FACING
THE CHALLENGE OF
BIRD FLU

Facing the Challenge of Bird Flu

Bird flu is a complex and dangerous disease that recognizes no borders. It is being watched anxiously by the entire world.

The reason for the concern is that the virus that causes bird flu, H5N1, is continually evolving. Each change in the virus has the potential to make it more dangerous. Originally, the virus was an ordinary avian influenza, confined to a few species of waterfowl. At present, the virus can infect many types of animal, including humans. The fatality rate among humans is very high.

Scientists argue that a crucial threshold has been reached in the evolution of bird flu. Further mutations may well enable bird flu to spread from human to human. If that happens, then a pandemic will be difficult to avoid. Such a pandemic is likely to kill millions of people in a short time. This is what happened in the six or seven influenza pandemics that have occurred in the past two centuries.

Meanwhile, the virus continues to spread. Even if one country manages to control it, the disease spreads elsewhere, often returning to re-infect the source.

The present challenge is how to cope with bird flu, so that the number of deaths is minimized. This will require concrete policies, cooperation, and transparency from all concerned, at both the national and international levels.

A disease without borders

The scientific term for bird flu is "avian influenza" since bird flu is a type of influenza that afflicts birds, and particularly waterfowls.

The most important fact about avian influenza is that it is caused by the same virus that causes influenza among humans. This virus has many strains. Some strains lead to severe symptoms among birds, while others lead to mild symptoms. The strain that has spread through Thailand and other countries in the past two years causes severe symptoms. Its scientific name is H5N1.

Originally, H5N1 was confined entirely to birds, with no known cases of transmission to humans. The first time it was contracted by humans was in Hong Kong in 1998. After 1998, cases occurred among humans in several other countries, including Thailand.

Evidence of bird flu spreading to humans caused enormous concern among scientists and among national and international health organizations. The reason for the concern was the fear that the virus might one day evolve into a form that spreads easily from human to human. If that were to happen, it would be difficult to avoid a pandemic causing hundreds of millions of illnesses, and millions of deaths. Pandemics of this magnitude have occurred six or seven times in the past two centuries.

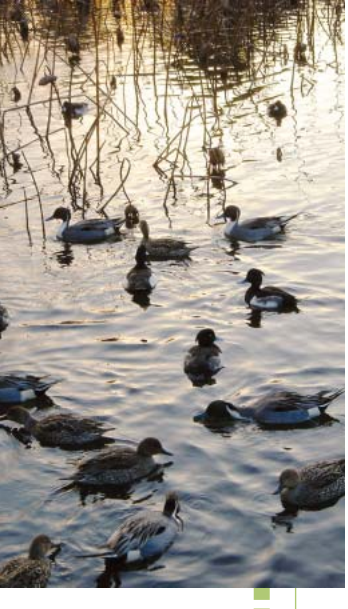
There are three main types of virus that cause influenza among humans and birds. Scientists call the three types A, B, and C, which are further classified into many strains.

Type A causes more severe illnesses than Types B and C. Eighty percent of cases of bird flu among humans have been caused by Type A. Type A also causes illness in many other animals, including birds such as chickens and ducks, and mammals such as pigs, whales, cats, and tigers.

Most mammals have their own particular strain of virus, which is usually named after them, such as "human influenza", "swine influenza" and "equine influenza." Avian influenza spreads easily among different bird species, which is why it acquired the name "**bird flu**".

Type B and C only cause illness among humans and not other animals (except that Type C may cause illness in pigs.) Type B and C do not cause severe illnesses. They have so far been confined to limited areas.

Bird flu has infected many species of migratory birds, as well as domestic birds, such as ducks and chickens, which can easily infect humans. It is now very difficult to control the spread of the virus, since it can easily move from country to country or region to region. Bird flu can truly be called a disease without borders.

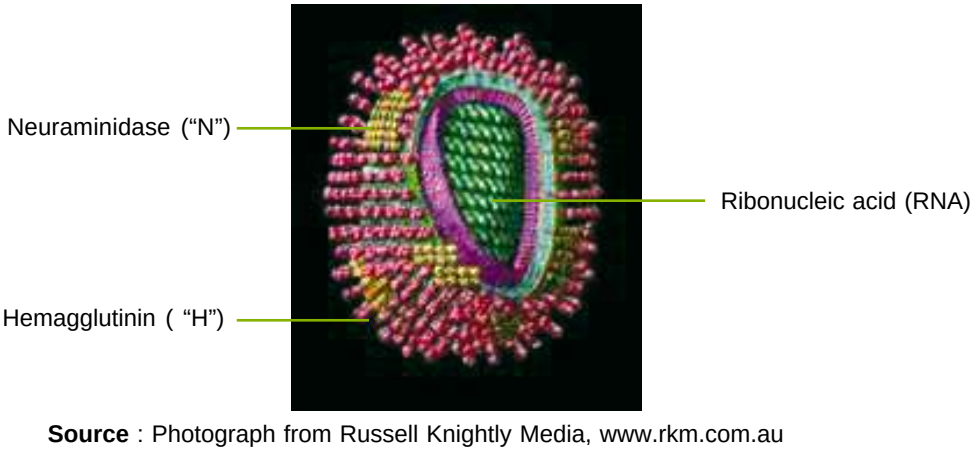


Avian influenza

Viewed through a microscope, Type A influenza virus is shaped like a ball. The virus contains eight strands of ribonucleic acid (RNA). The RNA is covered by two layers of protein membrane. The outer layer is covered with protuberances rather like the skin of a durian. The protuberances are classified into two kinds, depending on the proteins of which they are composed. One kind is called Hemagglutinin (acronym "H"). Its function is to attach to the receptor outside of the living cells that the virus is trying to infect. The other kind is called Neuraminidase ("N"). It is an enzyme. Its function is to dissolve the protein on the outside of the cell, to create a hole for the virus to enter.

Hemagglutinin and Neuraminidase can be further subdivided into many varieties. Currently scientists distinguish among fifteen types of Hemagglutinin (though some distinguish among sixteen), with names H1, H2, H3, up to H15. Similarly, scientists distinguish among nine types of Neuraminidase, with names N1, N2, N3, up to N9. Different strains of the virus are composed of different combinations of H and N: H1N1, H7N7, H5N1, H3N2, and so on.

Most of the strains that infect humans are composed of H1, H2, H3, N1, and N2. The best-known strain at present is H5N1, which spread from birds to humans in Thailand and other countries in the region during 2004. The other well-known strain is H7N7, which caused an epidemic in the Netherlands in 2003.



Source : Photograph from Russell Knightly Media, www.rkm.com.au

Influenza Pandemics in the Past Two Centuries

Start of pandemic	Virus strain	Details
1781-82	Unknown	The pandemic began in North Africa and subsequently spread to China. Around 10 million people were infected.
1889-90	H2N2	Began in Central Asia. Spread to Europe, including Russia. There were approximately one million deaths, mostly children.
1918-19	H1N1	The pandemic began in the United States, but news about the pandemic was suppressed. When it reached Europe, reports appeared in the Spanish media, which is why it became known as “Spanish Flu.” Across the world, 20-40 million people were killed.
1959-60	H2N2	The pandemic began in China and spread across the world within six months. It became known as “Asian Influenza.” Approximately 1-2 million people were killed.
1970-71	H3N2	The pandemic began in Hong Kong. Around 200,000 people were infected. It subsequently spread across the world, and became known as “Hong Kong Flu.” Approximately one million people were killed.
1979-80	H1N1	The source of this pandemic was Russia. From there is spread to Siberia and to some countries in Europe. It was called the“Russian Influenza.” Most victims were children and old people, but the total number of deaths is unknown.

Source – Prasert Thongcharoen 2004
http://www.nature.com/nature/focus/avianflu/timeline.html
http://www.globalsecurity.org/security/ops/hsc-scen-3_pandemic-influenza.htm
http://www.andypryke.com/pub/InfluenzaPandemic

Sporadic outbreaks of the disease in the region over the past years have led many scientists to believe that it is now here permanently. This means that regular outbreaks of the disease are inevitable.

Experts believe that the virus H5N1 must has been evolving among bird populations for many years, to the point where it can infect birds without causing disease. Migratory birds are therefore a natural reservoir of disease, which they pass to other species along their migration routes

The spread of bird flu

It is still not certain how bird flu first came to Thailand. However, current evidence points towards migratory water birds such as ducks and geese.

