

Comprehensive Report of Prevention Strategy for Influenza Pandemic

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Abstract

Three influenza pandemics occurred during the 20th century - the Spanish flu of 1918 (H1N1), the Asian flu of 1957 (H2N2) and the Hong Kong flu of 1968 (H3N2) - which were all caused by the avian flu virus and resulted in a total of over ten million deaths. In 2003, Korea and Vietnam were hit by incidences of avian and human H5N1 flu epidemics that have not been stamped out so far. Furthermore, the avian flu has spread from Asia to Europe and Africa, prompting the World Health Organization (WHO) and leading global experts to warn of an imminent influenza pandemic. Therefore, the question about the next influenza pandemic is not a question of if, but rather a question of when, it will happen. The next influenza pandemic has become a subject of global interest and has attracted close attention from WHO and countries around the world. Here in Taiwan, the importance placed on a possible avian influenza pandemic can be seen from the fact that it is considered an issue of national security.

This article first provides a description of the avian flu, its dissemination, and the epidemics it caused in the past. Next, the current epidemic situation of H5N1 influenza in both birds and humans is examined, followed by a discussion

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of the strategies for coping with and preventing a worldwide influenza pandemic. Last but not least, an attempt is made to enhance public understanding of avian flu and the prevention of an influenza pandemic in Taiwan through an explanation of the national strategies for responding to such a pandemic and a discussion of key directions for future prevention measures.

Keywords: influenza, disease surveillance, H5N1 influenza virus

Introduction

In light of the devastating consequences of the influenza pandemics of the 20th century, no one in the global community could ignore the news when late in 2003 Vietnam reported the first case of influenza H5N1 in a human. To date the problem of humans and the avian H5N1 influenza continues but has been confined to limited transmission between humans. Consequently, worldwide preparation in response to the avian flu has been rapid, with effort being made in many areas. Early on, in March of 2004, in the hope of reducing the harm resulting from an influenza pandemic as much as possible, the World Health Organization convened the WHO Consultation on Priority Public Health Interventions Before and During an Influenza Pandemic [1], with the primary subjects of discussion being the surveillance for pandemic preparedness, public health interventions, the use and availability of antiviral drugs, and better access to vaccine.

Although Taiwan has had no H5N1 case in humans or avian to date, it is true that epidemic disease knows no boundaries. Taiwan should aggressively prepare for the possibility of an influenza pandemic in order to guarantee that in the event of such a pandemic, we are able to respond in a timely manner so as to reduce the threat to the health of our population as well as other negative social and

economic impacts.

Introduction to avian influenza (avian flu)

Avian influenza is an infectious disease of birds caused by type A strains of the influenza virus. Based on the nature of the avian influenza virus it can be divided into highly pathogenic and lowly pathogenic. Highly Pathogenic Avian Influenza (HPAI) is highly contagious and highly pathogenic. The mortality among infected domestic poultry can reach 100% with the disease spreading rapidly. Lowly Pathogenic Avian Influenza (LPAI) has low contagiousness and is lowly pathogenic. Poultry infected with LPAI usually lack or have only a few clinical symptoms. However, some low pathogenic avian influenza viruses, after mutating for a period of time, can become highly pathogenic avian influenza viruses [2].

Besides the fact that avian influenza virus is highly contagious among birds, it is easily transmitted between farms by birds, people (particularly when shoes or clothing have been contaminated), contaminated vehicles, equipment, feed, and livestock cages. The avian influenza virus is able to survive in the environment for long periods of time, especially when the ambient temperature is very low. For example at a low temperature of 4°C avian influenza virus H5N1 can survive in bird feces for 35 days; at a temperature of 37°C it can survive six days.

