Animal &
Plant Health
Agency

Rapid risk assessment on incursion of High Pathogenicity Avian Influenza (HPAI) H5N1 into housed or not housed poultry flocks and captive birds

11 March 2022

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Summary

This is an update of the rapid risk assessment (RRA) dated 23 November 2021 and updated on 7 February 2022 in response to detection of high pathogenicity avian influenza (HPAI) H5N1 in captive birds (confirmed on 27 October 2021) with detection in wild birds in November. Since then, there have been further findings of HPAI H5N1 in poultry, captive birds and wild birds in the UK. All updates made on 11 March are shown in red for ease of reference.

A request was made in November 2021 to review the evidence for the effect of implementing housing orders for poultry and captive birds on the number of outbreaks of HPAI across GB. In the past few years, a housing order has been put in place twice (2016/17 and 2020/21), triggered by an increase in risk of infection of poultry from contact with (infected) wild birds. An opinion by the European Food Safety Authority (EFSA) in 2017 (EFSA 2017) used expert opinion to assess the effectiveness of various biosecurity measures in preventing outbreaks, as there is no experimental evidence base. The opinion concluded that housing alone is not able to completely prevent all outbreaks, and other biosecurity measures are equally or more effective. Previously the number of outbreaks reported in the 2016/17 and 2020/21 epizootics was compared against the predicted protective effect of housing:

- Predictions based on the expected fold reduction of outbreaks and the number of captive bird/poultry outbreaks reported last year (2020/21 season) concluded that implementing the housing order on 14 December 2020 prevented 12 outbreaks across GB. By starting the housing order at the very beginning of the epizootic (03 November 2020) and continuing it for 16 weeks (ending 23 February 2021) only a further 2.5 outbreaks would have been prevented. Outbreaks were still occurring after 23 February, and extending the housing order to 21 weeks could have prevented a further two outbreaks (i.e.16.5 outbreaks in total). However, extending the housing order to 21 weeks does represent law of diminishing returns, saving only an additional two outbreaks, for the uncalculated costs of extending beyond the 16 week grace period for free range birds.
- Of the 12 outbreaks prevented across GB by the 14 December 2020 housing order, two would have been in Scotland, one in Wales and nine in England. Therefore, on the basis of the distribution of outbreaks in 2020/21, the housing order had a greater return in England than in Scotland and Wales.

Here the assessment for the current HPAI risk levels is updated, based on current biosecurity levels and the infection pressure for different areas of GB from wild bird abundance. During the 2021/22 HPAI season in the UK, to 11 March 2022:

1. From early October 2021, there was an increase in risk of an incursion of HPAI H5Nx to the UK through wild birds based on the wild bird cases occurring across Northern, Eastern and Central Europe and outbreaks in poultry in Netherlands,

Italy, Czech Republic, Finland and Germany. In early October 2021, the risk of HPAI H5 incursion in wild birds in GB was increased to **MEDIUM**.

2. Following this, the first confirmed events of HPAI H5N1 in GB since July 2021 were identified in a wild bird rescue centre in Worcestershire (AIV 2021/07) and a backyard chicken flock in Wrexham (AIV 2021/08) on 26 October and 1 November, respectively. Five other wild bird cases were also reported from areas of Southport, Preston, Fife, Edinburgh and Wrexham. **Therefore, the risk level was increased to HIGH for wild birds on the 29 October 2021 with LOW and MEDIUM risks of exposure to poultry, depending on biosecurity.**
3. The risk of HPAI H5N1 incursion through movements of migratory wild waterfowl was increased to **VERY HIGH on 22 November 2021** as a result of the increasing infection pressure in Europe, including western Europe and initial reports of HPAI H5N1 in wild birds in all three GB administrations. The risk level to poultry was also increased from **MEDIUM** to **HIGH** (where biosecurity is poor) and from **LOW** to **MEDIUM** (where there is good biosecurity).
4. An AIPZ was declared in England, Wales and Scotland on 3 November 2021**, and in Northern Ireland on 17 November 2021, such that personnel working with poultry and hobbyists should take additional biosecurity measures.** Additional housing measures came into force from 29 November 2021. This means that all bird keepers in GB (whether they have pet birds, commercial flocks or just a few birds in a backyard flock) are required by law to take a range of biosecurity precautions, including housing their birds (except in very specific circumstances).
5. To 11 March 2022, HPAI H5N1 has been confirmed at 95 poultry and captive bird premises in Great Britain.
6. There has been a pattern of spread consistent with previous disease epidemics in which wild bird transmission was a factor (EFSA 2021). There is overwhelming evidence for spread of HPAI H5 to UK poultry by wild waterfowl migrating through northern Europe to their wintering sites in the UK as has happened in previous epizootics.
7. The arrival of wild waterfowl to overwinter in the UK has by and large ended (February), and numbers are expected to have peaked in December and January, depending on the species and weather conditions in Continental Europe. Large populations of migratory waterfowl are still present in the UK. These birds will remain here until March/April and will start departing in numbers from late March.
8. To 11 March 2022, there have been 782 HPAI H5 detections in wild birds, in 228 locations involving 38 species in 78 counties, including a significant number of resident sedentary birds of species such as mute swan, Canada goose, and some raptor species, including common buzzard and peregrine falcons. The wild bird risk level remains **VERY HIGH,** owing to continued high numbers of HPAI H5 detections in wild birds, across various species.
9. Given the large poultry population, some of which are located in the regions close to the high aggregations of wild waterfowl, we consider the risk of exposure of poultry across the whole GB to be maintained at **MEDIUM** where good (stringent) biosecurity is applied, but **HIGH** where biosecurity is poor (suboptimal). This is

