



Addressing avian influenza A(H7N9)

Emergency risk assessment summary

Issue no. 1



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1. BACKGROUND

- On 31 March 2013, the Chinese authorities reported the identification of a new strain of avian influenza A(H7N9) virus in three people displaying flu-like symptoms in Shanghai City and Anhui Province; all of these people died. This particular strain had never been identified in humans or poultry before.
- By 30 May 2013, a total of 132 human cases had been confirmed,¹ including 37 deaths, in the 11 provinces/municipalities of Anhui, Beijing, Fujian, Henan, Hunan, Jiangsu, Jiangxi, Shandong, Shanghai, Taiwan Province of China and Zhejiang. Although exposure prior to the onset of symptoms was not identified in each of the cases, many of them reportedly had contact with poultry, through either market visits or slaughter and transportation activities.
- Guangdong Province is the only province where the virus was found without any human cases – in two chickens in two markets.
- As of 30 May 2013, no clinical disease involving avian influenza A(H7N9) had been reported in domestic poultry or

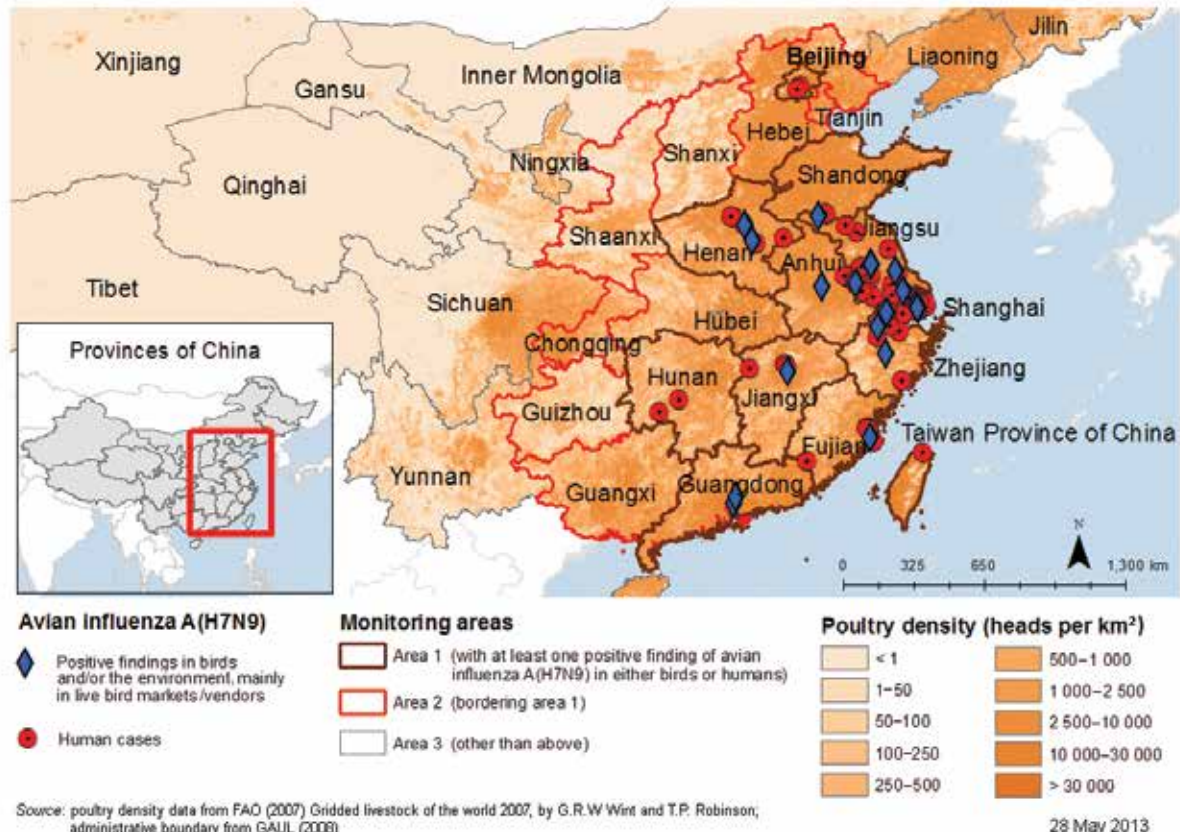
other potentially susceptible animal species (wild birds and pigs) in China.