The Spread of Avian Influenza

1. Movement of migratory birds

Research shows that the virus found during the second half of 2005 in the Soviet Union, Kazakh, Nigeria, Iraq, Turkey as well as parts of Europe was homologous to the influenza virus found in the spring of 2005 in wild birds at Qinghai Lake in China. Furthermore, the H5N1 virus had also been detected in

the excrement of healthy wild birds at Poyang Lake, China. The highest level of H5N1 antibodies in the wild bird's excrement measured was 3.1%, which indicated the virus had already adapted to living internally in a number of wild birds, and had continued to be distributed along the migratory routes of the birds [3]. The aforementioned research confirms the significance of the role migratory birds plays in spreading the H5N1 virus and the possibility that this might speed the worldwide dissemination of avian influenza.

2. Smuggling of birds

According to statistics, birds and related manufactured goods account for the third highest quantity of all smuggled products, second only to narcotics and firearms. Following the implementation of import bans in certain countries, the hazard associated with smuggling birds and their related manufactured goods began to increase [5]. Consequently it has become more difficult to prevent the clandestine entrance and dissemination of the avian influenza virus. An example is that of June, 2008, when H5N1 influenza virus was detected in live birds from a Hong Kong live market; it was suspected that the origin of the virus was from birds smuggled in from mainland China.

3. Trade activity

Academics have pointed out that in addition to the virus being disseminated via smuggling and bird migration, international trade (including the importation of birds and associated manufactured goods) is also a factor that should not be overlooked. In particular are a number of large bird-raising nations that, after a breakout of highly pathogenic avian influenza, had allowed the virus to enter undetected into another nation with products traded secretly before a ban could be issued on the exportation of related manufactured goods.

The relation between avian influenza and influenza pandemic

Avian influenza virus is usually highly species-specific, also known as a species barrier. Since 1959, human infection with avian influenza virus have been documented on only 10 occasions. Of the hundreds of strains of avian influenza A virus, only four are known to have caused human infections: H5N1, H7N3, H7N7, and H9N2. [2].

1. Crossing the species barrier

There are two mechanisms by which the avian influenza virus can cross the species barrier, thus increasing the ability of the virus to be transmitted between humans. The first mechanism is viral reassortment, where if a human or a pig becomes concurrently infected with both the human and avian viruses, subsequent reorganization could produce a strain of virus that could spread efficiently, becoming a pandemic virus. The second mechanism is a gradual and progressive process of adaptive mutation, where in the course of human infection the virus increasingly integrates with human cells.

2. The threat of H5N1 influenza virus

There are two reasons to believe that H5N1 influenza virus currently possesses the ability to induce a human influenza pandemic. The first is that the avian epidemic situation is ongoing, and the H5N1 influenza virus possesses the necessary characteristics to trigger another influenza pandemic if it is given sufficient opportunities. Secondly, at present there are already incidences in many countries where the H5N1 influenza virus has caused illness in humans, and many people have died as a result. In the past few years there have been at least three waves of infection in humans. There have been sudden outbreaks in Hong Kong in 1997 and 2003 respectively as well as from December 2003 onwards. Although the H5N1 influenza virus is currently receiving the most

attention, the possibility cannot be ruled out that other avian influenza virus strains already known to infect humans may cause an influenza pandemic.

As the H5N1 virus expands the range of environment under which it can survive, the risk of human exposure to the virus and the chances for human infection with the virus both increase. If this virus evolves into a form that is easily transmissible among humans, a large number of people may become infected within a short period of time because humans have not yet developed antibodies against this virus. The result is an influenza pandemic. [6]

Worldwide epidemic status of H5N1 influenza

1. Epidemic status in animals

Beginning in mid 2003, bird farms in nine East Asian countries experienced serious sudden outbreaks of highly pathogenic avian influenza virus. The virus continues to exist in these countries and is difficult to eradicate. On September 16, 2008 the geographical distribution of the virus expanded to include Africa and the Middle East. In total, 61 countries have reported incidences of domestically raised poultry and/or wild birds that had been infected with the H5N1 virus, with 22 countries reporting such incidences in 2008. The population density in some of these affected areas is high, and some lack the proper surveillance and health care systems, thus increasing the risk of human infection.