Experts believe that the virus H5N1 must have been evolving among bird populations for many years, to the point where it can infect birds without causing disease. Migratory birds are therefore a natural reservoir of disease, which they pass to other species along their migration routes.

Migratory birds release the disease into the environment through their feces, urine, blood, and saliva. When domestic birds such as ducks and chickens come into contact with wild birds, they pick up the disease through one means or another. If the domestic birds are exposed to sufficiently large amounts of the virus, they will sicken and die, since they have no natural resistance. The disease spreads rapidly among domestic birds, which is why hundred or thousands of birds in the same farm or community can die within a few days.

However, parts of this explanation have been subject to debate. For instance, some people have argued that migratory birds are not the most likely source of infection. They point out that migratory birds themselves have contract the disease and died in large numbers, particularly in places where there are outbreaks among domestic birds. This suggests that the disease is spread through other means.

Regardless of how it first arrived, bird flu has been found in Thailand and in neighboring countries such as China, Vietnam, Cambodia, Laos, Malaysia, and Indonesia. Sporadic outbreaks of the disease in the region over the past years have led many scientists to believe that it is now here permanently. This means that regular outbreaks of the disease are inevitable.

The Thai epidemic

By late 2005, there had been three major outbreaks of bird flu in Thailand:

• From late 2003, unusually large numbers of birds began to die. However, the government did not officially acknowledge the existence of a problem until January 2004. The outbreak died down in June of the same year. The disease was reported in 190 different sites, across 42 provinces.

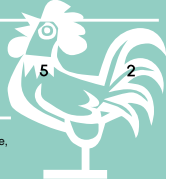
• The second outbreak lasted from July 2004 to April 2005. The disease was reported at 1,542 sites, in 51 provinces.

• The third outbreak began in July 2005 and was still underway in December 2005.

The Thai Bird Flu Epidemic, 2003-2005

Outbreak	Time	Place	Number of birds culled or dying from illness	Number of people Infected	Dead
1	Late 2003 to June 2004	190 sites in 42 provinces	60,000,000	12	8
2	July 2004 to April 2005	1,542 sites in 51 provinces	3,000,000	5	4
3	July 2005 to December 2005	40 sites in 5 provinces	400,000	5	2

Source – Department of Livestock Development, Ministry of Agriculture, and Department of Disease Control, Ministry of Public Health



Concerns about high-density farms in the delta area

Bird flu outbreaks in Thailand are associated with two ecological features that may provide clues on how to control the epidemic.

When bird flu first broke out, there was no apparent relationship between the way the birds were raised and the likelihood of infection. Birds raised on large, commercial farms had the same chance of contracting infection as birds raised in backyards. The likely reason for the lack of difference was that no one had any information about the disease and so could not take precautions. When the second and third outbreaks occurred, most cases of disease occurred among ducks and chickens raised in backyards and small farms, and few occurred among poultry raised in commercial "closed system" farms. The likely reason is that ducks and chickens raised in backyards were more likely to come in contact with wild birds when searching for food. Commercial farms had much better systems for protecting against disease.

The interesting second feature of the outbreaks is that they mainly occurred in the Chao Phraya Delta, the biggest delta region in Thailand. Bird flu outbreaks occurred from the Upper Delta down to the Lower Delta, but were rare in other parts of Thailand.

Was the intensity of the epidemic in the Chao Phraya Delta related to the unusually high poultry population densities in this region? Do the ecological system and land use patterns of the region affect the spread of the epidemic?

As is well known, the Chao Phraya Delta is highly fertile. There are many natural water sources, including rivers, swamps, and ponds. These water sources draw many kinds of migratory birds, including birds from Siberia coming south for the winter, from November to March. If, as most experts believe, wild migratory birds are a reservoir of H5N1, then it is not surprising that the Chao Phraya Delta has been infected.

Picture by MP BIRDLAND

Patterns of land use in the Chao Phraya Delta raise the risk on infection still further. Rice farmers in the delta grow two, or even three, crops of rice a year. The crabs, molluscs, and small fish that live in the paddy fields attract birds. In addition, farmers allow ducks to search for rice grains, insects, and shellfish in fields that have just been harvested. The raising of ducks in open fields (free-range ducks) is therefore particularly common in the delta.

It is important to recognize that the raising of ducks in rice fields is highly efficient, and is an integral part of the farming methods and lifestyle of Central Thai rice farmers. The ducks feed themselves at virtually no cost to the farmer. In fact the ducks help the farmer to control pests such as the cherry snail and grasshopper, and supply fertilizer to the field.

Unfortunately, the ducks also come into contact with migratory birds, and therefore with the bird flu virus, which is found in the feces of the migratory birds or in bird corpses.

Once the ducks have eaten all the food in the rice fields, the owners take them elsewhere. Some farmers carry them in trucks to neighboring provinces in Central Thailand, or even to North and Northeast Thailand. If any of the ducks are infected with bird flu, the virus is transported long distances. This greatly complicates efforts to control the virus.

Research shows that birds that are newly infected with the virus do not show any symptoms. They feed and carry on as normal for many days before becoming ill. Ducks that are transported long distances can therefore release the virus into the environment and infect many other ducks and other bird species, before they themselves fall ill and die.

Free-range ducks in rice fields: An important part of Thai farming culture

Mr. Son, aged 63 years, is a farmer in Suphan Buri Province, where he was born. He has raised ducks for more than 10 years, and looks after 3-4 flocks. At present Mr. Son has more than 2,000 egg-laying ducks, yielding an income of at least 2,000 baht per day. Mr. Son has no financial worries. He buys newly-hatched chicks from farms around Suphan Buri for 17-27 baht each, as well as food and medicine. He raises the ducks inside for about a month and a half before releasing them outside to look for food themselves. The ducks begin to lay eggs at about the fourth month. At sunrise every day Mr. Son collects the eggs and then drives the ducks out into the fields. The ducks feed on snails, frogs, crabs, fish, and insects. If no food is left in fields near the house, the ducks travel further afield. Sometimes it is necessary to hire someone to help watch the ducks 24 hours a day, and to build a temporary shelter for the ducks to use at night, which makes egg collection easier.

Mr. Son says that he only needs to buy food for the ducks during the first one or two months. Once the ducks move out to the fields, his costs are minimal, apart from the occasional need to hire someone to watch the flock. Mr. Son has never taken his ducks to look for food outside his district because traveling with the ducks is difficult. Sometimes, however, people come from the Northeast of Thailand, and ask him to bring his ducks to catch the cherry shellfish in their rice fields. In these cases, Mr. Son takes the ducks on a truck. Rice fields around Suphan Buri Province are very productive, and it is common for farmers to grow three crops of rice per year. Farmers do not all plant and harvest at the same time, so there is always somewhere for the ducks to eat. Mr. Son is careful to keep his ducks away from fields where the rice is still immature, but he brings them later to eat cherry shellfish and other pests. The farmers are happy because they do not have to pay for pest control. However, Mr. Son is careful to keep his ducks away from fields where chemical fertilizers or pesticides have been applied, because of the risk to the ducks.

Mr. Son's methods of caring for the ducks are very simple. If a duck appears lethargic or drowsy, he grinds up some onions or herbs for it to eat, which usually fixes the problem overnight. Mr. Son's ducks are very healthy, because they have plenty of exercise and eat nutritious food. They therefore lay large eggs, with pinkish shells and dark yellow, pleasant-smelling yolks. The eggs fetch a good price at the market. According to Mr. Son, ducks that only eat commercial food lay small, inferior eggs that are no good for making desserts.

