CHAPTER II

LITERATURE REVIEW

This study aimed to explore perceptions and health behaviors toward Avian Influenza among backyard poultry farmers. The researcher reviewed literature and related research as follows:

Avian Influenza

Type A Influenza viruses can infect several animal species, including birds, pigs, horses, seals and whales. Influenza viruses that infect birds are called "avian viruses". Birds are an especially important species because all known subtypes of Influenza A viruses circulate among wild birds, which are considered the natural hosts for Influenza A viruses. Avian Influenza viruses do not usually directly infect humans or circulate among humans (CDC, 2004).

Influenza A viruses can be divided into subtypes on the basis of their surface proteins-*hemagglutinin* (HA) and *neuraminidase* (NA). There are 15 known H subtypes. While all subtypes can be found in birds, only 3 subtypes of HA (H1, H2 and H3) and two subtypes of NA (N1 and N2) are known to have circulated widely in humans.

Avian Influenza usually does not make wild birds sick, but can make domesticated birds very sick and kill them. Avian Influenza A viruses do not usually infect humans; however, several instances of human infections and outbreaks have been reported since 1997. When such infections occur, public health authorities monitor the situation closely because of concerns about the potential for more widespread infection in the human population.

Characteristics of Avian Influenza in Birds

Certain water birds act as hosts of Influenza viruses by carrying the virus in their intestines and shedding it. Infected birds shed virus in saliva, nasal secretions and feces. Avian Influenza viruses spread among susceptible birds when they have contact with contaminated nasal respiratory and fecal material from infected birds; however, fecal-to-oral transmission is the most common mode of spread.

Most Influenza viruses cause no symptoms, or only mild ones in wild birds; however, the range of symptoms in birds varies greatly depending on the strain of virus and the type of bird. Infection with certain Avian Influenza A viruses (for example, some H5 and H7 strains) can cause widespread disease and death among some species of wild and especially domesticated birds such as chickens and turkeys (CDC, 2004).

The signs of illness seen in domestic poultry infected with Avian Influenza viruses are variable and affected by the viruses strain, age and species of infected birds, concurrent bacterial disease, and the environment. Such signs may include: (U.S. Department of Labor, 2004)

1. Sudden death without any signs
2. Lack of coordination
3. Purple discoloration of the wattles, combs, and legs
4. Soft-shelled or misshapen eggs
5. Lack of energy and appetite
6. Diarrhea
7. Swelling of the head, eyelids, combs, wattles, and hocks
8. Nasal discharge
9. Decreased egg production
10. Coughing, sneezing

Characteristics of Avian Influenza in Chickens

Avian Influenza in chickens is characterized by a high morbidity and mortality rate with respiratory and nervous signs. The characteristic lesions include subcutaneous haemorrhages, cyanosis of the head region, oedema of various parts of the body, and haemorrhages in the proventriculus. Avian Influenza virus associated with highly fatal disease, has been isolated in a number of countries. Infection is probably widespread in wild bird populations. (Bains B.S., 1979). Wild birds serve as reservoirs and transmit infection to subsistence flocks or commercial units with substandard bio-security (Shane

S.M., 1997). In susceptible chickens following and incubation period of 2-4 days the signs of the disease may appear suddenly. The course of the disease is usually short and the virus spreads rapidly within a flock. Following the onset of signs, birds may only live for a few hours. In field outbreaks morbidity may be 100% and mortality may vary from 50% to 100%. The inappetence and drop in egg production. The eyelids may be closed and the conjunctiva is red and swollen. Characteristically oedema and cyanosis develop around the head region involving the comb, wattles and the area surrounding the eyes. The oedema may extend down the neck and breast. Oedema of the glottis may occur causing difficulty in breathing resulting in suffocation. When respiratory signs are present a grey to blood-tinged mucus exudes from the nostrils. There may be haemorrhages in the mouth. In most outbreaks varying degrees of diarrhea may be observed. Affected birds usually die within 2 days of the onset of signs. Birds surviving the acute phase of the disease develop nervous signs including excitation, convulsions, or circling movements and ataxia.

Symptoms of Avian Influenza in Humans

The reported symptoms of Avian Influenza in humans have ranged from typical Influenza-like symptoms (e.g., fever, cough, sore throat and muscle aches) to eye infections, pneumonia, acute respiratory distress, viral pneumonia, and other sever and life-threatening complications (CDC, 2004).

Transmission from Animal to Humans

Avian Influenza A viruses may be transmitted from animals to humans in two main ways (CDC, 2005):

- Directly from birds or from avian virus-contaminated environments to people.
- Through an intermediate host, such as a pig.

Influenza A viruses have eight separate gene segments. The segmented genome allows Influenza A viruses from different species to mix and create a new Influenza A virus if viruses from two different species infect the same person or animal. For example, if a pig were infected with a human Influenza A virus and an Avian Influenza A virus at the same time, the new replicating viruses could mix existing genetic information (reassortment) and produce a new virus that had most of the genes from the human virus, but a hemagglutinin and neuraminidase from the avian virus. The resulting new virus might then be able to infect humans and spread from person to person, but it would have surface proteins not previously seen in Influenza viruses that infect humans. It is possible that the process of genetic reassortment could occur in a human who is co-infected with Avian Influenza A virus and a human strain of Influenza A virus. The genetic information in these viruses could reassort to create a new virus with a hemagglutinin from the avian virus and other genes from the human virus. Theoretically, Influenza A viruses with a hemagglutinin against which humans have little or no immunity that have reassorted with a human Influenza virus are more likely to result in sustained human-to-human transmission and pandemic Influenza. Therefore, careful evaluation of Influenza viruses recovered from humans who are infected with Avian Influenza is very important to identify reassortment if it occurs (CDC, 2005).

