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HIGHLY PATHOGENIC AVIAN INFLUENZA (H5N1) IN EASTERN EUROPE

Working Document

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1 Summary

An outbreak of HPAI (H5N1) in domestic poultry in Asia is on-going. Following its detection in central China, southern Russia, Kazakhstan and Mongolia in mid 2005, the H5N1 virus has been confirmed in western Turkey, eastern Romania, western Russia and eastern Croatia in October 2005.

1.1 Overall conclusion

Overall, at this stage the risk assessment considers that the likelihood of further geographical spread or detection of the H5N1 virus is high. This conclusion takes into account the existing uncertainty, and the latest epidemiological developments which suggest that the H5N1 virus has been detected over broad geographic areas within a few months. This in turn increases the risk to the UK as it increases the opportunities for the introduction of the virus via various potential pathways (e.g. migrating birds, trade in live birds, movement of people).

It remains uncertain how widespread the H5N1 virus may be in Asia and Europe or beyond. It remains uncertain how the virus was introduced to any of the affected eastern European countries. It also remains uncertain whether the increasing level of detection in the wider geographic region may in part be as a result of increased surveillance following the availability of modern diagnostic techniques and heightened sensitivities about the disease. This highlights uncertainty whether the virus may have already been present in many areas of the world at a very low level either in non-commercial poultry or wild bird populations and escaped detection in the past. It remains uncertain what possible pathways may exist for the H5N1 virus being disseminated over broad geographic areas. Systematic studies are therefore required at international and national level to understand these routes, the species susceptibility, pathogenesis and ecology of the virus.

Nevertheless, the fact is that the emerging epidemiological evidence, although circumstantial so far, points to the virus continuing to be detected in dead migratory waterfowl and non-commercial domestic poultry in wider geographic regions since May 2005. The virus was detected mainly in areas that potentially provide for some contact between domestic and wild birds.

1.2 Pathways considered

The recent spread over a broad geographical region suggests existence of a potentially very mobile carrier of the virus. It is tempting to conclude that (A) migrating wild birds have at least a part to play at this stage. This risk assessment also recognises that there are several other possible pathways by which the H5N1 virus can be introduced to the UK from the affected regions. These are: (B) legal trade, (C) illegal imports; (D) intra-community trade; (E) other activities, and (F) mechanical transmission by people.

A) With regard to migratory waterfowl, the following has been considered:

For the purpose of this assessment, it is assumed that migrating waterbirds may to some extent be asymptomatic carriers of the virus, and therefore, have at least a part to play in the virus dissemination given that the current H5N1 virus detection in Eastern Europe appears to coincide with seasonal migration. It is also assumed that

the recent outbreaks in eastern Europe indicate that the H5N1 virus is getting geographically closer to the EU and the UK. Based on these assumptions, this risk assessment considers that two conclusions are possible at this stage:

- 1) There is an increased (but still low) likelihood for the introduction of the H5N1 virus to the UK from the outbreaks in the known affected countries in eastern Europe. This is based on the advice from the UK experts on migration that there is no major migration of waterbirds from these countries to the UK. However, there is a possibility that the frequency of H5N1 virus detection in wild birds may increase in these countries. Should this be the case, the experts consider that H5N1 virus may arrive to the UK at some point in the future because of the potential for limited 'mixing' at some 'contact' points between the existing waterbirds populations from this part of Europe with the populations in the EU.
- 2) The likelihood of the H5N1 virus being introduced to the UK may escalate to high should outbreaks be detected in the northern part of European Russia. This conclusion is based on the fact that outbreaks of H5N1 virus in this area would be within the direct migratory routes that exist between northern Russia and the UK and involve greater numbers of migratory waterfowl.

This risk assessment acknowledges that these two conclusions are based on much uncertainty given that currently only a few outbreaks have been reported and that migration has just begun. Nevertheless, these two conclusions will be subject to scrutiny when more structured epidemiological information becomes available within the next few months once this migration season has occurred in Europe and the European-wide surveillance in wild birds have been completed for this migratory season.

B) With regard to legal trade in poultry and poultry products from the countries where the H5N1 virus was confirmed, the following has been considered:

- 1) There is a negligible likelihood of the H5N1 virus being introduced by legal imports of live game birds and poultry and their products from the affected countries. This conclusion is based on the EU bans on imports of poultry and their products from the affected countries provided these bans are effectively applied and monitored. That is, these imports will not be admitted through any UK Border Inspection Posts (BIPs) and the same should apply at any EU border. In accordance with international trade agreements, legal imports from countries that have not reported an outbreak of H5N1 continue undisrupted subject to official veterinary certification that specific EU requirements for HPAI have been fulfilled.
- 2) There is an increased (but still low) likelihood of the H5N1 virus being introduced by legal trade in captive, wild caught birds and possibly pet birds from Third Countries. Therefore, on the basis of uncertainty about how widespread the virus is in Asia, Europe and beyond this trade is now banned from all Third Countries until options for limited trade are examined.

C) With regard to illegal imports of poultry meat and poultry products from the countries where the H5N1 virus was confirmed, the following has been considered:

- 1) There is an undeterminable likelihood of the H5N1 virus being introduced by illegal imports (live birds and personal imports). On this basis, there is a need to improve understanding of the nature and extent of illegal trade in live birds and enhance detection and prevention measures accordingly. This will also require revision of the existing quarantine requirements to enable fully controlled legal trade to resume following a ban, so as to mitigate the risk from potentially increased illegal imports.

D) Intra-Community trade

- 1) In the light of the increasing likelihood of the virus being introduced to the EU on a larger scale, this risk assessment concludes that the relevant EU rules for intra-community trade should be reviewed.

E&F) With regard to other activities and potential for mechanical transmission by the movement of people, the following has been considered:

- 1) In the light of the increasing likelihood of the virus being introduced to the EU on a larger scale, this risk assessment concludes that issues of bird markets/fairs/shows, pigeon racing and the potential mechanical transmission of the virus by the movement of people should be considered in accordance with the potentially increased knowledge on the epidemiology and disease spread and relevant expert advice.

The International Animal Health Division will continue to monitor and review the outcomes of this risk assessment and will provide an update, if required.

2 Introduction

This qualitative risk assessment considers the likelihood of the introduction of highly pathogenic avian influenza (HPAI) to the UK following the confirmed outbreaks of highly pathogenic avian influenza (HPAI) virus of H5N1 type in Eastern Europe (Western Turkey, Romania and the European part of Russia – western Russia thereof) and Croatia.

