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**Qualitative risk assessment for introduction of highly pathogenic avian influenza H5N1 virus to Uganda**

Ejobi F1\*, Ocaido M1, Odoch T1, Sserugga J2, Nantima N2 and Rutebarika C2

1College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University, Kampala, Uganda

2Ministry of Agriculture, Animal Industry and Fisheries, Entebbe, Uganda

**\*Corresponding Author Address:** College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University, P.O. Box 7062, Kampala, Uganda. E-mail: ejobifrancis@gmail.com, Tel: +256-772-492236

**Abstract**

A qualitative risk assessment study was done from January to April 2013. The risk question addressed was “What is the risk of introduction of highly pathogenic avian influenza (HPAI) H5N1 virus to Uganda through wild migratory birds and cross border trade in live poultry and poultry products. The OIE framework for risk assessment was used. Emphasis was, however, laid on exposure assessment. The study involved content analysis of unclassified government reports, key informant interviews and expert opinion consultations. We estimated the risk of introduction of HPAI H5N1 virus through cross border movement of live poultry or poultry products from South Sudan to Uganda as very low with a low level of uncertainty. Furthermore, we also estimated the risk of introduction of HPAI H5N1 to Uganda through migratory wild birds as medium with a high level of uncertainty. The major risk increasing factors for the spread of HPAI H5N1 virus from migratory wild birds to resident poultry and humans included mixing of migratory wild birds with domestic poultry; abundance and spatial distribution of breeding sites; and in some communities, migratory wild birds are hunted and consumed. To prevent introduction of HPAI virus to Uganda, we recommend enhanced veterinary capacity in the whole country; heightened risk-based surveillance programs, especially in the high risk districts; and strengthened biosecurity measures in poultry farms in the high risk districts.

**Key words:** Qualitative Risk Assessment, Highly Pathogenic Avian Influenza Virus, Uganda

**Introduction**

As of January 2013, no outbreak of HPAI had occurred in Uganda. Though that was good news for the people of Uganda, the country was at risk of introduction and establishment of HPAI given that outbreaks occurred in other African countries including South Sudan, Nigeria, Ghana, Egypt, Djibouti, South Africa, Burkina Faso, and Togo. Outbreaks have also occurred elsewhere in the world especially in South East Asia. This potential risk is heightened by real-time cross-border mobility of people, trade in live poultry and poultry products, migration of wild birds, low level farm bio-security in poultry production systems as well as constrained national veterinary infrastructure and service delivery. Of the countries that share borders with Uganda, HPAI outbreak has been reported only in South Sudan. Uganda has very close trade and cultural relations with South Sudan.

The poultry industry in Uganda contributes significantly to household food security and livelihoods, especially in rural areas. The total poultry population is estimated at 52 million, while the per capita consumption of poultry meat is estimated at 2.5 kg/person/year (1). The demand for poultry meat is estimated to grow at a rate of 3% per year. In rural areas, the average number of chicken kept per household ranges from 10 to 15, depending on the region. Indigenous chicken contribute the largest proportion of the poultry population, comprising about 88% of the national flock. They are highly praised for their adaptation to harsh environments where resources are often limited and where challenges imposed by climatic conditions, pathogens and predators are severe. They are utilized for several purposes simultaneously and therefore outperform specialized commercial breeds when scored for multipurpose productivity such as food security, immediate cash needs and cultural rites, among others (2). Therefore, any disruption of indigenous chicken value chain through introduction of HPAI would greatly harm rural livelihoods in Uganda.

This study was conducted to generate snapshot scientific risk-based evidence to support informed decisions by the Government of Uganda on actions for preparedness and response to HPAI. The specific objective of the study was to evaluate the likelihood of entry, establishment and spread of HPAI in Uganda.

