Team work project

1A The bird flu

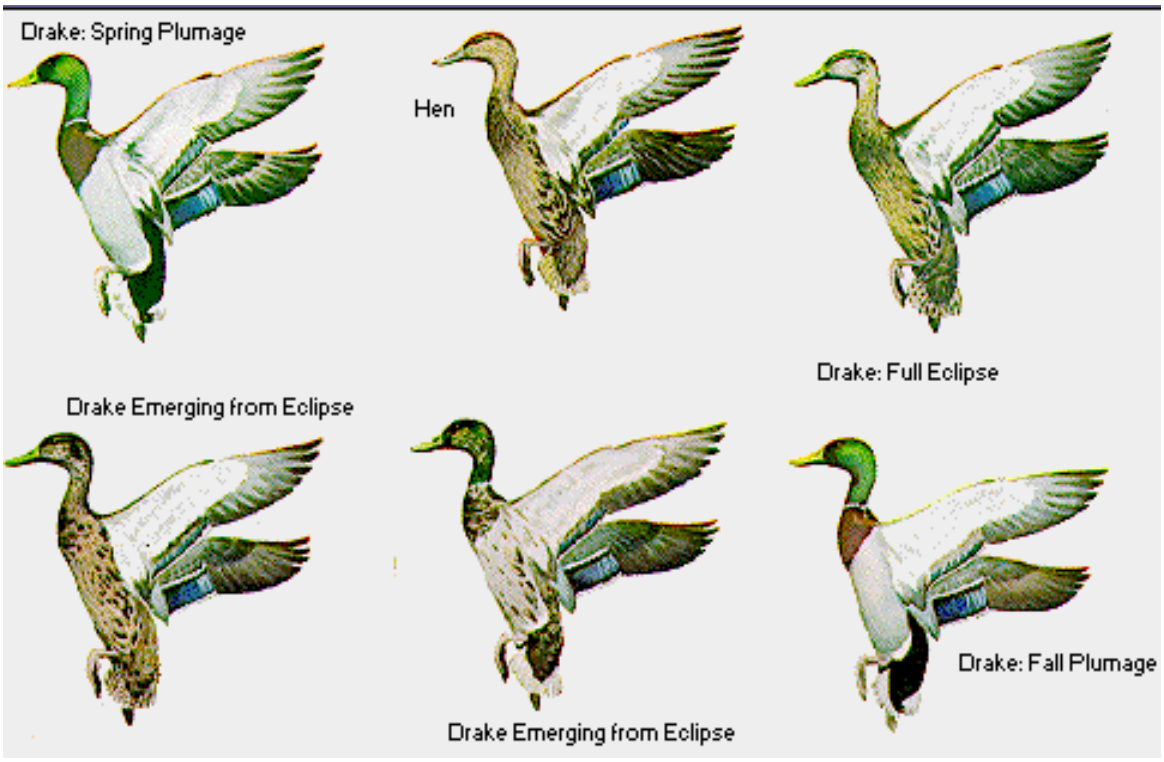

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Table of content

Waterfowl

1. Introduction

Bird flu disease has a long history and cause serious impacts on poultry stocks, national economics and as a potential threat to human beings. The disease has recently occurred in a number of Asian countries and has also been found in Europe. The world has been hard preparing to minimize the risk of a potential new pandemic bird flu.

This report provide a background of bird flu disease and focus/emphasize on safety aspects of people (i.e. scientists, fieldworkers) working with birds in areas of potential risk of bird flu disease.

2. What is the bird flu? And which virus cause bird flu? What is the situation now?

Bird flu, also known as avian influenza, is an infectious disease of birds caused by type a strains of the influenza virus. This disease was first identified in Italy more than 100 years ago and occurs worldwide.
(http://www.who.int/mediacentre/factsheets/avian_influenza/en). There are 3 main types of influenza: influenza a, influenza b and influenza c. Influenza a and influenza b are associated with annual outbreaks and epidemics. There are fifteen subtypes of influenza virus known to infect birds which therefore produce huge extensive reservoir of influenza viruses potentially circulating in bird populations. Influenza a viruses[1] have 16 H subtypes and 9 N subtypes[2]. So far, all outbreaks of the highly pathogenic form have been caused by influenza a viruses of subtypes H5 and H7. (http://www.birdflu.gov.sg/flu/WhatIs.htm). However, not all viruses of the H5 and H7 subtypes are highly pathogenic and not all will cause severe disease in poultry. Avian influenza viruses are highly species-specific, but have, on rare occasions, crossed the species barrier to infect humans. The subtype H5N1 first broke out in China in 1996 and has since that circulated between poultry in Southeast Asia.