It builds on several previous qualitative risk assessments that have been carried out by Defra (<http://www.defra.gov.uk/animalh/diseases/monitoring/index.htm>) during this evolving situation in Central Asia and Turkey and Romania. These risk assessments concluded that there was an increased (but still low) likelihood of the introduction of

H5N1 virus by migratory waterbirds from the affected region to the UK during the migratory season.



Nevertheless, these risk assessments stressed that their estimates of the likelihood for the virus to be introduced to the UK should be viewed in the context of the lack of epidemiological evidence and uncertainties regarding wild birds in the breeding grounds of Russia. They also indicated that the situation will continue to be monitored and the risk assessment updated if required.

An outbreak of HPAI (H5N1) in domestic poultry in Asia is ongoing. Since its spread to southern Russia, Kazakhstan and Mongolia during the past few months, the H5N1 virus has now been confirmed in Turkey, Romania, western Russia and Croatia

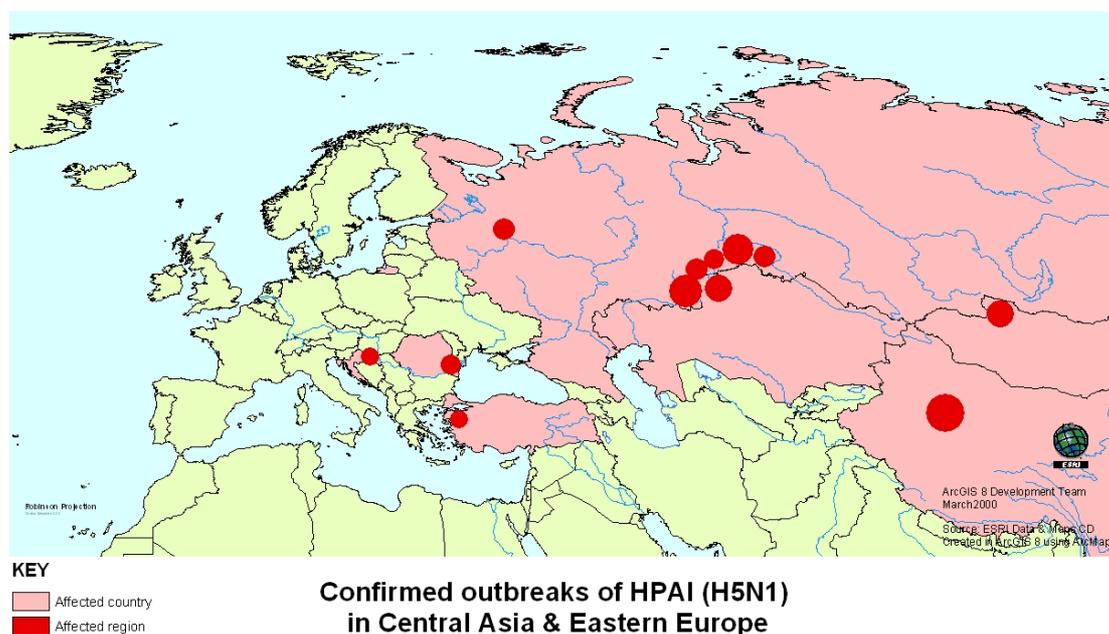
The detection of H5N1 in Eastern Europe requires that our previous risk assessment be reviewed in order to determine whether the most recent epidemiological information may have any impact on the change in the likelihood of H5N1 virus introduction to the UK.

3 Hazard identification

3.1 Outbreaks of HPAI (H5N1) – Official Disease Reports

3.1.1 Central Asia (China, Russia – southern Siberia, Kazakhstan, Mongolia)

Between May and October 2005, outbreaks of HPAI (H5N1) virus have been reported in Central Asia and Eastern Europe (see map) (OIE, 2005), and one case in a secure quarantine facility in UK which is not classified as an outbreak.



3.1.2 Eastern Europe

Following confirmed reports of H5N1 in Central Asia during the period between May and August 2005, the virus was detected in eastern Europe. The affected countries have taken appropriate control measures to contain the further spread. EU has banned imports of poultry and poultry products from countries where H5N1 virus was detected (OIE, 2005).

3.1.2.1 Turkey

Turkey has confirmed an outbreak of H5N1 in an open-air turkey farm at the beginning of October 2005. The farm is located in the Region of Balikesir, in the north-western part of Anatolia (see map). It is near to an area supporting large numbers of waterbirds in the Kus Lake. No further outbreaks have since been reported from Turkey (OIE, 2005).

3.1.2.2 Romania

Following reports from Turkey, two outbreaks of the H5N1 virus were confirmed in back-yard poultry and waterbirds (swans – species not specified) in the eastern part of Romania in October 2005. This area is near to an area supporting large numbers of waterbirds in the Danube Delta (OIE, 2005). No further outbreaks have since been reported from Romania.

3.1.2.3 Russian Federation – western Russia

A number of H5N1 outbreaks in mixed free-range village poultry (geese, ducks, turkeys and chicken) have been reported from six provinces in southern Siberia in mid 2005 (OIE, 2005).

Following these reports, a number of H5N1 outbreaks in village poultry (ducks, muskovy ducks, chicken, geese, turkeys) have been reported for the first time in western Russia (Tula province) at the end of October (OIE, 2005). No outbreaks have since been reported from the affected province. No outbreaks have since been reported in other provinces in western Russia.

NOTE: Information from the World Reference Laboratory for Avian Influenza, Weybridge, UK, suggest that the H5N1 virus detected in Turkey and Romania in October 2005 is almost identical to the virus isolated in wild birds in Central Asia in May 2005.

3.1.2.4 Croatia

On 25 October 2005, the Croatian authorities confirmed that the H5N1 virus has been confirmed in dead swans (species not stated) that have recently been discovered in eastern Croatia. Croatia has applied disease control measures in the affected area and intensified surveillance of wild waterbirds (OIE, 2005).

3.1.3 European Union

3.1.3.1 Imported captive birds in secure quarantine (United Kingdom)

The HPAI H5N1 virus was detected in a secure quarantine facility in Essex in October 2005 (Defra, 2005)

Note: The closest match is a strain identified in ducks in China earlier this year. It is not similar to the strains from Romania and Turkey

3.2 Other recent reports of suspected avian influenza

3.2.1 European Union

3.2.1.1 Greece

The Greek authorities have informed the European Union of a suspected H5 virus infection on a turkey farm on an island near to Turkish border. Further laboratory tests, including virus isolation have, excluded the H5 virus.