Most cases of Avian Influenza virus infection in humans are though to have resulted from contact with infected poultry or contacting contaminated surfaces followed by self-inoculation of the virus into eyes, nose or mouth. Wearing a respirator can reduce exposures to airborne organic dusts that might pose a risk of respiratory disease and decreased breathing capacity. The following information describes why respiratory protection, eye protection, protective clothing, and hand hygiene practices are recommended for disease control and eradication activities and gives guidance on selecting personal protective equipment for workers responding to outbreaks of Avian Influenza (U.S. Department of Labor, 2004).

Avian Influenza Outbreak

Avian Influenza caused by H5N1 first received widespread recognition following a 1997 outbreak in poultry in Hong Kong with subsequent spread of the virus to humans. During that outbreak, 18 human cases were recognized; six patients died. The outbreak was stopped when all of the domestic chickens present in wholesale facilities and vendors in Hong Kong were slaughtered. An outbreak of HPAI caused by H5N1 Avian Influenza started in Asia in the fall of 2003 and spread in domestic poultry farms at a historically unprecedented rate. The outbreak tapered off in spring 2004 but in summer re-emerged in several countries in Asia. Aquatic birds, particularly ducks, shored birds and gulls are considered the natural reservoirs for Avian Influenza viruses. These waterfowl generally do not develop disease when infected with Avian Influenza viruses (CIDRAP, 2007).

The current outbreaks of highly pathogenic Avian Influenza, which began in South-East Asia in mid-2003, are the largest and most severe on record. Never before in the history of this disease have so many countries been simultaneously affected, resulting in the loss of so many birds. The widespread persistence of H5N1 in poultry populations poses two main risks for human health. The first is the risk of direct infection when the virus passes from poultry to humans, resulting in very severe disease. Of the few Avian Influenza viruses that have crossed the species barrier to infect humans, H5N1 follows an unusually aggressive clinical course, with rapid deterioration and high fatality. Primary viral pneumonia and multi-organ failure are common. In the present outbreak, more than half of those infected with the virus have died. Most cases have occurred in previously healthy children and young adults. A second risk, of even greater concern, is that the virus - if given enough opportunities – will change into a form that is highly infectious for humans and spreads easily from person to person. Such a change could mark the start of a global outbreak (a pandemic). 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 dropping 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 (WHO, 2005).

In Thailand, outbreaks have been reported in 21 of 76 provinces. These outbreaks, many without apparent epidemiological links to each other, suggest A/ H5N1 is now widely prevalent and is very likely to have become endemic. The outbreaks in birds pose a significant threat to human health. As WHO has stated since the first A/ H5N1 outbreaks were reported, this virus has the potential to ignite a global Influenza pandemic in humans. In a number of these outbreaks since the beginning of 2004, the virus has jumped from infected chickens or ducks directly to humans. These direct human infections have produced severe and sometimes fatal outcomes. WHO's continuing concern is that virus may reassert its genes with those from a human Influenza virus, thereby acquiring the ability to move easily from human to human and thus triggering a pandemic (WHO, 2004).

Thailand, in the first round of the outbreak, there were 12 confirmed cases and 8 deaths, while in the second round, there were 5 confirmed cases and 4 deaths, thus making the fatality rate as high as 70% (MOPH, 2006). An important factor of the Avian Influenza outbreak is that if there is adaptive mutation or re-assortment of the virus, it could lead to a more severe outbreak. If a host is infected with the avian and human Influenza at the same time, it could lead to re-assortment of the avian and the human Influenza viruses, thus leading to a new strain of Avian Influenza virus which could be transmitted from human-to-human through very close contact and the transmission could be air-bone. This could lead to easy and rapid transmission of the virus. The combination of a virulent strain of the Avian Influenza virus, the high fatality rate within two weeks of contract, and the easy and rapid human-to-human transmission of the virus could lead to a pandemic, which is estimated to cause large number of deaths. The Avian Influenza problem is complicated and is concerned with multiple factors, including economics, medical, public health, husbandry lifestyle of natural birds and the lifestyle of the local people, like raisers of poultry for personal consumption, raisers of free range ducks, raisers of exotic birds, etc.

Avian Influenza Infections in Humans (WHO, 2006)

Timeline	Avian Influenza Infections in Humans
1997	Human infections with H5N1 are reported in Hong Kong. Altogether, 18 cases (6 fatal) are reported in the first known instance of human infection with this virus.
Feb 2003	Two cases of H5N1 (one fatal) are confirmed in a Hong Kong family with a recent travel history to Fujian Province, China, A third family member died of severe respiratory disease while in mainland China, but no samples were taken.
11 Jan 2004	Viet Nam identifies H5N1 as the cause of human cases of severe respiratory disease with high fatality. Sporadic cases are reported through mid-March.
23 Jan 2004	**Thailand reports two laboratory-confirmed cases of human infection with H5N1. Sporadic cases are reported through mid-March.**
18 March 2004	Case studies of 10 patients in Viet Nam point to close contact with infected poultry as the probable source of infection in most cases, but conclude that, in two family clusters, limited human-to-human transmission within the family cannot be ruled out.
Mid-March 2004	Reports of human cases end. In total, 12 cases (8 fatal) occurred in Thailand, and 23 cases (16 fatal) occurred in Viet Nam.
Jul 2004	A case report is published indicating atypical human H5N1 infection in Thailand (from March 2004), with fever and diarrhea but no respiratory symptoms. The report suggests that the clinical spectrum of disease may be broader than previously thought.
12 Aug 2004	Viet Nam reports 3 new human cases, all fatal. Dates of hospital admission are from 19 July to 8 August 2004.
7 Sept 2004	A 4^{th} fatal case is reported in Viet Nam.
9 Sept 2004	**Thailand confirms a fatal case of human infection.**
28 Sept 2004	**Thailand confirms 2 further human cases.**