considering an Avian Influenza Protection Zone (AIPZ) and housing order are in place, therefore personnel should be taking additional biosecurity measures.

10. There are a number of risk pathways for the introduction of disease to domestic birds, and contact, whether direct or indirect, with infected wild birds is the most important one, especially with respect to a primary introduction to domestic birds. Secondary spread when disease control measures and keeper awareness are high is a rare event in the UK; only two proven events of secondary spread of HPAI prior to this winter season have occurred, and that was in 2007 and 2017, where spread between two units of the same business occurred through shared workers. Nevertheless, in 2021/22, there has been an unprecedented number of outbreaks in commercial farms in some areas and the source of infection (lateral spread, separate incursions from wild birds or from a heavily contaminated environment) is still under investigation.
11. The housing of free-range poultry will reduce the likelihood of exposure of poultry and hence the risk of their infection by reducing the level of direct contact with wild waterfowl or with their contaminated environment. An EFSA opinion following the 2016/2017 epidemic concluded that housing birds gave a two-fold reduction in risk which would reduce the expected number of outbreaks in an epizootic by a factor of two.
12. However, to be effective, housing must be accompanied by thorough biosecurity measures to prevent the HPAI virus from being introduced to the poultry by contaminated people or other things (fomites and feed) that are taken into or enter the housing. Housing must be secure with adequate facilities to apply basic hygiene practices. EFSA concluded that good biosecurity measures, which includes housing but also a multitude of other biosecurity measures, bring an overall 44-fold reduction in risk.
13. Under some circumstances, poultry or other captive birds will not be able to be housed, whether for practical or welfare reasons relating to their husbandry needs, and so housing will not be universally achieved.
14. Any legal requirement to house and take biosecurity measures should be kept under review and adapted as needed to reflect emerging evidence, including levels of compliance with housing and biosecurity measures and the disease picture across Europe.

Risk Assessment

Hazard identification

The hazard identified is the high pathogenicity avian influenza (HPAI) virus H5N1 subtype, as this is the dominant subtype isolated from the UK during the current season with just a single confirmed report of HPAI H5N8 in a mute swan found in Wiltshire in November 2021. It is concluded from sequence data that the UK H5N1 virus demonstrates no strong correlations for specific increased affinity for humans.

Risk Question

What is the risk of incursion of HPAI H5N1 into housed and non-housed birds (domestic poultry and captive birds) in England, Scotland and Wales in March 2022 from direct and indirect contact with wild birds?

Terminology related to the assessed level of risk

For the purpose of the risk assessment, the following terminology will apply (OIE, 2021):