2. Epidemic status in humans

According to statistics on confirmed human cases of Avian Influenza A/H5N1 released by the WHO on September 10, 2008, 387 confirmed cases of human H5N1 influenza virus have been reported to WHO. Sixty-three percent (245 cases) of those infected with H5N1 had died [7]. Of the 15 countries that had

reported cases, the five countries with the highest number of infections were: Indonesia, Vietnam, Egypt, China and Thailand. A total of five countries reported cases in 2008, including Bengal, China, Egypt, Indonesia and Vietnam, with a total of 36 cases and 28 deaths, which translated into a mortality rate of 78%.

Of the countries that reported incidences of human infection, all are areas where avian epidemics have previously occurred. Moreover, the risk of human infection increases because people in these countries, due to their living environment, lack an awareness of the problem. In addition, the lack of proper disease monitoring and health systems has led to an unfortunately high death rate. Although there have been several successive incidences of infections within families in a number of countries, WHO investigations have revealed that the virus did not spread within the community, and not a single health care worker has become infected. This indicates that currently the risk of infection exists only in situations of extremely close contact with H5N1 patients [8].

Looking at the current evidence, the species barrier of H5N1 influenza virus still exists, and the virus is still a type of avian virus which is not easily transmitted from birds to humans. Those cases of human infection that have been investigated revealed that most of the people lived in areas known to have avian epidemic situations, and those people have engaged in high risk behaviors involving close contact with sick birds, such as slaughtering, plucking feathers or cooking these fowl [9].

Global preparedness and response

1. Prevention system

The Global Influenza Surveillance Network as well as the FluNet, both

coordinated by WHO, have created networks for the sharing and exchange of information on influenza virus DNA and surveillance data [10]. Currently, the Global Influenza Surveillance Network consists of more than 121 national influenza centers in 92 countries, as well as four WHO Collaborating Centers for Reference and Research on Influenza located in Australia, Japan, England, and America respectively. The FluNet is an internet-based geographical information system.

In order to implement the global prevention concept, WHO has created the Global Outbreak Alert and Response Network (GOARN) so that countries around the world can keep one another informed about their domestic epidemic situations and issue warnings to other countries when needed.

In order to prevent and control the international spread of a possible influenza pandemic, WHO has implemented the IHR (2005) to provide a set of legally-binding international regulations that help the world prepare for such a pandemic. Key stipulations of IHR (2005) include: expanding global sharing of information regarding public health emergencies of international concern; strengthening early alert and response; increasing the number of national IHR focal points; and increasing the fundamental requirements for national surveillance and responsiveness.

2. Strategic actions

In 2007 WHO, in order to assist countries prepare for an imminent influenza pandemic, developed a strategic action plan for pandemic influenza, which clearly set out five key action areas [11]: reducing human exposure to the H5N1 virus; strengthening the early warning system; intensifying rapid containment operations; building capacity to cope with a pandemic; and coordinating global scientific research and development.

3. Prevention strategy

Across the global community many strategies for influenza pandemic have been developed, including surveillance, border control, pharmaceutical interventions (antivirals and vaccine), non-pharmaceutical public health interventions (isolation, quarantine, social distancing, education and promotion), and rapid containment operations; WHO has pointed out that among all these prevention strategies, the key measure was the proper control of emergency outbreaks in animals. Once there is effective control of the viral spread between animals, then the extent of human infection will be effectively reduced.

4. Pandemic phase

In order to issue alert in a timely fashion and deploy the appropriate strategies, WHO has categorized the influenza pandemic into six phases. Currently the situation has remains at phase 3, which means although there are sporadic human cases with new subtypes, there is no evidence that the viruses are capable of efficient human-to-human transmission. At the next stage of epidemic intensity, phase 4, the question of whether or not to proceed with rapid containment needs to be addressed. The decision to escalate phases is dependan H5N1 influenza in both birds and humans is examined, followed by a discussion t on epidemiological factors as well as the genetic evolution of the virus [12].