At least 250 million poultry have died or been killed in connection with outbreaks of the bird flu the last 5 years. All birds are thought to be susceptible to infection with avian influenza, though some species are more resistant to infection than others. Turkeys and partridges are for example very sensitive to the disease. Infection causes a wide spectrum of symptoms in birds, ranging from mild illness to a highly contagious and rapidly fatal disease resulting in severe epidemics. The latter is known as “highly pathogenic avian influenza”. This form is characterized by sudden onset, severe illness, and rapid death, with a mortality that can approach 100%.

In Asia, domesticated birds like ducks and geese a natural part of farming and these birds are quickly infected. Poultry is often brought and sold live in markets, which makes the infection spread easily. The influenza virus, like others, can change, and develop new virus types. Some of these have the ability to infect more than one species. The H5N1 have infected mammals like tigers in Asia. H5 and H7 change properties relatively easily, and may develop from a relatively harmless form to an aggressive type in just a few days.

Recent research has shown that viruses of low pathogenicity can, after circulation for sometimes short periods in a poultry population, mutate into highly pathogenic viruses. During a 1983–1984 epidemic in the United States of America, the H5N2 virus initially caused low mortality, but within six months became highly pathogenic, with a mortality approaching 90%. Control of the outbreak required destruction of more than 17 million birds at a cost of nearly US$ 65 million. During a 1999–2001 epidemic in Italy, the H7N1 virus, initially of low pathogenicity, mutated within 9 months to a highly pathogenic form. More than 13 million birds died or were destroyed.

Recent bird flu situation

Influenza pandemics are associated with high morbidity, excess mortality, and social and economic disruption. There were three such pandemics in the twentieth century (1918, 1957, and 1968). During 2004, the world moved closer to a further pandemic than it has been at any time since 1968.
(http://www.who.int/csr/disease/influenza/WHO_CDS_2005_29/en/index.html).

During period from mid-December 2003 through early February 2004, eight Asian nations (listed in order of reporting): the Republic of Korea, Viet Nam, Japan, Thailand, Cambodia, Lao People's Democratic Republic, Indonesia, and China reported to have poultry outbreaks caused by the H5N1 virus. It is important to note that most of these countries had never before experienced an outbreak of highly pathogenic avian influenza in their histories. Malaysia is the following country reported its first outbreak of H5N1 in poultry in early August 2004, becoming the ninth Asian nation affected. In Europe, Russia was the first country reported its first H5N1 outbreak in poultry in late July 2005, followed by reports of disease in adjacent parts of Kazakhstan in early August. Deaths of wild birds from highly pathogenic H5N1 were also reported in both countries. Almost simultaneously, dead migratory birds detected with H5N1 were reported in Mongolia. In October 2005, Turkey and Romania confirmed H5N1 in poultry. Outbreaks in wild and domestic birds are under investigation elsewhere. Japan, the Republic of Korea, and Malaysia have announced control of their poultry outbreaks and are now considered free of the disease. In the other affected areas, outbreaks are continuing with varying degrees of severity (http://www.who.int/csr/disease/avian_influenza/avian_faqs/en/index.html#whatare).

3. How does it infect, how can infection be detected and how can it spread?

How does it infect?

The virus infect from bird to bird through saliva, nasal secretions, faeces or drinking water (Dagbladet, 05.11.05). Avian influenza is mainly infecting birds, but may also on rare occasions infect humans. Infection happens by direct contact between sick birds and people, and you have to be exposed to massive contamination to get infected. Very rarely, inefficient and limited human-to-human transmission may occur.
(http://www.birdflu.gov.sg/flu/WhatIs.htm).

