[BA 03 attachment A]

World Health Organization

QUESTIONS AND ANSWERS

ON

AVIAN INFLUENZA

A selection of frequently asked questions on animals, food and water

Executive Version

Geneva, May 2006

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Food Safety, Zoonoses and Foodborne Diseases (FOS),
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FOREWORD

The epizootic of the highly pathogenic H5N1 avian influenza virus that started affecting domestic and wild birds and humans in South-East Asia in mid-2003, and has now spread to Africa and Europe, is the largest and most severe outbreak on record. Previously, outbreaks of highly pathogenic avian influenza in poultry and wild birds were rare. Since December 2003, some 45 countries in Africa, Asia, Europe and the Middle East have reported outbreaks of H5N1 avian influenza in poultry and/or wild birds.

Before the recent outbreaks (Hong Kong in 1997 and the Netherlands in 2003), human infection with avian influenza viruses were rarely reported and usually resulted in mild disease. The highly pathogenic H5N1 avian influenza virus has developed into a concern for human health for two main reasons. First, since December 1997, this virus has caused very severe disease in people, with more than 200 human cases and a 55% mortality rate. The second, and far greater concern, for human health is the risk that the H5N1 virus – if given enough opportunity – will develop the characteristics needed to start an influenza pandemic. There is a need to minimize infection opportunities because every infection presents a chance of genetic mutation that might give rise to a pandemic virus. Thus, preventing the human pandemic requires control of the disease in animals and sensible precautionary measures to prevent cases of human infection.

To prevent human disease, and especially to lower the risk of a human pandemic, this document aims to provide professionals with science-based answers to a number of common questions about avian influenza as related to animals, food and water. It addresses both the risks and associated preventive measures related to the transmission of the current H5N1 avian influenza virus (in relation to animal, food and water management); and the prevention of environmental transmission of a potential future pandemic human strain (with particular reference to hygiene and water/wastewater management).

SECTION 1: ANIMALS AND FOOD

INTRODUCTION

This section discusses the current H5N1 avian influenza epidemic in animals including domestic and wild animals that have been found to be infected with or involved in the transmission of the disease to humans. It also describes the safety of poultry and eggs which form an important part of the diet of people in all countries affected by the epidemic.

WILD BIRDS

Avian influenza is an infectious disease of birds caused by type A strains of the influenza virus. Wild birds usually carry low pathogenic avian influenza virus strains, which are harmless. In poultry, however, these viruses cause two distinctly different forms of disease – one common and mild, the other rare and highly lethal. While the mild form of the disease often escapes detection, the highly pathogenic avian influenza virus strains are characterized by a sudden onset of severe disease, rapid contagion and a mortality rate that can approach 100% within 48 hours.

What bird species are the main carriers of avian influenza?

Many wild bird species, especially those in wetlands and aquatic environments, harbour influenza viruses. Ducks, geese and swans as well as gulls, terns and waders constitute the major natural reservoir of avian influenza viruses. Transmission of avian influenza viruses between shore birds and wild ducks may occur when their breeding grounds overlap providing an opportunity for the mixing and recombination of different avian influenza virus subtypes. Avian influenza viruses are less common in birds more closely associated with human environments such as domestic chickens, turkeys, pheasants, pigeons and parrots.

What avian influenza viruses can be found in wild birds?

All subtypes of influenza A viruses infect wild waterfowl. While most subtypes have low pathogenicity, the H5 and H7 strains can, after circulation in the poultry population, mutate into highly pathogenic viruses. Until mid-2005, these avian influenza viruses were generally not pathogenic for wild water birds.

What role do the migratory birds play in the spread of H5N1 avian influenza?

In April 2005, the deaths of more than 6000 migratory birds, mostly bar-headed geese, due to the highly pathogenic H5N1 avian influenza virus, was reported at the Qinghai Lake nature reserve in central China. This event was very unusual and probably unprecedented. Scientific studies comparing viruses isolated from diseased birds in Africa, Europe and the Middle East have shown that they are almost identical to viruses recovered from dead birds at Qinghai Lake. Also, in countries affected more recently, diseased birds have all been found along the migratory routes of wild birds. While still poorly understood, it appears that the Qinghai Lake outbreak was the source of the westward spread of H5N1 avian influenza virus in birds in 2005-2006. Currently a total of at least 80 species of wild birds have been found to be infected by the H5N1 avian influenza virus. At least some migratory waterfowl have carried the H5N1 avian influenza virus in its highly pathogenic form, sometimes over long distances, and have infected poultry flocks in areas that lie along their migratory routes.