3.2.1.2 Sweden

The Swedish authorities informed the European Commission that a recent case of the H5 virus in a duck in Sweden was confirmed to be a mild H5N3 type (low pathogenic) of the avian influenza virus.

3.2.1.3 Germany

NOTE: An unofficial report indicate that that some 20 dead migratory birds have been found at a lake in Germany which died from poison and that an avian influenza virus has been found in two of these birds. No official information has been received from Germany on this event so far.

3.2.2 Western Asia

3.2.2.1 Iran

Iran reported a high mortality in wild waterbirds (wild ducks) in the Poldasht, coast of Arras, West Azerbaijan province in October 2005 (OIE, 2005). There is currently no information on laboratory tests that may have been carried out.

3.2.3 Asia

3.2.3.1 Nepal

The Nepalese authorities reported to the OIE that an H5 virus has been excluded as a cause of death of pigeons that were brought to a local market in the Gorkha district.

3.2.3.2 China

The Chinese authorities reported to the OIE that an outbreak of an H5 virus was reported in domestic chicken and ducks in a village located in the Inner Mongolia province of China.

NOTE: An unofficial report indicates an outbreak has been reported on a geese farm in Anhui and that outbreaks (species unspecified) have also been noted in Xinjiang and Qinghai. No official information from China is available on the OIE website so far.

3.2.4 Eastern Europe

3.2.4.1 Bulgaria

There were recent media reports on suspected AI in three birds (species not stated) found dead in north-east Bulgaria. The Bulgarian authorities have informed the European Commission that the preliminary (post-mortem) examination of these birds does not suggest infection with AI. However, further laboratory tests are underway. As a precautionary measure Bulgaria has stepped up surveillance on wild birds in the area (European Commission, 2005).

3.2.4.2 Other Balkan countries

Increased mortality in village poultry in southern part of the Former Yugoslav Republic of Macedonia has been due to Newcastle disease. However, serological testing against a panel of AI viruses indicated that one sample tested positive for influenza A virus. Further samples have been submitted for laboratory testing (OIE, 2005).

NOTE: The situation in Balkan countries remains unclear. Unofficial reports indicate that dead wild birds (information on species currently unavailable) found in Serbia and Montenegro and Bosnia and Herzegovina have tested negative for the presence of the virus.

3.2.5 North America

The Canadian Food Inspection Agency (CFIA) confirmed that three pigeons out of a shipment of 102 pigeons recently exported from Canada to Australia have antibodies to AI but not the virus. (CFIA, 2005).

3.3 Hazards to be considered

As it currently stands, it appears that the H5N1 virus is quickly spreading over large geographic areas. It should also be born in mind that the H5N1 virus may have already been present in many areas of the world at a very low level and escaped detection due to the absence in the past of sophisticated diagnostic tools that are available now.

As a working hypothesis, several risk pathways have been considered as potential hazards for the H5N1 virus introduction to the UK.

4 Risk assessment

4.1 Release Assessment

4.1.1 Terms and definitions

This release assessment considers the likelihood of HPAI virus introduction to the UK from the affected or potentially affected countries in Eastern Europe. For the purpose of the release assessment (Section 4.1) the following definitions will apply:

Term	Definition
HPAI	<i>"HPNAI viruses have an IVPI in 6-week-old chickens greater than 1.2 or, as an alternative, cause at least 75% mortality in 4-to 8-week-old chickens infected intravenously. H5 and H7 viruses which do not have an IVPI of greater than 1.2 or cause less than 75% mortality in an intravenous lethality test should be sequenced to determine whether multiple basic amino acids are present at the cleavage site of the haemagglutinin molecule (HA0); if the amino acid motif is similar to that observed for other HPNAI isolates, the isolate being tested should be considered as HPNAI"</i> (OIE, 2005a)
Waterbirds	<i>"Means those species of birds that are ecologically dependant on wetlands for at least part of their annual cycle..."</i> (UNEP, 2005)

For the purpose of the release assessment (Section 4.1) the following terminology* will apply (OIE, 2004):

Term	Definition
Likelihood	Probability; the state or fact of being likely
Likely	Probable; such as well might happen or be true; to be reasonably expected
High	Extending above the normal or average level
Highly	In a higher degree
Low	Less than average; coming below the normal level
Negligible	Not worth considering; insignificant
Remote	Slight, faint

* This risk assessment uses the OIE recommended terminology. This is important to maintain consistency in expressing estimates. Defra is aware of some concerns that have been expressed lately about the appropriateness of this terminology for practical purposes (ie. clarity for the purpose of understanding by wider non-technical audience). Defra will consider this issue in the near future.

NOTE: This qualitative risk assessment was undertaken to assist the process of identifying appropriate safeguard measures to prevent the introduction of the H5N1 virus to the UK via legal trade among other pathways specified. Any such measures must maintain appropriate level of protection (ALOP) without unduly restricting trade. The UK ALOP is that legal importation of live animals or their products from EU Member States or Third Countries must present a negligible likelihood that the diseases of concern will be introduced.

4.1.2 Potential pathways for spread of H5N1

4.1.2.1 Waterbird migration

Recent experience demonstrated that the H5N1 virus is likely to cause the death of migratory birds as a result of infection. However, limited experimental evidence suggests that the virus may be able to infect domestic ducks without causing overt clinical signs. This is yet to be proven in field conditions.

Nevertheless, as a working hypothesis, this risk assessment considers that migratory waterbirds can be infected with the H5N1 virus to a certain extent without causing overt clinical signs. This is on the basis of limited experimental evidence of a possibility of such infection in domestic ducks.

4.1.2.1.1 Likelihood of further geographical spread

Conclusion: There is a high likelihood of further geographical spread or detection of H5N1 virus on the basis of uncertainty about how widespread the virus is in Asia, Europe and beyond.

