

CENTERS for DISEASE CONTROL

Annual Report 2009



CDC Annual Report 2009

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MESSAGE FROM THE DIRECTOR



Welcome to the 2009 annual report from the Taiwan Centers for Disease Control (Taiwan CDC). This report aims to provide the reader with an overview of Taiwan CDC's major events and achievements in 2008.

Taiwan CDC is a leading public health agency in Taiwan that plays a key role in protecting all people on the island from the threats of infectious diseases. In this report, you will see how Taiwan CDC's employees work effectively together to ensure a healthier environment for the people in Taiwan and a safer place for people all around the world. Last year, we confronted an enterovirus outbreak and worked to successfully control the epidemic. In the meantime, we actively seek ways to meet many new challenges posed by emerging infectious diseases such as tuberculosis, H5N1 influenza, and HIV/AIDS.

For years, tuberculosis (TB) has had the highest incidence and mortality rate among all communicable diseases in Taiwan. The situation has been worsened by the risk of disease transmission stemming from thriving international activities and the increasing number of HIV/AIDS patients who are at greater risks of TB infection. In order to bring TB under effective control, Taiwan CDC has launched the "Program to Halve TB Incidence in Ten Years". This program focuses on strategies aimed at expanding the coverage of TB Directly Observed Treatment Short-course (DOTS), treating active TB cases in isolation as well as restricting their air travel, establishing the Multi-drug Resistant Tuberculosis (MDR-TB) Medical Care System, and improving epidemic reporting and surveillance in order to achieve the goal of halving the annual number of new TB cases by 2015.

In view of the fact that the highly pathogenic influenza runs the risk of becoming a worldwide epidemic, Taiwan CDC has worked collaboratively with many related authorities to formulate preemptive measures concerning the prevention and control of the disease. For instance, we have established the National Influenza Center (NIC) to integrate the existing influenza surveillance systems, analyze the antigens and genomes of influenza viruses, and periodically release related information to the public. In addition, the National Health Command Center (NHCC), which is well-equipped with communications facilities and designed to coordinate officials at all levels, has been set up to monitor the activities of influenza. We believe that the two aforementioned centers have provided Taiwan with an extra layer of protection against a possible invasion of avian flu. In the evaluation conducted by Dr. Richard Coker, Reader in Public Health at the London School of Hygiene & Tropical Medicine in the United Kingdom, the overall score of the preparedness plan of Taiwan CDC was rated 70%, and the plan was assessed to have "high level of preparedness."

On the other hand, the HIV infection rate among injecting drug users (IDUs) has risen acutely in recent years, and studies have shown that needle-sharing among IDUs has replaced risky sexual behavior as the primary route of HIV transmission. To counter the increase, Taiwan CDC has been working closely with the Ministry of Justice and the local health-related bureaus to implement nation-wide harm reduction programs. We first reversed the rising trend of new HIV infection in 2006. Towards the end of 2008, we have effectively reduced the number of HIV infections. Therefore, the harm reduction program has remained one of the most important strategies of Taiwan CDC.

As a member of the international community, we look for opportunities to strengthen cooperation with other countries as well as other international healthcare institutes. In 2008, Taiwan CDC organized the "APEC Workshop for the Control Practice of Dengue Fever" in Kaohsiung. The workshop gathered 40 representatives from 12 APEC member economies. The purpose of this workshop was to assist APEC economies to strengthen capacity building by sharing information and practices on vector control, risk communication, and community mobilization on dengue fever. Most participants believed that the new skills and knowledge they have acquired during the workshop would benefit themselves as well as their economies.

Taiwan CDC's employees form our national frontline in the battle against epidemics, and they devote every effort to helping our people cope with infectious diseases. We stay true to our motto: "Disease prevention should be regarded as a battle. Unity, professionalism and swift action are the keys to success." We are committed to achieving our disease control targets and making Taiwan a healthier country to live in. I sincerely hope you will enjoy reading this report and continue to support us.



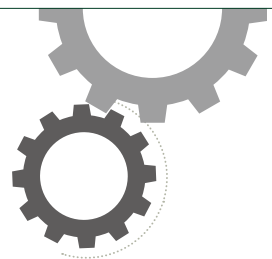
Steve Hsu-Sung Kuo, MD, MPH, PhD
Director
Taiwan Centers for Disease Control



ABOUT TAIWAN CDC



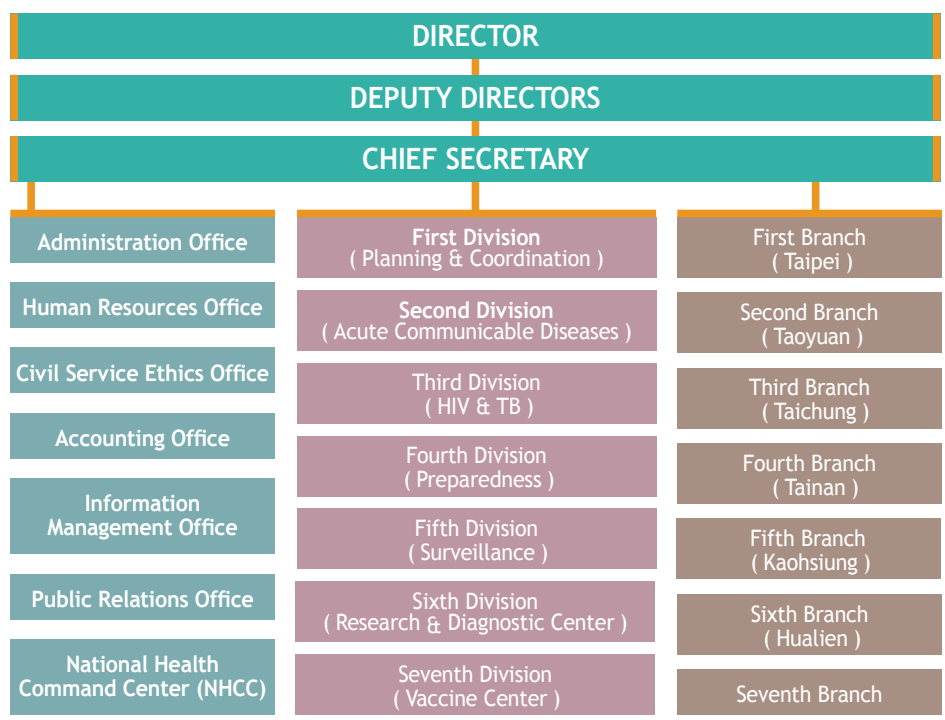
About Taiwan CDC



In 1999, the Taiwan Centers for Disease Control was established by merging the Bureau of Communicable Disease Control (BCDC), the National Quarantine Service (NQS) and the National Institute of Preventive Medicine (NIPM) under the Organization Law of the Centers for Disease Control, the Department of Health, in order to consolidate resources, and to establish a comprehensive infectious diseases control system for the challenges of the 21st century.

Taiwan CDC is under the command of the Director, who is assisted by the Deputy Directors and Chief Secretary. Taiwan CDC is composed of seven divisions, seven offices, and seven branches (see Table 1). The areas of jurisdiction of Taiwan CDC headquarters and seven branches are as shown in Figure 1.

Table 1. Organization of Taiwan CDC



Currently, Taiwan CDC has 832 employees. The male to female ratio is 1:4 and the average age is 42.6 years. Statistically, 76% of employees are younger than 49 years old, 48% of the staff have been college and university educated and 35% hold advanced degrees.

Branches

Jurisdiction

The first six branches facilitate disease control and quarantine efforts by monitoring, coordinating, supervising and evaluating the performance of local health authorities in carrying out measures to prevent the occurrence and spread of communicable diseases, whereas the Seventh Branch responds to international emergencies by swiftly recruiting and sending personnel to epidemic areas or disaster zones to carry out epidemiological investigation and relief work.