Timeline	Avian Influenza Infections in Humans
4 Oct 2004	Thailand confirms 4 th human cases.
25 Oct 2004	Thailand confirms 5 th and final case in second wave.
Nov 2004	No further human cases are reported. Altogether, 5 cases (4 fatal) occurred in Thailand, and 4 cases (4 fatal) occurred in Viet Nam in this second wave.
30 Dec 2004	Viet Nam reports a new human case.
6 Jan 2005	Viet Nam reports 2 further cases.
14 Jan 2005	Total cases in Viet Nam rise to 6. Sporadic cases continue to be reported over the coming months, making Viet Nam the hardest hit country.
27 Jan 2005	Research concludes that a girl in Thailand probably passed the virus to at least her mother in Sept 2004, causing fatal disease. This is the first published account of probable secondary human transmission, resulting in severe disease, of any Avian Influenza virus.
2 Feb 2005	Cambodia reports its first human case, which is fatal.
17 Feb 2005	Research retrospectively identifies at least one fatal atypical case in Viet Nam (from Feb 2004), presenting with diarrhea and encephalitis, but norm chest X-rays.
29 Marc 2005	Cambodia reports its 2 nd case, also fatal.
12 Apr 2005	Cambodia reports its 3 rd case, also fatal.
4 May 2005	Cambodia reports its 4 th case, also fatal.
30 Jun 2005	A WHO investigative team finds no evidence that H5N1 has improved its transmissibility in humans in Viet Nam.
21 Jul 2005	Indonesia reports its first human case. Infection in two other family members is considered likely, but cannot be laboratory confirmed. Subsequent investigation is unable to determine the source of infection.
5 Aug 2005	Viet Nam now has 64 confirmed cases in the third wave, of which 21 were fatal.
16 Sept 2005	Indonesia confirms its 2 nd case.

Timeline	Avian Influenza Infections in Humans
22 Sept 2005	Indonesia confirms its 3 rd case.
29 Sept 2005	Indonesia confirms its 4 th case. Research describes the clinical features of H5N1 infected and reviews recommendations for the management of cases.
Oct 2005	Research on the evolution of human and animal viruses circulating in Asia in 2005 suggests that several amino acids located near the receptor-binding site are undergoing change, some of which may affect antigenicity or transmissibility.
6 Oct 2005	Research describes reconstruction of the lethal 1918 pandemic virus, concludes that this virus was entirely avian, and finds some similarities with H5N1.
20 Oct 2005	**Thailand reports its 1 st new case since 8 October 2004.**
24 Oct 2005	**Thailand and Indonesia report more cases.**
9 Nov 2005	Viet Nam reports its first new case since July 2005.
16 Nov 2005	China reports its first two cases.
23 Nov 2005	China reports its third case. Sporadic cases continue to be reported in the coming weeks.
5 Jan 2006	Turkey reports its first two human cases. Sporadic cases continue to be reported in the coming weeks, but rapidly end.
30 Jan 2006	Iraq reports its first human case.
13 Feb 2006	China reports its 12 th case and 8 th fatality. Many of these cases occurred in areas with no reported outbreaks in poultry. Indonesia reports its 25 th case and 18 th fatality.
17 Feb 2006	Iraq reports its second human case.
14 March 2006	Azerbaijan confirms its first human case.
24 March 2006	Cambodia confirms its first human case since April 2005.

Situation of Highly Pathogenic Avian Influenza (HPAI) of H5N1 Subtype Re-occurrence and Control Measures in Thailand (3rd July- 30th September 2004) (Department of Livestock, 2004)

Disease Status

The initial highly pathogenic Avian Influenza was firstly confirmed by the National Institute of Animal Health of Livestock Development on 23rd January 2004 with the last 2 cases on 21st April 2004. There was one single unexpectable outbreak in Muang Distict of Chiangmai Provinces on 24th May 2004, which made up the 190th case from the index case in Suphan Buri Province. In total, there were 89 districts in 42 provinces affected and about 30 million birds were destroyed with full compensation and rehabilitation programmes for the affected farmers to resume their poultry raising or related business. There were 8 human among these there were 7 children from 12 cases.

The occurrence HPAI was suspected on 3rd July 2004 in a layer farm in Ayudthaya Province before later confirmed to be H5N1 subtype. The government has emphasized more on public health that there must be no more human death and no AI vaccination in poultry policy has been strictly maintained in the outbreak this time. The Vice Prime Minister, Mr. Jaturon Chaisang who was appointed to be the Head of the National HPAI Committee, has convened the meeting on weekly basis. The Committee comprises personnel from all involved parties of both public (11 Ministries) and private sectors. There are also Sub-Committees appointed for specific working on HPAI Crisis, Technical, Poultry Raising Strategy, and Public Relation aspects etc.

Conclusively to the end of July 2004, there were 126 cases found and alls stamped-out up to 31st July. In details, only 70 positively confirmed in 23 provinces with 23 negative results and 33 pending results by laboratory diagnoses. There were 228,743 in-contact and affected poultry involved in such findings and 35,000 quail eggs were destroyed during the period.

At the end of August 2004, the re-occurrence of the HPAI, attributed for 190 suspicions whereby all 370,938 poultry and 35,000 quail eggs were destroyed. To 31st

August 2004, there were 116 confirmed positive in 26 provinces from the definitely first case on 3rd July 2004.