**Methodology**

The study was conducted from January to April 2013. The risk question addressed was “What is the risk of introduction of highly pathogenic avian influenza (HPAI) H5N1 virus to Uganda through wild migratory birds and cross border trade in live poultry and poultry products. The OIE framework for risk assessment was used (3). Emphasis was, however, laid on exposure assessment. The methods utilized included content analysis of unclassified government reports, key informant interviews and expert opinion consultations. The government reports that were analyzed were sourced mainly from the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Ministry of Trade, Industry and Cooperatives (MTIC) and Uganda Bureau of Statistics (UBOS). Permission to use these reports was obtained from relevant government officers. A total of 36 key informants were interviewed using a structured checklist that inquired mainly cross-border trade in poultry and poultry products, animal movement controls, and provision of veterinary services. The key informants comprised of border immigration officers, district veterinary officers, police officers, poultry keepers, local council chairpersons, district marketing officers, border post revenue officers, village elders, poultry farmers, and poultry traders. The Uganda-South Sudan border districts that were visited for key informant interviews and ground truthing were Koboko, Kitgum, Lamwo, and Adjumani. In addition to Ugandan key informants, officers at the Directorate of Vector Control and Disease Control in the Government South Sudan were interviewed, mainly to inquire on the last HPAI H5N1 outbreak in Juba, provision of veterinary services, and trade in poultry and poultry products between Uganda and South Sudan. Information on migratory birds was obtained through interviews with officers from Uganda Wildlife Authority (UWA) and Nature Uganda. Expert opinion was sought from four (4) select academics at Makerere University, Uganda. Major supermarket chains in Kampala, the capital city of Uganda, were also visited to ascertain the source of poultry and poultry products they sold. We interpreted the qualitative risk categories and uncertainty levels according to the description given by the European Food Safety Authority (4).

**Results and Discussion**

Records at the Ministry of Trade, Industry and Cooperatives showed that Uganda imports chicken and chicken eggs mainly from Brazil, South Africa, Kenya, Tanzania, and India (5MTIC, 2013). However, our survey of major supermarket chains including Nakumatt, Shoprite and Tuskys showed that dressed poultry and eggs were also imported from Belgium and Denmark. Though there were no official records on trade between Uganda and the Democratic Republic of Congo (DRC), there was evidence that poultry from Odramachaku livestock market in the DRC is brought to Arua district in Uganda. Furthermore, chicken and eggs from the DRC are also traded with the western districts of Uganda through Bwera border post.

Interviews with officers in the Directorate of Vector Control (South Sudan) revealed that the last outbreak of HPAI H5NI occurred in August 2006 in Juba County, in Juba, the capital city of South Sudan. That outbreak was confirmed by FAO. It affected chicken predominantly reared under the backyard system. The control measures instituted during that outbreak included a ban on importation of poultry into South Sudan from Uganda, DRC and Sudan; quarantine of chicken from Juba county; isolation of sick chicken from healthy ones, and also isolation of ducks from chicken; and awareness creation through radio, television, songs, workshops and leaflets. The main veterinary service providers in South Sudan are sourced from government, private individual veterinary practitioners as well as veterinarians employed by International Non-governmental Organizations (INGOs) like *Veterinaries San Frontiers* (VSF) Belgium. The government of the Republic of South Sudan does not have any animal traceability system. Furthermore, there is no policy to compensate poultry farmers in case of mass culling of poultry. There is, however, a cross-border cooperation mechanism between Uganda and South Sudan to control trans-boundary animal diseases. However, this cooperation largely remains unimplemented. There are animal check points along major roads, for example, in Nimule and Kaya. The population of poultry in South Sudan is currently estimated at 20 million. As of March 2013, official records showed that no live poultry or poultry products from South Sudan are moved across the border and traded in Uganda. However, amongst border tribal communities in South Sudan and Uganda, exchange of live poultry as gifts occurs.

From the qualitative evidence gathered, we were unable to construct a meaningful scenario tree for movement of the HPAI H5N1 virus in poultry and poultry products from Juba County to Uganda. However, given that, 1) since 2006 there has been no cases/outbreak of HPAI in South Sudan, 2) no significant live poultry or poultry products are moved from the Juba county to Uganda through known border points, 3) effective control measures were instituted, we therefore estimated risk of introduction of HPAI H5N1 virus through cross-border movement of live poultry or poultry products from South Sudan to Uganda was very low with a low level of uncertainty.

From interviews with the key informants, the following key data were abstracted: 1) At the border crossing points and markets, no special attention is given to details on poultry and no specific poultry disease control measures exist in all border districts; 2) poultry are transported with other goods and sometimes with other animals; 3) in all border districts visited, there were no organized markets specifically for poultry; 4) during livestock market days, poultry that are not sold are transported back home and are freely mixed with those that were not taken to the market; 5) poultry are not inspected at the livestock markets; 6) there were no records on the number of poultry sold in the districts; 7) in most cases, poultry are transported with other goods and livestock from Uganda to South Sudan; 8) at animal check points, movement permits are inspected only for cattle and small ruminants and not for poultry; and 9) poultry and chicken eggs are transported from Uganda to South Sudan mainly through Atiak, Nimule and Afungi.