5. Main focus

H5N1 influenza epidemics in animals and in humans continue to occur, and the threat of an influenza pandemic still exists. The current foci in pandemic preparedness by various countries are summarized below:

(1) Establishment of platforms for sharing samples of viral strains

WHO continues to urge all nations to share strains of influenza virus as

well as to establish a platform for exchanging sample strains in order to assist vaccine research and development. WHO also urges nations to commit to working towards increasing the worldwide production capacity of pandemic influenza vaccine to ensure that the needs of developing countries are covered. To this end WHO convened an intergovernmental conference from November 20 to 23, 2007, on the topic of “Sharing of Influenza Viruses and Access to Vaccines and other Benefits” and made recommendations in order to ensure a fair and reasonable system and mechanism of sharing benefits [13].

WHO has given between 2.0 to 2.6 million US dollars to fund 6 companies in developing countries for conducting influenza virus research and technology transfers, which will serve the ultimate goal of establishing or strengthening the production capabilities of influenza vaccine in these countries. WHO continues to discuss cooperative models with relevant companies, international pharmaceutical businesses and associations in order to facilitate the acquisition of the necessary technology by developing countries.

(2) Establishment of international vaccine stockpiles

WHO will cooperate with vaccine production facilities to promote the development of a global stockpiling plan for H5N1 influenza virus vaccine and a more extensive procedure for acquiring pandemic vaccines. This would include determining vaccine allotment priorities, discussing the problem of stockpiling technology, planning in advance the logistics for control and supervision as well as management models for vaccine stockpiles, standardizing the procedure for receiving contributions, accumulating the resources needed to maintain stockpiles, and determining

guidelines for fair access to stockpiles.

WHO hopes to stockpile 150 million doses of H5N1 vaccine, out of which 50 million will be used in the beginning stages of a pandemic in an attempt to confine the outbreaks in their areas of origin. The remaining 100 million doses would be given to those countries that don't have easy access to the H5N1 vaccine for the purpose of protecting core working personnel.

(3) Increasing the vaccine production capacity

Currently the highest production capacity for seasonal influenza vaccine under normal conditions is 500 million doses. Once the need for pandemic influenza vaccine appears, the production capacity of vaccine must be increased. WHO has developed the Global Action Plan for Pandemic Influenza Vaccines in order to help raise the global production capacity. This plan's focal points include: increasing seasonal vaccine use; building vaccine production plants; and improving the technology used for producing vaccines.

The current technology is able to produce roughly 100 million doses of H5N1 avian influenza vaccine per year. It is estimated that by 2010 this number will raise to 4.5 billion doses per year. The production of seasonal influenza vaccine went from 350 million in 2006 to 565 million in 2007. It is estimated that by 2010 the production of seasonal influenza vaccine will increase to 1 billion.

(4) Stockpiling antiviral drugs

Currently WHO, along with the Association of South-East Asian Nations (ASEAN) and the United states, adhere to the idea of "regional joint defense" as well as stockpiling influenza antiviral drug (the primary medicine being oseltamivir), in the hope of halting the risk of human to

human infection.

In addition to governmental stockpiling of antivirals, private businesses are also being encouraged to stockpile antivirals so they can be provided to employees when an influenza pandemic occurs, thus maintaining the critical operations of the business. In June 2008 the U.S. department of Health opened for public comment a draft proposal for business to stockpile antiviral drugs.

(5) Maintaining critical infrastructures and business continuity

Developed countries continuously emphasize that the development of a Business Continuity Planning (BCP) is an important step in preparing for a pandemic. The American government has repeatedly proposed a checklist for pandemic response for different industries, so early preparation can be carried out in various areas to maintain critical infrastructures and economic performance during a pandemic. On March 30, 2008, the APEC EINet (Emerging Infections Network of the APEC Health Working Group) discussed the issue of “partnership and continuity planning for critical systems” at the second international virtual symposium held on influenza pandemic. Representatives from 16 economic entities attended, each sharing their various experiences in promoting services in the public and private sectors.