Direct contact with infected poultry, or surfaces and objects contaminated by their faeces, is presently considered the main route of human infection. To date, most human cases

have occurred in rural or periurban areas where many households keep small poultry flocks, which often roam freely, sometimes entering homes or sharing outdoor areas where children play. As infected birds shed large quantities of virus in their faeces, opportunities for exposure to infected droppings or to environments contaminated by the virus are abundant under such conditions. Moreover, because many households in Asia depend on poultry for income and food, many families sell or slaughter and consume birds when signs of illness appear in a flock, and this practice has proved difficult to change. Exposure is considered most likely during slaughter, defeathering, butchering, and preparation of poultry for cooking. There is no evidence that properly cooked poultry or eggs can be a source of infection.
(http://www.who.int/csr/disease/avian_influenza/avian_faqs/en/index.html#whatis).

Avian Influenza Infections in Humans

Pandemic influenza occurs when a new influenza virus emerges and starts spreading as easily as normal influenza (i.e. efficient human-to-human transmission) - by coughing and sneezing. The new virus must be able to replicate in humans and cause serious illness. As the virus is new, the human immune system will have no pre-existing immunity. This makes it likely that that people who contract pandemic influenza will experience more serious disease than that caused by normal influenza. (WHO website).

The first registered infection from bird to human was in Hong Kong in 1997, when the H5N1 strain caused severe respiratory disease to 18 people, of whom six died. The infection of humans coincided with an epidemic of highly pathogenic avian influenza, caused by the same strain, in Hong Kong's poultry population.

Extensive investigation of that outbreak determined that close contact with live infected poultry was the source of human infection. Studies at the genetic level further determined that the virus had jumped directly from birds to humans. Limited transmission to health care workers occurred, but did not cause severe disease.

Rapid destruction – within three days – of Hong Kong's entire poultry population, estimated at around 1.5 million birds, reduced opportunities for further direct transmission to humans, and may have averted a pandemic.

The Hong Kong episode alarmed public health authorities, as it marked the first time that an avian influenza virus was transmitted directly to humans and caused severe illness with high mortality. Confirmed instances of avian influenza viruses infecting humans since 1997 have been summarized in Table 1. In all these cases close contact with poultry was incriminated.

Table 1. ***Confirmed cases of avian influenza in human beings 1997-2003***

Year	Country	Cases	Deaths	Type of Influenza A Virus
1997	Hong Kong	18	6	H5N1
1999	Hong Kong	2	0	H9N2
1999	Mainland China	Several	?	H9N2
2003	Hong Kong	2	1	H5N1

2003	Netherlands	80	1	H7N7
2003	Hong Kong	1	1	H9N2

Source: http://w3.whosea.org/en/Section10/Section1027/Section1091_4083.htm

According to BBC broadcast in 5.11.2005, two more confirmed cases of bird flu cause human death reported in Indonesia. There may be signal of the virus transferred from human to human.

How can infection be detected?

In birds

In domesticated poultry, infection with avian influenza viruses causes two main forms of disease, distinguished by low and high extremes of virulence. The so-called "low pathogenic" form commonly causes only mild symptoms (ruffled feathers, a drop in egg production) and may easily go undetected. The highly pathogenic form is far more dramatic. It spreads very rapidly through poultry flocks, causes disease affecting multiple internal organs, and has a mortality that can approach 100%, often within 48 hours. The virus can be isolated in the lab for definitive diagnosis.

Clinical diagnosis:
• Severe depression, inappetence
• Drastic decline in egg production
• Facial oedema with swollen and cyanotic combs and wattles
• Petechial haemorrhages on internal membrane surfaces
• Sudden deaths (mortality can reach 100%)
Lesions (chickens):
• Lesions may be absent in cases of sudden death
• Severe congestion of the musculature
• Dehydration
• Substaneous oedema of the head and neck area
• Severe congestion of conjunctiva, sometimes with petechia
• Excessive mucous exudate in the lumen of the trachea, or severe haemorrhagic tracheitis
• Petechia on the inside of the sternum, on the serosa and abdominal fat, serosal surfaces and in the body cavity
• Severe kidney congestion, sometimes with urate deposits in the tubules
• Hemorrhages and degeneration of the ovary
• Hemorrhages on the mucosal surface of the proventriculus, particularly at the juncture with the gizzard
• Hemorrhages and erosions of the gizzard lining
• Hemorrhagic foci on the lymphoid tissues in the intestinal mucosa
The lesions in turkeys are similar to those in chickens, but may not be as marked. Ducks infected with HPAI and excreting the virus may not show any clinical signs or lesions. (www.da.gov.ph/updates/ bird_flu_04.html).