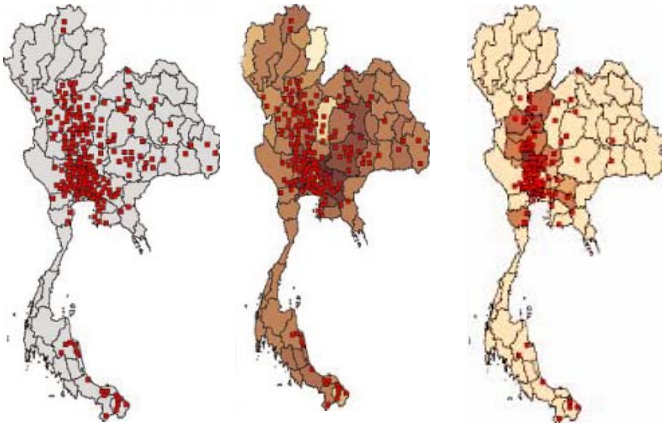
On the day we met him, Mr. Son and about 700 other local duck farmers have come to listen to staff from the provincial agricultural office. The officials try to persuade the farmers to raise their ducks indoors. They claim that if the ducks are raised in sheds, the quality of the eggs will be better, and the eggs can be exported throughout the world. Mr. Son is, however, worried about changing. At present he has very few costs, but if he was to build a shed for the ducks, he would have to borrow money from the Bank for Agriculture and Agricultural Cooperatives. He would no longer be financially secure.

(**Source:** Interview with Mr. Son, a duck farmer, January 6, 2006)

All this explains why bird flu has been more common in the Chao Phraya Delta than in other parts of Thailand. Significantly, the situation in Vietnam is very similar. Bird flu in Vietnam has been concentrated in the Mekong Delta in the South and the Red River Delta in the North, with relatively few outbreaks elsewhere.

The policy response to bird flu must include measures to control the raising of ducks and chickens outdoors. Ducks and chickens raised outdoors face the highest risk of exposure to the bird flu virus.

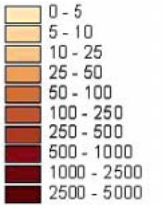
The first and second outbreaks of bird flu were concentrated in the Chao Phraya River Delta where there is high-density duck farming



Outbreaks among ducks and chickens, whole country

Outbreaks among chickens, and numbers of chickens per square kilometer

Outbreaks among ducks, and numbers of ducks per square kilometer



Number of ducks and chickens per square kilometer.

Source: Department of Livestock Development, Ministry of Agriculture and Agricultural Cooperatives, 2004

Essential facts about bird flu

1. How do people contract bird flu from animals?

Everyone in Thailand who has contracted bird flu has had some sort of contact with infected or dead birds. For instance, they have had contact with saliva or blood, or they have eaten infected birds. Under these conditions, the virus can easily enter the human body.

2. How can I protect myself from bird flu?

Avoid infected birds. If contact with infected birds is unavoidable, wear gloves or several plastic bags. If raising birds at home, watch carefully for outbreaks in surrounding areas, and monitor for signs of infection in household birds. If signs of infection are detected, or if birds die suddenly, then contact the sub-district head, the village head, a village health volunteer, a Subdistrict Administrative Organization official, or a health worker, as quickly as possible.

3. Do cooks who come into contact with raw poultry contract bird flu?

So far, no cooks have contracted bird flu. However, since the bird flu virus is found in poultry, it is safest to watch hands and cooking equipment carefully after coming into contact with raw chicken or duck. The bird flu virus is easy to kill with soap or detergent.

4. What is the safest way to choose and store eggs?

Choose eggs that look clean and do not have any excrement on the outside. Do not buy large numbers of eggs at the same time, and do not keep eggs in the fridge, since the virus can survive longer if it is refrigerated. When there is an epidemic avoid eating under-cooked eggs.

5. What are the symptoms of bird flu?

People infected by bird flu start to show symptoms after 1-3 days. The symptoms are similar to those of influenza: high fever, aches, exhaustion, sore throat, coughing, difficulty breathing, and infected lungs.

From bird flu to human flu: How soon?

The viruses that cause bird flu and human flu store their genetic code in RNA. These viruses frequently mutate; in other words, changes occur in their genetic code. The mutations often alter the characteristics of the viruses. The immune systems of individuals infected by earlier strains of the virus do not necessarily recognize the new strains. Thus the same individuals can become infected for a second time.

Mutations in the influenza virus, including avian and human influenza, can occur either gradually or quickly. Either type of mutation can give rise to new strains of the virus. These new strains may increase or decrease the severity of the symptoms. The effects are impossible to predict.

Gradual changes in the virus

Viruses naturally undergo gradual genetic change. These changes occur due to mistakes in copying the genetic code. Scientists call this sort of change "antigenic drift." All kinds of influenza, including human and avian influenza, are continually subject to antigenic drift. The effects on the character of the virus are sometimes minor and sometimes major.

Scientists have found that mistakes in copying the genetic code that lead to minor modification in the virus occur once for every 10,000 base pairs that are copied. The bird flu virus has approximately 13,000 base pairs. On average, one or two mistakes can be expected each time the virus replicates itself. In other words, each new virus that is created tends to be minutely different from the original version.

This means that the virus sample used to create vaccines must be changed each year. Only by constantly updating is it possible to ensure a close fit between the vaccine and the current version of the virus. The need for constant change greatly increases the costs of producing the vaccine, and hence the price paid by the consumer.

Because the virus is constantly changing, it is possible for a completely new strain to emerge eventually. This new strain can have a different genetic code and different character than the original.

No one knows how long it will be before the virus develops the ability to infect humans easily. Some authorities predict that it will take ten years or longer. There is, however, little scientific evidence on which to base predictions.

Any mutations, whether large or small, can enhance the virus's ability to survive. For instance, the virus might become more infectious, or might gain the ability to infect a wider range of host animals, or might no longer be remembered by the immune systems of animals that had previously been infected. All these characteristics are subject to natural selection. On the other hand, mutations may also reduce the virus's ability to survive. These mutations will be eliminated by natural selection.

Through natural selection, bird flu and human flu are continually adapting themselves to changes in the environment. This has important implications for control of bird flu in Thailand and elsewhere. If the virus infects humans frequently, over a long enough period, then the virus will adapt itself to the human host. The virus will be able to infect humans easily, though at present it has difficulty doing so. Once this happens, however, a pandemic will be more likely.

No one knows how long it will be before the virus develops the ability to infect humans easily. Some authorities predict that it will take ten years or longer. There is, however, little scientific evidence on which to base predictions.

Rapid change: A real possibility

Viruses sometimes undergo rapid changes. Such changes occur because different viruses exchange genes. For instance, bird flu and human flu can exchange genes. Scientists call these sorts of changes “antigenic shifts”. The viruses that result from antigenic shifts tend to differ markedly from the original viruses.

The exchange of genes could lead to a virus that can spread from person to person, creating a pandemic. If people’s immune systems did not recognize the new virus, it could infect people easily. Scientists believe that this is what happened in the previous 6-7 influenza pandemics over the past 200 years.

These sorts of changes can occur when the two viruses are present at the same time in the same animal or human. For instance, a person might be simultaneously infected with the human influenza virus and the avian influenza virus. If the two viruses are present in the same host, they may exchange genetic material when they multiply. The newly-created virus may inherit characteristics from each of the original viruses. Such exchanges can occur because, as noted above, the genetic materials of the influenza viruses exist in separate pieces.

The exchange of genetic material is known as “reassortment.” Sometimes the new strain is sufficiently different from the old strain that it is not recognized by people’s or animals’ immune systems. The new strain can thus cause severe illness and can spread widely.

There are, at present, two scenarios in which reassortment is likely to occur.

The first scenario is that reassortment occurs in pigs that farmers raise at their homes for extra income. A pig contracts swine influenza, and at the same time contracts H5N1. The pig then acts as a “mixing vessel,” so that the viruses exchange genetic material.

Swine influenza can spread easily to humans because the fibrous cells lining the respiratory tract are very similar in pigs and humans. Human influenza can also easily spread to pigs.

Bird flu among domestic chickens and ducks has many opportunities to spread to pigs. Farmers raising animals on a small scale often allow ducks, chickens, and pigs to mix: the ducks and chickens eat food spilt or missed by the pigs. It would be easy for a pig infected with swine influenza to come into contact with a duck or chicken infected with avian influenza. It would then be easy for a novel virus to be formed.

The second scenario is that reassortment occurs in a human. If measures to protect humans from bird flu are not completely effective, it is possible that someone may be simultaneously infected with bird flu and human flu. The two viruses exchange genetic material when they multiply, creating a new strain that can spread from person to person. The new strain might also be more virulent than the original ones. If a strain like this emerges, then it will be very difficult to prevent a repeat of previous influenza pandemics.

It is extremely important to prevent reassortment, and the emergence of new strains, from occurring. Pigs must be protected from contact with infected ducks and chickens by being raised separately. This would significantly reduce the danger of a major pandemic.