Key facts:

- a) *It remains largely uncertain how widespread H5N1 may be in Asia, Europe and beyond;*
- b) *An outbreak of HPAI (H5N1) in domestic poultry in Asia is on-going. Since its spread to southern Russia, Kazakhstan and Mongolia during the past few*

months, H5N1 has now been confirmed in Turkey, Romania, western Russia and Croatia;

- c) It is not certain how the virus was introduced to any of these countries, but the detection over a broad geographical region leads us to suspect that migrating wild birds have at least a part to play. Nevertheless, other possible pathways will have to be considered (see below sections);*
- d) It also remains uncertain whether the increasing level of detection may in part be the result of increased surveillance following the availability of modern diagnostic techniques and heightened sensitivities about the disease.*

Supporting evidence

It remains uncertain how widespread H5N1 may be in Asia and Europe or beyond. It remains uncertain how the virus was introduced to any of the affected eastern European countries.

It also remains uncertain whether the increasing level of detection in the wider geographic region may in part be as a result of increased surveillance following the availability of modern diagnostic techniques and heightened sensitivities about the disease. This highlights uncertainty about whether the virus may have already been present in many areas of the world at a very low level either in non-commercial poultry or wild bird populations and escaped detection in the past. That is, the outbreaks of the disease in domestic poultry have been reported in China, the southern part of Russia (Siberia), north-east Kazakhstan, Turkey, Romania and western Russia (OIE, 2005). On the other hand, in May 2005, the H5N1 virus was detected in dead migratory waterbirds (Ruddy shelduck, Bar-headed geese, Great black-headed and Brown-headed gulls, great cormorants) in China. In August 2005, H5N1 was confirmed in a few dead migratory waterbirds (Bar-headed geese and a Whooper swan) in the northern part of Mongolia close to the Russian border, eastern Romania (Whooper swan) and Croatia (swans – species not stated).

Nevertheless, the fact is that the emerging epidemiological evidence, although circumstantial so far, points to the virus continuing to be detected in dead migratory waterfowl and non-commercial domestic poultry in the wider geographic regions since May 2005. The virus was detected mainly in areas that potentially provide for some contact between domestic and wild birds.

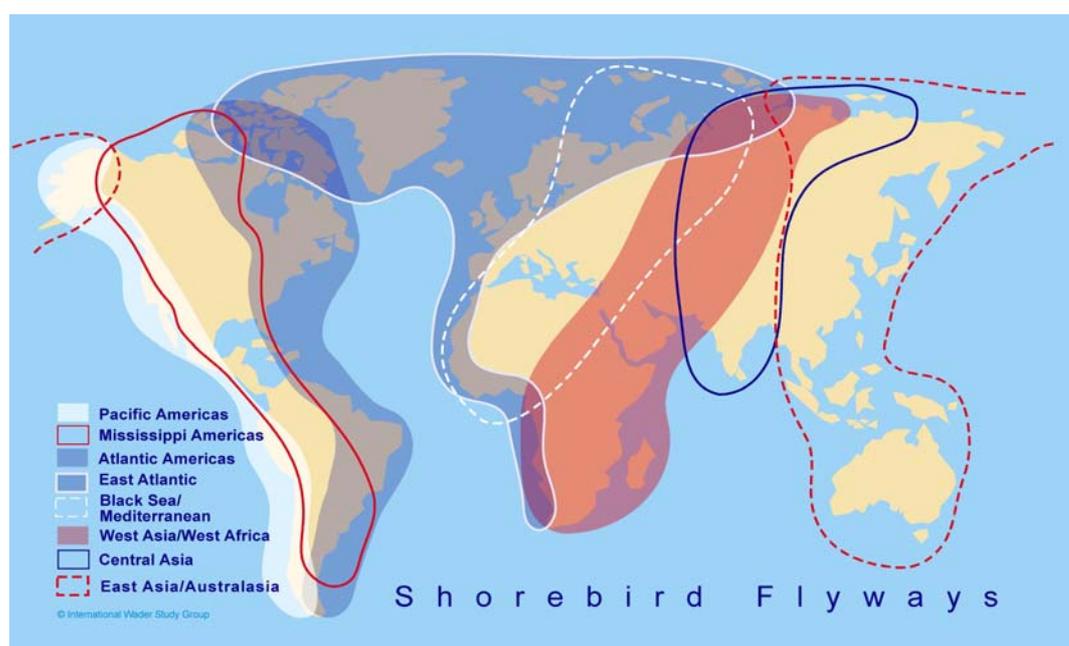
Wildbird migration is a natural phenomenon where the waterbirds “entire population or a significant proportion of the population cyclically and predictably crosses one or more national jurisdictional boundaries. Waterbirds use a wide variety of habitats during their annual cycle, from the arctic tundra, forested wetlands of the temperate taiga, forest-steppe, steppe grasslands, deserts, inland and coastal wetlands, wet and dry agriculture croplands, rivers, floodplain wetlands, marshes, lakes, tanks, ponds, irrigation tanks, sewage and waste treatment farms” (UNEP, 2005).

Wetland habitat in Siberia supports large numbers of breeding waterbirds, many of which migrate in the autumn to wintering areas in Europe, Africa, India and East and South-East Asia using various routes (“flyways”) (BirdLife International (2005). “A “flyway” is the total area used by (groups of) populations or species of birds, throughout their annual cycle, including the breeding areas, migration stop-over and

non-breeding (wintering) sites. Many of these sites tend to be highly productive and are thus also of importance to non-migratory birds and other biodiversity”) (UNEP, 2005).

For migratory waders (shorebirds) the principal flyways of Eurasia (Hötker and others, 1998; Stroud and others, 2004) are:

- The East Atlantic Flyway
- The Black Sea/Mediterranean flyway,
- The West Asia/West African flyway
- The Central Asia/India flyway,
- The East Asian-Australasian flyway.



(Map from: Stroud and others, 2004)(*)

[NOTE: (*)the map indicates existence of West Asia/West Africa flyway (in pink). It has been pointed out to us that this should be “West Asia/East Africa” flyway. Defra will seek clarification from the author of the map]

Anatidae (ducks, geese and swans) have different migration systems (Scott and Rose 1996; Miyabayashi and Mundkur 1999). For ducks especially, flyways tend to be poorly defined, and migration occurs on a broad front, typically between a number of wetland staging areas. (See also Stroud and others, 2005, for a recent review of migratory waterbird biogeographic populations).

There is no information on whether there has been systematic clinical or laboratory surveillance for H5N1 in wild migratory waterbirds or domestic poultry in the affected regions on a regular basis. It is, therefore, possible that recent awareness of HPAI has also impacted on raising the level of surveillance, hence, these cases are now more readily noticed and reported and investigated in more detail. It is hoped that more information will become available from the affected or potentially affected regions. On the other hand, increased surveillance of wild migratory waterbirds for the presence of the virus, combined with ringing data should provide a better insight on the virus ecology in migratory waterbirds, including information on their movements, respectively.

