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Highly pathogenic H5N1 avian influenza outbreaks in poultry and in humans: Food safety implications

SUMMARY NOTES

- Conventional cooking (temperatures at or above 70°C in all parts of a food item) will inactivate the H5N1 virus. Properly cooked poultry meat is therefore safe to consume.
- The H5N1 virus, if present in poultry meat, is not killed by refrigeration or freezing.
- Home slaughtering and preparation of sick or dead poultry for food is hazardous: this practice must be stopped.
- Eggs can contain H5N1 virus both on the outside (shell) and the inside (whites and yolk). Eggs from areas with H5N1 outbreaks in poultry should not be consumed raw or partially cooked (runny yolk); uncooked eggs should not be used in foods that will not be cooked, baked or heat-treated in other ways.
- There is no epidemiological evidence to indicate that people have been infected with the H5N1 virus following consumption of properly cooked poultry or eggs.
- The greatest risk of exposure to the virus is through the handling and slaughter of live infected poultry. Good hygiene practices are essential during slaughter and post- slaughter handling to prevent exposure via raw poultry meat or cross contamination from poultry to other foods, food preparation surfaces or equipment

On-going outbreaks of highly pathogenic H5N1 avian influenza in poultry in Asia and, more recently, in Europe have raised concerns about the source of infection and the risk to humans from various exposures. On present evidence, the vast majority of human cases have acquired their infection following direct contact with infected live or dead poultry. Exposure might also occur when the virus is inhaled through dust and possibly through contact with surfaces contaminated with the virus. Infected poultry excrete virus in their saliva and faeces. WHO is aware of recent concerns that the virus could also spread to humans through contact with contaminated poultry products. To date, no epidemiological data suggest that the disease can be transmitted to humans through properly cooked food (even if contaminated with the virus prior to cooking) or that products shipped from affected areas have been the source of human infections.

Poultry

Presence and survival of the virus

Most strains of avian influenza virus are found only in the respiratory and gastrointestinal tracts of infected birds, and not in meat. However, available studies indicate that highly pathogenic viruses, such as the H5N1 strain, spread to virtually all parts of an infected bird, including meat. Avian influenza viruses survive in contaminated raw poultry meat and therefore can be spread through the marketing and distribution of

contaminated food products, such as fresh or frozen meat. In general, low temperatures maintain the viability of the avian influenza virus.

The virus can survive in faeces for at least 35 days at low temperature (4°C); while at 37°C, viruses could survive for 6 days in stability tests on faecal samples in studies using H5N1 viruses circulating during 2004. Avian influenza viruses can also survive on surfaces, such as those within the poultry house environment, for several weeks.

Due to these survival properties, common food preservation processes such as freezing and refrigeration do not substantially reduce the concentration or viability of these viruses in contaminated meat. However, normal cooking (temperatures at or above 70°C in all parts of the product) will inactivate the virus. To date, there is no epidemiological evidence that people have become infected following consumption of contaminated poultry meat that has been properly cooked.

Handling raw poultry

Areas currently experiencing avian influenza outbreaks in poultry. In backyard production settings, the practices of home slaughtering, defeathering, and eviscerating, related to the marketing of live birds, create opportunities for further and extensive exposure to potentially contaminated parts of poultry. These practices pose a significant risk of infection. From the information currently available, a large number of confirmed human cases acquired their infection during the slaughtering and subsequent handling of diseased or dead birds prior to cooking. Safe home slaughtering, defeathering and eviscerating poultry are activities that require that the person is equipped with full protective gear and fully informed about preventive measures. For this reason, such practices involving obviously diseased or dead birds, as it occurs in traditional rural settings in Asia and elsewhere, must be stopped.

Recent studies of traditional practices have shown that public health education campaigns about the disease and measures for protection have reached rural people, who are at the greatest risk of acquiring infection through contact with infected backyard poultry. However, changing behaviour is particularly difficult and activities such as retaining sick or dead poultry and preparing them for consumption continue to occur, thus perpetuating risks of both further human cases and the emergence of a pandemic virus. Given the on-going outbreaks in poultry, renewed efforts are needed to change these behaviours. If properly explained and enforced by rural populations in affected areas, such behaviour change would go a long way towards reducing the risk of further human infections and would at the same time decrease significantly the potential for transmission of other infections. Rapid socio-economic improvements in areas where the value of a diseased or dead chicken is such that it cannot be wasted are ultimately needed.

In industrial production settings, under strict veterinary control, diseased poultry would not enter the food-chain; the likelihood of infected poultry being marketed and eventually handled by a consumer or a restaurant worker is therefore considered to be very low. However, this risk might increase given the documented ability of at least some poultry to carry the virus without showing overt symptoms of disease.

Areas with no outbreaks: Import restrictions of raw poultry products from affected areas are commonly adopted to prevent the potential spread of the virus to domestic poultry flocks.