Figure 1. Areas of Jurisdiction of Branches

MILESTONES IN PUBLIC HEALTH

Disease Eradication

1940s

1948

Plague eradicated

1950s

1955

Smallpox eradicated

1960s

1959

Rabies eradicated



Vaccination Programs

1940s

1948

Diphtheria toxins vaccination program implemented

1950s

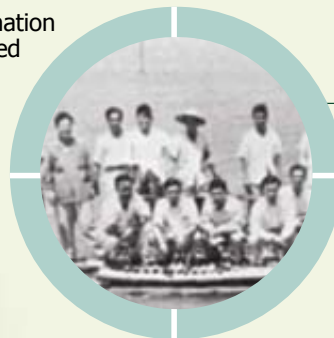
1955

DPT vaccination program implemented

1960s

1956

BCG vaccination program implemented



1980s

1984

Hepatitis B vaccination program implemented, reducing the child-carrying rate by 84%

1990s

1992

MMR vaccination program implemented

2000s

1986

Rubella vaccination program implemented

1995

Hepatitis A vaccination program implemented, successfully eliminating outbreaks in mountainous areas

1998

Free influenza vaccines provided for people over the age of 65 and in high risk groups; People under special care, or working in health care institutions also became eligible for free vaccination

1960s

1970s

2000s

1965

Malaria eradicated



Taiwan Polio Eradication Certification Committee

1. Name: Wei-Chuan Hsieh, M.D., M.P.H., F.R.C.P., Ph.D.—Chairman
Signature: *Wei-Chuan Hsieh*
2. Name: Kenneth S.S. Chang, M.D., Ph.D.
Signature: *Kenneth S.S. Chang*
3. Name: Tung-Chuan Chang, M.D.
Signature: *Tung-Chuan Chang*
4. Name: Chuan-Jen Chen, M.D.
Signature: *Chuan-Jen Chen*
5. Name: Shun-Hung Chen, M.D., Ph.D.
Signature: *Shun-Hung Chen*
6. Name: Hsiang-Chia Fu, M.D., Ph.D.
Signature: *Hsiang-Chia Fu*
7. Name: Hsu-Dong Kuo, M.D., M.P.H.
Signature: *Hsu-Dong Kuo*
8. Name: Chang-Fu Loh, D.Phil.
Signature: *Chang-Fu Loh*
9. Name: Chung-Tai Lin
Signature: *Chung-Tai Lin*
10. Name: Chiu-Tsu Liu, M.D., M.S., Ph.D.
Signature: *Chiu-Tsu Liu*
11. Name: Huang-Chiang Hsu, M.D., M.P.H., Ph.D.
Signature: *Huang-Chiang Hsu*
12. Name: Hsiao-Jen Chen, M.D., M.P.H., Ph.D.
Signature: *Hsiao-Jen Chen*
13. Name: Teresa J.C. Yen
Signature: *Teresa J.C. Yen*

2000

Polio eradicated

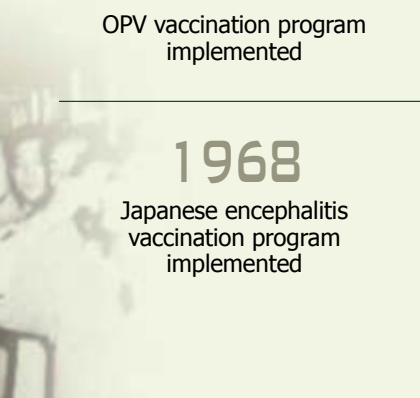
1960s

1970s

1980s

1966

OPV vaccination program implemented



1968

Japanese encephalitis vaccination program implemented



1978

Measles vaccination program implemented



2000s

2010s

2001

Free influenza vaccines expanded to cover all people over the age of 65

2004

The target groups for free influenza vaccines expanded to infants over 6 months and under 2 years of age

2008

Implementation of the flu immunization program for children in grades one-four.

2003

The target groups for the free influenza vaccines expanded to workers of medical institutions, health centers, and livestock or poultry farms

2007

The target groups for free influenza vaccines expanded to first grade and second grade students

Provision of nationwide Streptococcus pneumoniae vaccinations for elderly persons over 75 years of age.



2008 CDC TIMELINE

JAN 2

Formal inauguration of travel medicine outpatient services offered in cooperation with National Taiwan University Hospital.



18

Announced "Scope of Persons Required to Receive Human Immunodeficiency Virus Testing"; took effect immediately.

22

Held the "2008 Academic Seminar on Methadone Replacement Therapy" in conjunction with the Hospital Administration Commission and Taoyuan Mental Hospital, DOH.

APR 25-30

The "Beat TB Amusement Park" Touring TB Prevention Exhibition " got underway in the lobby of the Taipei Railway Station. Starting in May, the exhibition was held in various locations throughout Taiwan, including Taichung, Kaohsiung, Taoyuan County, Hualien County, and Chiayi.

MAY 30

Participated in the second Virtual Symposium On Pandemic Influenza Preparedness of "APEC Health Working Group—Emerging Infections Network" (APEC EINet).



JUN 5-6

Held the "APEC Workshop for the Control Practice of Dengue Fever" at Kaohsiung's Garden Villa. Representatives from 12 APEC economies attended and shared their experiences in the disease control. We also shared Taiwan's "Kaohsiung Model" of dengue fever prevention in this workshop.



SEP 26

Held the "HIV-TB Co-infection Workshop." Participants shared knowledge and experience concerning AIDS/tuberculosis co-infections from a global perspective, and discussed the epidemics in Taiwan, Africa, and Thailand. Roughly 190 persons attended this event.

27-28

Held the "9th Taipei International Conference on HIV/AIDS." 14 foreign experts, including Dr. David Ho, were invited to discuss such issues as the epidemiology of HIV/AIDS, control strategies, treatment and drug resistance as well as harm reduction. Around 750 persons took part.



OCT 1

Conducted 2008 flu vaccinations at public expense. Provided nationwide Streptococcus pneumonia vaccinations for elderly persons over 75 years of age.



FEB 16-17

Held the "IOHA 2008 International Scientific Conference—Professional Education and Training on Biosafety" in conjunction with the Occupational Hygiene Association of Taiwan.



19

Signed the "Memorandum of Cooperation on the Production of Horse Serum" with National Pingtung University of Science and Technology, cooperated in the establishment of a immunological horse farm and improvement of horse immunological technology.

Signed the "Dengue Fever Control Center Forerunner Project" with Chung-Ho Memorial Hospital, Kaohsiung Medical University, and developed a localized dengue fever control model.

26



Successfully developed the "Coxsackievirus A IFA Typing Kit Set I" enterovirus test kit, and made an announcement concerning the kit in the Journal of Clinical Microbiology; this highlighted Taiwan's ability to develop test reagents for infectious diseases.

JUL 1

Taiwan CDC, together with the Kaohsiung National Science & Technology Museum, held an inaugural press conference for the "Disease Control Exhibit—Disease Prevention Boot Camp" at the museum.



19



Held the "Academic Symposium on the method and application of Rapid Diagnosis of Infectious Diseases" at National Taiwan University's international conference center. We shared knowledge and experience in rapid microbiological diagnostic and testing technology, epidemiology, as well as law and ethics; roughly 370 participants took part in this symposium.

AUG 1

The "Antivenin of *D.russellii* (Lyophilized)" developed by Taiwan CDC received a pharmaceutical permit (Wei-Shu-Han-Chun-Yi-Chih No. 000001).

8

Held the "2008 Disease Prevention Awards" ceremony and press conference. With a topic of "Do Everything Possible, Be a Disease Prevention Vanguard," this year's event strove to create an image of "disease prevention warriors," and highlighted the dedication and hard work of local disease prevention personnel. A total of 60 groups and individuals received the awards.



14

Responded to "Global Handwashing Day" on October 15 by holding the 2008 Global Handwashing Day press conference and inviting five leading enterprises to help promote the global "hand washing with soap" campaign.



NOV 15

Commissioned the Infectious Diseases Society of Taiwan to hold the "2008 Symposium on Zoonoses." Around 400 participants attended this event.

MAR 20

The standardized vessel inspection and quarantine operating procedures employed by Taiwan CDC's seven quarantine units passed review by the Taiwan Accreditation Foundation, and was awarded ISO 9001: 2000 certification.



23

Held the "2008 International Tuberculosis Symposium" on March 24, in harmony with the World Tuberculosis Day, in conjunction with the Taiwan Tuberculosis Prevention Association and Municipal Wan Fang Hospital, Taipei Medical University.

APR 8

Held the "Hand-washing Educational Campus Tour Kick-off Press Conference" together with Ronald McDonald House Charities. This campaign held 270 school activities throughout Taiwan, on offshore islands, and in indigenous areas.



13

Drafted the "Statute for Hansen's Disease Patients' Human Rights Safeguard And Compensation"

SEP 2

Drafted the "Regulations Governing Protection of the Rights of HIV Patients."

Commissioned the Academia Sinica to develop a dual-effect vaccine against human and avian influenza. The results of this project were published in Proceedings of the National



11-12

Held the "5th Taiwan-Japan Bilateral Symposium" together with the National Institute of Infectious Diseases, Japan. Participants from the two countries shared their experiences concerning international cooperation and tuberculosis control.

21

Held the "Flu Fighters—Battle Against Disease," which selected and recognized 30 young flu fighters from elementary schools nationwide.



30

Held the "Stop AIDS: Keep the Promise-Leadership" event at the Grand Hotel. Vice President Vincent Siew attended on invitation and delivered a speech.

DEC 19

The Legislative Yuan passed the revised "Article 27 of the Communicable Disease Control Act," which calls for the establishment of a national vaccine fund that can be used for the purchase of vaccines and implementation of immunization.



Dengue Fever

Date: 5-6 June 2008

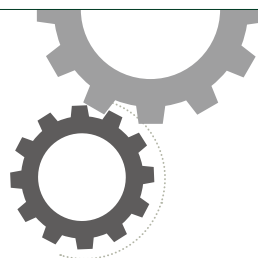
Thank You!