(6) Assessment of drills and plans

In April 2007, the WHO Western Pacific Regional Office (WPRO) and 10 Asian countries jointly held the Panstop 2007 drill, while The United States went as far as holding a financial organization response drill for an influenza pandemic. In addition every country paid great attention to the evaluations and plans for influenza pandemic preparations.

In 2006, Dr. Richard Coker, an academic from the London School of Hygiene and Tropical Medicine, evaluated the preparedness level of 21 European countries and seven Asian countries, and published his paper in the internationally renowned journal, *The Lancet*. In 2007, the United Nations System Influenza Coordinator (UNSIC) and the World Bank issued a joint international assessment about the preparedness level of 146 nations.

(7) Early detection and rapid containment

The IHR (2005) has been implemented to strengthen public health warnings for sudden incidents as well as the rapid handling of epidemic situations through the cooperation of the international community. It also serves to strengthen the effectiveness of surveillance systems. WHO has also published successive guidelines for epidemiological investigations, rapid containment and the operation national influenza centers.

Response and preparedness of Taiwan

In order to respond to a possible influenza pandemic, in December 2003 Taiwan began formulating plans and acquiring the necessary materials for containing an epidemic, including masks, personal protective equipments and antiviral stockpiles. In September 2004, the Department of Health began holding regular Preparatory Meetings; in December of that same year novel influenza was proclaimed a notifiable communicable disease. In July 2005, an exercise for influenza pandemic response was held. In August 2005, a National Security Meeting on influenza pandemic preparedness was convened. In November 2005, the Executive Yuan began the regular Coordination Meetings. In 2006, the concept of “Business Continuity Planning during an Influenza Pandemic” was

promoted to both the public and private sectors.

1. The overall objectives for prevention and treatment in Taiwan

The overall objectives of the prevention and treatment of pandemic influenza in Taiwan are: avoiding the occurrence of domestic human infection, preventing further transmission of imported human infection, mitigating the health impact of a pandemic as well as maintaining social functions and economic activities during a pandemic, and recovering from the social, economic and psychological consequences of the pandemic. This would entail the elimination of human H5N1 influenza virus before the onset of a pandemic. For example, if the H5N1 virus entered the country from abroad, all efforts must be used to contain the virus and prevent further infection. Aggressive medical countermeasures and public health interventions must be implemented in order to reduce the damage to public health in the case that the H5N1 influenza virus does become more virulent. Important societal and economic activities must be continued during a pandemic. Recovery plans need to be launched to restart the economy as well as restore public confidence during the post-pandemic period.

2. Taiwan's response plans

In order to respond to an influenza pandemic, multilevel plans have been formulated for attaining a variety of goals:

(1) "National Influenza Pandemic Preparedness Plan" (Preparedness plan):

The Executive Yuan approved the Preparedness Plan, which specifies the highest guiding principles for influenza pandemic preparedness. Based on the Preparedness Plan, central and local governments can budget for stockpiling medicines and vaccines, coordinating response systems and training personnel.

(2) “Influenza Pandemic Strategic Plan” (Strategic plan):

Based on the Preparedness Plan, the Department of Health (DOH) formulated the Strategic Plan and annually revises it as needed. The strategies for each pandemic phase are elaborated and will be employed by all authorities to develop their practical plans.

(3) “Influenza Pandemic Response Plan” (Response Plan):

Based on the Strategic Plan, the Centers for Disease Control (CDC) formulated the Response Plan to regulate the implementations of each strategy outlined in the Strategic Plan. The latest edition includes 10 working plans, 2 guidelines and 1 checklist. The Response Plan will be constantly revised as updated information becomes available during a real situation.

3. The framework of Taiwan’s prevention and treatment response

As part of the influenza pandemic response, Taiwan has established its framework for prevention and treatment response called the “Four Major Strategies and the Five Lines of Defense” to ensure the well being of the citizens of Taiwan.