It would appear that the virus has become endemic in free range domestic ducks, certainly in countries like Thailand, Vietnam and probably some parts, if not all, of China. Therefore, there could have been some spill-over into wild waterbirds probably as a result of the extensive nature of rearing domestic ducks and their frequent movement, especially on paddy fields where they are used for pest control (Alexander, 2005). These conditions can accelerate virus transmission (Matsui, 2005) between birds and other susceptible species. Nevertheless, both past and recent work has shown that experimentally infected ducks had detectable HPAI virus in a variety of organs including the brain. This raises questions on how efficient such birds would be at travelling over any substantial distance (Alexander, 2005).

In contrast, the possibility that infection could have been carried to the region and remain undetected for two months, it is also possible that waterbirds in their breeding grounds could have acquired H5N1 virus from undetected infection in local poultry.

4.1.2.1.2 Likelihood of H5N1 spread to the UK

Our previous risk assessment emphasised that caution is required when generalising trends that may relate to carriage of the HPAI H5N1 virus or any other HPAI virus to different regions or countries because wild migratory waterbirds use different routes (flyways).

To assess the likelihood for the H5N1 virus introduction to the UK via migratory waterbirds, this risk assessment considers the following:

4.1.2.1.2.1 Wildbirds migration between Eastern Europe and the UK

Conclusion: There is an increased (but still low) likelihood of the introduction of H5N1 virus to the UK by migratory birds from the affected regions in Eastern Europe. Nevertheless, this estimate is highly likely to change to high should H5N1 be detected in northern Russia because of the existing direct migratory routes between northern Russia and the UK.

Key facts:

A) Migratory waterbirds from southern Siberia

- 1) *With regard to migratory birds moving from southern Siberia to the UK, expert ornithologists consider that:*
 - a) *Ringling recoveries indicate limited movement of migratory waterbirds between southern Siberia in Russia and the UK and from Turkey, Romania and Croatia to the UK during the migratory season;*
 - b) *It is unlikely that extreme eastern recoveries of UK waterbirds will involve birds that have travelled from southern Siberia in Russia to the UK or from Turkey, Romania or Croatia to the UK in a single winter. However, more information is required about population sizes in the area and reporting rates. The furthest east recoveries probably represent waterbirds visiting different wintering areas in different winters;*

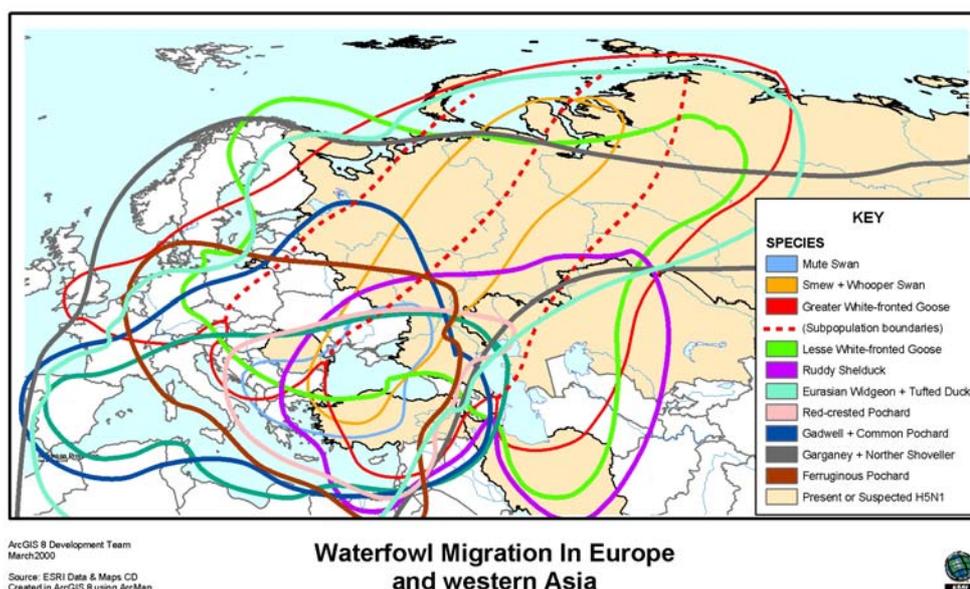
- c) *The UK plays host to only a proportion of these species' populations during the winter: the majority of individual birds breeding in Russia east of the Urals are highly unlikely to reach Britain because they winter further east in Europe, for example in the Mediterranean, and for some species in the Baltic;*
 - 2) *Because of the geographical closeness, recent outbreaks in Turkey, Romania western Russia and Croatia indicate an increased possibility that the virus may be introduced to some EU Member States that are on the major north-to-south migratory routes of the birds from southern Siberia;*
 - 3) *Currently, the H5N1 virus has not been detected in any EU Member State. Nevertheless, a possibility that it may be present, but still undetected in some EU Member States cannot be excluded;*
 - 4) *EU Member States are on high alert for the potential introduction of H5N1 to the EU and have broadened surveillance to include migratory waterbirds;*
 - 5) *Given the above, it would be reasonable to expect that the virus is likely to be detected in waterbird populations in some Member States that are geographically closer to the currently affected regions in Eastern Europe before its detection in the UK waterbirds population.*
- B) *Migratory waterbirds from northern Russia***
- 1) *With regard to migratory birds moving from northern Russia to the UK, expert ornithologists consider that:*
 - a) *The majority of many migratory species that arrive in the UK are from arctic areas of North America, Greenland, Iceland, Fenno-Scandia and further east in northern Russia;*
 - 2) *Should outbreaks of the H5N1 virus be detected in the northern part of European Russia, these outbreaks would be within the direct migratory routes that exist between northern Russia and the UK.*

Supporting evidence

Our previous risk assessment emphasised that caution is required when generalising trends that may relate to carriage of the HPAI H5N1 virus or any other HPAI virus to different regions or countries by migratory birds because they use different migratory routes (flyways).

NOTE: The map below in this section was prepared by Defra's International Animal Health Division staff and is based on information sourced from Wetlands International (Scott & Rose, 1996). It does not necessarily reflect the true situation. The map should be regarded as indicative rather than as a definitive reflection of migratory flyways between Siberia and Europe. The map was produced using ESRI Data and maps CD - 2002.