2008 FOCUS APEC WORKSHOP FOR THE CONTROL PRACTICE OF DENGUE FEVER

2008 Focus

APEC Workshop for the Control Practice of Dengue Fever



Background

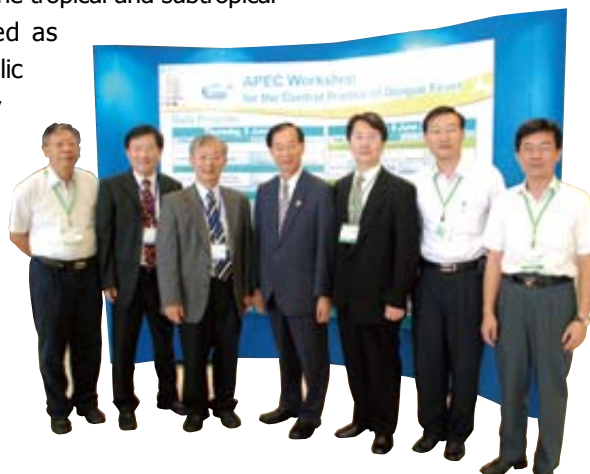
APEC

Asia Pacific Economic Cooperation (APEC) forum was established in 1989, and is a forum for consultation among high-level government officials from 21 economies in the Asia-Pacific region.

The emergence of Severe Acute Respiratory Syndrome (SARS) in the Asia Pacific Region and the outbreak of H5N1 influenza has shown the impact that health challenges can cross a broad range of sectors, including public health, agriculture, trade, tourism, transportation, and business. In October 2003, APEC established the Health Task Force (HTF) to address health-related threats to economies' trade and security, focusing mainly on emerging infectious diseases.

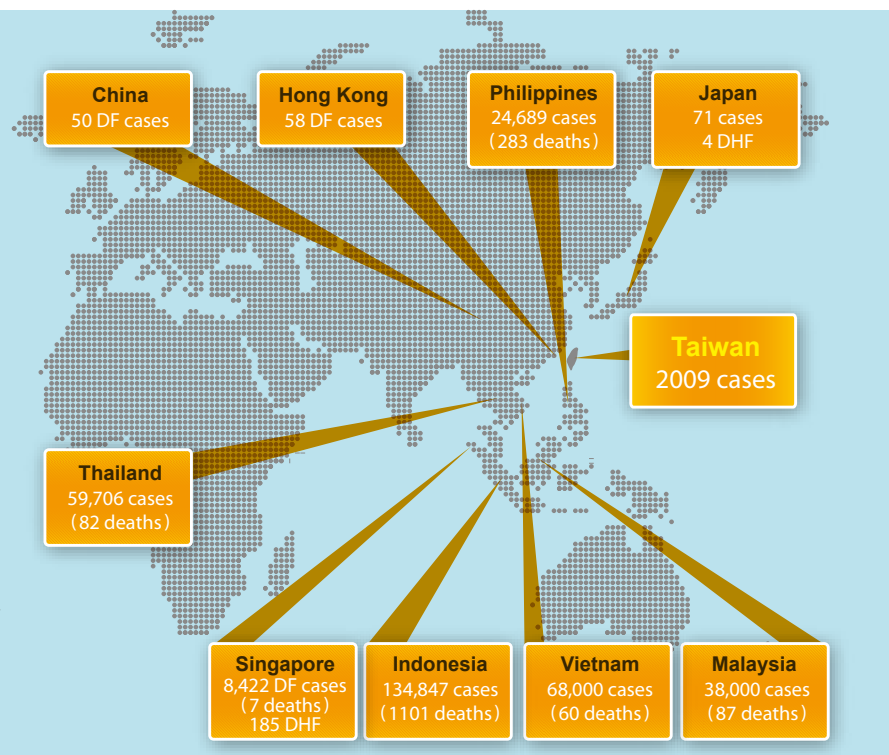
In 2006 the Senior Officials' Steering Committee on ECOTECH (SCE) recommended that the HTF be transformed into the Health Working Group (HWG). The establishment of the HWG was endorsed by APEC Ministers in September 2007. In the first meeting in Lima, Peru, in 2008, the HWG agreed on the following issues as priorities for 2008: preparedness and response towards public health threats, including avian and human pandemic influenza and vector borne diseases; fighting against HIV/AIDS in the APEC region; and improving health conditions through advanced health information technology.

Dengue Fever mainly occurs in the tropical and subtropical areas. It has rapidly emerged as one of the most important public health problems. It not only causes a heavy economic burden but also influences the health status of the people in these regions. As a vector-borne disease, as long as there is any breeding source, there are possibilities of outbreaks.



Dengue fever has rapidly emerged as one of the most important public health problems in countries of Asia-Pacific Region

(2007.1.1-2008.1.5)



The global prevalence of dengue fever has grown dramatically in recent decades and over 50 million dengue fever infections, including about 400,000 cases of dengue hemorrhagic fever, are estimated to occur annually. Dengue hemorrhagic fever is a leading cause of child mortality in many endemic countries. In July, 2007, the World Health Organization (WHO) has warned that the Western Pacific Region may be facing a major dengue outbreak unless concerted effort and cooperation are undertaken quickly. One of the key strategies for prevention and control is vector control through community participation and mobilization of the community at household level.

Due to intense international air travel, dengue fever has become a major international public health concern and need to be controlled through international cooperation. The situation is even worse in developing countries among APEC economies, such as Thailand, Indonesia, Vietnam, Malaysia, Philippines, and Mexico, where there are tens of thousands of people infected with dengue virus every year. Recognizing the urgent need of improving the capacities among Western Pacific Region countries for the control of dengue fever, Taiwan CDC has held numerous APEC seminars concerning dengue fever, such as the 2002 Training Course on the Molecular Epidemiology of Dengue Viruses, the 2003 APEC Control of Dengue Outbreaks: Regional Cooperation Workshop, and the 2005 Virological Surveillance, Diagnosis, and Molecular Epidemiology of Dengue Conference and Workshop. These activities have made a tremendous contribution to boosting dengue fever control and promoting regional cooperation in APEC areas. As a consequence, Taiwan CDC planned to hold a workshop on Control Practice of Dengue Fever in 2008.

This project was designed in response to the 2007 Sydney Leaders' Declaration—"the need to build community resilience and preparedness for emergencies and natural disasters." In addition, the workshop in accordance with the priorities raised in the First Health Group Meeting priorities "Enhancing preparedness for and response to public health threats, including avian and human pandemic influenza and vector borne diseases."

In Taiwan, dengue epidemics still occur every year, especially in Kaohsiung. The lessons we've learned from containing epidemics in Kaohsiung are also applicable to other cities around the world, which are known as the "Kaohsiung Model." In order to share the model with the participants, the workshop was held in Kaohsiung, Taiwan.

Goals

1. Improve skills and knowledge on the practice of vector control, risk communication and community mobilization.
2. Build the capacities and the cooperation among APEC member economies by sharing the updated information and experiences.
3. Apply innovative, effective and affordable tools to effectively manage the dengue vectors and dengue fever cases.

Implementation

The Workshop for the Control Practice of Dengue Fever is a two-day conference and field exercise, and includes the following five topics: Coordination & Cooperation, Community Mobilization and Communication, Vector Control, Applying New Technology, Dengue Fever Emergency Control Practice.

Experts in dengue and vector control field workers had been invited to the workshop to share their views and explore alternative control measures for dengue fever prevention. The former director of Health Bureau of Kaohsiung City, Dr. Ming-Rong Harn, was invited to attend the workshop as a keynote speaker to talk about the "Kaohsiung Model." Dr. Harn pointed out that our strategies are to apply the preventive control measures in advance, to be vigilant to the imported dengue cases, to integrate public and private resources, and to clear up the vector breeding sites. Dr. Harn also mentioned that during the epidemics, SOP of emergency control method will be performed. The control method is called "6 in 1" method, which includes disease surveillance, vector surveillance, clean-up vector breeding sites, insecticide fogging, health education, and ovitraps disposal. Concerted effort among administrations and people is the key to success.

Dr. Robbin Lindsay, research scientist of Public Health Agency of Canada, was also invited to the workshop to deliver a speech entitled "Approaches to Controlling Mosquitoes and Mosquito-Borne Infections in Canada" to share Canada's experience in dengue fever control.



Besides the "Kaohsiung Model", the other focus of the workshop was to introduce to all participants a self-developed tool called "Management & Visualization of Vector Mosquito Breeding Sites Using Google Maps", which integrated Google Maps with GPS. It is difficult to automate the information collected from the vector-breeding sites when the data is traditionally stored in documents. To improve the efficiency for data management, Taiwan CDC integrated the Google Maps into an information system for monitoring vector-breeding sites and visualizing dengue clusters for enhancing vector control. A multi-langue web-based management system has been developed and embedded with an interactive map using the Google Maps API (Application Programming Interface). Google Maps provides street maps and high-resolution photographs. Public health workers can use cameras with GPS (Global Positioning System) receivers to capture the geographic coordinates and photos of the vector-breeding sites simultaneously. After the public health workers upload the photos to the system, their geographic coordinates and uploading time could be stored into database directly. The locations of the breeding sites with the photos are then marked and displayed on the Google Maps.

