALDINELLI, F. (2022) Avian influenza overview June – September 2022. EFSA Journal 20, e07597

GIBBENS, N., BROWN, I. H. & IRVINE, R. M. (2014) Testing for exclusion of notifiable avian disease. Veterinary Record 174, 534-535

GUO, X. X., JANG, T., JIANG, Y. T., ZHAO, T., LI, C. X., DONG, Y. D., XING, D., QIN, C. F. & ZHAO, T. Y. (2020) Potential Vector Competence of Mosquitoes to Transmit Baiyangdian Virus, a New Tembusu-Related Virus in China. Vector-Borne and Zoonotic Diseases 20, 541-546

KUMAR, R., SHARAFELDIN, T. A., SOBHY, N. M., GOYAL, S. M., PORTER, R. E. & MOR, S. K. (2022) Comparative pathogenesis of turkey reoviruses. Avian Pathology 51, 435-444

METELMANN, S., CAMINADE, C., JONES, A. E., MEDLOCK, J. M., BAYLIS, M. & MORSE, A. P. (2019) The UK's suitability for Aedes albopictus in current and future climates. Journal of the Royal Society Interface 16

REID, S., BROOKES, S., HANSEN, R., WELCHMAN, D., IRVINE, R. & BROWN, I. (2021) Testing for exclusion of avian notifiable disease: six-year review. Vet Rec 189, 193-195

WELCHMAN, D., HANSEN, R. & SCHOCK, A. (2019) Differential diagnosis of negated avian notifiable disease cases in Great Britain. Veterinary Record 184, 276-276

YAN, D., LI, X., WANG, Z., LIU, X., DONG, X., FU, R., SU, X., XU, B., TENG, Q., YUAN, C., ZHANG, Z., LIU, Q. & LI, Z. (2022) The emergence of a disease caused by a mosquito origin Cluster 3.2 Tembusu virus in chickens in China. Veterinary Microbiology 272, 109500

YURAYART, N., NINVILAI, P., CHAREONVIRIYAPHAP, T., KAEWAMATAWONG, T., THONTIRAVONG, A. & TIAWSIRISUP, S. (2021) Interactions of duck Tembusu virus with Aedes aegypti and Aedes albopictus mosquitoes: Vector competence and viral mutation. Acta Tropica 222

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