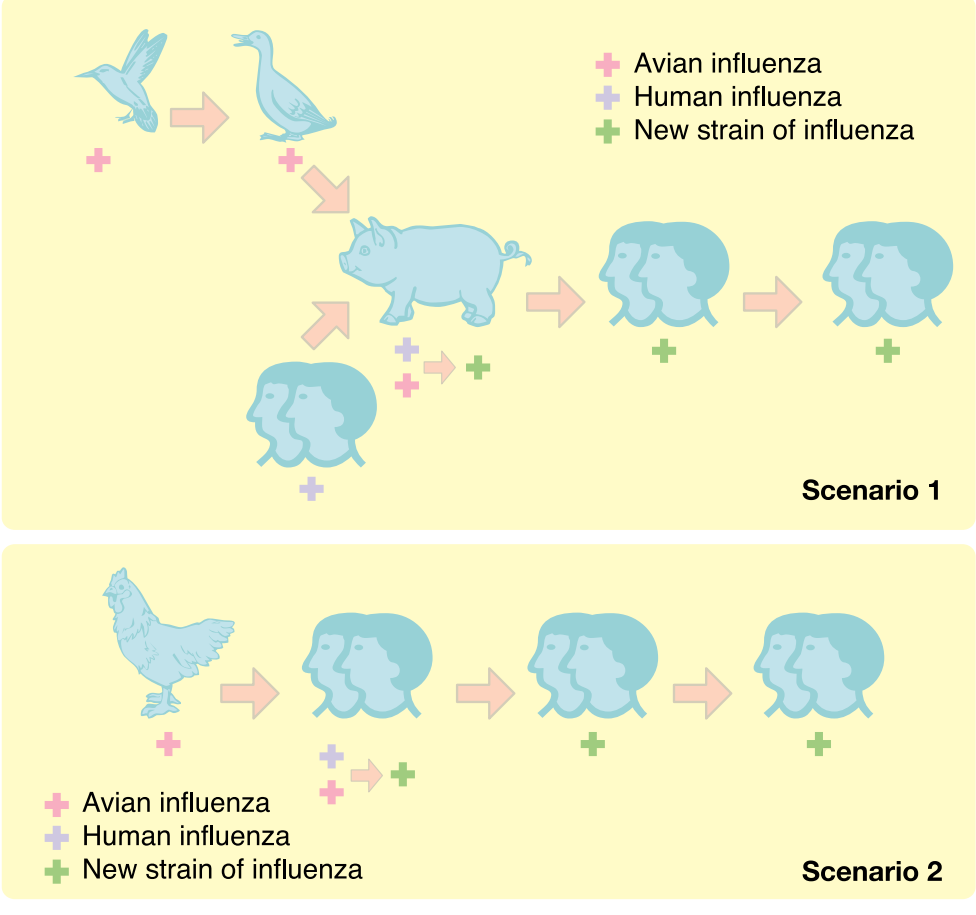
It is also important to protect humans from contracting bird flu. As long as humans continue to be infected, it is only a matter of time before someone infected with human influenza also becomes infected with avian influenza. If a new virus then emerges that combines the high fatality rate of bird flu with the infectiousness of human flu, the result will be a disastrous pandemic. On the other hand, the new virus might be less virulent than the original one.

The bird flu surveillance system operated by scientists at Chulalongkorn University and the Department of Livestock Development has gathered information on the three outbreaks of bird flu since 2004. So far, no major changes in the H5N1 virus have been detected.

The world is already on the path from a bird flu pandemic to a human flu pandemic. The question is no longer whether there will be an influenza pandemic, but when and where

There is so far no evidence to suggest that bird flu can spread efficiently from person to person. However, inefficient person to person transmission, resulting from very close and prolonged exposure with infected people, may have caused a small cluster of cases in Thailand and a number of family clusters in neighboring countries. The possibility of bird flu changing into the form that can easily pass among humans continues to cause global concern.

Scenarios for bird flu to mutate into human influenza



A pandemic is possible – but when and where?

What concerns scientists and health workers the most is the possibility of rapid changes in the H5N1 virus. As the history of influenza over the past two centuries shows, the ensuing pandemic can kill millions of people. The most violent such pandemic was the “Spanish flu” of 1918-19, which took 20-40 million lives.

The “Thai Health 2006” does not want to alarm readers unnecessarily. We simply want the public to understand that the world is already on the path from a bird flu pandemic to a human flu pandemic. The question is no longer whether there will be an influenza pandemic, but when and where.

In the past two centuries there have been 6-7 major influenza pandemics. The pandemics have taken place every 10-40 years, with an average interval of 27 years. The most recent pandemic occurred in 1968, or 38 years ago. We have now exceeded the average interval, and are only two years short of the maximum recorded interval. This does not necessarily mean that there will be a pandemic in two years time, despite the claims of some health experts and international organizations. However, it does help remind people that a new pandemic may not be too far off.

Can a pandemic be prevented?

To prevent the bird flu pandemic from turning into a human flu pandemic, the world needs to stop the bird flu virus from mutating into a human flu virus. However, as discussed above, all viruses, including the bird flu virus, undergo continuous change. It is always possible that the virus will be subject to a major mutation, and a new strain emerges. The result could be a global pandemic. This process could, however, take many years. It is not possible to predict exactly how long, and there is little that we can do to prevent it from happening.

Humans can, however, reduce the probability of the other, more rapid, type of mutation. We need to halt the spread of the virus in bird populations, and prevent the infection of humans. To do so will require effective and timely cooperation between many countries. Bird flu is a threat to all countries.

The impact of the bird flu epidemic: Large and multifaceted

Bird flu raises many different problems and challenges, in the short term and the long term. The effects can be divided into three broad kinds: health, economic, and social. All the effects are interrelated.

The effect on health: A high death rate

The World Health Organization estimates that between late 2003 and December 2005, there were 174 confirmed cases of bird flu in humans. Of these 174 people, 94 died (as of March 1, 2006). Almost all of the people contracting the virus were in East and Southeast Asia, including Vietnam, Thailand, Indonesia, China, and Cambodia. There have also been illnesses and deaths in Turkey. In 2003, one person in the Netherlands died from the H7N7 strain of the virus.

In Thailand, there have been 22 confirmed cases of bird flu in humans, of whom 14 died.

The number of illnesses and deaths to date is relatively small. What is worrying is the potential for future illnesses and deaths. The fatality rate from bird flu is extremely high. For the whole world up to March 2006 it was 54%. For Thailand in the years 2004 and 2005 it was 64%. Few diseases have fatality rates this high. If the victim is less than 15 years old, the fatality rate is higher still, reaching 75% in Thailand. Children have a relatively high risk of contracting the illness, because they lack the knowledge to protect themselves.

Number of illnesses and deaths from bird flu, in various countries, from 2003 to March 1, 2006

Country	2003		2004		2005		2006		Total	
	Illnesses	Deaths	Illnesses	Deaths	Illnesses	Deaths	Illnesses	Deaths	Illnesses	Deaths
Cambodia	0	0	0	0	4	4	0	0	4	4
China	0	0	0	0	8	5	6	3	14	8
Indonesia	0	0	0	0	17	11	10	9	27	20
Iraq	0	0	0	0	0	0	2	2	2	2
Thailand	0	0	17	12	5	2	0	0	22	14
Turkey	0	0	0	0	0	0	12	4	12	4
Vietnam	3	3	29	20	61	19	0	0	93	42
Total	3	3	46	32	95	41	30	18	174	94

Death rate: 54 %

Source--World Health Organization (WHO), data from March 1, 2006

Economic loss through the bird culls, the reduction in domestic consumption, and the reduction in exports was estimated to be about 60-80 billion baht. An unofficial estimate is that,if other costs were included, the total impact could exceed 100 billion baht.

Economic effects: Sudden and dramatic

At present there are no official estimates of the effects of bird flu on the Thai economy. Different commentators offer different numbers. However, it is clear that the effects have been severe, and that will be felt over the short term and the long term.

An obvious short-term effect has been the loss of large numbers of poultry, through illness or through the culling of at-risk birds. In the first and second outbreaks, the number officially culled came to 63.5 million birds. The Thai government spent 2.5 billion baht compensating farmers for these losses, at a cost of 40 baht per bird.

Altogether, through illness or culls, approximately 25% of Thailand's poultry were lost because of bird flu.