The users can also upload the data of the dengue cases with their geographic coordinates to the system. The locations of the dengue cases with their 50-meter buffers and the dengue clusters, which are automatically identified through the calculation of the system, could be displayed on the Google Maps. Each interested economics has been provided an administrative account for managing their own data and user accounts. Taiwan CDC will continue to maintain and improve this system and to ensure its security. Taiwan CDC hope this system could really provide a practical vector control model for controlling dengue among APEC economies.





Accomplishments

40 delegates from 12 member economies participated in the workshop.

After the two-day workshop, many constructive conclusions and consensus have been reached among participants on how to tackle the challenges of dengue prevention and control. According to the survey conducted after the workshop, most participants highly recognized that the knowledge and new skills they acquired during the workshop and found it useful in their own economies, which could be applied to further improve the dengue control and prevention programs in APEC economies.

Future Prospects

Due to such factors as increased international contact and climate change, the likelihood of vector-borne disease outbreaks has risen sharply. Taiwan CDC is responding to this situation by continuing to strengthen collaboration with other APEC members, sharing its experience, and actively participating in regional disease control initiatives that will improve global disease control efforts.

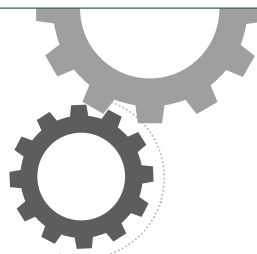


APEC Workshop For the Control Practice of Dengue Fever 5-6 June 2008.



NATIONAL COMMUNICABLE DISEASE SURVEILLANCE SYSTEMS

National Communicable Disease Surveillance Systems



Background

After the Taiwan CDC was reorganized in July 1999, the National Communicable Disease Surveillance Systems has taken responsibility for surveillance of infectious diseases in Taiwan. They began with surveillance of notifiable diseases and sentinel surveillance to detect epidemics. Later on, several systems were built to collect timely, complete and precise information on infectious diseases. The vision is to monitor the nation's health status and to detect outbreaks rapidly by integrating various infectious disease surveillance networks, and its missions are to: (1) Construct diversified disease surveillance systems; (2) Collect and monitor data for disease trend analysis, prediction and alert; (3) Provide analysis and assessment of global and indigenous infectious diseases regularly.

Goals – Establishing Multi-surveillance Systems

Notifiable Diseases Surveillance System

The first stage of the web-based version of the Notifiable Diseases Surveillance System was accomplished in July 2001, which enabled easier and more complete transmission of reported information. To strengthen the surveillance system, the second stage of the system was completed in September 2004. The third stage of the system was completed in September 2006, which effectively integrated the Notifiable Disease Surveillance System, Syndromic Surveillance System, and Symptom Surveillance System. The fourth stage of the system, to be established in June 2008, will accomplish a single reporting gateway and increase the systems' user-friendliness.

Sentinel Surveillance System

The system was planned in 1989, and established in 1990. This system can be used to measure prevalence trends and treatment rates of influenza, and act as an important reference on preventative measures, vaccine strain selection, and health care. As of December, 2008, 799 doctors (676 in clinics, 123 in hospitals) have volunteered to become sentinels for the system, which covers about 87% of cities and towns in Taiwan. The medical issues being monitored by the system include influenza-like illness (ILI), hand-foot-and-mouth disease (HFMD), herpangina, and diarrhea. The system also collects information from stationary monitoring networks every week, analyzes regional and national epidemic trends, and provides reports to the sentinel doctors via newsletters and the Internet.

School-based Surveillance System

The system was implemented in 2001. As of December, 2008, 611 elementary schools (23% of all elementary schools) have joined the program, which covers grade 1 to grade 6 students (and kindergarten) in 93% of cities and towns. The medical issues being monitored include influenza-like illness (ILI), hand-foot-and-mouth disease (HFMD), herpangina, diarrhea, fever, acute hemorrhagic conjunctivitis (AHC) and other notifiable diseases. The system collects information from schools every week, analyzes trends at the regional level and in each school, and regularly provides reports to participating schools, education authorities, and health authorities.

Symptom Surveillance System

In March 2003, Taiwan was hit by the global outbreak of severe acute respiratory syndrome (SARS) that sent panic across the nation and caused unprecedented damage to our economy. In December of the same year, Korea, Japan, and Vietnam reported outbreaks of avian flu. Furthermore, in Vietnam, Thailand, and Indonesia, cases of human deaths resulting from H5N1 virus infection have caused concerns, and a degree of panic, globally. To prevent the virus from finding its way into our nation, the Symptom Surveillance System has been put in place to facilitate early detection of SARS (discontinued in 2005), or of H5N1 infections to allow for prompt response and implementation of various epidemic prevention measures. In addition, in 2006, several active surveillance systems were integrated. To date, the disease categories under surveillance include: persons-under-investigation for H5N1 influenza matching definition infections, clusters of influenza-like illness cases, fever of unknown etiology, diarrhea, cough persisting for more than three weeks, upper respiratory tract infection, and clusters of enterovirus infection cases.

Surveillance System for Populous Institutions

The system is aimed at early cluster detection of infectious diseases in organizations amongst inhabitants or workers. It applies to elderly hospices, long-term care facilities, apartments for the elderly, facilities for the disabled, protectories for children and juveniles, veterans' homes, prisons, nursing homes, and day-care centers for mental recovery. If an individual or cluster respiratory disease case is found among inhabitants or workers, the concerned facility must file weekly online reports, confirming the data reported, and report the number of people accommodated.

International Epidemic Intelligence Collection System

Established to filter the latest daily international epidemic information and to relay pertinent information to those charged with applying suitable control measures. The filtered information is simultaneously posted on a website accessible to the public. The major information source is the internet and is gathered from the World Health Organization website, various national health department websites, official online publications, public health and epidemiological journals, and news websites. Other sources include diplomatic documents and the media. Taking advantage of the rapid publicity of this media and the accuracy of official reports, any potential crisis can be promptly evaluated to determine any necessary actions.

Disease Reporting and Consulting Center for the General Public

This center was established to provide the public with timely and complete consultation services.

Accomplishments

Notifiable Disease Surveillance System

The following table shows the number of confirmed cases of acute and chronic notifiable diseases in Taiwan in 2008 (Tables 1 & 2).

Table 1. Number of Confirmed Cases of Acute Notifiable Diseases in Taiwan, 2008

Category	Disease	Total	Indigenous	Imported
I	Smallpox	0	0	0
	Plague	0	0	0
	SARS	0	0	0
	Rabies	0	0	0
	Anthrax	0	0	0
	H5N1 Influenza	0	0	0
II	Diphtheria	0	0	0
	Typhoid Fever	33	13	20
	Dengue Fever	714	488	226
	Meningococcal Meningitis	19	19	0
	Paratyphoid Fever	11	3	8
	Poliomyelitis	0	0	0
	Acute Flaccid Paralysis	74	74	0
	Shigellosis	90	46	44
	Amoebiasis	226	143	83
	Malaria	18	0	18
	Measles	12	6	6
	Acute Viral Hepatitis type A	236	201	35
	Enterohemorrhagic E. coli Infection	0	0	0
	Hemorrhagic Fever with Renal Syndrome	1	1	0
	Hantavirus Pulmonary Syndrome	0	0	0
	Cholera	1	1	0
	Rubella	33	25	8
	Chikungunya	9	0	9
	West Nile Fever	0	0	0
	Epidemic Typhus Fever	0	0	0
III	Pertussis	41	40	1
	Tetanus	0	0	0
	Japanese Encephalitis	17	17	0
	Congenital Rubella Syndrome	1	0	1
	Acute Viral Hepatitis type B	232	217	15
	Acute Viral Hepatitis type C	124	122	2
	Acute Viral Hepatitis type D	4	4	0
	Acute Viral Hepatitis type E	14	10	4
	Acute Viral Hepatitis Unspecified	22	22	0
	Mumps	5	3	2
	Legionellosis	69	66	3
	Haemophilus Influenza type B Infection	12	12	0
	Neonatal Tetanus	0	0	0
	Enteroviruses Infection with Severe Complications	373	373	0

IV	Herpesvirus B Infection	0	0	0
	Leptospirosis	46	46	0
	Melioidosis	45	40	5
	Botulism	11	11	0
	Invasive Streptococcus Pneumoniae Infection	805	805	0
	Q Fever	91	90	1
	Endemic Typhus Fever	31	28	3
	Lyme Disease	2	0	2
	Tularremia	0	0	0
	Scrub Typhus	491	488	3
	Varicella	3	3	0
	Cat-Scratch Fever	28	28	0
	Toxoplasmosis	2	2	0
	Severe Complicated Influenza Case	22	22	0
V	Rift Valley Fever	0	0	0
	Ebola-Marburg Hemorrhagic Fever	0	0	0
	Yellow Fever	0	0	0
	Ebola Hemorrhagic Fever	0	0	0
	Lassa Fever	0	0	0

Note 1: Announced by Department of Health, the Executive Yuan, on October 9, 2007, under Shu-Shou-Chi No. 0960000892, and became effective on October 15, 2007. Amended and announced by Department of Health, the Executive Yuan, on October 24, 2008, under Shu-Shou-Chi No. 0970001187, and became effective on November 1, 2008.