Wild migratory bird species susceptible to and can to spread H5N1 virus include water fowls and shore birds such as ducks and geese. The following duck species are recorded in Uganda: Northern shoveler, Garganey, Common Teal and Southern pochard all arriving Uganda from October to April every year (6). The species of gulls recorded are common black headed gull, slender billed gull (October to April) and Lesser black backed gull and Heuglins gull (October to March). The Egyptian geese are residents in most parks but are equally susceptible and likely to spread HPAI.

Migratory bird likely to release and expose domestic poultry to HPAI are scavenger migratory birds like the Black kite, Short toed snake eagle, Steppe eagle, Wahlbergs eagle and Lesser Spotted eagle (October to April) and Terns like Caspian tern, gull billed tern, and the White winged black tern (July to May). The major breeding sites of migratory wild birds in Uganda are: Sango-bay, Musambwa island and Kagera wetland in Rakai district . These sites support the largest breeding population of grey headed gulls and 75% of total global population of blue swallow. Lake Nabugabo wetland in Masaka district hosts the blue shallow, shoe bill and large congregation of migratory birds. Lutembe bay at shores of Lake Victoria in Wakiso district hosts over 200 species of migratory birds and 80% of total world population of white winged black terns (paleartic migratory birds). Murchison Falls Wetland in Nebbi district supports migratory bird species as well as African skinners and shoe bills. Nakiwogo landing site near Entebbe Airport (Wakiso district) has grey headed gull, black headed gull, great comorant and garganey. Kitobo island in Kalangala district has the grey headed gull, black headed gull and great comorant. Nsherewe island in Ssese islands (Kalangala districts).Bisina wetlands (Kumi and Katakwi districts) hosts the black headed gull.

In Europe, HPAI virus has been found in the following migratory birds: black headed gull, black headed gull, great comorant and garganey. These birds migrate to Uganda (i.e, they are palearctic migrants), and therefore pose a high risk of introducing HPAI virus to domestic poultry in Uganda. These migratory birds are found in the following areas in Uganda: Kazinga channel, Kitobo island, Lutembe bay, Nakiwogo landing site, Musambwa island, Bisina wetlands, Banda island, and Nsherewe island. These migratory birds breeding sites put the districts of the Lake Victoria basin (Tororo, Busia, Bugiri, Mayuge, Jinja, Mukono, Kampala, Wakiso, Mpigi, Masaka, Rakai and Kalangala), Kazinga channel (Kasese and Bushenyi) and Bisina wetland (Katakwi and Kumi) at a high risk of outbreak of HPAI in Uganda.

Given that a diversity of paleartic and afro-tropical migratory wild birds species susceptible to H5N1 that migrate to Uganda (6), we estimated the risk of introduction of HPAI H5N1 through migratory birds as medium with a high level of uncertainty.

The major risk increasing factors for the spread of HPAI H5N1 virus from migratory wild birds to resident poultry and humans include mixing of migratory wild birds with domestic poultry; the abundance and spatial distribution of breeding sites; and in some communities, migratory wild birds are hunted and consumed.

We conclude that: 1) the risk of introduction of HPAI H5N1 virus through cross-border movement of live poultry or poultry products from South Sudan to Uganda was very low with a low level of uncertainty; 2) we estimate the risk of introduction of HPAI H5N1 through migratory birds as medium with a high level of uncertainty; and 3) the high risk districts for outbreaks of HPAI in Uganda are: Tororo, Busia, Bugiri, Mayuge, Jinja, Mukono, Kamapla, Wakiso, Mpigi, Masaka, and Rakai, Kalangala, Kasese, Bushenyi, Kumi, and Katakwi.

We recommend the following: 1) given that Uganda borders are largely porous, there is a need to foster regional cooperation in concerted efforts to prevent introduction of HPAI into the country; 2) the Government of Uganda should strengthen animal disease surveillance; and 3) biosecurity in poultry farms in the high risk districts should be strengthened.

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