In human

Provisional Case Definitions for Avian Influenza

For facilitating clinical management and reporting within a country or territory, case definitions with a hierarchy of case categories will need to be developed according to the epidemiological situation.

-Patient under investigation

Any individual presenting with fever (temperature >38°C)
AND one or more of the following symptoms:

Cough
Sore throat
Shortness of breath

who is under clinical observation and laboratory investigations are under way.

- Possible influenza A/H5 case

I. Any individual presenting with fever (temperature >38°C)
AND one or more of the following symptoms:

Cough
Sore throat
Shortness of breath

AND one or more of the following:

a Laboratory evidence for influenza A by a test that does not sub-type the virus;

b Having been in contact during the 7 days prior to the onset of symptoms with a confirmed case of Influenza A/H5 while this case was infectious*;

c Having been in contact during the 7 days prior to the onset of symptoms with birds, including chickens, that have died of an illness;

d Having worked in a laboratory during the 7 days prior to the onset of symptoms where there is processing of samples from persons or animals that are suspected of having highly pathogenic avian influenza (HPAI) infection.

OR

II. Death from an unexplained acute respiratory illness
AND one or more of the following

a. Residing in area where HPAI is suspected or confirmed;

b. Having been in contact during the 7 days prior to the onset of symptoms with a confirmed case of Influenza A/H5 while this case was infectious*.

-Probable influenza A/H5 case

Any individual presenting with fever (temperature >38°C)
AND one or more of the following symptoms:

Cough
Sore throat
Shortness of breath

AND limited laboratory evidence for Influenza A/H5 (H5 specific antibodies detected in a single serum specimen).

- *Confirmed influenza A/H5 case*
An individual§ for whom laboratory testing demonstrates one or more of the following

a. positive viral culture for Influenza A/H5;
b. positive PCR for Influenza A/H5;
c. immunofluorescence antibody (IFA) test positive with A/H5 monoclonal antibodies;
d. 4-fold rise in Influenza A/H5 specific antibody titre in paired serum samples.

* Individuals infected with Influenza A/H5 virus are considered to be infectious starting from one day before the onset of symptoms up to 7 days after onset of symptoms.

How can it spread?

Migratory birds carrying influenza virus are considered as important route of spreading disease. However, the role of migratory birds in the spread of highly pathogenic avian influenza is not fully understood. Wild waterfowl are considered the natural reservoir of all influenza a viruses. They have probably carried influenza viruses, with no apparent harm, for centuries. They are known to carry viruses of the H5 and H7 subtypes, but usually in the low pathogenic form. Considerable circumstantial evidence suggests that migratory birds can introduce low pathogenic H5 and H7 viruses to poultry flocks, which then mutate to the highly pathogenic form. Domestic poultry, including chickens and turkeys, are particularly susceptible to epidemics of rapidly fatal influenza. Spread of avian influenza virus is related chiefly to the excretion of high concentrations of virus in the faeces of the infected birds.

In the past, highly pathogenic viruses have been isolated from migratory birds on very rare occasions involving a few birds, usually found dead within the flight range of a poultry outbreak. This finding long suggested that wild waterfowl are not agents for the onward transmission of these viruses.

Recent events make it likely that some migratory birds are now directly spreading the H5N1 virus in its highly pathogenic form. Further spread to new areas is expected. (http://www.who.int/csr/disease/avian_influenza/avian_faqs/en/index.html#consequences).

Direct or indirect contact of domestic flocks with wild migratory waterfowl has been implicated as a frequent cause of epidemics. Live bird markets have also played an important role in the spread of epidemics.

Epidemiological evidence of higher prevalence of infection in poultry on routes followed by migratory waterfowls supports this hypothesis which is further strengthened by the fact that most of the commercial poultry farms are concentrated in some countries on precisely the flyways of migratory waterfowls. The absence of poultry farms or poultry

congregations on the flyways of the migratory birds may also explain the non-occurrence of avian influenza in some countries in spite of their geographical location.

Avian influenza outbreaks have been reported from Australia and the USA because of the presence of natural or artificial lakes or ponds near the poultry farms. The lakes always attract migratory waterfowls because of the availability of surface drinking water.