- The Chinese authorities detected avian influenza A(H7N9) virus in surveillance samples taken from chickens, ducks and pigeons (captive-bred and feral), mostly at live bird markets (LBMs) and from poultry vendors linked to human cases. Reports indicate that none of the birds testing positive showed clinical signs.
- Surveillance activities are continuing, including environmental and poultry sampling in LBMs, and environmental, wild bird and poultry sampling at the farm level. As of 23 May, 197 389 swab samples had been tested by the veterinary authorities, of which only 53 were found positive for avian influenza A(H7N9) virus.
- The reservoir of the virus and the source(s) for the human infections remain unclear, although historical evidence and the detection of virus in poultry in markets strongly suggest poultry as the most likely reservoir. Avian influenza A(H7N9) seems to have originated from a reassortment of several viruses of avian origin:
 - » The gene coding for the H protein derives from a Eurasian avian virus, but differs from known circulating strains.
 - » The gene coding for the N protein derives from avian H11N9 virus circulating in Eurasian wild birds, with some genetic distance from the nearest known ancestor.
 - » The gene codings for the non-structural proteins derive from H9N2 viruses, most likely from poultry. The close

1. Plus one asymptomatic human case found via active surveillance.



Avian influenza A(H7N9) human cases and positive findings in birds and the environment, mainly in live bird markets / vendors



relationship between the internal protein genes in avian influenza A(H7N9) and in recent H9N2 viruses suggests that the reassortment is relatively recent.

- Genetic analysis suggests that avian influenza A(H7N9) can infect mammalian cells and shows that it has low pathogenicity in chickens. Laboratory experiments show that the intravenous pathogenicity index for chickens is zero.
- So far, no sustained human-to-human transmission has been reported by the World Health Organization (WHO). Known contacts with human cases are being investigated. According to a WHO risk assessment released on 13 April 2013, “two possible family clusters that were investigated suggest that limited human-to-human transmission may occur where there is close contact between cases and other individuals, as occurs in family and, potentially, healthcare settings”.

2. MAIN RISK QUESTIONS ADDRESSED

- What is the likelihood of the avian influenza A(H7N9) virus spreading from an infected farm to an uninfected farm within affected areas of China?
- What is the likelihood of the avian influenza A(H7N9) virus spreading from a known affected area to a moderate- to high-risk² area?
- What is the likelihood of the avian influenza A(H7N9) virus spreading from an affected area to a low-risk³ area?
- What is the likelihood of a human becoming exposed to the avian influenza A(H7N9) virus from a potentially infected bird within affected areas of China?

3. MAIN ASSESSMENTS

Question 1: What is the likelihood of the avian influenza A(H7N9) virus spreading from an infected farm to an uninfected farm within affected areas of China?

- The highest likelihood* of spread within already affected areas is associated with the risk pathways that involve *LBM*s, trade in live birds, illegal or illicit movements of live birds, and fomites.
- Moderate likelihood* of infection of domestic poultry flocks within an affected area is through movements of day-old chicks (DOCs) and fighting cockerels. It is unclear whether DOCs will have the opportunity to become infected, and whether the virus could survive high temperatures in the incubator.
- Low likelihood* is associated with many other potential risk pathways, including humans as a source of infection to poultry (note that soiled clothes and footwear can act as vehicles for the introduction of the virus to clean premises)

- Moderate-risk areas or countries are unaffected areas or countries that import live birds or bird products from areas or countries that import live birds or bird products from at least one infected area or country and/or that have migration stopover sites (depending on the season) of wild bird species known to be the main natural reservoir of low pathogenic avian influenza (LPAI) viruses. The cross-border trade of live birds and bird products may include historical or existing, formal or informal trading activities. High-risk areas or countries are unaffected areas or countries that share a land border with at least one infected area or country or that have formal or informal imports of live birds or bird products (including historical trading activities) with at least one infected area or country.
- Low-risk areas or countries are unaffected areas or countries that are not classified as high-risk or moderate-risk.

and transmission through hatching eggs, wild birds or sporting birds. The uncertainty varies with each of these pathways.

- The likelihood of virus spread through *unprocessed animal by-products or products of animal origin* will vary from very low to negligible, depending on cultural traditions and uses, but is generally considered to be *very low*.
- Please note that the likelihood of virus transmission to poultry flocks through processed animal by-products and hatching eggs has been found to be negligible and does not merit further consideration as a risk pathway within affected areas.

Question 2: What is the likelihood of the avian influenza A(H7N9) virus spreading from a known affected area to a moderate- to high-risk area?