Can wild birds transmit avian influenza to humans?

H5N1 avian influenza is first and foremost a disease of poultry. Most human cases of H5N1 avian influenza have occurred in rural or periurban areas where many households keep small domestic poultry flocks. The H5N1 avian influenza virus is probably transmitted to humans through exposure during slaughter, defeathering, butchering and preparation of domestic poultry for cooking. Transmission through the handling of dead wild birds or their parts, such as feathers, is also possible. The public should be advised to report, and avoid contact with, dead wild birds. Defeathering or butchering of dead

wild birds, especially waterfowl, is particularly hazardous in areas where H5N1 avian influenza virus has been reported or is likely to occur, such as along migratory routes.

PIGEONS

Do pigeons carry and spread avian influenza viruses in nature?

The H5N1 avian influenza virus was isolated from one dead pigeon in Hong Kong in 2001, while all other birds sampled around the quarantine area, including 57 other pigeons, tested negative for the virus. In 2002, comparative studies involving pigeons and other bird species determined that pigeons were resistant or minimally susceptible to infection with avian influenza viruses. In 2003, various avian influenza viruses were isolated from 0.5% of the pigeons sampled in south central China. In 2006, a total of six individual pigeons were found infected with H5N1 avian influenza virus in Romania, Turkey and the Ukraine. These findings suggest that pigeons have played a minimal role in the spread of the virus. However, the latest studies conducted with the H5N1 avian influenza virus, which emerged in Asia in 2004, demonstrated an increased susceptibility of pigeons to this virus compared to the 1997 Hong Kong virus. Thus, the general public should try to avoid unnecessary close contact with pigeons, especially in places where pigeons congregate in large numbers.

PIGS

What role do pigs play in the current epidemic?

In general, pigs can be easily infected by many human and avian influenza viruses and thereby provide an environment favourable for viral replication and genetic re-assortment. Until recently pigs were considered the most likely "mixing vessels" for the generation of a human pandemic strain of the avian influenza virus. In Viet Nam, during the 2004 epidemic of H5N1 avian influenza in poultry, only eight out of more than 3000 pigs tested on farms with infected poultry were found to be serologically positive. None of the animals had any clinical signs and it was not possible to isolate the virus. Pigs have not played a role in the current epidemic of H5N1 avian influenza.

CATS AND OTHER MAMMALS

How do cats and other mammals get infected with the avian influenza virus?

In late 2003, reports from South-East Asia confirmed that the H5N1 avian influenza virus infected domestic cats, large wild cats in captivity and other mammals. The wild cats involved in the outbreaks are thought to have eaten uncooked infected chicken carcasses, while the domestic cats are thought to have eaten, or come into contact with, infected wild birds. Recently, there have been an increasing number of informal reports of domestic cats dying in areas where H5N1 avian influenza outbreaks are occurring in domestic birds. In Indonesia and Iraq the presence of the H5N1 avian influenza virus has been confirmed in various cat tissues. In Europe a report dated February 2006 involved one cat found dead soon after the disease was reported in wild birds in the same area. In Thailand, 160 out of 629 village dogs tested serologically positive indicating that they had been infected; but, to date, no deaths have been reported in dogs.

What are the effects of the avian influenza virus in cats?

The susceptibility of cats to infection by the H5N1 avian influenza virus has been clearly demonstrated. Three recent experimental studies have shown that a few days after infection cats develop severe clinical signs that can result in death. The H5N1 avian influenza virus is excreted from the pharynx and nose for several days after infection and can cause cat to cat transmission. Despite such recent experimental studies, major gaps in our knowledge remain and limit our ability to accurately assess the public health implications of infections in cats. Specifically, issues such as whether cats can excrete the virus without

showing clinical signs, and whether cats can transmit the disease to other cats, poultry or humans, need to be studied.

What are the public health implications of infected cats and other mammals?

No human H5N1 avian influenza case has as yet been associated with a pet animal in any country, even in those countries where the virus has been present in birds for more than two years. Thus, there is no evidence at present that domestic cats play a role in the transmission cycle of the H5N1 avian influenza virus. However, the vulnerability of cat species is of particular concern because they could acquire the infection by eating infected wild or domestic birds. In the absence of further data, an assessment of whether cats are dead-end hosts of the H5N1 avian influenza virus or if they pose an additional public health risk is very difficult.

What can be done to prevent avian influenza infections in domestic cats and dogs?