Note 2: Data were re-downloaded on February 16, 2008 and the coverage period was from January 1, 2008 to December 31, 2008.

Note 3: "-" represents no confirmed data of specimen collection.

Note 4: Data were analyzed by the onset dates.

Table 2. Number of Confirmed Cases of Chronic Notifiable Diseases in Taiwan, 2008

Category	Disease	Total
II	MDR	155
III	Smear-Positive Tuberculosis	5650
	Other Tuberculosis	8378
	HIV Infection	1788
	Hansen's Disease	8
	Syphilis	6522
IV	Gonorrhea	1621
	Creutzfeldt-Jakob Disease	0

Note 1: Announced by Department of Health, the Executive Yuan, on October 9, 2007, under Shu-Shou-Chi No. 0960000892, and became effective on October 15, 2007. Amended and announced by Department of Health, the Executive Yuan, on October 24, 2008, under Shu-Shou-Chi No. 0970001187, and became effective on November 1, 2008.

Note 2: Data were re-downloaded on February 16, 2008 and the coverage period was from January 1, 2008 to December 31, 2008.

Note 3: Data were analyzed by the diagnosis dates.

Note 4: Confirmed tuberculosis cases were added to the statistical figures based on their dates of report; MDR-TB cases were confirmed through central reference laboratory test results that showed the Mycobacterium tuberculosis isolated to be resistant to at least isoniazid and rifampicin. The statistical figures, therefore, used the dates of initial CDC registry.

Sentinel Surveillance System

The overall trends for ILI in 2008 did not show an obvious seasonal peak, but reached its highest prevalence in winter. As for the epidemic of enterovirus, it peaked in spring and summer, and a comparatively mild wave emerged in early winter. Diarrhea epidemic is also not apparent over the whole year (Figure 1).

School-based Surveillance System

In response to the outbreak situation, a new surveillance and reporting item, acute hemorrhagic conjunctivitis (AHC), was added starting from Week 9, 2008. The weekly data from 611 elementary schools showed that the overall trend of ILI in 2008 was more stable than that of the previous years (Figure 2). However, it still reached a peak in winter. Furthermore, ILI trends shown in the sentinel surveillance system and the school-based surveillance system are similar to each other (Figure 3).

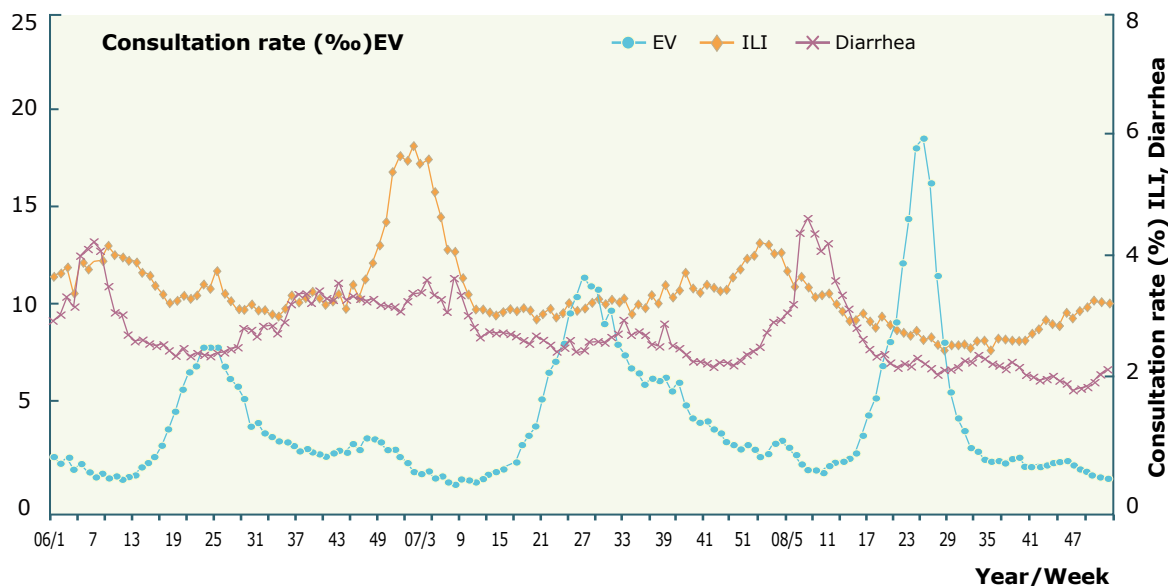


Figure 1. Weekly Consultation Rate of ILI, EV and Diarrhea Cases Reported from Clinic Sentinel Sites in Taiwan, Week 01, 2006 – Week 52, 2008

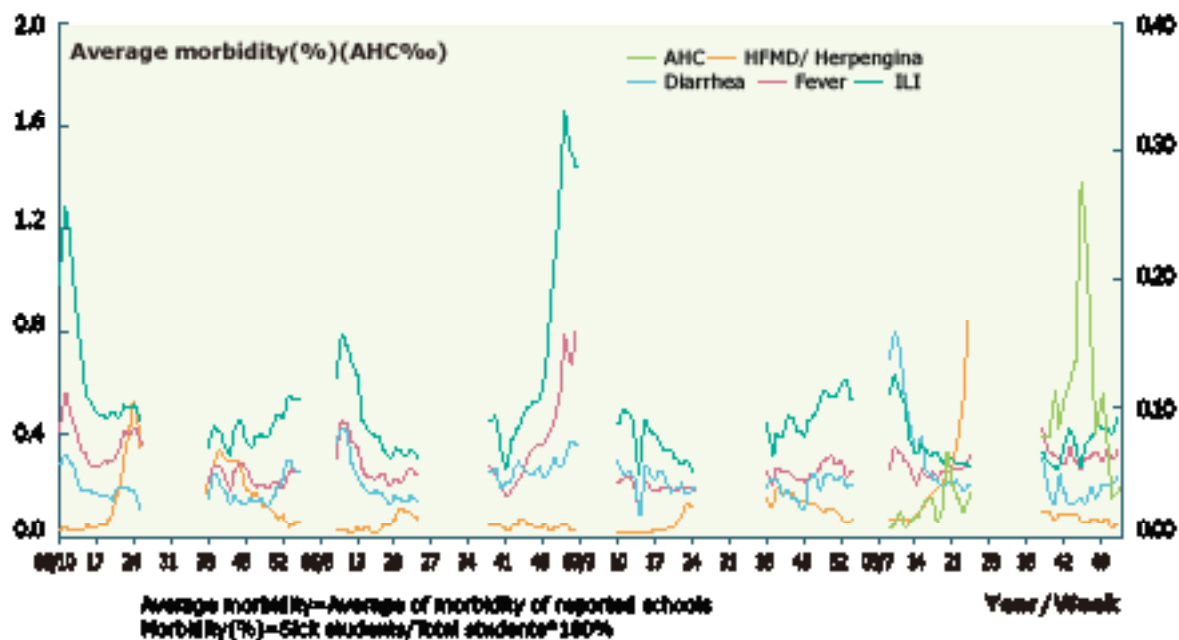


Figure 2. The Average Morbidity of Disease Reported by Sentinel Schools in Taiwan (2005.02.27 - 2008.12.27)