• **Negligible**: Event is so rare that it does not merit consideration

• **Very low**: Event is very rare but cannot be excluded

• **Low**: Event is rare but does occur

• **Medium**: Event occurs regularly

• **High**: Event occurs very often

• **Very High**: Event occurs almost certainly

Entry Assessment

Probability that HPAI H5 is still present in wild birds in GB

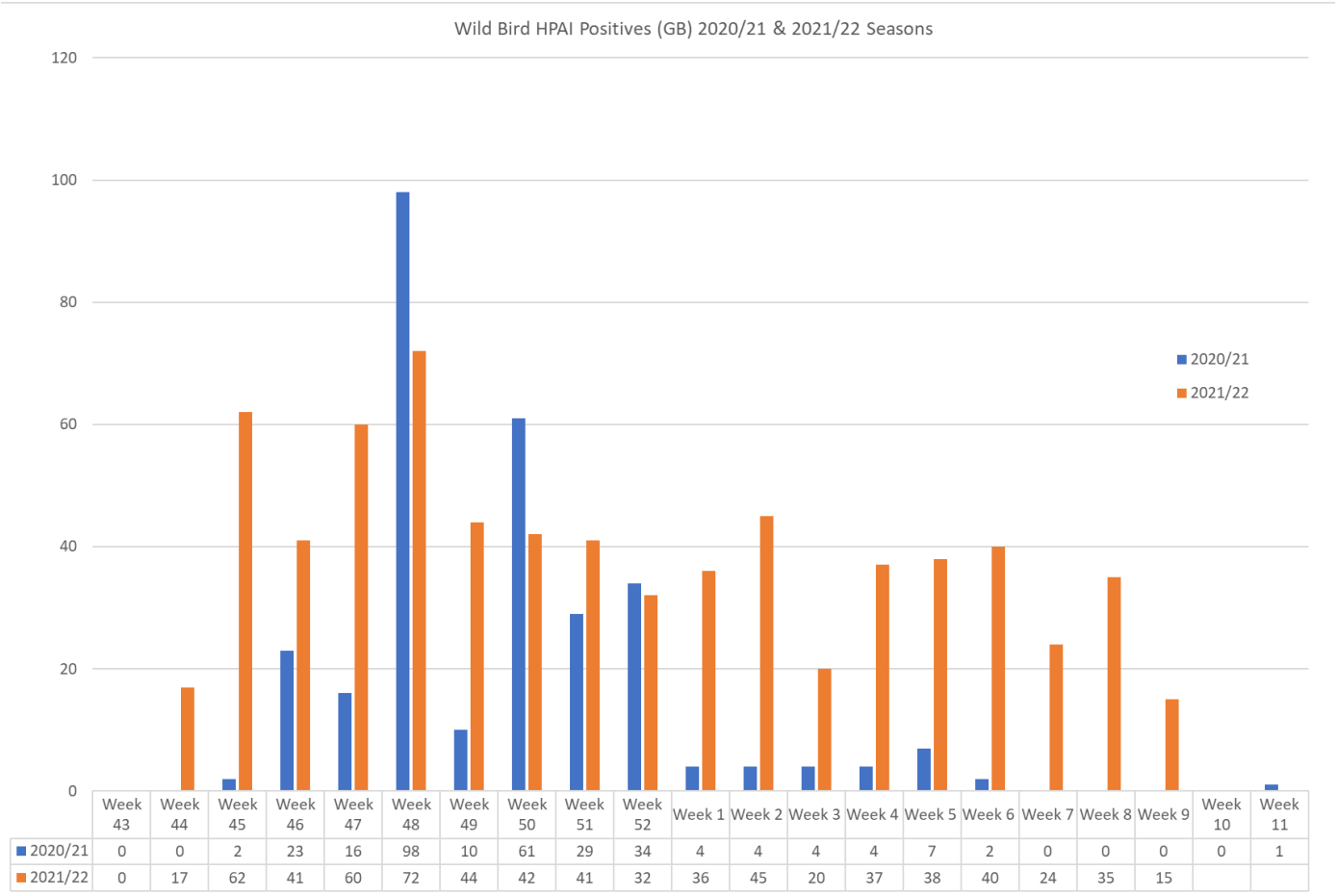
The probability of entry of HPAI H5 virus into GB is not important at this late stage of the epizootic. It is in the autumn months when migratory ducks, geese and swans are arriving in the UK from Europe that entry is a key consideration. Although there could be some flyover of birds migrating from Ireland in the coming months, most geese and swan species migrate north from Ireland to breeding sites in Greenland and Iceland with perhaps some flyway limited to over western Scotland. At this stage of the season

(March), the wild migratory ducks and geese which brought the HPAI H5 virus into GB are already here and will shortly be making their return journeys (end of March/April). Instead, the focus in the “entry” assessment is now on the probability that HPAI H5 is still circulating in wild birds in GB.

The wild waterfowl population in GB is relatively well understood. Several NGOs conduct regular surveys for the wild waterfowl at known wintering and breeding sites across GB. In particular, the British Trust for Ornithology (BTO), The Joint Nature Conservation Councils (JNCC), the Royal Society for the Protection of Birds (RSPB) and the Wildfowl and Wetlands Trust (WWT) carry out counts of wild birds. There are 53 sites counted with at least 20,000 birds wintering year after year across GB, though this represents only a portion of wintering sites used by waterfowl in GB.