- *The highest likelihood* of virus spread to poultry within these regions is associated with *LBM, live poultry movements, and informal/illegal movements of birds*.
- *Moderate likelihood of virus spread is associated with fomites, wild birds and fighting cockerels*. Climatic conditions (such as hot/dry weather) can decrease the survival time of influenza viruses on fomites and affect the likelihood of transmission. Wild birds are a risk factor because of their movements across country borders in flyways, as biosafety measures do not prevent the introduction of wild birds. There is uncertainty about the role that migratory birds will play, but it is likely that there is no difference in risk between high- and moderate-risk countries.
- The likelihood of virus spread through *legal/illegal trade*

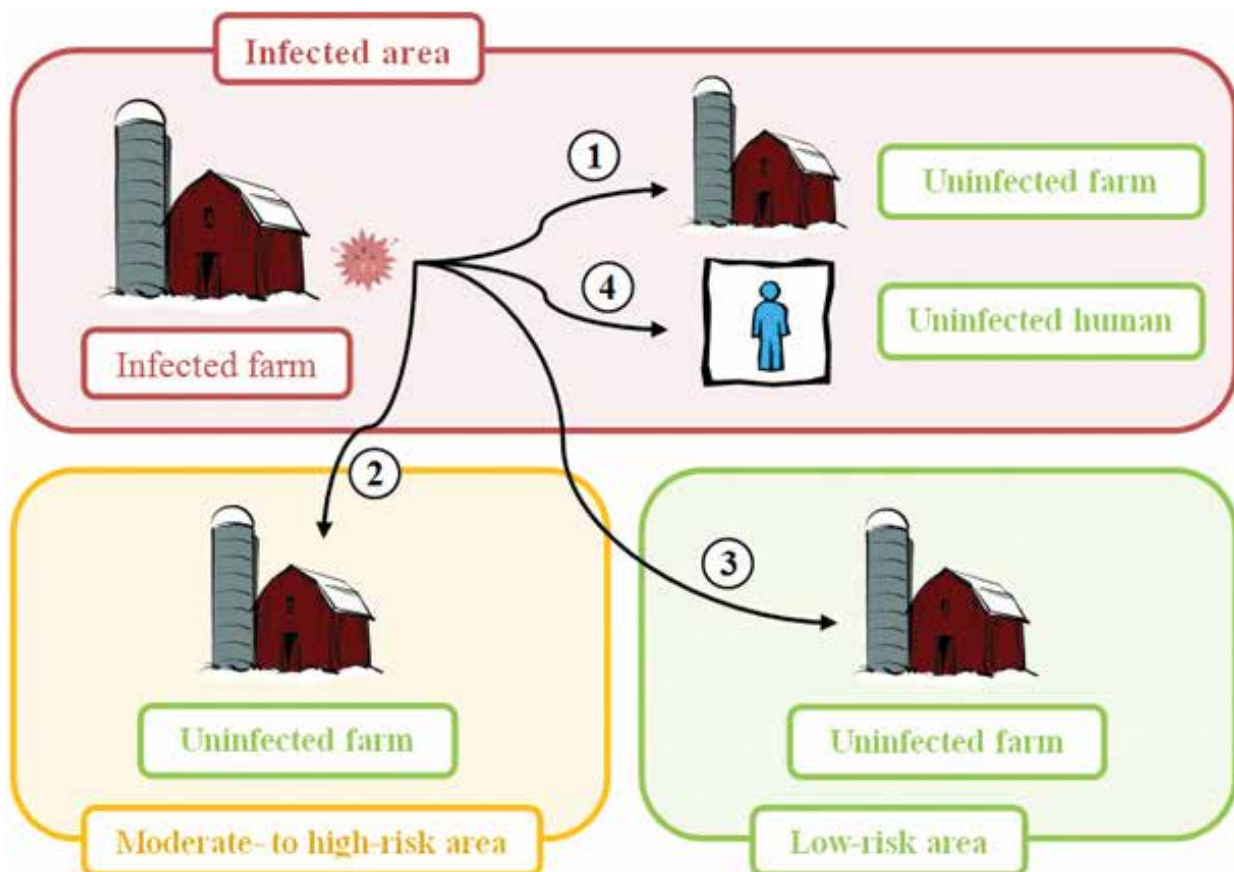
in bird by-products or products of bird origin, and trade in live animals of other potentially susceptible species is considered low.

Question 3: What is the likelihood of the avian influenza A(H7N9) virus spreading from an affected area to a low-risk area?