Cases of bird flu in Thailand 2004 - 2005

Characteristics, source of infection	Illnesses	Death	Case Fatality Ratio
Age			
Less than 15 years	12	9	75
15 years and over	10	5	50
Region			
North	6	4	67
Center	13	8	62
Northeast	3	2	67
South	Not available	-	-
Source of infection			
Butchering infected birds	5	3	60
Playing, having close contact with infected birds	4	4	100
Not taking preventative measures when disposing of infected birds	2	0	0
Contact with fighting cocks	1	1	100
Contact with blood, feces from infected birds	8	5	63
Close contact with people infected with bird flu	2	1	50
Total	22	14	64

Source : Weekly Epidemiological Surveillance Report, Bureau of Epidemiology, Department of Disease Control, Ministry of Public Health

Number of poultry, and number of households raising poultry, in Thailand 2005:

Type	Number of birds (millions)	Number of households (thousands)
Broiler chickens	147.6	32.9
Layer hens	41.2	20.7
Native chickens	65.3	2,892.8
Fighting cocks	13.0	970.7
Bantams, guinea fowl, turkeys	1.8	208.7
Meat ducks	6.5	84.1
Layer ducks	10.5	99.6
Free-range ducks	11.0	12.1
Muscovy ducks	4.4	426.0
Partridges	3.2	4.9
Geese	0.2	30.6
Other birds, e.g. ostrich, pigeons, decorative birds	1.8	328.1
Total	306.5	-

Source : Department of Livestock Development, Ministry of Agriculture and Agricultural Cooperatives

Bird flu has also affected the domestic and international sale of poultry. In Thailand, people reduced their consumption of poultry because of concerns about bird flu. The reduction in consumption was large, and occurred almost immediately. Businesses selling ducks, chickens, and eggs were thrown into crisis, prompting a campaign to boost consumption of eggs and poultry. There are no reliable statistics on the economic losses, but the amounts are likely to be hundreds of millions of baht, including long-term effects.

Another cost was the loss of export markets. The evidence here is fairly clear. The Thai government announced the existence of a bird flu epidemic in late January 2004. The main importers of Thai fresh and frozen chickens, Japan and Europe, immediately cancelled all orders. Other importers quickly followed. An export industry that in 2003 had earned the country 4.5 billion baht disappeared.

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Thailand had previously been the world's leading exporter of fresh and frozen chickens. It was now unable to export anything but cooked chickens. Although cooked chickens fetch higher prices than raw ones, the chicken industry still experienced large losses. It is unlikely that Thailand will ever regain its position as one of the world's biggest exporters.

An additional economic cost was the money that the Thai government had to pay to affected farmers. The costs included forgiving debts, assisting farmers to purchase new birds, and providing low-interest loans to build new facilities that reduced the risk of bird flu.

Many industries associated with poultry farming were adversely affected by the epidemic. The bird farms themselves, factories making bird feed, and meat processing plants were all hit. Together these farms and factories employ about 100,000 people. The industries recovered fairly quickly, but the short-term effects on incomes were severe.

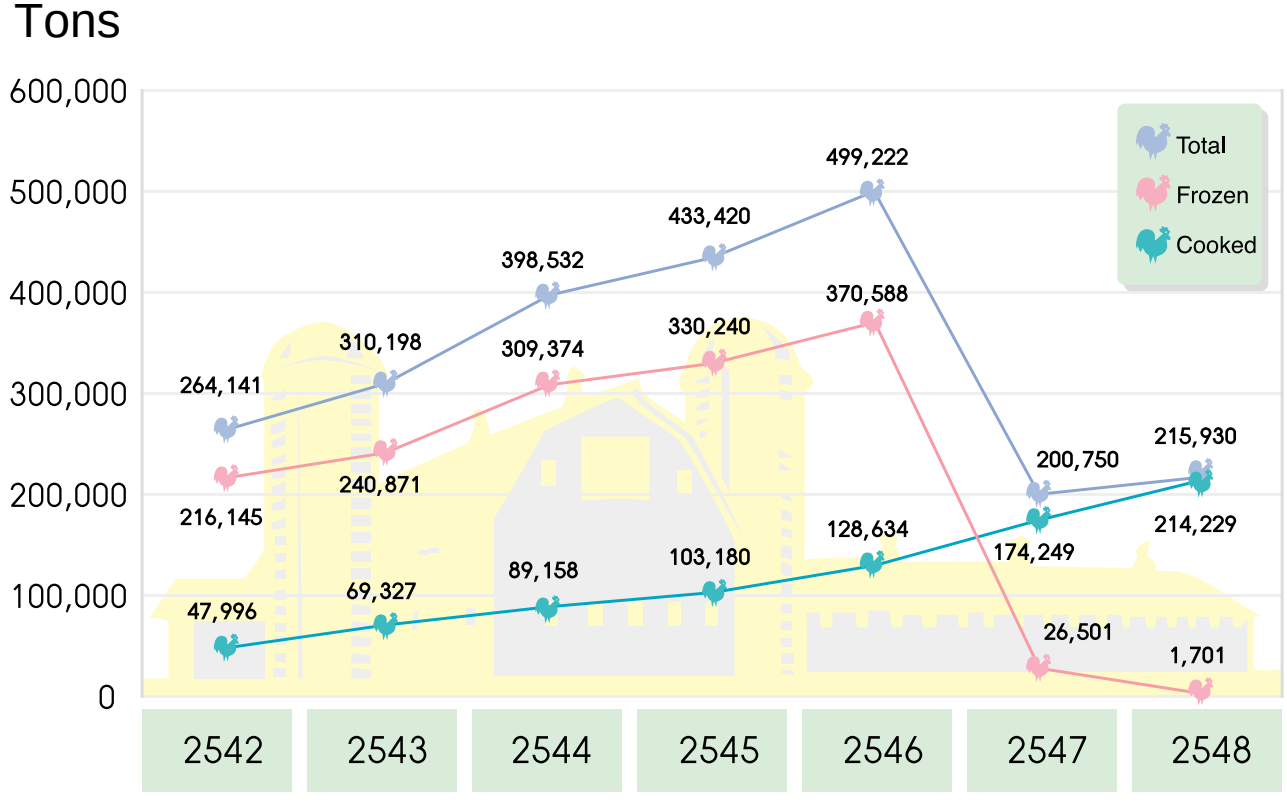
According to the ***National Avian Influenza Strategic Plan (2005-2007)*** issued by the National Avian Influenza Committee, economic loss through the bird culls, the reduction in domestic consumption, and the reduction in exports was estimated to be about 60-80 billion baht. An unofficial estimate is that, if other costs were included, the total impact could exceed 100 billion baht.

Effects on society: Threatening the way of life of Thai farmers

The effects on Thai society are easily overlooked, and hard to quantify. Bird flu is affecting the living styles of Thai farmers, the way they earn an income, and their farming methods.

There are only a few diseases that have forced rural people to change their way of life. Ducks are an affordable source of protein, and a useful supplement to household incomes for many Thai farmers. Duck farming has a very long history. However, farming

Numbers of chickens exported, 1999-2005



Source : Office of Agricultural Economics, with assistance from the Customs Department, 2005

methods will now have to change, and traditional duck farming may disappear entirely. This is because the traditional method of allowing ducks to seek food in open paddy fields means allowing them to mix with wild birds. This exposes both ducks and people to the risk of contracting bird flu. Farmers will have to change to a "closed" farming system, where ducks no longer search for food themselves.

The traditional method of duck farming required minimal capital or expenditure. Many poor households will not be able to afford the new method.

For those households that can afford to implement the new methods, there are several benefits. One is that it allows them to continue earning money from duck farming. Another is that they, as well as the consumers, will be safer. The disadvantage, aside from the need for capital, is that many farmers lack the skills and technology to implement the new methods. Many households may decide that it is not worthwhile to continue raising ducks.

Some households may refuse to adopt the closed system of duck farming, and continue to use the open system. Such households run the risk of contracting bird flu. The farming of ducks in open fields, a long-standing tradition in rural Thailand, is now banned.

These changes may reduce rural households' ability to produce their own food, and increase their dependence on the market. It may lessen the food security of poor households. Measures to control the spread of bird flu may have profound effects on the lives of Thai farmers.