Influenza outbreaks also show a seasonal occurrence in high risk areas, which coincides with the migratory activity. In most documented specific outbreaks evidence has been obtained of probable waterfowl contact at the initial site.

Live bird markets may also play an important role in the spread of epidemics and so does the transport of infected chickens across borders, both legally as well as illegally. Man-driven movement of poultry within the country, mainly for commercial purposes, has the potential to cause secondary spread among poultry. Avian influenza usually does not make wild birds sick, and they may function as carriers of the virus to sensitive domesticated birds
(http://w3.whosea.org/en/Section10/Section1027/Section1091_4083.htm).

The quarantining of infected farms and destruction of infected or potentially exposed flocks are standard control measures aimed at preventing spread to other farms and eventual establishment of the virus in a country's poultry population. Apart from being highly contagious, avian influenza viruses are readily transmitted from farm to farm by mechanical means, such as by contaminated equipment, vehicles, feed, cages, or clothing. Highly pathogenic viruses can survive for long periods in the environment, especially when temperatures are low. Stringent sanitary measures on farms can, however, confer some degree of protection. In the absence of prompt control measures backed by good surveillance, epidemics can last for years. For example, an epidemic of H5N2 avian influenza, which began in Mexico in 1992, started with low pathogenicity, evolved to the highly fatal form, and was not controlled until 1995.

4. How can you protect yourself if you have been in contact with potentially infected birds?

It would be wise that you protect yourself adequately before you contact with potentially infection birds or potential infected area. How can you protect yourself after having been in contact with potentially infectious birds? One can find relevant advices at the WHO website. You should keep in mind that by protecting yourself you protect the community surrounding you! The following are general advices from the WHO website:

> People should avoid contact with chickens, ducks or other poultry unless absolutely necessary. This is the best way to prevent infection with the bird flu virus.

If you unintentionally come into contact with poultry in an affected area, such as touching the bird's body, touching its faces or other animal dirt, or walking on soil contaminated with poultry faces:

- o Wash your hands well with soap and water after each contact;
- o Remove your shoes outside the house and clean them of all dirt; and
- o Check your temperature for 7 days at least once daily. If you develop a high temperature (>37.5°C), visit a doctor or the nearest health care facility immediately.

If you need to handle dead or sick poultry, make sure you are protected:

- o Wear protective clothing such as a mask, goggles, gown, rubber boots and gloves.
- o If these are not available, cover your mouth with a piece of cloth, wear glasses, use plastic bags to cover hands and shoes and fix these tightly around wrists and ankles with a rubber band or string.
- o Wear overalls that can be washed.

If you encounter sick and dead poultry for the first time and are unsure of the situation, inform the authorities immediately and leave the handling of the poultry to experienced personnel (cullers, clean-up personnel, etc.).

5. Assess the risk for fieldworkers of getting infected in different part of the world

During recent year, 2003 to 2005, bird flu disease caused by avian influenza virus have caused outbreak disease for poultry in 9 Asian countries, including Thailand, Cambodia, Vietnam, possibly Lao, China, Indonesia, Malaysia, Republic of Korea and Japan. The bird flu has not stayed only in Asian countries, but has also already moved to some European countries such as Russia, Turkey and Romania in 2005. The virus may alter themselves to easily be transferred between people, and therefore this disease has the possibility to evolve into a pandemic influenza which may cause a serious threat to people. Cases of human death due to bird flu virus have been confirmed in some Asian countries (Table 1). The world has been preparing hardly to minimize the risk if, in the worse case, the pandemic spread would happen.

Field workers who need to work closely with birds, especially with wild birds, obviously will face some risk of being infected with bird flu disease. The risk will increase if they work in areas/countries where continuing outbreak of the disease is confirmed. Wild bird such as waterfowl carry avian influenza virus but at low pathogenic forms that makes disease symptoms appear mildly or not at all. In other words, their disease symptoms are not easily detected just from their appearance. This factor makes it important that the fieldworker is careful even with ‘healthy’ birds. In addition to the forgoing, the complex migratory pattern of the bird is another risk that bird flu can transfer fast from infected area to uninfected area.