By 3 rd September 2004, or 2 full-month of the HPAI re-occurring outbreaks, there were 119 positively confirmed cases among 191 suspicions with 69 negatively confirmed and 2 laboratory pending results of the H5N1 subtype genetically similar to the first index case found at Suphan Buri Province in January 2004. There were 373,698 poultry and 35,000 quail eggs were completely destroyed.

On 30th September 2004, the end of Thailand 2004 Fiscal year and almost 3 months, there were 288 suspected those were all destroyed with 187 (64.93%) were positive and 101 (35.06%) were negative confirmed cases. There were 855,790 birds and 35,000 quail eggs involved in all HPAI suspicions destroyed in 38 provinces. During this period, there were 2 human deaths of H5N1 and 1 recovery from 3 positive confirmed cases. Excluding, there was one girl death on 8th September 2004 considered as the HPAI probable case due to circumstantial evidences and that here dead mother later confirmed of H5N1 infection. Unfortunately, there was no sufficient and suitable specimen from the girl case left for laboratory confirmation, Also no conclusion could be made upon human-to-human transmission though the mother nursed her during the illness.

Owing to the government policy that emphasized on human health concerns and there should be no human death. The policy on prohibition of AI vaccination has been strictly maintained through the authorities involved of the Ministry of Agriculture and Cooperatives and the Ministry of Public Health, as well as the Customs Authority at the ports and borders checkpoints.

During the meeting of provincial personnel from Ministries of Interior, Public Health and Agriculture and Cooperatives, on 29th September 2004, the prime Minister mentioned that the Bird flu occurrence could be considered to be a recent national agenda, after a wide spread among countries in Southeast Asia. He assigned Provincial governors to be the Head of the HPAI Control Taskforce in their respective provinces and have a full power to recruit all relevant authorities, procurement supplies and coordinate the HPAI issue in order to effectively cope with the disease in such responsive area. The Premier also reiterated on integrated working and coordination of all potential parties in any provinces to actively contribute in the circumstance remedy mission. This shall include poultry survey with clinical surveillance in all premises, of about 70,000 villages during 1st - 31st October 2004 and immediate response with the ultimate goal of no more human death. By 30 th September 2004, there were 3 human case. There have been few human cases hospitalized for a close surveillance on the disease.

Type of Affected Animals

At the initial outbreaks from 23rd January to 24th May 2004, types of affected birds in were native chicken (58.5%), layer (12.4%), broilers(11.9), quails (4.7%), turkeys (1.6%), geese (0.5%) and 3.4 % of others (ostriches, peacocks, domestic cats, tiger, leopard, white tiger and clouded leopard).

In the re-occurrence from 3 rd July to present, the types of affected bird were not much different from the pattern found in the initial outbreaks i.e. free-ranging poultry (40.5%), ducks (23.7%), broilers (16.4%), quails (4.5%) and 1.2% of the others (pet birds).

Sources and Transmission

The source of HPAI outbreaks in Southeast Asia, from the early of 2004 has not yet been conclusive. But the crucial cause of the outbreaks in the re-occurrence H5N1 in Thailand was believed to be the residual virus that eluded from the all intervention measures during the initial outbreaks that still circulated in some poultry population. There were evidences that some kids of domestic birds were associated with several outbreaks. In addition, the transmission through mechanical vectors such as farm equipments, feedstuffs, vehicles and human were also found to be another factors.

Avian Influenza Situation among Poultry at Suphan Buri Province (Suphan Buri Provincial Office Report, 2006)

The first phase of outbreak of Avian Influenza, occurred at Jan – May 2004, spread over the area of Suphan Buri Province. It was reported that there were a sudden death of 8 millions poultry and ended with the elimination of those death. The most serious case was shown in Bangplama, Songpeenong, and Muang District of Suphan Buri Province. The second phase, which occurred at July 2004 - April 2005, caused 439 poultry farmers to lose their 1,145,281 poultries. However, to eliminate poultries was to kill suspect cases which shown more than 10% of sudden death. The third phase, June – December 2005, was reported that 25 point sources of Avian Influenza cases lead to the termination of 299,163 poultries from 75 poultry farmers.

Avian Influenza among Human Cases at Suphan Buri Province

The surveillance of 28 pneumonia suspected cases occurred after the poultry sudden death were reported in the lower northern and the central of Thailand. Then, on January 23, 2004, it was the first time ever reported that there was Avian Influenza in human at Suphan Buri Province. It was found that there were 235 patients in human Avian Influenza surveillance in the second phase of the outbreak, and, similarly, 451 patients were equally treated in the third phase. However, none of Avian Influenza in human cases was reported. In addition, the highest rate of Avian Influenza surveillance was in Muang District in Suphan Buri Province, 432.32 patients per one hundred thousand populations.

Key Behavioral Interventions for Reducing Animal to Animal and Animal to Human Transmission (H5N1) (WHO/FAO/UNICEF, 2006)

1. Report unusual sickness/death among poultry, wild birds and other animals immediately to the authorities.
2. Separate poultry, Burn and bury dead birds safely.
3. Wash hands with running water and soap often, especially after touching birds and before and after food preparation.
4. Handle, prepare and consume poultry safely.

Take Precautions Prevent Birds Flu (WHO, 2006)

Bird flu (Avian Influenza) is caused by a virus. It is present in droppings, respiratory secretions and blood of infected birds. Human beings get accidentally infected. In adults, most infections have occurred among those who have removed feathers or slaughtered infected chickens; or children playing around sick or dying chickens. Disease starts with ordinary flu-like symptoms and may progress to severe pneumonia and death.