There is a system for wild bird surveillance in the UK, whereby found dead birds from target species are reported either by wardens at reserves and wetland sites, or by the public for testing at the NRL. The majority of these to 11 March 2022 have been in England (547) with 208 in Scotland and 27 in Wales. It also important to note that the sensitivity of the system is not high, as it is dependent on not only the birds being found, but also the triage system for pooled testing of samples. Once positive birds have been reported at a site, more findings will not be tested until a two weeks have passed. Furthermore, there have been mass die-offs involving thousands of birds, particularly in Svalbard barnacle geese on the Solway coast. The wild bird surveillance system in place across GB is still detecting HPAI H5N1 in wild birds, with a higher number observed overall when compared to the 2020/21 season (Figure 1). Though it should be noted that sensitivity of the wild bird testing is variable.

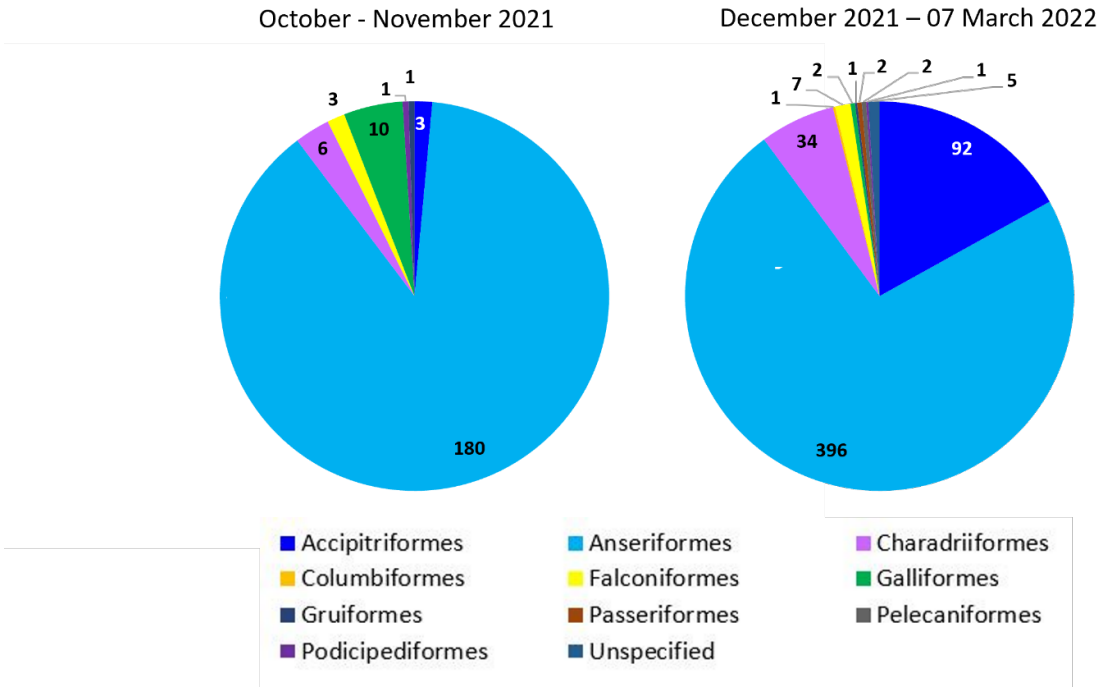
Figure 1 Showing wild bird HPAI positives by week for the 2020/21 and 2021/22 seasons



	Week 43	Week 44	Week 45	Week 46	Week 47	Week 48	Week 49	Week 50	Week 51	Week 52	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11
2020/21	0	0	2	23	16	98	10	61	29	34	4	4	4	4	7	2	0	0	0	0	1
2021/22	0	17	62	41	60	72	44	42	41	32	36	45	20	37	38	40	24	35	15		

The HPAI H5 virus is currently still circulating in those migratory ducks, geese and wild swans which migrated to the UK earlier last autumn to overwinter, and it is also in sedentary species such as mute swans, common buzzards and various species of gull. Compared to 2020/21, the number of positive findings in wild birds is much higher (Figure 1- using publicly available data from Defra) and there appears a longer, gradual decrease in cases which is also apparent in northern Europe including Germany, Netherlands, and Denmark (IZSVe 2022). Further analysis of the wild birds species order profile of HPAI positive findings throughout the current 2021/22 season has shown a shift in the UK. There is greater variety of wild bird species overall, in particular, a greater proportion of birds of prey (Accipitriformes) species becoming infected as the outbreak has progressed (Figure 2).

Figure 2 Number of HPAI H5 Wild bird positives by order across the 2021-2022 HPAI season in GB



In continental Europe, wild birds continued to test positive for HPAI H5N1 through March 2022, (Avian influenza in Europe: updates | EURL avian influenza Newcastle disease (izsvenezie.com)) including many ducks, geese and swans, gulls, several species of bird of prey, a small number of corvids (magpie, jackdaw and rook) and passerines including sparrows. Recently cases in pigeons have been reported including some 22 captive rock doves at a premises in Italy. Corvids, pigeons and sparrows could serve as bridging species, and therefore we presume these species could also become infected in the UK, presenting a route to poultry.