The following map outlines broad ranges of migratory waterbirds. Within these, migratory routes of ducks, geese and swans follow mainly north-to-south and northeast-to-southwest directions. Although it may appear confusing, we have produced it to highlight the possible complexity of the situation, in the first instance.



There may be some limited mixing of the waterbird populations in northern Russia from the four major flyways in Eurasia. However, it is uncertain at this stage whether there is any significant geographic and temporal overlap of these waterbird populations in northern Russia with the waterbird populations in southern Siberia.

Therefore, the level of risk, which will vary from one season of the year to another, will depend on migratory pathways, either direct from infected areas or through contact at intermediate 'mixing' points for migratory species. The evidence to quantify this risk seems to be incomplete. Systematic studies are therefore required to understand these routes, the species susceptibility, pathogenesis and ecology of the virus.

A) Southern Siberia

The Volga Basin and North Caspian regions are considered cross-roads for migratory waterbirds that use four major routes in Eurasia and East Europe. These two regions host the vast majority of migratory birds which are nesting in Eastern Fennoscandia, Northern-Central territories of the Russian plain, Ural and parts of western Siberia on their way to overwintering grounds in east Africa. A small proportion of these birds spend winters in south-western Asia. (Lvov and others 2001).

Ringed recoveries (Wernham and others, 2002) show there is some, albeit limited movement of birds between the UK and southern Russia. Therefore, the inferences about the scale and regularity of movement of birds between Southern Russia and the UK can only be preliminary and need to be treated with caution. For example, some of the extreme eastern recoveries of UK birds are highly unlikely to have travelled that far in a single winter. Rather, they may have paired with different mates in different breeding seasons and their wintering and breeding grounds may have

moved east. Lastly, the UK plays host to only a proportion of these species' populations during the winter: the majority of individuals breeding in Russia are highly unlikely to reach Britain because they winter further east in Europe, for example in the Mediterranean, and for some species in the Baltic (Cranswick, 2005)

Nevertheless, it needs to be emphasised that *“although bird banding has enabled scientists to gather very detailed information on birds, tracking the birds to understand their movements is a difficult task”* (Anonymous, 2005).

NOTE: We have been advised by experts that there is a great amount of ring recovery data. This data is held by individual schemes within the EU member states and centrally at the EU level on behalf of the different schemes for birds ringed in Europe.

We consider that it would be useful if this data could be collated and analysed on a continental and national scale to provide much more information on bird movements.

B) Northern Russia

Around 5 million waterbirds are present in Britain in winter. While some species are resident in the UK (i.e. birds present in winter that have bred here) many species arrive in the UK from arctic areas of North America, Greenland, Iceland, Fenno-Scandia and further east in northern Russia. Many of the waterbird species or populations wintering in the UK derive from northern (arctic or sub-arctic) areas and are highly unlikely to act as carriers of the virus to the UK from the current outbreaks in central Asia. Further, several species of wildfowl have a marine distribution during winter, and, remaining at sea, will therefore not come in to contact with farms or domestic livestock (Cranswick, 2005).

In their official notification to the OIE on 21 October 2005, the Russian authorities confirmed that the H5N1 virus has been confirmed in ducks, muskovy ducks, chicken, geese and turkeys on a number of backyard farms in Tula (Moscow region). At the moment, this appear to be the only report of the H5N1 virus detection in western Russia. However, should more outbreaks of the H5N1 virus be detected in wider areas of western Russia, this will impact on the likelihood of the virus introduction to the UK. That is, this changed situation could indicate that the virus may be present in migratory populations that arrive to the UK from further east in northern Russia. The expert ornithologists consider that this area would be within the direct migratory routes that exist between the northern Russia and the UK and involve greater numbers of migratory waterfowl.

The UK experienced two outbreaks of HPAI H5N1 virus in the past. The first outbreak occurred in a flock of chicken in Scotland in 1959. The second outbreak occurred in a flock of turkeys in England in 1991. These outbreaks were limited to the affected flock only. The source of infection was not identified. There were no reports of the disease in humans during these outbreaks. These outbreaks were detected quickly due to sudden and high mortality associated with the introduction of the virus and effectively dealt with at the time resulting in no further spread. The H5N1 viruses isolated in these earlier outbreaks are different to the virus currently present in Central Asia.

4.1.2.2 Third Countries – Legal trade and the likelihood of the introduction of H5N1 to the UK by other pathways

4.1.2.2.1 Live poultry and poultry products

Legal imports of all live birds and their products from countries where H5N1 has been detected have been banned. They will not be admitted through any UK Border Inspection Posts (BIPs) and the same should apply at any EU border. Therefore, direct legal importation to the UK of live birds and products from a third country known to be affected, or indirect importation to the UK of live birds and products from a third country known to be affected through another Member State to the UK is highly unlikely to occur.

NOTE: Defra also considers that there is a negligible likelihood of the H5N1 virus introduction by legal imports of live poultry and their products from countries where H5N1 has been detected. Imports of live poultry, day-old chicks and hatching eggs into the EU and the UK from countries that have not reported an outbreak of HPAI and are on the approved EU list is subject to official veterinary certification that specific EU requirements AI have been fulfilled. (e.g. HPAI must be notifiable; export farms must be specially approved on the basis of biosecurity and disease surveillance, the birds must come from areas not subject to restrictions for HPAI).

Processed feathers and, for some countries, processed (cooked) poultry meat are exceptions to the general ban. It is unlikely that the raw material would have been contaminated and in any case would have been heat treated to destroy any virus present.

4.1.2.2.2 Captive and wild birds and pet birds from third countries

Conclusion: There is a low likelihood risk of H5N1 virus arriving in the UK by captive and wild birds and pet birds. This estimate raises the possibility of a ban on importations of captive and pet birds to ensure that adequate measures are in place to mitigate the potential from an evolving risk of this magnitude.