6. Recommendations for field workers to minimize the risk of being infected.

Based on “Advice for people living in areas affected by bird flu or avian influenza ” published by WHO (WHO website), followings are recommendations for fieldworkers to minimize the risk of getting infected with the bird flu virus:

a. Should not work with bird in on-going bird flu infected area unless absolutely necessary.
b. If fieldworkers really need to work with bird with potential risk of being infected with the virus, make sure that they protect them self well before contact with the birds by follow instruction of WHO described earlier in this project.
c. After having been in contact with potential risk of the virus, check your temperature for 7 days at least once daily. If you develop a high temperature (>37.5°C), visit a doctor or the nearest health care facility immediately.

It is very important that fieldworkers know how to minimize the risk of transferring disease from their study area to Trondheim or other places where they work. This includes how they should handle the bio-samples such as tissue and blood samples that potential contain pathogenic viruses. Here are some recommendations for the fieldworkers:

Clean themselves thoroughly after contact with potential risk sources.

Clean up or discharge equipments in contact with potential risk sources by following veterinary hygienic instructions.

Do not bring biosamples from potentially risk source unless absolutely necessary.

In case they need to bring biosamples to working area from studying area, the sample must be checked if they are free from any kind harmfully pathogenic disease, especially avian influenza virus. Seek advices from veteran institute.

Isolation of samples and study them separately to avoid transferring disease to working area.

7. Restrictions can be expected from Norwegian Food Safety Authority on field work area that have bird flu or in areas that are close to infected areas.

The Norwegian government has taken several steps to prevent a possible bird flu epidemic from entering the country and further spreading within the nations border. Apart from obtaining a stock of the medicine Tami flu, The Norwegian Food Safety Authority issued an order for all poultry in eleven of the of the country's nineteen counties to be kept indoors: Rogaland, Vestfold, Buskerud, Telemark, Østfold, Akershus, Oslo, Hedmark, Oppland, Vest-Agder, and Aust-Agder. The authority also asked the border customs to increase the inspections against possible illegal import of poultry. The situation is monitored continuously with cooperation with other authorities as well as

other European authorities. Import of poultry has also been stopped from parts of Russia and other countries.

With the above mentioned situation, we can expect from the Norwegian Food Safety Authority that all field work in areas at risk and potential risk of being infected have to be applied to the Authority for approval. Field workers will need to describe their activities in the potential risk areas and justify the necessity of their work. Furthermore all bio-samples such as tissue, blood, carcass of birds and other animals from areas of potential risk of bird flu will not be imported to Norway unless these samples are proved free from avian flu virus or having special permission. In addition, handling of poultry in affected areas may be restricted within the area without transporting them to other areas.

8. How should IBI/NTNU react/prepare for prevention of potential bird flu?

As far as we know, specific restrictions from Norwegian Food Safety Authority about fieldwork and taking biological sample from potential risk of bird flu areas are not available yet. However one may find useful information related to transferring live animals. The rules for non-commercial movement of dogs, cats and ferrets to Norway are given in the regulation of 1. July 2004 no 1105 regarding animal health conditions for non-commercial movement of pets as amended. The Norwegian regulation is based upon corresponding legislation in the European Union, according to the EEA-agreement. The regulation (only in Norwegian) and corresponding EU-legislation (English version) is available.

In this context it would be wise of IBI/NTNU to be one step a head by establishing their own self-restrictions. These restrictions will first help to protect their animal unit from potentially being infected with bird flu, their staff working on bird and the community living around them. The restrictions will include fieldwork in potentially risk areas, biological sample handling and transferring and hygienic regulation in the experimental animal units.

References

1. Advice for people living in areas affected by bird flu or avian influenza ” published by WHO (WHO website)

2. http://www.who.int/mediacentre/factsheets/avian_influenza/en

3. http://www.birdflu.gov.sg/flu/WhatIs.htm

4. http://www.who.int/csr/disease/influenza/WHO_CDS_2005_29/en/index.html

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7. http://www.who.int/csr/disease/avian_influenza/avian_faqs/en/index.html#whatis

8. www.da.gov.ph/updates/ bird_flu_04.html

9. http://www.who.int/csr/disease/avian_influenza/avian_faqs/en/index.html#consequences

10. http://w3.whosea.org/en/Section10/Section1027/Section1091_4083.htmNorwegian Food Safety Authority website (http://www.mattilsynet.no/portal/page)