1. Do not touch or handle sick birds, or those that have died unexpectedly.
2. Do not remove feathers or slaughter or handle infected birds at home.
3. Children should not be allowed to touch, carry or play with birds since they may carry the virus.
4. Always wash hands with soap and water after handling birds.
5. Wear a mask or cover the nose and mouth with a thick cloth when handling birds, especially chickens. Be careful not to rub your eyes, nose or mouth after touching birds.
6. Cook poultry meat and eggs well before eating. Raw poultry products should not be eaten.
7. If you live in an area where there are bird flu outbreaks, avoid going to places where live birds are sold or slaughtered.
8. Chicken droppings should not be used as fertilizers.
9. Report unusual death of birds to local authorities. Precaution should be taken while disposing dead birds.

10. Immediately consult a doctor if you or someone you know develops flu-like illness after contact with birds. Visit the nearest health center or hospital for check-up and treatment. Inform them of your contact with birds. Visit the nearest health centre or hospital for check-up and treatment. Inform them of your contact with sick, dying or dead birds.

Appropriate Performances of Self-Prevention from Avian Influenza
(Chevaviwat, N. and Pitiviwat, K., 2005)

In order to have appropriate perceptions and health behaviors among backyard poultry farmers, it can be concluded the appropriate performances of self-prevention from Avian Influenza into eight performances:

1. Avoid contact to infected or potentially infected poultry.
2. Avoid contact to infected area or crowded areas with poultry which suspect to be infected or potentially infected.
3. Parents realize that their children not be allowed to contact to infected or potentially infected poultry and practice them to have appropriate performances of self-prevention i.e. washing hand after contact infected, potentially infected poultry or even ordinary poultry.
4. As if there is a necessity for contact with outbreak area, wear goggles, mask and gloves. Whenever it has been found infected poultry, it should be appropriated managed by digging and burning.
5. Washing hands after contact to potentially infected poultry or even ordinary poultry and their secretion such as saliva, nasal secretions and feces.
6. Consuming only well-cooked meat and egg only.
7. If there are suspected symptoms such as having a fever, cough, sore throat, conjunctivitis, and muscle aches especially in the cases of high risk groups, dealing with potentially infected poultry or even ordinary poultry, they should have to see a doctor even suggested to be with the above symptoms and inform the doctor about symptoms and touching poultry.
8. Be prepare yourself healthy to have an immune as follows:
   8.1 Take a rest and sleep as enough.

8.2 Always exercise

8.3 Consume high nutrition food including vegetable and fruit.

8.4 Reduce high risk behaviors such as smoking and drinking alcohols.

8.5 In cold weather, warm yourself by clothing

Appropriate Suggestions for Backyard Poultry Farmers

1. Do not allow other poultries included all birds and avian host entering in the farm.
2. If it can be found dead poultry without causes, contact livestock officer. Do not leave it in the public area such as the cannel, river and the public road.
3. Avoid use fertilize from chicken feces.
4. Do not move any poultries from restricted area.
5. Enhanced bio-security
   5.1 Clean applicants after use.
   5.2 Clean and wash instrument and vehicle before entering into the farm after using and spray anti-virus liquid all of the used applicants every week.
   5.3 In the case of outbreak, await farm and spray anti-virus liquid for three weeks.

Appropriate Suggestions for Consumption of Chicken Products

1. For prevention, should eat well-cooked of chicken products.
2. For egg, it is properly cooked.
3. Wash hand after handling poultry.
4. Do not touch nose, eye and mouth after contact poultry.
5. Separate chop for meat, vegetable and fruit.

Health Belief Model

The Health Belief Model (HBM) (Strecher V. J. And Rosenstock I.M., 1997) has been one of the most widely used conceptual frameworks in health behavior. The HBM has been used both to explain change and maintenance of health behavior and as a guiding framework for health behavior interventions. The HBM is a value expectancy theory. When value expectancy concepts were gradually reformulated in the context of health-related behavior, the translation were 1) the desire to avoid illness or to get well (value) and 2) the belief that a specific health action available to a person would prevent (or ameliorate) illness (expectancy). The expectancy was further delineated in terms of the individual's estimate of personal susceptibility to and severity of an illness and of the likelihood of being able to reduce that threat through personal action.

The Health Belief Model (HBM) is a psychological model that attempts to explain and predict health behaviors. This is done by focusing on the attitudes and beliefs of individuals. The HBM was first developed in the 1950 s by social psychologists Hochbaum, Rosenstock and Kegels working in the U.S. Public Health Services. The model was developed in response to the failure of a free tuberculosis (TB) health screening program. Since then, the HBM has been adapted to explore a variety of long-and short-term health behaviors, including sexual risk behaviors and the transmission of HIV/AIDS.

The HBM is based on the understanding that a person will take a health-related action (i.e. use condoms) if that person:

1. Feels that a negative health condition (i.e. HIV) can be avoided.
2. Has a positive expectation that by taking a recommended action, he/she will avoid a negative health condition (i.e. using condoms will be effective at prevention HIV).
3. Believes that he/she can successfully take a recommended health action (i.e. he/she can use condoms comfortably and with confidence).

The HBM attempts to predict health-related behavior in terms of certain belief patterns. Emphasis is placed on the above described categories. The model is used in explaining and predicting preventive health behavior, as well as sick-role and illness behavior.

The HBM has been applied to all types of health behavior. A person's motivation to undertake a health behavior can be divided into three main categories: individual perceptions, modifying behaviors, and likelihood of action. Individual perceptions are factors that affect the perception of illness or disease; they deal with the importance of health to the individual, perceived susceptibility, and perceived severity. Modifying factors include demographic variables, perceived threat, and cues to action. The likelihood of action discusses factors in probability of appropriate health behavior; it is the likelihood of taking the recommended preventive health action. The combination of these factors causes a response that often manifests into action, provided it is accompanied by a rational alternative course of action, provided it is accompanied by a rational alternative course of action.