Key facts:

- a) *It remains largely uncertain how widespread H5N1 may be in Asia, Europe and beyond;*
- b) *The recent detection of a highly pathogenic avian influenza in a consignment of captive birds has highlighted uncertainties related to species susceptibility.*
- c) *There is potential for illegal movements of birds from the affected areas to unaffected areas which may result in arrival of potentially infected birds to the UK presented as legal consignments from unaffected areas. Therefore the UK has called for a ban on importations of captive birds from all countries with a possibility of derogation on a country by country basis;*
- d) *In order to make this ban effective it is also necessary to suspend imports of pet birds because the concession for fewer than 6 birds could be exploited as*

a loophole for unscrupulous traders. However, this could have a disproportionate effect on EU citizens;

- e) *Therefore, the UK asked the European Commission to come forward with a proposal for strict, harmonised rules for importation of genuine pets and a Decision was passed on 25 Oct 2005.*

Supporting evidence:

A) Captive and wild caught birds

Imports of captive birds are normally permitted from any country which is a member of the World Organisation for Animal Health (Office International des Epizooties, Paris, France - OIE). This could include Asian or African countries where H5N1 virus has been introduced but has not yet been detected.

Although this trade is highly regulated, the detection of the H5N1 virus in a UK quarantine indicates that this trade poses a plausible pathway for its introduction into unaffected countries. As H5N1 continues to be detected over large geographic areas, the risk that a small error or oversight in the quarantine facility could lead to the introduction of the virus and its possible escape cannot be discounted. This possibility is difficult to quantify.

Captive birds (other than parrots and poultry of any species) intended for 'exhibition, show or contest' may be traded from a registered establishment in a member state on the basis of an owner's self-certificate. These include waterbirds. It is more likely that undetected infection could be present in such birds than for farmed poultry because there is no pre-export veterinary inspection or certification.

This trade would appear to present a low likelihood of the disease being introduced into the UK while there is no evidence of H5N1 being present in other EU Member States.

B) Pet birds

Imports of pet birds are not subject to harmonised EU rules. Great Britain requires 35 days domestic quarantine and two official veterinary inspections after arrival (but no tests) for birds from all third countries.

Individual import licences are issued by local Divisional Veterinary Managers. No central record is kept of these licences.

Other Member States set their own conditions for pet bird imports. It is possible that another Member State may admit a pet bird from a high risk country (other than one which has an explicit ban) with minimal conditions.

4.1.2.3 Third Countries – Illegal imports and the likelihood of the introduction of H5N1 to the UK by possible pathways

4.1.2.3.1 Captive, wild caught and pet birds

Conclusion: There is an increased likelihood that illegally imported live birds may be infected with H5N1 given the recent geographical dispersal of the virus. This likelihood might be further increased if a ban on currently legal trade were introduced.

Key facts:

- a) *The risk that illegal trade may be one of the potential routes for the virus introduction to the UK of illegal trade has always been present. This risk is difficult to quantify;*
- b) *The UK recent experience with H5N1 virus detected in a legally imported parrot highlighted a possibility of the virus introduction by this pathway;*
- c) *There is potential for illegal activities that may result in arrival of potentially infected birds to the UK as legal consignments. Therefore the UK has called for a ban on the import of captive birds from all countries with a possibility of derogation on a country by country basis;*

Supporting evidence: There is lot of uncertainty related to illegal imports of captive birds to the UK. Therefore, Defra has always maintained that this risk is undeterminable.

The illegal import of live birds from the affected areas and their neighbouring areas pose a risk, the scale of such risk depending upon the scale of the trade which in turn seem difficult to quantify. Therefore, these imports will also have to be considered as a potential mechanism for the virus to spread. Whether coincidentally or not, it is noticeable that the recent outbreaks in western Siberia broadly occurred in the regions through which the main Trans-Siberian railway lines pass. Some consider (Chu and others, 2005) that illegal hunting and catching of wild waterbirds in the two bird reserves in China (Quinghai lake and Zhalong reserve) are still happening. The most recent unofficial reports indicate that H5N1 virus was detected in captive birds that have been smuggled by ship from China to Taiwan.

Although the H5N1 virus has not been isolated from apparently healthy wild waterbirds in Mongolia in August 2005 and Hong Kong in January 2005, it has been isolated from two crested hawk-eagles from Thailand that were seized at Brussels International Airport in 2004. The birds showed no apparent clinical signs of the disease. However, necropsy indicated that both eagles suffered from enteritis and one of them had bilateral pneumonia. This study highlights the notion that *“international travel and smuggling represent major threats for introducing and disseminating H5N1 virus worldwide”* (Van Borm and others, 2005).

Therefore, there would be a need to consider improving intelligence gathering in order to get a better handle on what the illegal trade in live birds looks like and enhance detection and prevention measures accordingly. There would also be a need to consider revising quarantine requirements/measures to enable fully controlled legal trade to resume following a ban, so as to mitigate the risk from increased illegal trade.

4.1.2.3.2 Other illegal imports

Conclusion: There is an indeterminable likelihood of the introduction of H5N1 virus to the UK by illegal imports of meat/meat products

Key assumption:

- a) *Illegal movements of poultry meat/meat products pose a risk for the introduction of the disease from any infected countries worldwide;*
- b) *The risk of the introduction of H5N1 to the UK via illegal imports from the affected countries exists and is difficult to estimate.*

Supporting evidence

We cannot rule out the possibility that poultry and poultry products may be imported illegally to the UK from any country and may contain HPAI virus.

Attempts to illegally import meat as personal imports have been recorded from many countries. As with all disease agents, illegal imports from worldwide infected countries give rise to a constant, background risk of infection. Refrigeration of illegally imported meat is unlikely and makes detection by enforcement authorities more likely. The risk associated with the illegal personal import of poultry meat appears to be negligible because it is highly likely that the meat will be cooked. The virus has been recovered from fresh duck meat (Tumpey and others, 2002). However, cooking temperatures for consumption purposes (usual temperature above 70°C) are considered sufficient to destroy the virus.

Large-scale commercial illegal imports of poultry may be attempted from any country using false or forged documentation. However, thorough documentary checks and awareness at Border Inspection Posts (BIPs) that this may happen are likely to mitigate this type of risk. The information on these intercepted consignments must also be entered in the EU electronic notification system for trade in live animals and their products (Trade Control and Expert System – TRACES).

4.1.2.4 Intra-Community trade - Likelihood of the introduction of H5N1 to the UK

4.1.2.4.1 Possible detection of H5N1 in an EU Member State

Conclusion: There is an increased likelihood of the H5N1 virus being introduced to the EU on a larger scale. The EU rules should be reviewed to ensure that adequate measures are in place to mitigate the potential for further spread.