The government decreed that duck farmers had to move their ducks into barns by March 2006. Farmers are now forbidden from taking their ducks to feed in rice fields. Many farmers will not be able to adjust to the new system, which requires them to buy food for the ducks, instead of the ducks seeking food themselves. The government is providing loans to help farmers make the transition, but this means that households will need to go into debt. At least 13,000 households that currently raise ducks in open fields will be affected.

The raising of chickens for cockfighting is also unavoidably involved. Cockfighting is an integral part of Thai rural culture. Strict controls over cockfighting are being introduced to prevent the spread of bird flu. Owners of fighting cocks now have to register their birds and maintain fighting cock "passports." There are tight restrictions over the movement of birds between districts. Because of these restrictions, Thais may loose enthusiasm for breeding fighting cocks, and another long-standing Thai tradition will be weakened.

Small farms suffer the worst effects

The people who are suffering the greatest social and economic effects from bird flu are small-scale farmers. Industrial-style farms have incurred some losses, particularly in the first outbreak in 2004, but have nevertheless been spared the worst consequences. Big farms have the capital, technology, and knowledge necessary to adjust. They have quickly introduced the necessary safety measures.

To understand the social and economic consequences it is necessary to know something about poultry farming in Thailand. Farms raising chickens for export are particularly important, as they are the biggest producers.

Thai chicken producers can be divided into four groups, based on their size and safety levels.

1. Industrial farms produce chicken mainly for export. They raise the chickens, manufacture the chicken food, and process the carcasses. They use the latest technology, and have effective quality control and safety systems.

2. Large farms, unlike industrial farms, do not carry out all stages of the production process themselves. Their quality control and safety systems are similar to those of industrial farms.

3. Small farms producing mainly for sale are generally family businesses, with open farming systems, and poor quality control and hygiene systems.

4. Many rural households raise chickens by letting the chickens gather food for themselves around the house. There is little or no attempt to protect the birds from disease. Many fighting cocks and ducks are raised in the same way.

Seventy percent of chickens in Thailand are raised on industrial farms, and another 20% on large farms. The remaining 10% are raised on small farms or in backyards.

Even though they produce 90% of all chickens, industrial and large-scale farms employ only about 2% of the workforce involved in poultry production. In other words, 98% of the workforce raises only 10% of the chickens.

Production of poultry in Thailand

Type of production	Percent of output	Percent of workforce
Industrial	70	2
Large farms	20	
Small farms	10	98
Backyard		

Source – McLeod, Morgan, Prakash, and Hinrichs 2005

These facts have social implications.

Almost all the income earned from raising chickens goes to large companies producing for export. In fact most production for export is carried out by 20 companies.

The people most affected by bird flu are the small producers. These people form the majority of the workforce raising chickens. They rely on traditional methods, with little use of technology. They take few if any measures to protect their flocks from bird flu. In contrast, following the first outbreak, the industrial producers took elaborate precautions, and had few infections in the second and third outbreaks.

The people most affected by bird flu are the small producers – those who raise chickens as an inexpensive source of protein and as a supplement to their incomes.

Moreover, all of the people who have contracted bird flu have been small-scale producers or their families. Not a single worker on an industrial farm has been infected, even though they are in constant contact with birds. Thus there are clear social differentials in the prevalence of bird flu.

Measures to protect ourselves against bird flu

In late 2003, although it was still uncertain whether bird flu had arrived in Thailand, unusually large numbers of birds were dying, and neighboring countries were known to have H5N1. Yet Thailand did not yet have a strategy for dealing with bird flu, and there was still a great deal of indecision. There was political and economic pressure on the government and no clear idea of what measures to take.

A particular problem at the time was a lack of transparency and up-to-date data. The general public did not know what was causing the bird deaths or what they should do.

Farmers were forced to protect themselves as best they could. The major industrial livestock producers faced problems similar to those of small farmers but had better access to capital and modern technology and could respond more quickly. Indeed, the major producers were relatively unaffected by later outbreaks while small farmers continued to suffer major losses.

In early 2004, once it became clear that H5N1 was causing the epidemic in Thailand, the government officially acknowledged the existence of the virus and promptly began to disseminate information. The government also introduced firm measures to control the spread of the virus.

Many of the initial measures were focused on the most urgent task, which was to bring the epidemic under control as quickly as possible. The aim was to prevent the disease from spreading to more flocks and to prevent it from reaching humans. Measures were also introduced to reduce the harm caused to businesses and agricultural producers.

Bringing the epidemic under control has not been easy because many methods for raising poultry are practiced in Thailand. At one end of the spectrum, some poultry are raised in backyards, using no modern technology whatsoever. At the other end of the spectrum are large industrial farms using the latest technology to raise large numbers of birds for export. In addition, there are still gaps in current knowledge on how to control bird flu. Controlling bird flu depends on information about many issues besides health, including information on social and economic factors. Thus there are inevitably delays in designing effective counter-measures.

Initial counter-measures were poorly coordinated and based on limited data. However, as organizations gained more experience and more information became available, the situation improved. Even though it was not possible to avoid further outbreaks entirely, the system for controlling the spread of the disease became considerably more effective. Thailand has been praised by the World Health Organization, which describes Thailand's system as a model for others to emulate.

The Thai system for controlling the spread of bird flu

The government has established a "National Committee for Avian Influenza Control." This committee coordinates the many governmental and non-governmental agencies involved in the campaign against bird flu. The committee is chaired by the Deputy Prime Minister. Three agencies are particularly important. The first is the Ministry of Agriculture and Agricultural Cooperatives, which runs the surveillance and prevention system for domestic birds. The second is the Ministry of the Environment and Natural Resources, which runs the corresponding system for wild birds, including migratory and native species. The Ministry of Public Health is responsible for surveillance and prevention among humans. Other organizations include the Ministry of Interior, the Ministry of Finance, the Ministry of Education, the Ministry of Foreign Affairs, the Ministry of Commerce, the Department of Public Relations, local governments, businesses, and public groups.

All the various agencies and organizations have coordinating bodies at the local and regional level.

Source: Compiled from Dr. Supamit Chunsuttiwat and others, 2005

The keys to the control of bird flu among bird populations are speed and thoroughness

The system for preventing the spread of bird flu among birds has been improving over time. **In the first outbreak** of bird flu, from January to May 2004, there were 190 separate sites of infection in 42 provinces. Altogether 60 million birds died of the disease or were culled. Counter-measures were based on the principle "x-ray every square inch." If infection was found, every bird in the flock or farm and every bird within a 5-kilometer radius was culled. Farmers were compensated at a rate equal to 75% of the market value of the birds lost. The area was cleaned and disinfectant applied. Strict surveillance was carried out in a 50-kilometer radius. Movement of animals of all kinds was forbidden within a radius of 60 kilometers. Cockfighting was banned in affected areas.

During **the second outbreak**, from July 2004 to April 2005, the disease was reported at 1,542 small sites, in 51 provinces. Almost all cases were chickens raised at home or ducks raised in open fields. The number of birds dying from the disease or culled was 3.5 million. This time, only birds in the infected flock were culled. Surveillance was restricted to a one-kilometer radius. Movement of animals was forbidden within a 5-kilometer radius. These measures were complemented by an "x-ray every square inch" policy covering every household in the country. As a result, the epidemic was brought under control within three months.

In **the third outbreak**, from July to December 2005, the "x-ray every square inch" was implemented for a third time. Bird flu was discovered in domestically raised birds in 50 places in 5 provinces. Similar counter-measured were used as had been used in the second outbreak. The epidemic was again brought under control quickly.

Source – Compiled from Dr. Supamit Chunsuttiwat and others, 2005

Problems and disagreements

The campaign to control bird flu still faces a number of difficulties. There are still disagreements over strategy. One debate concerns small-scale farming of chickens and ducks. The raising of chickens and ducks has been an integral part of Thai farming strategies for many years, and is part of Thailand's rural tradition. Cockfighting is similarly a long-standing tradition. Another debate concerns the use of vaccines.

Both debates have policy, social, and technical dimensions.

The National Strategic Plan for Avian Influenza states that the methods used in small-scale farming of chickens and ducks need to be changed. However, although it proposes concrete measures for fighting cocks and for ducks raised in open fields, it does not contain similar measures for chickens. About one million households raise fighting cocks and/or raise ducks in open fields, but about 3.5 million households raise chickens. According to the National Strategy ducks and chickens need to be farmed in a "closed system" for the sake of public health. But what a "closed system" means in the case of small-scale farmers is unclear.