The HBM states that the perception of a personal health behavior threat is itself influenced by at least three factors: general health values, which include interest and concern about health; specific health beliefs about vulnerability to a particular health threat; and beliefs about the consequences of the health problem. Once an individual perceives a threat to his/her health and is simultaneously cued to action, and his/her perceived benefits outweighs his/her perceived benefits, then that individual is most likely to undertake the recommended preventive health action. There may be some variables (demographic, socio-psychological, and structural) that can influence and individual's decision.

Key concepts

Perceived Susceptibility

Each individual has his/her own perception of the likelihood of experiencing a condition that would adversely affect one's health. Individuals vary widely in their perception of susceptibility to a disease or condition. Those at low end of the extreme deny the possibility of contracting an adverse condition, Individual in a moderate category admits to a statistical possibility of disease susceptibility. Those individuals at the high extreme of susceptibility feel thee is real danger that they will experience and adverse condition or contract a given disease.

Perceive Severity

It refers to the beliefs a person holds concerning the effects a given disease or condition would have on one's state of affairs. These effects can be considered from the point of view the difficulties that a disease would create. For instance, pain and discomfort, loss of work time, financial burdens, difficulties with family, relationships, and susceptibility to future conditions, it is important to include these emotional and financial burdens when considering the seriousness of a disease or condition.

Perceived Benefits of Taking Action

Taking action toward the prevention of disease or toward dealing with an illness is the next step to expect after an individual has accepted the susceptibility of a disease and recognized it is serious. The direction of action that a person chooses will be influenced by the beliefs regarding the action.

Barriers to Taking Action

Action may not take place, even though an individual may believe that the benefits to taking action are effective. This may be due to barriers. Barriers relate to the characteristics of a treatment or preventive measure may be inconvenient, expensive, unpleasant, painful or upsetting. These characteristics may lead a person away from taking the desired action

Cues to Action

An individual's perception of the levels of susceptibility and seriousness provide the force to act. Benefits (minus barriers) provide the path of action. However, it may require a "cue to action" for the desired behavior to occur. These cues may be internal or external.

Concept	Definition	Application
Perceived Susceptibility	One's opinion of chances of getting a condition	- Define population (s) at risk, risk levels. - Personalize risk based on a person's characteristics or behavior. - Make perceived susceptibility more consistent with individual's actual risk.
Perceived Severity	One's opinion of how serious a condition and its sequel are.	- Specify consequences of the risk and the condition.
Perceived Benefits	One's opinion of the efficacy of the advised action to reduce risk or seriousness of impact	- Define action to take: how, where; clarify the positive effects to be expected.
Perceived Barriers	One's opinion of the tangible and psychological costs of the advised action	- Identify and reduce perceived barriers through reassurance, correction of misinformation, incentives, assistance.
Cues to action	Strategies to activate one's "readiness"	- Provide how-to information, promote awareness, and employ reminder systems.

Concept	Definition	Application
Self-efficacy	One's confidence in one's ability to take action	- Provide training, guidance in performing action. - Use progressive goal setting. - Give verbal reinforcement. - Demonstrate desired behaviors. - Reduce anxiety.

Therefore, the Health Belief Model is central thesis that health behavior is determined by two interrelated factors: person's perception both of the threat of a health problem and their accompanying appraisal of a recommended behavior for preventing or managing the problem. The model works well, especially for early detection or for some conditions, such as infectious diseases, that people might find frightening, especially if they are uncertain about the effect of treatment methods.