Even domestic cats will eat small animals, including sick birds and poultry, and may become victims of any infection in this prey. To reduce the risks of the H5N1 avian influenza virus infecting domestic cats in areas where the H5N1 avian influenza virus has been identified in domestic or wild birds, direct contact between cats and birds should be avoided, and any unusual morbidity or mortality in cats should be closely monitored. Owners of cats and dogs in designated control and surveillance areas surrounding an H5N1 avian influenza outbreak should control the movement of their pets.

FOOD SAFETY AND FOOD HANDLING

Is it safe to slaughter chicken and handle dead chicken in outbreak areas?

In backyard production settings, the system of marketing live birds and the practices of home slaughtering, defeathering and eviscerating, create opportunities for extensive human exposure to potentially contaminated parts of poultry. Therefore, the wearing of protective gear, and practicing measures to prevent personal contamination, is essential. A large number of confirmed human cases are believed to have acquired their infection during the slaughtering or subsequent handling of diseased or dead birds prior to cooking. For this reason, such practices involving obviously diseased or dead birds must be stopped. In general, birds found in a diseased state or dead should never be used for human consumption.

The H5N1 avian influenza virus spreads to virtually all parts of an infected bird, including blood, meat and bones. 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 the viability of the avian influenza virus is maintained at low temperatures. The H5N1 avian influenza virus can survive in faeces for at least 35 days at 4°C and at least six days at 37°C. The virus has also been shown to survive on surfaces for several weeks at ambient temperatures.

In outbreak areas, some poultry species (such as domestic ducks) can be asymptomatic carriers of the virus. Vaccinated poultry can also carry the virus without showing symptoms. In these areas, it is important to effectively monitor the poultry population. In the absence of such monitoring systems, it is recommended that home-slaughtering be avoided. In non-outbreak areas, the likelihood of the virus being present in the poultry population is very low. Therefore, the likelihood of infected poultry being marketed and eventually handled by a consumer or a restaurant worker is considered to be very low. In this case, the public health risk related to avian influenza is negligible.

Is it safe to eat chicken?

Consumption of properly handled and properly cooked poultry is safe. The virus is inactivated at temperatures reached during conventional cooking (at least 70° C at the centre of the product - “piping” hot - or when the meat is not pink in any part). To date, there is no epidemiological evidence that people have become infected following consumption of contaminated poultry meat that has been properly

cooked. There have been reports of a few human cases potentially linked to the consumption of raw poultry parts (e.g. raw blood-based dishes). It should therefore be emphasized that the consumption of any raw poultry parts must be considered a high-risk practice and discouraged. In areas affected by highly pathogenic H5N1 avian influenza virus, handling of frozen or thawed raw infected poultry meat prior to cooking may be hazardous, if good hygienic practices are not observed. Standard hygienic handling practices should be used to prevent cross contamination:

- Clean and disinfect all work surfaces, equipment and utensils used for preparing poultry frequently and wash your hands regularly;
- Separate raw meat and cooked meat; and
- Ensure that food is cooked to the proper temperature, reaching 70°C in all parts of the food - with either meat juices running clear or no pink meat remaining.

Is it safe to eat eggs?

Highly pathogenic H5N1 avian influenza virus can be found inside and on the surface of eggs laid by infected birds. There is no epidemiological evidence to suggest that people have been infected with avian influenza through the consumption of eggs or egg products. Only proper cooking will inactivate virus present inside the egg. 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).

SECTION 2: DRINKING-WATER AND SANITATION

INTRODUCTION

This section aims to provide public health authorities, those involved in the management of water resources and supplies, those involved with patient care and the general public with answers to common questions related to pandemic influenza planning as it affects drinking-water, sanitation, hygiene in healthcare settings and hygiene in domestic and community settings. By design, these answers are provisional due to the changing nature of the virus. The character of the pandemic influenza virus may be very different from the H5N1 avian influenza virus which is currently producing disease in birds. The answers here relate to both the current H5N1 avian influenza virus and a potential future pandemic human strain. Additionally, a technical review paper (*Review of latest available evidence on risks to human health through potential transmission of avian influenza (H5N1) through water and sewage*) is available from the Water, Sanitation and Health Programme[1].

DRINKING-WATER

Could the avian influenza virus contaminate drinking-water sources?

Sources of drinking-water that may be susceptible to contamination with the avian influenza virus include surface water bodies (e.g. reservoirs, ponds, lakes and rivers), groundwater aquifers and rainwater collection systems. Of these sources, open water bodies where infected waterfowl gather are the most likely potential route of entry of virus into the drinking-water supply.