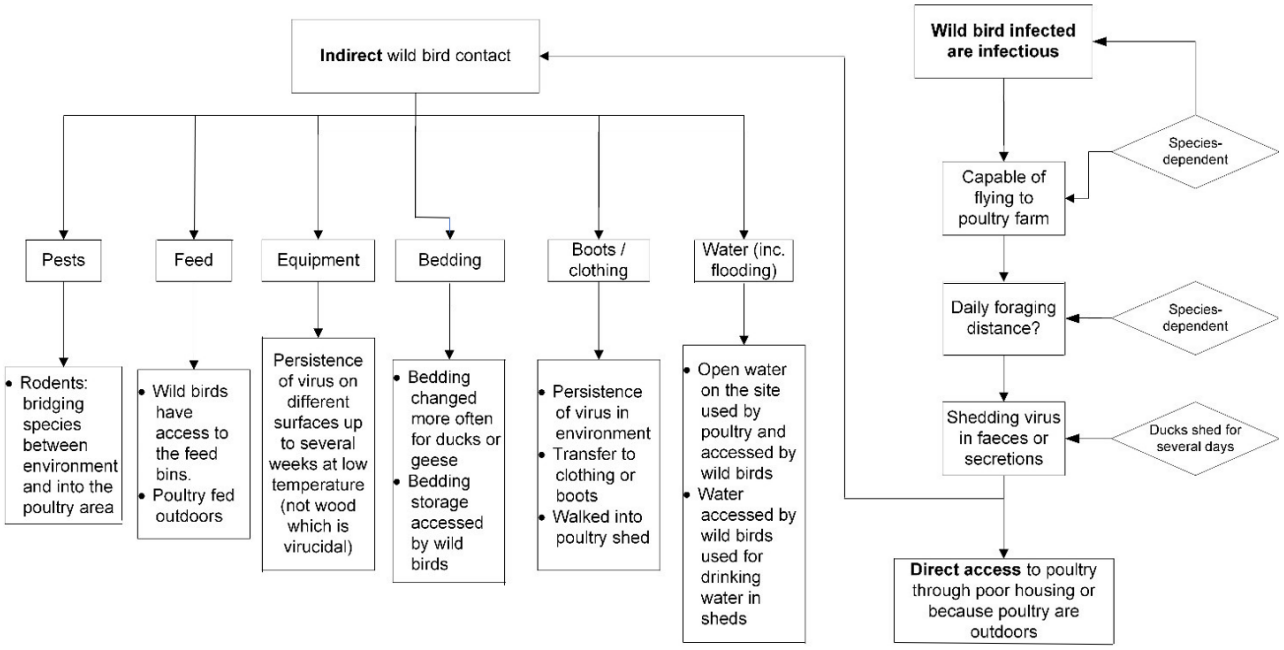
The mixed populations of wintering and sedentary species have resulted in a large infection pressure this season. Generally, as winter progresses, migratory species may expand their range for forage and come into contact with more endemic species. Furthermore, migratory birds may move to stopover sites in other parts of the country as they begin their eastward and northward migration (which might explain consistent recent detections in Scotland). The virus is likely to continue to circulate in wild birds in GB over the next month, although the rate is predicted to continue falling throughout spring in line with previous epizootics. Increasing temperature and sunlight will reduce the level of environmental contamination but the current weather patterns in the UK will not predict this is likely in the foreseeable future. Using Met Office data and based on the West Yorkshire weather station as the centre of GB, the average maximum temperature will remain below 10^{o}C until April according to a 20-year average (Bingley SAMOS (West Yorkshire) UK climate averages - Met Office).

We therefore consider that the likelihood of there being infected wild waterfowl and endemic wild bird species present in the UK is still **VERY HIGH** as a country-wide

assessment and that more HPAI H5 cases in wild birds will be detected in the next month (March 2022) (low uncertainty).

Exposure Assessment

Figure 3 Exposure pathways for poultry from contact with wild birds



There are multiple pathways for the exposure of poultry to influenza viruses causing notifiable avian diseases via aerosol, direct or indirect contact.

These include:

- Contact with infected poultry such as live birds, hatching eggs and day-old chicks of poultry
- Contact with live infected wild birds, particularly waterfowl
- Contact with poultry products and by-products of infected poultry,
- Contact with contaminated feed, water, bedding, equipment, vermin or clothing / footwear of people in contact with infected birds or contaminated environment.
- Contact with contaminated environment, e.g. contaminated flood water.