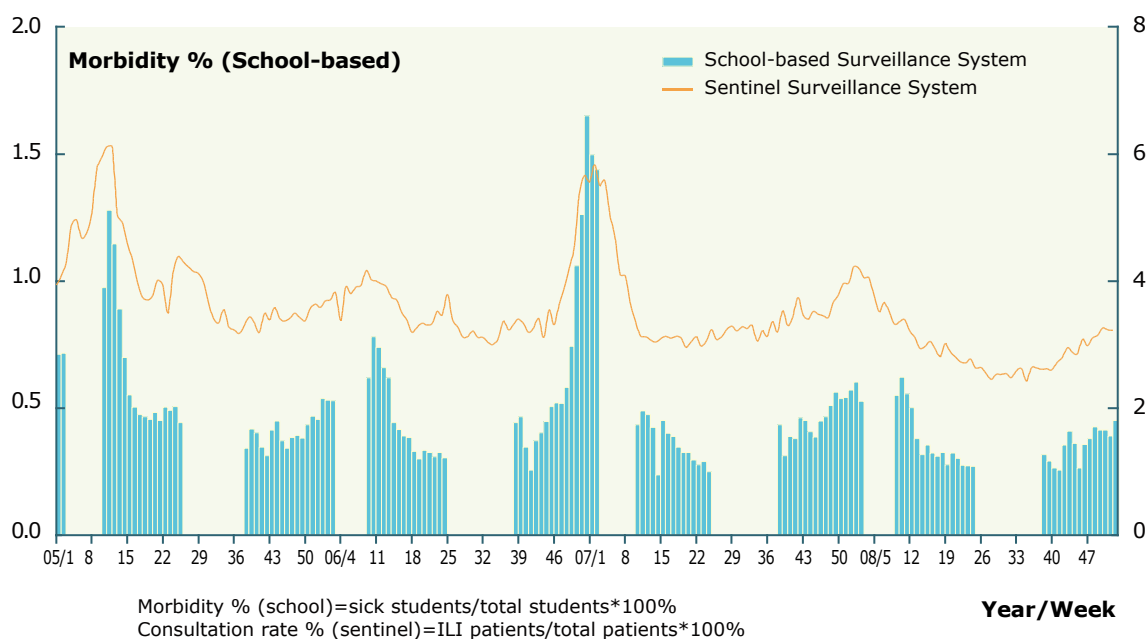


Figure 3. Comparison of Trends in ILI Shown in Sentinel Surveillance and the School Surveillance System

Symptom Surveillance System

H5N1: In 2008, 10 specimens were taken from patients being checked for human infection with influenza A (H5N1) in Taiwan. Of those specimens, 4 were identified as influenza AH1 (+), and 2 were influenza AH3 (+).

Influenza-like illness cluster: Epidemic analysis of clusters of influenza-like illness cases. In 2008, a total of 27 clusters of influenza-like illness were reported. 18 of them tested positive for type A influenza, and 7 positive for type B influenza (Table 3).

Diarrhea cluster: Epidemic analysis of diarrhea clusters: In 2008, a total of 49 clusters of diarrhea were reported. 30 of them tested positive for Norovirus, and 8 positive for Rotavirus (Table 4).

Table 3. Tests Results for Influenza-like Illness Clusters in 2008

Month	Number of Clusters	Influenza A	Influenza B	Negative
1	3	3	0	0
2	3	1	1	1
3	3	2	1	0
4	3	0	2	1
5	0	0	0	0
6	3	2	1	0
7	1	1	0	0
8	3	3	0	0
9	0	0	0	0
10	2	2	0	0
11	3	2	1	0
12	3	2	1	0
Total	27	18	7	2

Surveillance System for Populous Institutions

By the end of 2008, this surveillance system had 1,959 participating organizations. In 2008, a total of 32 clusters were reported for suspected respiratory illness and 18 clusters for showing gastrointestinal symptoms (Table 5).

Table 4. Tests Results for Diarrhea Clusters in 2008

Month	Number of Clusters	Norovirus Positive	Rotavirus Positive	Negative
1	9	8	0	1
2	11	9	2	0
3	14	7	3	4
4	6	0	3	3
5	1	1	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	3	1	0	2
10	1	1	0	0
11	4	3	0	1
12	0	0	0	0
Total	49	30	8	11

Table 5. Clusters of Respiratory & Gastrointestinal Symptoms in Populous Institutions in 2008

Month	Respiratory Symptoms	Gastrointestinal Symptoms
1	1	5
2	1	8
3	2	3
4	2	1
5	4	1
6	5	0
7	5	0
8	2	0
9	2	0
10	4	0
11	2	0
12	2	0
Total	32	18

Future Prospects – Enhancing the Effectiveness of Various Surveillance Systems

Establishing Support Systems for Management and Analysis

- (1) The Geographical Information System (GIS) was used in conjunction with the Notifiable Diseases Surveillance System, Syndromic Surveillance System, and the Sentinel Surveillance System to analyze epidemic data and try to develop a disease prediction model that can estimate the distribution of the predicted diseases.
- (2) An Emerging Infectious Disease Hospitalization and Management System was completed in July 2005. The new system is flexible, allowing adjusting of diseases categories and extension of variable fields for keeping daily hospitalization records whenever required.
- (3) Surveillance systems were installed for data acquisition and analysis.

- (4) On February 24, 2004, the Taiwan CDC outsourced the establishment of the "Disease Reporting and Consulting Center" to the telecom industry. The general public can dial 1922 for communicable disease reporting, consultation, education, and for information of communicable disease policies. The Taiwan CDC assigned full-time personnel to answer calls and take caller messages. The center has become a communications platform.

Reporting via the Internet

To make surveillance operations more effective, the Taiwan CDC established several web pages on its systems for users to upload information.

Systems Integration

To integrate information and analysis for more presentation and application, the Taiwan CDC enhanced the integration functions of its surveillance systems, including the Symptom Surveillance System, the Syndromic Surveillance System, and the Notifiable Disease Surveillance System. This task was completed in September 2006.

Information Exchange

- (1) Besides collating the updated endemic data from the Sentinel Surveillance System, Weekly Reports are published and distributed to sentinel physicians, school nurses, and other related personnel for reference. To increase visibility, the contents of the Weekly Reports are also posted on the Internet. Weekly Reports include the Sentinel Surveillance Weekly Report, the School-based Surveillance Weekly Report, and the Influenza Express.
- (2) To understand effectiveness of surveillance material, the Taiwan CDC, in collaboration with academia, conducts research projects every year.





(3) The hardware, software, and database developments that have brought other new users to the Geographic Information System (GIS) partly explain this diffusion into the public health sphere. Like the close relationship between pathogens, geographical factors, and the distribution and spread of infectious disease cases that contain geographical information were integrated based on location. GIS was frequently used to analyze spatial and epidemiological data as a guide for further applications and research worldwide. Although GIS has many disease distribution and map display applications, it needs more advanced research in correlation of disease and spatial data in Taiwan to analyze temporal and geographic trends in disease outbreaks. Proceeding to the next step, it will help us to estimate the risk and spread of infectious diseases. Since the disease surveillance system works closely with disease prediction and GIS, the Taiwan CDC organizes "Disease Prediction Model and GIS" symposiums regularly for professionals and CDC staff to exchange views. This exchange program provides a better understanding of the GIS program and possible GIS applications.

Information Sharing

Daily updated information on international epidemics is generated and forwarded to related authorities. The collection, evaluation and dissemination of information to the public, local health departments, as well as governing authorities and information sharing are the keys to the success of this task.

Training and Education

Every year, Taiwan CDC offers training to system users so that they can remain up to date on new information about epidemic surveillance.



IMPORTANT COMMUNICABLE DISEASES PREVENTION AND CONTROL

Important Communicable Diseases Prevention and Control

Tuberculosis

Background

Introduction

Tuberculosis has always been the most dangerous communicable disease in Taiwan. Taiwan's GDP per capita has now reached USD13,000, but there are still about 14,000 new cases of tuberculosis every year, which is more threatening than all other communicable diseases combined.

Tuberculosis is not only a threat to people's lives and productivity, but can also adversely affect a nation's image and competitiveness. Health workers in Taiwan have been working hard to control tuberculosis for over half a century, and the prevalence of the disease has certainly been reduced. However, when compared with advanced countries, Taiwan is still decades behind and needs to accelerate reforms in order to catch up.

Taiwan has a dense and highly mobile population. However its highly developed nature has caused a distancing of personal relationships. The abundance of medical resources also means patients have many options when it comes to medical services. These two factors make the discovery and management of patients more difficult compared to rural societies. Recently, tuberculosis has once again begun to rise globally. The disease is also becoming more prevalent in Taiwan due to factors such as tourism, importation of foreign labor, high frequency of international travel, and AIDS-related complications. Therefore, to protect the health of the general public, we should use more active and aggressive methods when faced with new challenges in tuberculosis prevention.

Status and Trends of the Spread of Tuberculosis in Taiwan

(1) Incidence Rate

There were 16,472, 15,378, and 14,480 tuberculosis cases in 2005, 2006, and 2007 respectively. The incidence rate of tuberculosis was 72.7, 67.4, and 63.2 persons per 100,000 during these three years. This indicates that the number of tuberculosis cases is gradually decreasing with the implementation of active control measures (such as directly observed treatment) (Table 1). In addition, there were 1,210, 1,021, and 802 cases of extrapulmonary tuberculosis during the three years (including cases of combined pulmonary and extrapulmonary tuberculosis); pulmonary tuberculosis cases thus accounted for 92.7%, 93.4%, and 94.5% of all cases. It is by far the most common notifiable disease, with 70 % of notifiable illness cases being tuberculosis. On average in Taiwan, a new tuberculosis patient is discovered every 36 minutes.