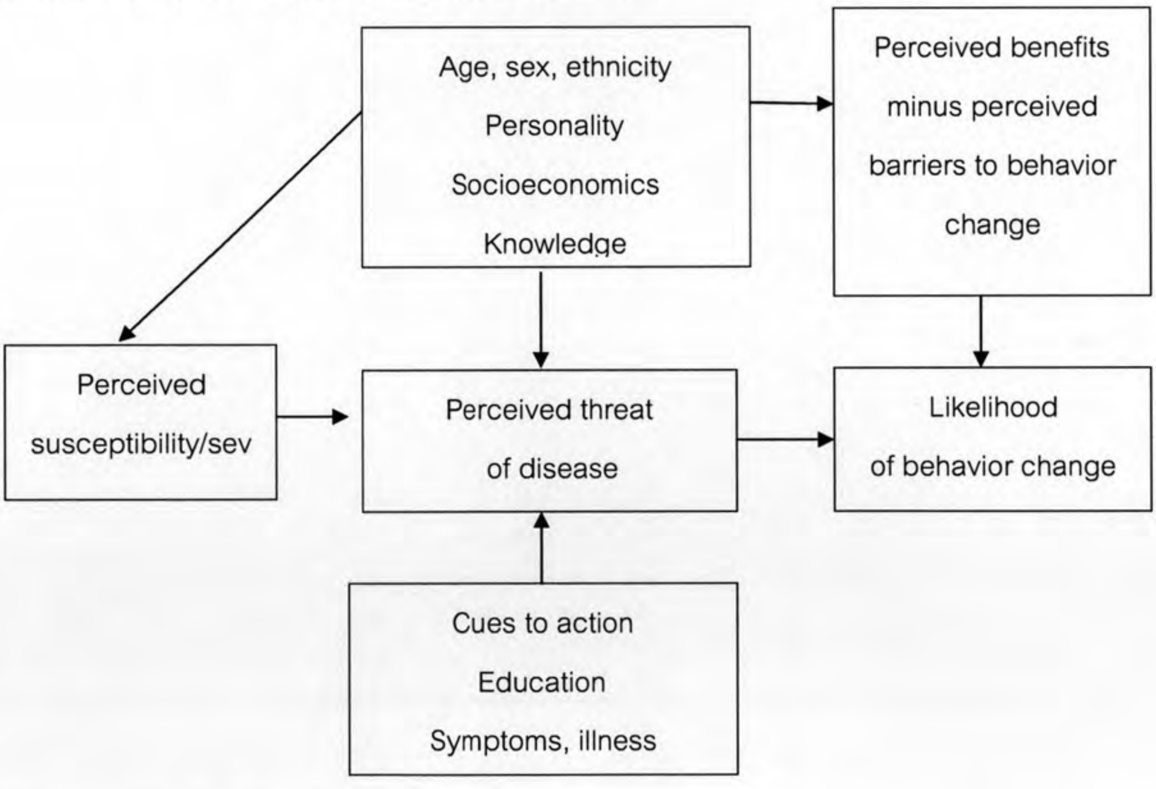

Figure 2: Health Belief Model

For this research, Health Belief Model was implied that focused on backyard poultry farmers in two main issues.

1. As far as, this theory has been concerned the perceived susceptibility and the perceived severity toward Avian Influenza.
2. It is obviously important and related to the health behaviors especially backyard poultry farmers who habitually raise their native chickens independently to their nature kinds.

Health Behavior

Gochman (22) defines health behavior as "those personal attributes such as beliefs, expectations, motives, values, perceptions and other cognitive elements; personality characteristics, including affective and emotional states and traits; and overt behavior patterns, actions and habits that relate to health maintenance, to health restoration, and to health improvement".

S. Kasl and S. Cobb. (23) defined three categories of health behavior;

- Preventive health behavior involves any activity undertaken by individuals who believe to be healthy for the purpose of preventing or detecting illness in asymptomatic state. This can include self-protective behavior, which is an action intended to confer protection from potential harm, such as wearing a helmet when riding a bicycle, using seat belts, or wearing a condom during sexual activity. Self-protective behavior is also known as cautious behavior.

- Illness behavior is any activity undertaken by individuals who perceive to be ill for the purpose of defining their state of health, and discovering a suitable remedy.

- Sick-role behavior involves any activity undertaken by those who consider themselves to be ill for the purpose getting well. It includes receiving treatment from medical providers, generally involves a whole range of dependent behaviors, and leads to some degree of exemption from one's usual responsibilities.

Preventive health behavior (Strecher, V. J. and Rosenstock, I. M., 1997) generally follows from a belief that such behavior will benefit health. An obvious example is quitting smoking to reduce the chances of early morbidity and mortality. It does not follow, of course, that all beliefs on which preventive behaviors are based are well founded, nor that the resulting behaviors will have the desired outcomes. Many preventive behaviors have never been demonstrated to be effective, such as megadoses of vitamin C to prevent the common cold. Preventive actions can reduce, but not eliminate, the chance of acquiring a disease or illness. The strength of the cause and effect relationship between a certain behavior and the health problem one is trying to prevent will determine the impact performing the behavior will have on reducing the risk. This impact is measured in terms of attributable risk. Attributable risk is a measure of the chance of acquiring a disease if the risk factors for it are eliminated or preventive health behavior is engaged in. The chances are influenced by the relationship of the preventive behavior to the etiology of the disease. Most people are aware that if you smoke you have an increased risk of getting lung cancer. Data indicate that almost 90 percent of lung cancer cases in males and 79 percent in females can be attributed to smoking, according to the Office on Smoking and Health. Some people who do not smoke get lung cancer, of course, but the numbers are small. Similarly, wearing a seat belt reduces the chance of dying in an automobile crash, yet it does not guarantee that the individual involved will not be seriously hurt.

Health-related behavior is one of the most important elements in people's health and well-being. It importance has grown as sanitation has improved and medicine has advanced. Diseases that were once incurable or fatal can now be prevented or successfully treated and health-related behavior has become an important component of public health. The improvement of health-related behaviors is, therefore, central to public health activities.

This study of health behaviors toward Avian Influenza from poultry raising activities, raising modes, cooking and consumption, indicated that health behaviors are originated from individual's believe toward the practical actions in relation to poultry raising activities. It is noted that this kind of believe is one of the key decision making. For example, if individual believes that touching poultry is the main cause of infection, he/she will avoid touching it.

Related Research

Onno de Zwart et. al. (2007) investigated risk perceptions and efficacy beliefs related to Avian Influenza. The samples were recruited by random digital dialing. Computer-assisted telephone were collected data from September to November 2005 in eight areas; Denmark, the Netherlands, United Kingdom, Spain, Poland, Singapore, People's Republic of China and Hong Kong. The questionnaire focused on risk perceptions of Avian Influenza and other infectious diseases, precautionary behavior and use of information sources. Risk perceptions were measured by multiplication of seriousness and vulnerability. A total of 3,436 respondents were interviewed. The results found that the respondents thought they were likely or very likely to become infected with Avian Influenza if an outbreak occurred in their country 45.0%. The scores of Risk perceptions varied significantly across countries; the highest means score was in Poland and the lowest was in Denmark. Higher scores were observed in Europe than in Asia ($t = 5.2$, $df = 3,250$, $p<0.001$) and differences between individual countries within Europe were significant. Multivariate analysis showed that country, sex, and age group remained independent significant factors and showed a significant interaction between country and sex and between country and age group. Levels of efficacy and self- efficacy related to Avian Influenza were highest in China and lowest in the Netherlands. Mean response were significantly higher in Asia than in Europe. (Response efficacy $t = -14$, $df = 2,868$, $p<0.001$; self-efficacy $t = -20$, $df = 2,701$, $p = 0.001$). Self-efficacy were inversely associated with risk perceptions ($p = 0.013$ and $p<0.001$, respectively). Multivariate analysis also showed that country, sex and age group were significantly associated with self-efficacy. This study pointed out that risk perceptions were intermediate level and efficacy beliefs were slightly lower.