For the purpose of this risk assessment, the pathways associated with trade in live poultry or poultry products (including domestic moves: points 1 and 3 above) will not be considered. There have not been any records of the legal trade in poultry or poultry products giving rise to an outbreak of HPAI in GB.

As LPAI viruses circulate constantly in wild birds, there is a constant low risk of incursion of a notifiable disease into poultry. Therefore, biosecurity advice which poultry keepers should practice at all times are often focused on the pathways involving wild birds and contaminated fomites. The EFSA opinion from 2017 used a combination of systematic review of all poultry outbreaks in the EU and expert knowledge elicitation from members of the poultry sectors. Experts were asked to consider four levels of biosecurity: preventing access to waterbodies; housing; carrying out “routine” daily biosecurity (boot washing, limiting visitors, rodent control, clean feed and water) and; high biosecurity as used in compartments (all the above, plus shower in and out, no visitors, reverse air pressure, dedicated staff and equipment etc). The opinion also concluded that the relative risk for entry is reduced **three-fold** by preventing access to water bodies, that housing gives a further **two-fold** reduction, and applying routine biosecurity gives a further **four-fold** reduction. The relative risk for entry is reduced **44-fold** by applying high biosecurity measures (which is difficult to implement and does not reflect the majority of the industry).

Contact with live infected wild birds, particularly waterfowl:

The likelihood of contact with wild waterfowl will be dependent on the number of such species in the near environment and how attractive the site is to such birds. The presence within the poultry premises of a pond or open feed bins are two well-known factors which make the direct contact with wild waterfowl more likely for poultry with access to the outside environment. Therefore, housing birds will eliminate the direct contact with wild waterfowl, and reduce the contact with contamination from outdoor soil, ponds, feed, waterers, feeders and roosting areas contaminated with wild bird secretions. It will not prevent any of the other pathways through which disease may enter a poultry premises. Other biosecurity measures will be more important.

Expert opinion is that the virus will retain infectivity in the environment at low temperatures, for up to 55 days at 4^{o}C (Ian Brown, EURL, Pers. Comm.). This means the environment could remain contaminated for several weeks at least.

Contact with contaminated feed, water, bedding, equipment, vermin or clothing / footwear of people in contact with infected birds or contaminated environment including flood water:

Contamination of feed, bedding and water by infected wild birds during an outbreak is expected on a poultry farm unless access is prevented. For Anseriformes poultry which require daily bedding changes, moving potentially contaminated straw into the poultry house is a source of infection. For poultry fed outdoors, feed may be accessed by wild birds (or rodents acting as fomites). Using drinking water from a local pond or reservoir may also introduce virus to the poultry. It is not always possible to estimate the infectious dose present on contaminated feed or in water as the dilution factor will be important, nevertheless during the winter months, when wild bird food is scarce, if poultry are fed outdoors it is quite likely wild birds will be attracted to the site. The presence of a pond on a poultry farm where gallinaceous poultry are kept, is not necessary for the birds’ welfare

but will attract wild waterfowl. The roofs of poultry sheds may also be suitable loafing sites for gulls or corvids which may act as bridging species.

These pathways can be prevented by sourcing such products from safe sources (i.e., where contamination from wild birds was not possible) and keeping such items in containers which no wild birds can access. The site can be made less attractive to wild waterfowl by removing or covering any ponds on site, using drinking water from bore holes or mains water and making sure feeding areas are protected. Contact with contaminated equipment, footwear and clothing can be prevented by making sure all personnel in contact with the birds use cleansing and disinfection appropriately. This will be particularly important where birds are housed, as personnel contact with the birds is more frequent, as feed, bedding and water must be brought into the houses and birds must be checked for welfare issues and/or eggs collected from inside the houses. Visitors to the farm should also be recorded for security. Other important biosecurity practices are to ensure wild birds are separated from flocks, such as feeding birds indoors or under cover, discouraging wild birds from landing, removing wild bird contamination, netting ponds and draining watercourses, removing feeders and water stations from the range, ensuring good building maintenance and regular inspections for signs of wild bird/rodent access. It is not always possible to prevent flooding at a site, and ingress of flood water has been implicated as a source of virus in past outbreaks, but housing should be wherever possible, securely built to prevent regular ingress.

Above all, the EFSA opinion recommended that all personnel are trained in and practice good biosecurity, regardless of whether birds are housed or not, as housing cannot reduce transmission through fomite pathways as a standalone measure.

Domestic poultry

The GB poultry sector is complex and seasonally variable. There is a requirement for all poultry keepers in England, Scotland and Wales with more than 50 birds to be registered with the British Poultry Register. Therefore, any data available will not include all the backyard or smallholder community. In terms of the proportion of the sector which is raised outdoors, for the egg sector, there are circa 25-26 million free-range hens, and 1.5 million organic hens accounting for approximately. 58% of UK production. For broilers, the proportion is a lot lower, at 3-5%. For ducks around 30% are outdoor and for geese, the majority are raised outdoors.