Consumption of poultry products

The virus is inactivated at temperatures reached during conventional cooking practices (at least 70° C at the centre of the product (“piping” hot) or when the meat is not pink in any part). Consumption of properly cooked poultry is safe. There have been reports of a few human cases potentially linked to consumption of raw poultry ingredients (e.g. raw blood-based dishes). It should therefore be emphasized that consumption of any raw poultry ingredients must be considered a high-risk practice and discouraged. This message is important not only for avian influenza, but also for preventing a range of other diseases transmitted through raw or undercooked poultry.

From the above, it can be concluded that well cooked poultry meat is safe but, in areas affected by highly pathogenic H5N1 avian influenza, handling of frozen or thawed raw infected poultry meat prior to cooking may be hazardous if good hygienic practices are not observed (see recommendations in box below).

Eggs

Highly pathogenic avian influenza virus can be found inside and on the surface of eggs laid by infected birds. Although sick birds will normally stop producing eggs, eggs laid in the early phase of the disease could contain viruses in the albumen and yolk as well as on the surface of the shell. In addition, some avian species, such as domestic ducks, may harbour the virus without displaying symptoms. Some vaccinated poultry may also still be infected without displaying symptoms. The potential for infection of their eggs is unknown. The survival time of the viruses in faeces (see above survival times at different temperatures) which may be present on surfaces such as eggs is sufficient to allow wide dissemination during marketing and distribution within the shelf-life of eggs. Only proper cooking will inactivate virus present inside the eggs.

Pasteurization protocols used by industry for liquid egg products will also be effective in inactivating the virus (e.g. whole egg, 60°C, 210 seconds; liquid egg white, 55.6°C, 372 seconds; 10% salted yolk, 63.3°C, 210 seconds). There is no epidemiological evidence to suggest that people have been infected with avian influenza by consumption of eggs or egg products. Eggs from areas with outbreaks in poultry should not be consumed raw or partially cooked (runny yolk). Pasteurization or cooking of eggs will also significantly decrease the potential for transmission of other infections; e.g. salmonellosis.

Vaccinated poultry

Regulations for the control of avian influenza in poultry exist in some parts of the world. In the European Union, for example, these regulations are stipulated in EU Directive 92/40 and other relevant texts. These texts permits vaccination of birds, but only as a supplementary control measure when an outbreak of the disease appears.

Vaccination of poultry is being recommended by FAO and OIE as a supplementary measure that can contribute to the control of highly pathogenic H5N1 avian influenza in poultry in affected countries in Asia.

Some countries in Asia affected by large and recurrent outbreaks of highly pathogenic H5N1 avian influenza are introducing vaccination programmes on a large scale as one measure to contribute to the control of the outbreaks in poultry. Such programmes must include monitoring and surveillance schemes in accordance with existing OIE standards and FAO/OIE guidelines. With appropriate monitoring programs in place and open communication to consumers, vaccinated poultry can enter the food chain without particular risk for the consumer.

Proper vaccination of domestic poultry which ensures that the vaccine matches the circulating strain of virus, is considered to be a useful tool as part of an overall integrated strategy for the control of HPAI. It must be implemented in accordance with existing standards and procedures for vaccination, including in backyard flocks. Poultry are usually vaccinated with a vaccine made from inactivated viruses which in itself does not pose a food safety risk. Such procedures would ensure that no asymptomatic infected birds would enter the food-chain.

Recommended good hygienic practices to reduce exposure to the virus and to reduce spread through food: (adapted from the WHO 5 Keys to safer food):

- 1 Separate raw meat from cooked or ready-to-eat foods to avoid contamination.** Do not use the same chopping board or the same knife for raw meat and other foods. Do not handle both raw and cooked foods without washing your hands in between and do not place cooked meat back on the same plate or surface it was on before cooking. Do not use raw or soft-boiled eggs in food preparations that will not be heat treated or cooked.

- 2 **Keep clean and wash your hands.** After handling frozen or thawed raw chicken or eggs, wash your hands thoroughly with soap. Wash and disinfect all surfaces and utensils that have been in contact with the raw meat.
- 3 **Cook thoroughly.** Thorough cooking of poultry meat will inactivate the virus. Either ensure that the poultry meat reaches 70°C at the centre of the product ("piping" hot) or that the meat is not pink in any part. Egg yolks should not be runny or liquid.
- 4 **Do not eat raw poultry parts or raw eggs.**

Additional guidance on food safety implications

WHO has developed two guidance notes, issued in January and February 2004, on the food safety implications of the first wave of outbreaks. The first note was on general food safety considerations related to the outbreaks in poultry while the second one dealt with the specific conditions found in rural areas in Asia experiencing poultry outbreaks. In December 2004, WHO disseminated, through the International Food Safety Authorities Network (INFOSAN), a consolidated note on the food safety implications of avian influenza outbreaks in poultry. The present document updates information in the previous three documents. These documents are available at: <http://www.who.int/foodsafety/micro/avian/en/>. WHO has also developed guidance for people living in areas experiencing outbreaks. This can be found at: <http://www.wpro.who.int/avian/docs/advice.asp>.

Further general information on the current avian influenza outbreaks is available at: http://www.who.int/csr/disease/avian_influenza/en/.