Ducks raised in fields: Time for modern farming methods

The sight of farmers taking their ducks to feed in the rice fields is becoming a thing of the past. The Department of Livestock Development instructed farmers to move their ducks into outbuildings–sheds or coops–by March 2006.

The plan is for farmers raising ducks outdoors to form cooperatives. Members of the cooperatives will only be permitted to raise ducks in outbuildings. Before March 2006, farmers who were not ready to make the transition could continue using open fields, but had to confine themselves to the sub-district where they are registered. Now that the deadline has passed, the government intends to prosecute farmers who continue to use open fields. Farms producing duck eggs were required to register by December 31, 2005.

Duck farmers lacking the capital to construct new facilities could borrow up to 300,000 baht from the government.

Successful implementation of these policies would contribute significantly towards the control of bird flu. However, it would also change the ecology of rice farming. At present one of the most important pests afflicting rice is the cherry shellfish, which can be kept under control by ducks. Without ducks, the rice grains left over after harvesting will also be wasted, and the fields will no longer be fertilized by duck manure.

The changes to duck farming will increase expenditures by rice farmers, and not just duck farmers, since rice farmers will have to spend more on pest control. Long-standing rural traditions will also be lost.

Source: Department of Livestock Development, Ministry of Agriculture and Agricultural Cooperatives

Controlling fighting cocks

Every fighting cock in the country must be registered and receive its own "fighting cock passport." The health care and movement of fighting cocks is now subject to government regulation. Places where cockfights are organized must also be registered.

Farmers raising fighting cocks often breed them from native chickens, bringing together birds from many different places. This can encourage the spread of bird flu.

On November 18, 2005, the Department of Livestock Development announced that all owners of fighting cocks must register their birds, and bring them for health examinations before December 31, 2005. In addition, owners were required to construct sheds for the fighting cocks that would prevent them from coming into contact with other birds.

All fighting cocks taking part in fights must have "passports" issued by the Department of Livestock Development. These birds must undergo health checks every 30 days, the results of which are recorded in the passports. Before moving a fighting cock between districts, the owner must seek permission from the district livestock officer. Only birds that are certified as being free from disease may be moved.

There are also strict regulations governing the places where cockfights are held. Information is collected on people attending the fights, and on the birds themselves. Troughs filled with disinfectant must be placed at all entrances, and all people entering or leaving must apply the disinfectant. The fight organizers must check the passports of all birds. Birds that have not passed the health tests are not permitted to participate. The fighting rings must be thoroughly disinfected after each match, and no birds are allowed into the area for at least seven days. The organizers must permit inspectors from the Department of Livestock Development to visit at any time.

By January 2006, 190,000 birds had been registered, which was less than the target of 250,000.

Source: Department of Livestock Development, Ministry of Agriculture and Agricultural Cooperatives

The debate over vaccines

The technical debate over the use of vaccines on birds is inextricably linked to the issue of poultry exports. People who support the use of vaccines note that the vaccines can reduce the spread of infection and reduce death rates among birds. Opponents point to many difficulties in administering vaccines. Use of vaccines may lead the virus to develop resistance. Vaccinated animals may continue to spread the virus. Complete coverage is likely to be difficult or impossible. The most important problem is that the availability of vaccines may lead farmers to become less vigilant.

The use of vaccines has been banned in Thailand. However, there are frequent reports of vaccines being imported illegally. It is likely that vaccines are being used, despite the law. Some farmers claim that, in practice, all expensive birds such as fighting cocks, exotic species, and breeding stock have been vaccinated.

The National Strategic Plan for Avian Influenza, 2005-2007

The National Strategic Plan brings together many different measures, covering every aspect of the disease, and many different organizations. The Cabinet approved the plan on January 25, 2005. The objectives of the strategy are to control the spread of the disease among domestic birds within two years, to control the spread of the disease among native wild birds within three years, to prevent all transmission to humans within two years, and to prepare for a pandemic within one year.

The first priority of the plan is the safety of the general public. Business profits and rural lifestyles should each be given equal weight. Priority is also given to preserving biological diversity and cultural traditions. The plan includes 6 basic strategic principles and 19 interrelated strategic measures

Advantages and disadvantages of using bird flu vaccines

The Thai government has banned the use of vaccines for bird flu among poultry. However, many people are still unclear about the advantages and disadvantages of vaccines, so we summarize them here.

Advantages	Disadvantages
Increases resistance to infection	The vaccine must be produced from the same strain as the virus causing the infection, and must be constantly updated. Vaccination can create resistant strains of the virus.
Protects birds from illness and death	Not 100% effective. Around 20% of animals can still spread the virus to some extent.
Reduces spread of virus from birds to the environment; reduces probability of epidemic	It is impossible to separate birds that have been infected from the environment and birds that have been vaccinated. Control of the epidemic is more difficult.

Source: Modified from slides presented by Dr. Wantanee Kulapravidth, FAO

The debate about the vaccine is a technical matter, but the government's decision to ban vaccines is also shaped by other considerations. The most important issues are the effect on exports and the possibility that farmers might become less concerned about biosecurity. Nevertheless, in places that use vaccines, such as Hong Kong, there is no evidence of reduced concern towards biosecurity. Although there were outbreaks of bird flu in many countries throughout Asia in 2004-2005, there were none in Hong Kong.

Even though vaccination is illegal, it is widely acknowledged that vaccines are given to almost all birds that live for two months or more, or that have high prices, such as breeding stock, egg-laying hens, and decorative birds. Most vaccines are imported from China.

The policy towards vaccination helps industrial farms producing for export, but hurts small-scale farmers.

The National Strategic Plan for Avian Influenza, 2005-2007

1. Development of a disease free poultry management system. Improve the system for preventing bird flu among animals to protect the health of consumers. Reform farming methods for domestic chickens, fighting cocks, decorative birds, and ducks raised in open fields, so that they conform to public health standards. Control the movement of birds. Establish surveillance systems throughout the country. Prepare systems to administer vaccines. Provide information to farmers.

2. Disease surveillance and response during outbreaks. Quickly detect and suppress outbreaks of bird flu to prevent the spread of disease among animals and humans. Closely monitor changes in the disease. Establish a proactive surveillance system for humans and animals. Report outbreaks within 12 hours. Prepare vaccines against avian and human influenza, and prepare for a pandemic among humans. Establish comprehensive procedures at all levels for dealing with the virus.

3. Knowledge generation and management. Create and disseminate knowledge about avian and human influenza. Develop vaccines and medicines for treating the virus. Develop methods for rapid diagnosis. Establish a central body for coordinating research on the virus.

4. Capacity building of organizations and manpower. Improve the skills of people responsible for monitoring and suppressing the virus. Establish epidemiology units in every district. Enhance the diagnostic and treatment skills of hospital staff.

5. Create understanding and participation of the civil society and private sectors. Seek participation from businesses and the general public, so that civil society has a role in combating the pandemic. Support voluntary organizations established by the public, and establish systems for rapidly disseminating information.

6. Develop sustainable integrated management systems. Establish a comprehensive management system, so that efforts to control the virus are well-coordinated and efficient. Establish knowledge management systems, and set up full-time teams to deal with the virus. In an emergency, set up a national committee. Development local-levels units.

A budget of 4 billion baht has been allocated for implementing the plan over three years.