(1) Four Major Strategies: early detection, interruption of transmission, antivirals, and Influenza vaccines.

(2) Five Lines of Defense: containment abroad, border control, community epidemic control, maintaining medical system functions, and individual and family protection.

4. Achievements in Taiwan’s preparedness and response

(1) In 2004 the “National Influenza Pandemic Preparedness Plan” was completed, and following ratification by the Executive Yuan all levels of government followed the preparatory plans and proceeded to make

preparations for medical treatment, as well as stockpile materials for epidemic prevention, establish mobilization procedures, and train personnel for epidemic prevention. In 2007 the “Influenza Pandemic Strategic Plan” was implemented according to the “Preparatory plans.” In 2008 this was updated so that each office was required to follow the formulated plans for practical matters of response. Year 2007 saw the establishment and publication of the “Influenza Pandemic Response Plan”.

In 2007, Dr. Richard Coker, of the London School of Hygiene and Tropical Medicine evaluated Taiwan’s “Influenza Pandemic Strategic Plan” recently enacted by the Executive Yuan against the seven categories and 166 items from WHO’s check list, and he weighted important items in the planning system as well as provided a score of the plan’s comprehensiveness. After evaluation, Taiwan was given a 70% score of overall comprehensiveness, superior to 28 previously evaluated countries (average score was 57%), and given an overall appraisal of “high level of preparedness”. Taiwan’s strategies are relatively creative and could be offered to other countries as reference.

(2) Establishment of communicable disease control medical networks

Following the concept of regional alliance, Taiwan was divided into the following six sub-networks: Taipei region, Northern region, Central region, Southern region, Kaohsiung and Pingtung region, and the Eastern region. The infectious disease medical prevention and treatment website was also created. Specialists were appointed to be commanding officers and assistant commanding officers responsible for each district. In addition, specialists in medical, infection control, and public health were brought into the advisory council. In the beginning stages of an epidemic,

contingency hospitals will take special responsibility of taking care of the ill, while the command centers will assess the nature of the epidemic, thereby enabling the rapid isolation of the patients in order to prevent further spread of the virus.

(3) Comprehensive stockpiling of personal protective equipment and antivirals.

In the central and, local government levels as well as regional levels and above, medical hospitals have established a three-level safety stock system for personal protective equipment. The Management Information System (MIS) information platform was developed and launched so that in the event of an epidemic, suppliers can use MIS to understand the amount of materials each unit is consuming and the remaining amounts in storage. This will enable suppliers to calculate the needs of each unit and replenish stock.

190,000 doses of human H5N1 vaccines, cover 10% of the population antivirals, surgical masks, N95 masks and personal protective equipments have been stockpiled

(4) Inspection and verification of practice exercises

Since July of 2005 practice drills have been continuously conducted on various levels to verify the plausibility of the response plans. More than ten practice exercises have been completed. Details of the drills include: operation by the Central Epidemic Command Center, control measures for incoming passengers in the airport and seaport, medical service for infected cases from off-shore islands, deployment of antivirals, vaccines and PPEs, response by local governments, and business continuity plan.

(5) Business continuity and the establishment of critical infrastructure

In order to properly respond to an influenza pandemic, beginning in 2006

the Department of Health's Centers for Disease Control introduced the concept of "Business Continuity Plan during an Influenza Pandemic" to the public and private sectors. Currently all of the ministries of the Executive Yuan have created plans for business continuity, and critical infrastructure is being verified. Business continuity plans are being developed to address the following concerns: sources of water and electricity, transportation, food, emergency services, medical first aid, financial affairs, telecommunications, waste management and education.

(6) Formulation of non-pharmaceutical public health interventions to halt the spread of disease

In order to halt or delay the spread of an epidemic, non-pharmaceutical public health interventions have been formulated in order to limit the spread of viruses between nations. These interventions include: border fever screening test and travel restriction.