The WHO "5 keys to safer food", which offer recommendations for good hygienic practices, can be found at: <http://www.who.int/foodsafety/consumer/5keys/en/>. These recommendations are available in several languages.

Background on avian influenza

Avian influenza is an infectious disease of birds caused by influenza A viruses. Migratory waterfowl - most notably wild ducks - are the natural reservoir of all influenza A viruses. Avian influenza also has a highly pathogenic form. Of the 16 main subtypes of influenza A viruses, only strains within the H5 and H7 subtypes cause highly pathogenic avian influenza, which is highly contagious and rapidly fatal in susceptible avian species. Chickens and turkeys are particularly susceptible to epidemics; direct or indirect contact of domestic flocks with wild waterfowl has been implicated as a frequent cause. Live bird markets have also played an important role in the spread of epidemics. Birds that survive infection may excrete virus for up to 10 days, orally and in faeces, thus facilitating further spread. Unlike chickens, some domestic ducks are known to be resistant to the viruses and can be asymptomatic carriers of the viruses, thus acting as a "silent reservoir" that perpetuates transmission. In recent months, evidence has mounted that at least some species of migratory birds are directly spreading the H5N1 virus, in its highly pathogenic form, to parts of Central Asia and Europe; spread via this vector is expected to continue. Suspicions that birds may be carrying highly pathogenic virus along their migratory routes were underscored following the detection of outbreaks in wild and domestic birds in the Russian Federation and adjacent parts of Kazakhstan beginning in late August 2005. In October 2005, outbreaks were detected in Turkey, Romania, and Croatia. All of these newly affected areas lie along the flyways of migratory birds. Spread to additional new areas is considered highly likely. WHO has recommended that dead wild birds or birds showing signs of illness should not be touched except by properly protected authorities.

Avian influenza viruses normally infect only birds and, less commonly, pigs. Since 1959, viruses of the H5, H7, and H9 subtypes have crossed the species barrier to infect humans on 10 occasions. Most avian influenza viruses affecting humans have caused mild respiratory symptoms or conjunctivitis, with one important exception: the H5N1 strain. H5N1 has caused severe disease with high fatality rates in 1997, 2003, and in an ongoing outbreak that began in mid-2003. Studies comparing virus samples over time show

that H5N1 has become progressively more pathogenic for mammals, and is now hardier than in the past, surviving several days longer in the environment. Evidence further suggests that H5N1 is expanding its range of susceptible mammalian species. In 2004, H5N1 caused fatal disease in naturally infected large felines (tigers and leopards) and experimentally infected domestic cats - species not previously considered susceptible to disease caused by any influenza A virus. Several mutations in the virus have been detected during 2005, but the significance of these mutations in terms of virulence and transmissibility in humans is not fully understood.

The public health concerns

The outbreaks of highly pathogenic H5N1 avian influenza in poultry that began in Asia in mid-2003 have, to date, been accompanied by over 120 confirmed human cases, of which more than half have died. The majority of cases have occurred in previously healthy children and young adults. At present the species barrier is significant: the virus does not easily cross from birds to humans. Most, but not all, of these cases have been linked to close contact with live or dead infected poultry or their secretions. The disease caused by H5N1 infection in humans follows an unusually aggressive course, with rapid deterioration and high fatality. Primary viral pneumonia and multiple organ failure are common.

A second and even greater implication for human health is the risk that the virus – if given enough opportunities – will change into a form that is highly infectious for humans and spreads easily from person to person. Such a change could mark the start of an influenza pandemic. Such opportunities arise each time close contacts between humans and infected birds occurs. Changes in human behaviours, including those related to food handling, that can reduce these opportunities are therefore of the utmost importance. Equally important is the continuing effort to control the disease at its source in the animal population.

Information in this note is supported by the following references:

European Commission. (1992, amended 2004) Council Directive 92/40/EEC of 19 May 1992 introducing Community measures for the control of avian influenza. Official Journal of the European Union, L 167, 22.6.1992, p.1

Olsen S.J., et al. (2005) Poultry-handling practices during avian influenza outbreak, Thailand. *Emerging Infectious Diseases*, Vol. 11, No. 10

Swayne D., Beck J. (2005) Experimental study to determine if low-pathogenicity and high-pathogenicity avian influenza viruses can be present in chicken breast and thigh meat following intranasal virus inoculation. *Avian Diseases* 49:81-85

Swayne D., Beck J. (2004) Heat inactivation of avian influenza and Newcastle disease viruses in egg products. *Avian Pathology* 33(5), 512-518

INFOSAN serves as a vehicle for food safety authorities and other relevant agencies to exchange food safety information and to improve collaboration among food safety authorities at both the national and international level.

INFOSAN Emergency, embedded in INFOSAN, links official national contact points to address outbreaks and emergencies of international importance and allows for the rapid exchange of information. INFOSAN Emergency is intended to complement and support the existing WHO Global Outbreak Alert and Response Network (GOARN).

INFOSAN is operated/managed by WHO, Geneva. It currently includes 145 Member States.

More information is available at: www.who.int/foodsafety