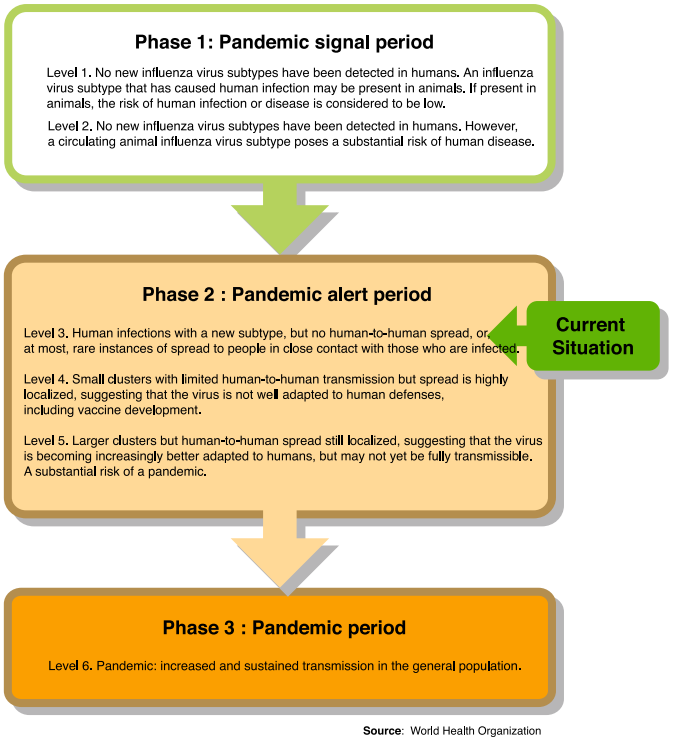
Source: Summarized from the National Strategic Plan for Avian Influenza, 2005-2007

Is Thailand prepared for a pandemic?

It is now only a matter of time before a pandemic of human influenza occurs. Scientists and officials from the World Health Organizations have warned the public that a mutation in the bird flu virus may lead to an influenza pandemic similar to the 6-7 pandemics that have occurred in the past 200 years. The previous pandemics were also caused by mutation in viruses that allowed the viruses to spread from human to human.

The H5N1 epidemic has reached phase 3 of the pandemic cycle, meaning that it has now spread from animal to human. Phase 4 is when the virus has changed sufficiently to cause efficient human to human transmission, but the spread remains highly localized. Phase 5 is when the new virus causes large clusters of human to human transmission but the spread is still localized. In Phase 6, the virus is spreading quickly through the general population, and is recognized as a pandemic. In this situation, it is estimated Thailand will see millions of hospitalized cases with tens or hundreds of thousand deaths.

Phases of an Influenza Pandemic



Source: World Health Organization

If a pandemic does break out, how well prepared is Thailand? It is difficult to be sure. We have done as much as we can, and changes in the disease are being monitored closely. Thailand is one of the minority of countries that have a comprehensive national plan for dealing with bird flu.

(At present fewer than 50 countries have such plans.) The plan is known as the *Strategic Plan to Prepare for and React to an Avian Influenza Pandemic.* The plan has five components.

***Strengthen influenza surveillance systems.** A surveillance system has been established for all types of domestic animals. The system covers all types of agriculture, from industrial farms to backyard chickens. Teams responsible for monitoring the disease among humans have also been established in every district in the country, and at higher levels. The total number of teams exceeds one thousand. There are medical science networks in each of the 12 public health zones. Each zone also has a laboratory capable of testing for the virus, so there is no need to send samples to a central location.

***Prepare essential medical supplies and equipment.** Vaccines and medicines used to treat human influenza are being stockpiled. Thailand is cooperating with other countries in Asia to develop a system for rapidly diagnosing the virus, and systems for preventing infection. There is a long-term plan to produce medicines and medical supplies in Thailand.

***Prepare for pandemic responses.** Health staff are receiving training on influenza. Hospitals and clinics are preparing equipment and facilities, such as rooms for treating influenza patients, extra hospital beds, and field hospitals. Plans for public health measures are being drawn up, including measures to isolate infected individuals and restrict movement.

***Public relations and education.** The government is disseminating information on the prevention and treatment of influenza. It is giving training to the media, and strengthening the local-level public health information system.

***Development of sustainable and integrated management systems.** The bird flu campaign involves large numbers of agencies and organizations, and requires an efficient coordination system. Procedures are being established and resources allocated to improve coordination.

Minimum Targets for Preparing for an Influenza Pandemic

Item	Status
1. Influenza vaccine	2005-295,0000 doses (distributed) 2005-295,0000 doses (distributed)
2. Kit to test for influenza	30,000-40,000 per year (purchased & distributed)
3. Antiviral drug Oseltamivir	Stockpile 1 million tabiets per year, for 3 year, for treatment of 300,000 people.
4. Protective masks, and surgical mask, for health workers	800,000 (N95) masks and 3 million surgical masks
5. Isolation rooms	100 rooms throughout the country
	Source: The National Strategic Plan for Avian Influenza 2005-2007

Cooperation with other countries

Bird flu cannot be confined to any particular area, because it is spread by migratory birds. Methods that work for other diseases, such as SARS, cannot be applied to bird flu. Bird flu is therefore a threat to the entire world. Combating a borderless disease such as bird flu requires cooperation from all countries.

In the early years of the virus, when it was only found in a few countries in Asia, most of the rest of the world showed limited interest. However, when it spread throughout Asia and reached Eastern European countries such as Russia, Turkey, and Romania, the West started to pay attention, and to devote significant resources to fighting the disease in Asia. There are now international meetings on bird flu almost every week. On January 17-18, 2006, in Beijing, the international community promised US$1.9 billion for the campaign against bird flu.

Thailand is working with many countries at a regional and global level. Thailand exchanges information and experiences with other countries. The Ministry of Public Health works closely with the World Health Organization, the US National Centers for Disease Control, the Food and Agriculture Organization, the World Animal Health Organization, and ASEAN + 3 (ASEAN plus China, South Korea, and Japan). Thailand and other countries in Asia are attempting to establish a regional stockpile of vaccines and anti-viral medicines, to be used in the region in an emergency. Requests for assistance from wealthy countries such as the US and Japan are another example of international cooperation.

Summary: Facing the Challenge of Bird Flu

The world is at risk of bird flu evolving into a human influenza pandemic. No one wants an influenza pandemic to occur, but many people cannot help asking themselves how we are going to cope with bird flu, now that it has established itself in Thailand. Even more importantly, if bird flu evolves into a form that can spread from human to human, as has happened in the past, what will we do?

Some answers to these questions have been offered in this article. The article has focused particularly on bird flu. The Thai government has tried to bring the bird flu epidemic under control as quickly as possible, to protect the health of humans and animals and to minimize the economic costs. At the same time, the government has been preparing for a pandemic of human influenza.

Policies to control the spread of the virus and tackle the health aspects of the epidemic have had tangible results. However, policies tackling the social aspects of the epidemic, dealing with matters, such as the way of life of farmers, need further consideration. Some current policies may need to be adjusted to take account of changing circumstances.

Time for change

If we are going to live safely with bird flu, we will need to make changes, at both the individual and social levels. We need to bring our ideas about bird flu up to date, to prevent the disease from spreading to humans from birds, particularly birds raised domestically. Efforts to control bird flu have a major impact on small-scale farmers, whether through the culling of birds or the introduction of new farming systems. The effect on industrial farms is relatively small. Differences in the effect on small-scale and large-scale farms will become particularly apparent under current policies.

The most urgent question is how farmers will adjust. At a minimum, the economic and social consequences of bird flu will include the following:

- Duck-farming will no longer be a low-cost activity.
- The raising of ducks in open fields may become a thing of the past.
- Fighting cocks must be registered.
- Domestic chickens are no longer supposed to wander freely but must be housed in chicken coops.

These changes must occur sooner or later.

It is still too early to judge the success of the anti-bird flu measures or their consequences for farmers and officials. But the measures will inevitably affect people's way of life.

Effective policies against a new disease such as bird flu depend on accurate information about the disease. The National Strategic Plan accordingly places substantial weight on research. It allocates funding for generating new knowledge, and for transferring knowledge from elsewhere. Cooperation with international agencies is essential. However, some of the necessary knowledge is already present in Thai traditions, such as methods for preventing the spread of infection in bird populations and methods for managing bird populations during an emergency. We need to combine this knowledge with new technologies and new discoveries.

The Thai bird flu epidemic contains many lessons. It demonstrates the importance of transparency and rapid dissemination of information, so that people can quickly take measures to protect themselves. The government needs to recognize that, when there are threats to public health such as epidemics, people must be provided with information quickly and transparently. The need to protect the people's health overrides commercial considerations.

Throughout history, changes to lifestyles and social structure have been brought about by major, unexpected forces, including natural phenomena such as floods, earthquakes, and epidemics. During such times, societies need to draw on their reserves of knowledge, to deal with unforeseen circumstances. Societies need to be prepared to reform longstanding beliefs and practices. Such changes are necessary, not just for the survival of the individuals concerned, but for the survival of the whole society.

The bird flu epidemic requires many changes in Thai society, to safeguard the health, and way of life of Thais.