- By definition, a low-risk uninfected country or area does not trade directly with affected or high-risk unaffected countries or areas. However, illegal trade of live poultry, DOCs, hatching eggs, poultry semen, animal by-products or products of animal origin from a farm within an affected area cannot be excluded, and infected birds may be traded in good faith given that they show no clinical signs. *Live poultry and DOCs* may both be considered as posing a *low likelihood* of virus spread, while the likelihood of virus spread through *hatching eggs* can be seen as *negligible*. The overall likelihood associated with the trade of live birds or bird products is considered negligible.
- *The likelihood associated with migratory movements of wild birds* cannot be excluded, and is *moderate* in low-risk countries. Although immediate spread may not be seen during the current migration season, virus amplification could be rapid at crowded stopover sites and may enable future long-distance virus spread.
- The risk of this virus spreading through trade is highly dependent on the regulatory frameworks applied in low-risk countries.

Question 4: What is the likelihood of a human becoming exposed to the avian influenza A(H7N9) virus from a potentially infected bird within affected areas of China?

Main risk questions addressed by the qualitative risk assessment



- To date, epidemiological investigations indicate that exposure of humans appears to be associated with direct or indirect contact with live bird species, especially in an LBM or poultry transport setting, or with direct contact with fomites (such as crates for transporting poultry).
- Likelihood of *exposure of humans* is considered *high* in affected areas; such exposure can occur through aerosol or water particles because virus transmission from potentially infected birds is mainly via the oropharyngeal route.

4. MAJOR DATA GAPS IDENTIFIED BY THE RISK ASSESSMENT

More information will be needed to conduct a more comprehensive risk assessment on avian influenza A(H7N9) at the national and regional levels. The important data gaps are:

- » surveillance results (positive and negative) for a wide range of samples from both active and passive surveillance;
- » prevalence at the local, national and regional levels;
- » market chain analysis;
- » the economic impacts of this event on poultry producers, markets, meat production, etc.;
- » virus characteristics (survival time, infectious dose, species range, etc.).

5. CONCLUSIONS ON THE POTENTIAL SPREAD OF THE AVIAN INFLUENZA A(H7N9) VIRUS

- It seems *most likely* that the virus will spread within and beyond the currently infected areas through LBMs and movements of live birds, unless measures are taken to

prevent this spread. Please refer to the *Risk management document* for further information. [available at <http://www.fao.org/docrep/018/aq241e/aq241e.pdf>]

- Illegal/illicit trade in live birds poses a serious risk for countries or provinces, even those attempting to minimize movements of live birds from affected areas.
- The likelihood of avian influenza A(H7N9) spreading to other poultry flocks within the currently known affected provinces, or to unaffected areas, through meat or eggs for human consumption is *very low*. Once poultry products have been cooked the risk becomes *negligible*.
- Importing countries should follow international standards for the importation of live animals or animal by-products from affected regions, including biosecurity requirements for the cleaning and disinfection of containers and transport. Please refer to the *Risk management document* for further information. [available at <http://www.fao.org/docrep/018/aq241e/aq241e.pdf>]
- The likelihood of avian influenza A(H7N9) spreading from currently affected regions to poultry in other geographic areas through migratory wild bird movements is difficult to assess at this stage owing to gaps in knowledge, but is estimated to be *moderate* for countries along migration flyways and with major stopover sites in poultry-dense areas.
- There is *negligible* likelihood resulting from the consumption of properly prepared and cooked meat, including meat from both poultry and game birds. Safe handling of these foods during preparation will minimize the risk posed to human populations. Occupational exposure during the transport and handling of live birds and unprocessed poultry products represents a *high* likelihood for human exposure if the birds are infected and if general hygiene and biosecurity measures are not followed.

CONTACT ☺))

The Emergency Prevention System (EMPRES) is an FAO programme, founded in 1994, with the goal of enhancing world food security, fighting transboundary animal and plant pests and diseases and reducing the adverse impact of food safety threats. EMPRES-Animal Health is the component dealing with the prevention and control of transboundary animal diseases (TADs).

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EMPRES-Animal Health can assist countries in the shipment of samples for TAD diagnostic testing at a FAO reference laboratory and reference centre. Please contact Empres-Shipping-Service@fao.org for information prior to sampling or shipment. Please note that sending samples out of a country requires an export permit from the Chief Veterinarian's Office of the country and an import permit from the receiving country.



This summary of the preliminary risk assessment is based on the information available to date and will be reviewed as new findings emerge from field investigations, laboratory testing and epidemiological studies at both the animal and human levels.

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