Captive birds

Captive birds, such as those held in collections, zoos or approved bodies are already semi-housed and should be kept separate from wild waterfowl. For some, it will be difficult to prevent access to their water environment (penguins, pelicans, flamingos etc) but it is unlikely it will be possible to house indoors, so every effort should be made to prevent wild waterfowl access. There were outbreaks in captive birds in Europe (in zoos) in 2016/2017

and 2020/2120 and a derogation exists in GB domestic legislation which means birds may not have to be destroyed, unless they are in contact with the infected collection.

Ratites

Ratites, such as ostriches, cannot be housed on a long-term basis, but the susceptibility of such birds to this virus is not known at present. Ratites are often refractory to HPAI infection from other viruses. However, there has been a case in Germany of an emu showing clinical signs in a zoo and therefore these birds should also be considered susceptible.

Game birds

The majority of game birds have already been released for the shooting season and therefore are considered wild birds and outside the scope of a prevention order around housing. However, at this time of year (early March) the process of gathering up will have been completed whereby those game birds that were not shot are collected for breeding purposes. Some will still be kept in pens and could not be housed due to welfare issues; therefore, the pens themselves would need to be netted as the birds will often be able to fly out of the pens and forage locally.

Captive birds used as decoys would be at risk of increased contact with wild waterfowl. If they remain at one place for the duration of the fowling season, then they will not come into contact with domestic poultry. However, if the birds are moved around to other sites or spend any time at a premises where domestic poultry are kept, this is an increased risk for the poultry. It is illegal to release by hand captive birds for the purpose of being shot immediately after their liberation, under Part 1, Section 8 of the Wildlife and Countryside Act, 1981. Therefore, if gamebirds are released and then test positive when they have been shot, they are unlikely to have been infected at the premises of origin and more likely from contact with wild birds.

Summary

As stated above, the probability of HPAI H5 still being present in wild birds in GB this month is VERY HIGH. With the continued high number of weekly detections (figure 1) and the 782 individual positive birds recorded to 11 March 2022 is without doubt an under-ascertainment due to the reduced sensitivity of a passive surveillance programme. It is important to emphasise both the role of wild ducks and geese visiting poultry premises, and the bridging species such as gulls, corvids and other undefined bridging species. Although housing will reduce the probability of poultry exposure to wild birds and their secretions, it will not completely prevent indirect contact, particularly via fomites such as clothing, footwear, feed, and equipment that can still bring the HPAI virus into a poultry house. The number of new outbreaks is likely to be reduced by the housing order, but not eliminated as some transmission through fomite pathways will still occur.

Given the large poultry population (around 20,000 establishments) in regions close to the high aggregations of wild waterfowl (estimated at around 10% based on previous work done in 2016), the continuing increased infection pressure from wild birds, and the continued reporting of outbreaks in poultry premises and backyard flocks, we consider the likelihood of *at least one outbreak* being detected in the next month in GB to be maintained at **HIGH** where biosecurity is poor, and **MEDIUM** where good biosecurity is applied. This assessment takes into consideration the Avian Influenza Protection Zone (AIPZ), Housing Order, and assumes that bird keepers are taking the additional biosecurity measures required.

Conclusions

The detailed consequence assessment of this outbreak will not be considered in this document. Nevertheless, any outbreak of notifiable avian disease has a significant impact on GB poultry industry, through the trade and economic impacts on the producer and the sector. Total costs may be between £2 and £4 million per infected establishment, depending on the type of birds involved and time taken to complete secondary cleansing and disinfection (C&D) and return to disease free status.

At this stage of the season (early March), few migrating waterfowl are expected to enter the UK from Continental Europe even if the weather there were to deteriorate significantly in the coming weeks. If a few more birds were to fly over, this would not necessarily increase the estimated risk areas alluded to in this document, given the VERY HIGH level already assessed for wild birds. The migration season for wild waterfowl to overwinter in the UK has by and large ended, and numbers are expected to have peaked in December and January, depending on the species and the weather conditions in Continental Europe. A large population of migratory waterfowl are still present, however, and will not be leaving the UK until the end of March/early April. Furthermore, there is evidence of spread to sedentary (endemic) birds in the UK.

Regarding wild birds, endemic species are predominantly those testing positive. The survival of the virus in the environment during winter means the risk will not decrease for a period of weeks at the earliest. The higher survival rate of the virus in the environment during the colder winter months means the risk of environmental transmission remains, and hence, the continued risk of secondary spread into indigenous UK wild bird species and naïve susceptible migratory birds still over-wintered here. Higher environmental temperatures, together with increasing sunlight intensities will reduce environmental levels of H5N1 and the associated risks in the spring months. The risk of HPAI H5 infection in wild birds in GB is therefore maintained at VERY HIGH for March 2022.