Key facts:

- a) *EU rules for movement of traded birds within the single market have proved adequate in the face of isolated outbreaks;*
- b) *The recent detections of the virus in Turkey, Romania, western Russia and Croatia have increased the risk of the virus introduction to many EU Member States because of the geographical proximity.*

Supporting evidence:

H5N1 is not currently known to exist in the UK or any other EU Member State. All EU Member States are understood to have effective systems for disease surveillance, notification and reporting. Given the geographic proximity, this risk is now increased, but could change at any time if disease is detected within the EU. This raises questions about intra-community trade in live birds.

Intra-community trade in live birds relies on monitoring and detection of disease at source, rather than on controls at or post-import. Therefore, intra-Community trade in live birds would seem to present an increased risk because of possible trade in live birds from premises where disease has been introduced but remains undetected.

In the recent past, HPAI of a different virus H (H7N7) type has been detected in three EU Member States (the Netherlands, Germany, Belgium) and was dealt with effectively without further spread to other Member States. Similarly, mild strains of avian influenza (low pathogenic avian influenza – LPAI) outbreaks in Italy have been contained effectively using vaccination in the affected areas.

Much trade is in high health status breeding birds or commercial poultry which should have been kept under conditions of high biosecurity. However, game birds (including ducks) could be wild caught or reared in open pens. The recent Newcastle disease outbreak in pheasants, legally imported to the UK from France, highlights the risk that disease may enter a holding and that birds may be traded before the disease is detected.

The official veterinary services are responsible for certifying that the holding of origin of birds is free from notifiable disease. They then notify the local Animal Health Divisional Office at the point of destination in the UK so that post-import checks may be carried out. This is done using the TRACES computer system. In Great Britain, the State Veterinary Service checks a proportion of consignments based on risk.

4.1.2.4.2 Other pathways

4.1.2.4.2.1 Bird markets and bird fairs/shows

This issue should be considered in the light of the disease spread; expert advice on bird migration and illegal trade. This would enable these events to proceed only on the basis of a veterinary risk assessment and subject to strict conditions.

4.1.2.4.2.2 Pigeon racing

The 2005 racing season has now finished. Racing takes place from April to October. Birds are released in western Europe to fly home to the UK. In the event of H5N1 being confirmed in an EU Member State restrictions would have to be considered proportionate to the risk.

4.1.2.5 Mechanical transmission by the movement of people

As with any disease outbreak in any country, there is a low likelihood that the movement of people could transmit the pathogen by mechanical transfer or through themselves being infected.

In the case of H5N1 virus, categories of people which could present a risk for the virus introduction to the UK are likely to be:

- UK farm workers on holiday to countries where the H5N1 virus has been confirmed (high-risk countries),
- Migrant workers from high-risk countries working on UK livestock farms
- Military personnel,
- Tourists, particularly any staying in the countryside or visiting bird markets in high-risk countries,
- Hunters, birdwatchers or anyone else who goes out of their way to contact wildlife in high-risk countries and who then come into contact with birds in the UK.

Defra, the Department of Health and the Health Protection Agency are working together to ensure that the risk of human mechanical transmission from birds is addressed adequately through biosecurity on farms and other places where poultry are kept.

NOTE: Defra has been advised that the Royal Society for Protection of Birds have undertaken to consult the relevant veterinary authority over measures necessary to reduce the risk of mechanical transmission, should an outbreak be confirmed on one of their reserves.

5 Conclusions

An outbreak of HPAI (H5N1) in domestic poultry in Asia is on-going. Since its spread to southern Russia, Kazakhstan and Mongolia during May to August 2005, the H5N1 virus has been confirmed in Turkey, Romania, western Russia and Croatia in October 2005. It is not certain how the virus was introduced to any of these eastern European countries. However, it should also be borne in mind that the increasing level of detection may simply be the result of increased surveillance following the availability of modern diagnostic techniques and heightened sensitivities about the disease.

With regard to:

5.1 An overall likelihood of further geographical spread

Overall, at this stage the risk assessment considers that the likelihood of further geographical spread of the H5N1 virus is high. This conclusion takes into account the existing uncertainty, and the latest epidemiological developments which suggest that the H5N1 virus has been detected over a broad geographic areas within a few months.

This in turn increases the risk to the UK as it increases the opportunities for the introduction of the virus via various potential pathways (e.g. migrating birds, trade in live birds, movement of people).

5.2 Likelihood of H5N1 spread to the UK

5.2.1 Wildbirds migration between Easter Europe and the UK

There is an increased (but still low) likelihood of the introduction of H5N1 virus to the UK by migratory birds from the affected regions in Eastern Europe.

Nevertheless, this estimate is highly likely to change to high should H5N1 be detected in northern Russia because of the existing direct migratory routes between northern Russia and the UK.

5.2.2 Third Countries – Legal trade

5.2.2.1 Live poultry and poultry products

Defra also considers that there is a negligible likelihood of the H5N1 virus introduction by legal imports of all live birds and their products from countries where H5N1 has been detected. These imports have been banned from the affected countries and will not be admitted through any UK Border Inspection Posts (BIPs). The same should apply at any EU border.

5.2.2.2 Captive, wild caught and pet birds

There is a low likelihood risk of H5N1 virus arriving in the UK by captive and wild birds and pet birds. This estimate raises the possibility of a ban on importations of captive and pet birds to ensure that adequate measures are in place to mitigate the potential from an evolving risk of this magnitude.

5.2.2.3 Illegal imports

5.2.2.3.1 Captive, wild caught birds and pet birds

There is an increased likelihood that illegally imported live birds (captive, wild caught or pet birds) may be infected with H5N1 given the recent geographical dispersal of the virus. This likelihood might be further increased if a ban on currently legal trade were introduced.

5.2.2.3.2 Other illegal imports

There is an indeterminable likelihood of the introduction of H5N1 virus to the UK by illegal imports of meat/meat products

5.2.3 Intra-Community trade

5.2.3.1 Possible H5N1 detection in an EU Member State

There is an increased likelihood of the H5N1 virus being introduced to the EU on a larger scale. The EU rules should be reviewed to ensure that adequate measures are in place to mitigate the potential for further spread.

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In the event of H5N1 being confirmed in an EU Member State restrictions would have to be considered proportionate to the risk.

5.2.4.3 Mechanical transmission by the movement of people

As with any disease outbreak in any country, there is a low likelihood that the movement of people could transmit the pathogen by mechanical transfer or through themselves being infected.

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