Table 1. Taiwan Tuberculosis Incidence and Mortality 2004-2007

Year	Number of Cases	Incidence	Death	Mortality
2004	16,784	74.1	957	4.2
2005	16,472	72.7	970	4.3
2006	15,378	67.4	832	3.7
2007	14,480	63.2	783	3.4

A tuberculosis patient registry was implemented in 1957, but was limited to infectious patients whose phlegm tested positive. The scope of the program eventually expanded, and from 1991, all active tuberculosis patients were required to register. However, reports from medical institutions often did not reflect the true number of patients. It was only after the Bureau of National Health Insurance adopted the policy: "No Report, No Payment" in July of 1997 and Taiwan CDC started to conduct inspection on deaths by tuberculosis in 2001 that the number of tuberculosis patients reported by medical institutions dramatically increased. The difference between the data and the reality also started to lessen.

There are 2.2 times more male tuberculosis patients than female patients, and the incidence rate in males is also 2.2 times higher than in females. Furthermore, the incidence rate of tuberculosis rises with age. Amongst all new patients, 51.7% are over 65 years of age.

New tuberculosis cases tend to appear in urban areas. In 2007, the cities or counties with the highest number of new tuberculosis patients were Taipei County (2,283 cases, 15.8%), Taipei City (1,280, 8.8%), Kaohsiung City (1,079, 7.5%) and Kaohsiung County (1,066, 7.4%). Also, the incidence rate in the eastern part of Taiwan is higher than the west, and the south higher than the north. The incidence rate was highest in Hualien County in 2007 at 114 per 100,000 people. The incidence rates in Pingtung County was 95 and Taitung County was 92 persons per 100,000. In mountain regions, the incidence rate of tuberculosis is 206.1 per 100,000 people, which is 3.2 times higher (63.2 per 100,000) than non-mountainous regions.

Compared to other countries, on average there are 15,000 new tuberculosis cases in Taiwan every year, which is 13 times higher than the US and 2.7 times higher than Japan. The priority of our policies is to lower the incidence rate of tuberculosis, protect residents' health, and improve the quality of life in our society.

(2) Morbidity Rate

Since it is required for infants and children to receive the Bacillus Calmette-Guerin vaccine (BCG) in Taiwan, it is difficult to determine the true morbidity rate of tuberculosis. Currently, grade 1 students who have not received the vaccine are required to take a tuberculin skin test, so from the number of students tested positive morbidity can be estimated. The BCG vaccination rate among infants and children in recent years has reached 98.62%, effectively reducing the incidence of tubercular meningitis among children. However the test sample has gradually gotten smaller, thus using the tuberculin skin test to estimate morbidity rates has lost its significance. Therefore, it has become difficult to estimate yearly morbidity with this method.

Statistics from 2007 showed that there were 1,769 students (0.63%) who did not receive the vaccination. 5.09% of these students tested positive through tuberculin skin test, so yearly morbidity was estimated to be 0.80% (PPD RT23 2TU).

(3) Mortality Rate

Tuberculosis claimed 783 lives in Taiwan in 2007, which is a mortality rate of 3.4 per 100,000 people. The disease also caused 0.6% of the total number of deaths, which makes it the 13th highest cause of death. The mortality rate of tuberculosis has dropped 98.8% from 1947 to 2007, and dropped 50.9% in the ten years between 1997 to 2007.

Among tuberculosis related deaths, the number of deaths amongst males was 618 deaths, 3.7 times higher than that of females which was 165 deaths. The mortality rate of tuberculosis also rises with age, which can be seen from the fact that 81% (637) of the deaths were people over the age of 65. This shows that in Taiwan the demographic group threatened most by tuberculosis is the elderly.

Geographically speaking, the mortality and morbidity rates of tuberculosis are positively correlated. Furthermore, rates in eastern Taiwan are higher than in western parts, while the south is higher than the north. The rates are lower in cities as well. The mortality rate of tuberculosis was highest in Pingtung County and Taitung County, at 8.19 and 8.09 per 100,000 people. Hualien County followed closely at 7.84 per 100,000. In mountain regions, the mortality rate was 17.1 per 100,000, which is 5 times higher than non-mountain areas (3.4 per 100,000).

Goals

1. To discover infected persons as early as possible. With early treatment, there is less chance for M. Tuberculosis to spread.
2. To provide comprehensive medical treatment for patients. Early treatment can stop the TB bacteria from spreading.
3. To prevent the TB bacteria from spreading and infecting the general population.

Accomplishments

Improved Epidemic Reporting and Monitoring

The National Tuberculosis Reporting and Management System collects and keeps track of information on a tuberculosis patient such as diagnosis, reports, registration, treatments, examination, management, and the people who have come in contact with the patient. It also provides the information required for case management and epidemic analysis. Also, the system has strengthened tuberculosis monitoring amongst high risk groups such as aborigines, teachers, students, medical workers, draft age men and soldiers, and in high risk areas such as prisons and any other institutions with a high population density.

Established a High Quality and Rapid Tuberculosis Testing Network

The tuberculosis testing network was established in October, 2001. In the early stages, its main goals were to establish a laboratory and testing network, provide feedback, and to create a testing procedure. Currently, the emphasis of the network is on the certification and improvement of laboratories, monitoring and training of staff members, and organization of reports on in vitro susceptibilities of drugs for the laboratories. It also monitors the drug resistance of tuberculosis in different regions, evaluates the quality of case management, and intervenes when problems arise.



Directly Observed Treatment Short-Course (DOTS)

A plan to halve the number of tuberculosis patients in ten years was implemented in April, 2006. In December of 2007, according to statistics, 92.6% of patients whose phlegm tested positive for tuberculosis bacteria were treated. Other than improved coverage, the quality of treatment was also greatly improved with constant supervision and reviews. In comparing the results of the 12 month treatment period of DOTS cases and non-DOTS cases, the results show that the successful treatment rate for DOTS cases is 73.1%, which is much higher than those non-DOTS cases 31.7% ($P < 0.001$) (see Figure 1). A campaign of 2006 data with pre-implementation 2005 cases shows significant progress. The successful treatment rate of 66.7% in 2006 was significant higher than the 63.4% in 2005, and the 2007 rate increased again to 70.9%. There was a statistically significant difference between these rates ($P < 0.001$), showing that Taiwan's implementation of DOTS has yielded noticeable benefits.

The execution of a treatment program requires corresponding strategies. These strategies, especially the five key factors suggested by the World Health Organization, require constant evaluation and correction of mistakes in order to improve the quality and effects of treatment.

Improved the Quantity and Quality of Tuberculosis Diagnosis and Treatment; Nosocomial Infection Control

To maintain and improve the quality of diagnosis and treatment, Taiwan CDC worked with related medical associations on the re-education of tuberculosis diagnosis and treatment. Taiwan CDC also worked with the Bureau of National Health Insurance on the prescription drug inspection system in order to strengthen the evaluation of nosocomial infection control. The program includes regular X-ray screening, education and training, examination of people who have contact with patients, quarantine of patients whose phlegm tests positive for tuberculosis, and monitoring of coughs. Furthermore, in 2005, tuberculosis examination became an item in the yearly nosocomial infection control evaluation program.

Established the "Multi-drug Resistant TB (MDR-TB) Medicare System"

The "Multi-drug Resistant TB (MDR-TB) Medicare System" was established in May, 2007. The system consists of five different medical teams which specialize in treating MDR-TB patients. The responsibilities of the Taiwan CDC are to provide resources and direct each team to provide treatment according to the WHO clinical guide. After admission, the teams will actively treat each patient for two years, and community health workers will be providing personal care via the DOTS-plus program. It is the system's goal to provide continuous and comprehensive care. A total of 323 cases were treated under the system from its inception until the end of December 2008, and the acceptance rate surpassed 83.68%. The MDR-TB and DOTS-plus programs have thus boosted the multi-drug resistant tuberculosis success rate.

Taiwan CDC also worked with the Bureau of National Health Insurance on fluoroquinolone control and random clinical treatment prescription inspection. Taiwan CDC also works hard at controlling and improving laboratory quality and introducing second line tuberculosis drugs. Through this advanced medical team, we may give difficult-to-treat MDR-TB patients a chance of full recovery.

Latent Tuberculosis Infection(LTBI) Treatment Program

The "Latent Tuberculosis Infection Treatment Program" was initiated on April 1, 2008, and has focused on treating latent infections in the population with the least drug side effects—children under 12 years of age in contact with tuberculosis—in conjunction with DOPT: Directly Observed Preventive Therapy. As of December 31, a total of 1,440 persons were enrolled in the program, of which 1,218 were also enrolled in DOPT; 68 persons had completed the treatment.

Exit Control of Tuberculosis Patients by Air Travel

The World Health Organization suggests passengers with infectious pulmonary tuberculosis or MDR-TB should delay their travel plans until their condition is no longer infectious. The Department of Health is responsible for notifying immigration authorities to prevent patients with untreated, infectious diseases from leaving the country, in accordance with the Communicable Disease Control Act.

The reasons for restricting tuberculosis patients from boarding international flights are to protect the health of other passengers and fulfill our responsibilities in terms of international public hygiene. Due to the completeness of our reporting and information systems, Taiwan is the first country in the world to actively restrict tuberculosis patients from leaving the country. Specifically, customs officials at international airports are authorized to restrict (1) infectious pulmonary tuberculosis patients from traveling on flights exceeding 8 hours and (2) infectious MDR-TB patients from traveling altogether.