Avian influenza viruses are known to persist for extended periods of time in water, depending on temperature, pH and salinity. However, information on the persistence of highly pathogenic avian influenza viruses, including H5N1 avian influenza virus, in water is lacking. In general, the avian influenza virus viability in natural water (fresh, brackish and seawater) decreases with increasing salinity and increasing pH above neutral.

Due to their structure, all influenza viruses are relatively susceptible to disinfectants, including oxidizing agents such as chlorine. They are also readily inactivated by heating. Bacteria and other microorganisms may also play a role in virus inactivation.

Should any precautions be taken to avoid consuming virus-contaminated water?

The fact that waterfowl excrete influenza viruses into water does not confirm waterborne transmission between birds; nor does it offer an indication of the extent of the risk of infection to humans exposed to the water. Although there is no epidemiological evidence, the little evidence available regarding modes of transmission and infection suggests that the potential risk of human infection from water contaminated with the H5N1 avian influenza virus is small.

Prevention and control measures can be suggested to minimize, if not eliminate, the risk from the consumption of virus-contaminated water. If water from open water reservoirs is to be used for the supply of potable water then, as indicated in the *WHO Guidelines for drinking-water quality*, treatment is strongly recommended, specifically disinfection[2].

Authorities charged with managing any potential risk in drinking-water may consider ensuring that chlorine or alternative disinfectant be maintained throughout distribution. For effective disinfection of adequately pre-treated water, there should be a residual concentration of free chlorine of at least 0.5 mg/litre after a contact of 30 minutes (minimum) with the water at pH <8.0.

[1] http://www.who.int/water_sanitation_health/emerging/avianflu/en
[2] http://www.who.int/water_sanitation_health/dwq/gdwq3/en

Where there is no access to community drinking-water treatment systems, and where household water safety is suspect, authorities should consider advising families to treat their drinking-water with available and acceptable household-level interventions, including home chlorination (addition of bleach) or boiling. These interventions are effective at inactivating viruses.

SANITATION

How might the avian influenza virus be transmitted to humans from sewage, excreta and animal wastes?

The H5N1 avian influenza virus could potentially enter into sewage in urine or faeces excreted by infected humans or in animal waste that is combined with human sewage. Although human and animal excreta are often managed separately, there are settings and scenarios where animal waste may be combined with human waste. There is some evidence to show that the H5N1 avian influenza virus is excreted in faeces of infected persons, but information on the excretion of H5N1 avian influenza viruses in urine or faeces by mammalian species, including humans, is very limited and unlikely to be representative of a potential future human pandemic strain.

Given the relatively small number of human cases to date, it is not surprising that information specific to H5N1 avian influenza virus persistence in sewage is lacking. The period of avian influenza infectivity in bird faeces and secretions depends primarily on the initial virus concentration, pH and temperature conditions, but, generally, four weeks after infection the avian influenza virus can no longer be detected.

The transmission of human influenza is commonly by aerosols (droplets and small particles in air) carrying the virus that enter the body through the nose or throat. Thus, other means of excreta disposal where aerosol formation is unlikely, such as latrines, probably represent an extremely low risk of virus transmission. The widespread use of untreated poultry faeces as fertilizer is, however, a possible risk factor.

What precautions should be taken with sewage?

To date, human infections with avian influenza viruses detected since 1997 have not resulted in sustained human-to-human transmission. However, national planning for pandemic influenza should include consideration of how to manage human sewage in outbreak areas where humans may excrete high levels of the virus.

Although there is no specific information available on the response of H5N1 avian influenza virus to wastewater treatment processes, virus concentrations are generally reduced at various rates and to various extents in both human and animal waste treatment processes, but the virus is typically not completely eliminated. Furthermore, virus concentrations may be enriched in certain treated or separated waste fractions (such as waste solids) by sedimentation and solid-liquid separation processes.

Providing that poultry house waste is not mixed with human sewage, there is currently little risk to sewage treatment workers. In the event of outbreaks of human infection with highly pathogenic avian influenza, human excreta could contain highly pathogenic avian influenza viruses and the exposure risks to sewage workers would need to be reconsidered.

In situations where exposure to potentially-infected poultry waste currently exists, there needs to be prevention and control measures in place to reduce airborne droplet and aerosol transmission.