The incursion into poultry premises depends on the level of biosecurity present. There are multiple pathways which can bring infection into poultry and these are not necessarily prevented by only housing birds. Events in poultry continue to be reported, with a greater number than observed in previous epizootics when lower numbers over a longer time period has been observed in terms of continued poultry outbreaks.

Direct evidence of the impact of housing suggests a two-fold reduction in risk, which is significant in terms of the number of outbreaks potentially prevented given the large number of outbreaks so far reported. The effect of housing may be underestimated because it also includes removing access to ponds which may have an additional three-fold effect. That the majority of the outbreaks happened after introduction of the housing order in already housed birds is not necessarily evidence that the housing order has not been effective. First, it is only predicted to reduce the risk by a factor of two (which would be significant given the large number of outbreaks this season) and second there are other routes of transmission other than from wild birds, for example fomite transmission from one premises to another. It should be noted that there are studies and expert opinion assessments which confirm that housing is only part of the biosecurity continuum (EFSA, 2017). Housing in addition to directly reducing contact with wild birds also enables the application of more stringent biosecurity measures. For example, a foot bath and change of clothes will be much more effective compared to when poultry have access to their ranges with wild birds able to visit their fields, water, feed and roosting areas. If good (stringent) biosecurity is applied, the risk to poultry is substantially reduced and housing of poultry will further reduce that risk. The risk of exposure of poultry across the whole GB is maintained at MEDIUM (with low uncertainty) where good (stringent) biosecurity is applied, and at HIGH (with low uncertainty) where biosecurity is poor (sub-optimal). This assessment takes into consideration the Avian Influenza Protection Zone (AIPZ) and assumes that bird keepers are taking the additional biosecurity measures required.

Housing birds which are not used to housing can cause welfare issues. Making sure their environment is enriched (e.g. with toys), that they have plenty of room to move, access to feed and water, clean bedding and the ability to display natural behaviours are all welfare priorities. For ducks, their bedding must be changed regularly (creating risk if not done in a biosecure manner) as they will mess it quickly and they need access to water so they can clean their feathers. If the birds become stressed, they may be more prone to infections or other behaviours which impact on welfare. Certain species cannot be housed for welfare reasons or because they are already considered wild: geese, ratites and gamebirds. Therefore, it is important that the benefits of housing outweigh the disbenefits and with this in mind, this assessment will be regularly reviewed.

The risk of exposure to poultry depends both on the levels of infectivity in wild birds in GB and the residual infectivity remaining in the environment. The following conditions could be used to inform a review of this document to assess when the risk levels to poultry will be reduced over the coming months. Firstly, the time of year as the number of migrant non-breeding waterfowl depart GB and migrate to their breeding grounds outside the UK; secondly, the time lapsed since the last reported case, and; thirdly, if the temperature has increased with higher sunlight levels such that the environmental contamination and transmission would be reduced. These conditions could form part of the “exit strategy” although other factors including the uncertainties listed below need to be considered. As the housing order has been applied, an exit strategy is now required, and this should also be based both on a risk assessment for wild birds and other epizootic considerations such as decay of infectivity in the environment. However, an expectation of no positive wild bird

cases could be over-optimistic even though the risk is low i.e., one case per week when surveillance sensitivity has been maximised could still represent a low wild bird risk, particularly with the expected long tail of the epizootic. Furthermore, the surveillance itself is not that sensitive as only dead birds are tested. The housing order was introduced on the basis of numerous wild bird cases and several poultry outbreaks and the same criteria in reverse could be used as an exit strategy in addition to using the three scientific conditions above to inform the risk assessment.

Assumptions and Uncertainties

- The wild bird counts for this year are not known and we are using an annual assessment based on previous years. This is likely to be similar year on year and the key point is that many birds have arrived as expected each year.
- Other wild waterfowl species (although this assessment considers the most abundant) may also be important for the transmission of this virus.
- The patterns of movement of gulls are more complex than waterfowl. They prefer to roost around landfill sites and reservoirs. Therefore, these should not be ignored as potential sites of concern for proximity to poultry farms. Frequently, on IPs to date, presence of gulls has been noted.
- The evidence for the economic benefits and dis-benefits of housing birds is not part of this assessment.
- While housing may prevent direct contact with wild waterfowl, the birds may be under stress, leading to reduced immune function, more disease transmission and greater likelihood of viral mutation (Abo-Al-Ela et al. 2021).

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