Abbate et al. (2006) evaluated that knowledge, attitudes and infection control practices of poultry workers in Italy regarding Avian Influenza. Two hundred fifty seven poultry workers were interviewed on December 2005 – March 2006. The results were reported average age was forty three years old (range 19 – 75 years), average duration of work activity was 18 years. The interviewees defined Avian Influenza as a contagious infection caused by a virus 63.8%. Most knew that poultry workers had a high risk of being infected. The samples answered a correct definition of Avian Influenza and knew routes and vectors of transmission. Nevertheless, the study showed the perceptions of low risk of contracting this disease at work only 4.3% and almost half of them wanted more information regarding Avian Influenza 62.3%. The researcher suggested that improving knowledge of transmission and application of preventive measures was a useful public health strategy fro reducing the effects of Avian Influenza in poultry workers.

Laoluekeat S. (2006) explored the environmental factors, Avian Influenza knowledge, receiving Avian Influenza receiving at Kanchanaburi Province, epidemic area. This study was cross-sectional study. The samples were selected by systematic random sampling. The questionnaire was used to data collection. The results showed the samples raised native chickens 21.1% around their house and there was not providing sanitary system for poultry feces. Avian Influenza knowledge score was equal 63.8% and most of them received information from public health officers. The samples had appropriate preventive health behavior 31.4%.

Sukvichai P. (2006) investigated the relationships of demography, knowledge, attitudes, perceptions and preventive behaviors among clients in Pathumthani Hospital. He revealed that 51% of the samples had high score of knowledge, 89.50% had positive attitudes and perceptions and 79.50% had appropriate practices in prevention of Avian Influenza transmission.

Takeuchi M. T. (2006) investigated Avian Influenza risk communication in Thailand. The study was conducted in Bangkok (urban, n = 126), Rangsit (suburban, n = 125) and

Phetchabun (rural, n = 50). The samples were worried about bird flu only 6.0%. Most participants had some knowledge of Avian Influenza. Of those knew that infections could be deadly and interacting with and slaughtering infected birds were the most risky activities. In the rural area, participants had backyard chickens. The study found that 6.0% were aware of the symptoms of HPAI. Most villagers knew that minimizing contact with birds could reduce their risk for infection; however, they were not sure how they could minimize contact. None of the owners of backyard chickens had tested them form HPAI. Behavior change as was a complex process; both motivators and barriers contributed to change. The researcher proposed that three practical items should be included in the campaign; 1) a list of detailed symptoms of HPAI in poultry and humans, 2) guidelines on raising and slaughtering home – raised poultry with a list of protective equipment such as boots, masks, and goggles, as well as cleaning materials, 3) instructions on how to report sick birds or persons to the Thai Ministry of Health.

Fielding et al. (2005) determined exposure and risk perceptions of Avian Influenza from live chicken sales. This research was a telephone survey among 986 Hong Kong households. The results found that the respondents reported their household bought live chickens 78.0%. One third of them touched chickens when buying 32.0%. The samples agreed with the statement "Buying live chickens is risky to health" 36% (95%CI, 33% - 39%). In addition, perceptions of risk from buying live chickens were moderate but sickness anxiety did not predict buying and touching habits. This was an important message for health education groups seeking to increase preventive practices to control possible Avian Influenza outbreaks.

Olsen et al. (2005) assess poultry – handling practices during Avian Influenza outbreak in Thailand. The research was conducted a community cluster survey in Nakhon Phanom Province. The samples were recruited 200 persons from a list of villages and their populations by using a probability proportional to size. Interviews were conducted from 25 to 31 August 2004. The results proposed the samples had heard about bird flu from television at the first time 91.0%. Knowledge and attitudes changed significantly after the respondent heard about Avian Influenza. The percentage of adults who thought touching sick and dead poultry with their bare hands was safe decreased from 40.0% to 14.0% ($p<0.01$). In contrast, most of samples reported that before they heard about Avian Influenza, they frequently washed their hands after touching raw poultry. The results pointed out the respondents learned they could protect themselves by wearing gloves 70.0%. The samples believed the information about how to protect Avian Influenza 86.0%.

Tiensin et al. (2005) examined that outbreaks were concentrated in the Central, the southern part of the Northern, and Eastern Regions of Thailand, which are wetlands, water reservoirs and dense poultry areas. More than 62 million birds were either killed by HPAI viruses or culled. Poultry populations in 1,417 villages in 60 of 76 provinces were affected in 2004. A total of 83% of infected flocks confirmed by laboratories were laboratories were backyard chickens (56%) or ducks (27%). A H5N1 virus from poultry caused 17 human cases and 12 deaths in Thailand.

Chotpitayasunondh et al. (2005) reviewed that Influenza A (H5N1) from January 1 to March 31, 2004. They found that all 12 confirmed case-patients resided in villages that experienced abnormal chicken deaths, 9 lived in households whose backyard chickens died, and 8 reported direct contact with dead chickens. Seven were children less than fourteen years of age. In Asia, a history of direct contact with sick poultry, young age, pneumonia and lymphopenia, and progression to acute respiratory distress syndrome should prompt specific laboratory testing for H5 Influenza.

According to the relevant literature, there was none of the research that study perceptions and health behaviors toward Avian Influenza among backyard poultry farmers at Suantaeng Sub-District. To study in the area mentioned was necessary. As far as, this area is the re-emerging and risk area toward Avian Influenza.