HYGIENE IN HEALTH-CARE SETTINGS

What is the role of hygiene in facilities treating patients infected with the avian influenza virus?

Presently, sound evidence on exact modes of human transmission of highly pathogenic avian influenza viruses is lacking. It is believed that multiple modes of transmission exist (large droplet, small particle aerosol, hand-contamination and self-inoculation, and possibly oral contamination), but their relative importance in sporadic highly pathogenic avian influenza infections is uncertain. Furthermore, if the virus changes to become more readily transmissible from person to person, the importance of particular practices may change.

Given the uncertainty about the exact modes by which the avian influenza virus, including highly pathogenic avian influenza, may be transmitted between humans, enhanced infection control precautions for patients with suspected or confirmed avian influenza infection are warranted. There is the need to minimize infection opportunities because every infection presents a chance of genetic mutation that might give rise to pandemic virus. In hospital settings, it is important to protect both patients and health-care workers from the avian influenza infection.

Strong hygiene practices are always a critical component of infection control. Of these practices, hand hygiene and surface cleaning are among the simplest and most cost-effective ways to prevent transmission of the highly pathogenic avian influenza virus.

What hygiene practices require specific attention?

Hand hygiene is a prerequisite to prevent the transmission of many infectious diseases. In environments where the highly pathogenic avian influenza virus may be present, hand hygiene, which includes hand washing and the use of alcohol-based hand rubs, is critical to prevent possible viral inoculation of the nose, mouth and conjunctivae by contaminated hands. Hand hygiene is also necessary to prevent the transmission of nosocomial infections to other patients and healthcare workers. Pathogens are removed by the mechanical action of hand washing. Alcohol disinfects (kills the pathogens). If hands are visibly dirty, washing with soap and water is required prior to disinfection. Otherwise, alcohol-based preparations or washing are both appropriate.

For **soiled surfaces**, cleaning **MUST** precede disinfection. Items and surfaces cannot be disinfected if they are not first cleaned of organic matter (patients' excretions, secretions, dirt, soil, etc). Potent disinfectants are not required to kill influenza viruses, common soaps and dilute household bleach are generally adequate.

Use cleaning methods that do not produce **aerosols** (e.g. use wet dusting methods instead of feather dusting) to mitigate any potential risk for virus transmission through direct inoculation (e.g. via inhalation or direct impact) into the respiratory (e.g. nose) or conjunctival mucosa. In healthcare settings, standard precautions are recommended for **cleaning linen and laundry** and **managing clinical or nonclinical waste** that may be contaminated with the highly pathogenic avian influenza virus.

PERSONAL HYGIENE

What is the role of personal hygiene in responding to the threat of pandemic influenza?

To date, human infections with the avian influenza viruses detected since 1997 have not resulted in sustained human-to-human transmission. If the current avian influenza H5N1 virus changes to produce a strain that is more transmissible among humans, it could signal the start of a pandemic. Strengthening personal hygiene practices to reduce human to human transmission will help stop or slow the spread of a pandemic virus.

Personal hygiene includes individual practices that serve to promote or preserve health such as habits of cleanliness. In the case of highly contagious diseases such as influenza, special attention should be paid to personal behaviour in community settings as well as the household. Public education, including public health messages, is an important part of national and local planning for pandemic influenza.

Should special personal hygiene precautions be taken in the home or at schools?

While WHO has guidance for issues such as personal hygiene, primarily for health-care workers, such guidance is based on general transmission patterns of seasonal human influenza. It is not known how effective this guidance would be in slowing the spread of a pandemic from a new virus strain.

However, there are basic good health habits that will help reduce the spread of influenza virus in the home or community settings. These include:

- Cover your mouth and nose with a tissue when coughing or sneezing.
- Wash your hands often, especially: before, during, and after you prepare food; before you eat; after you use the toilet; after handling animals or animal waste; when your hands are dirty; and more frequently when someone in your home is sick.
- Avoid touching your eyes, nose or mouth. Infections are often spread when a person touches something that is contaminated with microorganisms and then touches his or her eyes, nose, or mouth.

Cleaning and disinfection of household surfaces likely to be contaminated by infectious secretions appears worthwhile. However, presently, there is no evidence to support the efficacy of widespread disinfection of the environment or air.

As part of pandemic influenza planning, special attention should be given to teaching staff, children, and their parents on how to limit the spread of infection. Programmes should already be teaching these things (e.g. use good hand washing; cover the mouth when coughing or sneezing; and clean toys frequently) to build habits that protect children from disease in general.

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