In order to reduce the spread of viruses within the country, plans have been prepared to isolate and quarantine those who are ill and those who have had close contact with them, and procedures for school closure and increasing social distance have also been developed. In order to increase citizen compliance and avoid social panic and stress, steps have also been prepared to ensure the proper communication about health risks through the media.

Constant revisions, modifications and updates of plans will be carried out to make them more relevant to current needs and more effective in achieving the ultimate goal of minimizing the loss of lives and socioeconomic impact during a pandemic.

5. The unresolved issues of Taiwan's response system

(1) Establishing a systematic evaluation system

Although the various levels of government and contingency hospitals have finished composing plans in accordance with the overall preparatory plan, a systematic evaluation procedure still needs to be developed. By developing a systematic evaluation in time, the inspection, revision and updating of plans is possible. Such revisions will enable plans to meet actual needs and thus help reach the ultimate goals of reducing harm to the health of the citizenry as well as limiting the negative effects on the economy.

(2) Establishing a volunteer network

The network of people within a community is very important in maintaining prevention and treatment within that community, as well as providing individual and family first aid. However, at present, community volunteer groups aren't lacking members but are rather lacking effective and systematic integration. Establishing a community volunteer network that is well organized and can be efficiently mobilized will strengthen and increase effectiveness in two of the Five Lines of Defense - community prevention and treatment, and individual and family first aid.

(3) Business continuity

The scope of business continuity includes protecting the health of employees as well as maintaining business operations. If businesses can continue to operate, even in the event that an influenza pandemic continues for a few months or even a year, it would certainly help to improve the conditions for a healthy citizenry as well as reduce the negative effects on the economy and society in general.

(4) Self-manufacturing of vaccines

At the moment vaccines provide the most effective prevention. Currently there is no country in the world that is not putting large amounts of its resources into the research of pandemic vaccines as well as building vaccine manufacturing plants. The neighboring countries of Taiwan, such as Japan and China, have already completed research and development for pandemic vaccines and also have established production capabilities. Countries such as Vietnam, Korea, and Singapore are building and investing in vaccine industries. Taiwan has already reached short- and mid-term goals for the stockpiling of vaccines as well as the production, research and development of emergency vaccines. However, in order to prepare for and respond to an influenza pandemic, the long term self-manufacture capacity goals should be a critical focus of future efforts.

Conclusion

Influenza Pandemics have inflicted severe losses on human lives and led to serious negative consequences on society. Adding to these losses is the current five-year wave of H5N1 influenza virus outbreaks, of which there seems to be no end in sight. Although the current situation falls within the category of phase 3 with limited human-to-human transmission, H5N1 already has the potential to induce a human influenza pandemic. At any time the virus could evolve to acquire the ability for efficient and sustained human-to-human transmission and initiate an influenza pandemic. Currently the entire world is preparing for the “inevitable influenza pandemic”, and Taiwan should keep in pace with international trends. Moreover, Taiwan is not a member nation of WHO, and as such cannot participate in or receive the benefits of WHO sponsored surveillance activities, information sharing, and vaccine or pharmaceutical stockpiling initiatives. Consequently,

Taiwan must rely even more on itself for the development of its influenza pandemic preparations. Taiwan has carefully devised preparedness plans, built a communicable disease control medical network, stockpiled equipment for individual prevention and treatment as well as antivirals, performed practice exercises with inspection and verification of procedures, promoted business continuity, and established critical infrastructure. Furthermore, Taiwan has, by way of its annual seasonal influenza plan, established procedures for the circulation of materials during a pandemic. In order to ensure the health of the Taiwanese in the future, a systematic evaluation procedure has been established to evaluate the needs of each local government and responding hospital. Taiwan has also established a community volunteer network to strengthen the community prevention and treatment, along with the individual and family first aid aspects of the “Five Lines of Prevention”. In addition we have promoted business continuity to reduce economic losses and negative impacts on society from an influenza pandemic. Building domestic capabilities for vaccine production to provide for the prevention and treatment needs of an influenza pandemic is a critical direction for future efforts.

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