All tuberculosis patients are informed of the travel restrictions by mail and should have full understanding of the situation. Therefore, since the restriction was implemented on September 1, 2007, there hasn't been a single violation, showing that the air travel restrictions have been very effective.

Quarantining of Infectious Pulmonary Tuberculosis Patients

Patients with infectious tuberculosis (especially patients whose smear tested positive for tuberculosis or patients with MDR-TB) can be forced into quarantine for treatment if the physician determines that is the most favorable course of action or if the patient does not take their medicine regularly and refuses to enter into quarantine willingly in accordance with the Communicable Disease Control Act. The patient and his family will be informed of the forced quarantine.

Training, Research, and International Cooperation

Taiwan CDC has worked with other government agencies such as the Ministry of Foreign Affairs to plan various international relief projects. The goals of these projects are to improve tuberculosis prevention and treatment capabilities of countries that require our assistance and in turn strengthen our diplomatic relations. Taiwan CDC has also sent representatives overseas to participate in conferences, acquire knowledge and experience with the goal of improving our own abilities in the fight against tuberculosis. Lastly, Taiwan CDC has invited many foreign experts and scholars to Taiwan to participate in academic conferences in the hope of facilitating the exchange of knowledge and experience.

Future Prospects

To achieve year on year reduction of new tuberculosis cases. By Year Five (2010), lower the incidence rate to 52 per 100,000 people. By Year Ten (2015), lower the incidence rate to 34 per 100,000 people.

Table 2. Prospective study of treatment success rate among sputum smear positive cases, 2005-2007

Year	Type	Smear positive Treatment success rate Year Type		
		12Month	18Month	24Month
2005	ALL	63.4	70.1	71.2
	ALL	66.7	70.8	71.8
2006	DOTS	75	79.2	80.7
	Non-DOTS	51.6	55.7	56.4
2007	ALL	70.9		
	DOTS	73.1		
	Non-DOTS	31.7		

Note: DOTS implementation began on April 1, 2006

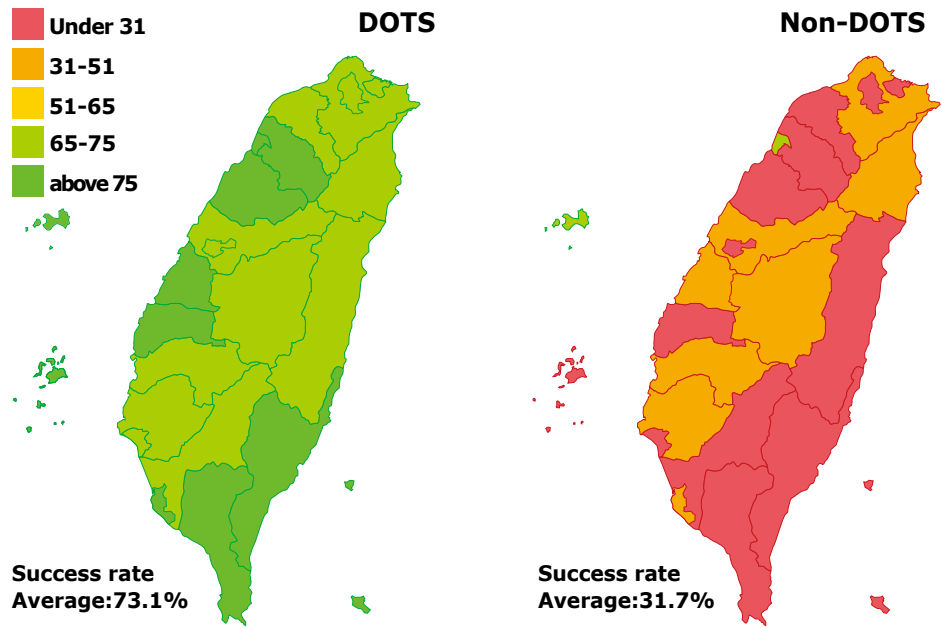


Figure 1. Treatment success rates among sputum smear positive, 2007

International symposium on tuberculosis, 2008



Touring tuberculosis control awareness event "Beat Tuberculosis Amusement Park"



HIV/AIDS

Background

HIV destroys the normal functions of the immune system and is transmitted from an infected person through blood, semen, or vaginal fluid through broken skin or mucus membranes. The infection can be passed from an infected woman to her child during pregnancy, birth, or through breast feeding.

The loss of immune functions can lead to AIDS (Acquired Immunodeficiency Syndrome). AIDS is expected to be one of the largest human catastrophes of the 21st century. The first HIV case in Taiwan was reported in 1984. By 2008, the number of HIV patients had risen to 17,428 (16,748 of which were Taiwanese nationals, 2,199 HIV patients have died). New HIV infections surged in 2005 to 3389, a 123% increase over the previous year. Faced with this serious situation, Taiwan CDC has dedicated a tremendous amount of effort and resources to AIDS control and prevention programs, including a harm reduction program in 2005. The reported number of HIV infections in 2006 was 2,924. This was the first trend reversal since 1984. Towards the end of 2008, we have effectively reduced the number of HIV infections (Figure 1).

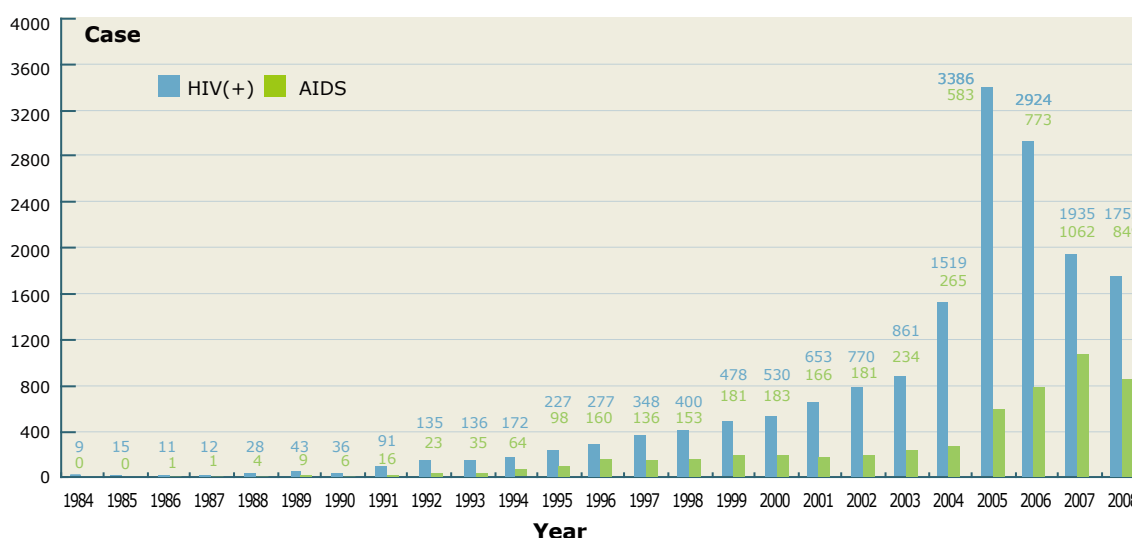


Figure 1. Reported Cases of HIV/AIDS by Year of Diagnosis in Taiwan 1984-2008

In terms of age, the largest number of infections in 2008 fell in the 20-29 age group which accounted for 709 or 40.47% of all cases. The second largest group was the 30-39 age group, numbering 558 or 31.85% of all cases (see Table 1). An analysis of risk factors shows that in 2008, the highest percentage of HIV infections was a result of sexual relations: men having sex with men (MSM), which accounted for 57.0% of all cases. The second largest percentage of infections was injecting drug users (IDUs), accounting for 21.5%. Heterosexual encounters accounted for 19.0% (see Figure 2). Of Taiwanese nationals infected by HIV in 2008, 1,653 or 94% were males and 99 or 6% were females. The ratio of infected males to female was 16.7:1.

Table 1. Age Distribution of HIV Patients in Taiwan 2007/2008/1984-2008

Age	2007		2008		1984-2008	
	Cases	Percentage	Cases	Percentage	Cases	Percentage
0-9	3	0.15%	2	0.11%	39	0.23%
10-19	40	2.06%	65	3.71%	509	3.04%
20-29	703	36.27%	709	40.47%	6,405	38.24%
30-39	676	34.88%	558	31.85%	5,870	35.05%
40-49	363	18.73%	283	16.15%	2,596	15.50%
50-59	110	5.68%	105	5.99%	886	5.29%
60-69	36	1.86%	18	1.03%	293	1.75%
70-79	5	0.26%	11	0.63%	121	0.72%
Over 80	2	0.10%	1	0.06%	15	0.09%
Unknown	0	0.00%	0	0.00%	14	0.08%
Total	2,930	100.00%	1,752	100.00%	16,748	100.00%

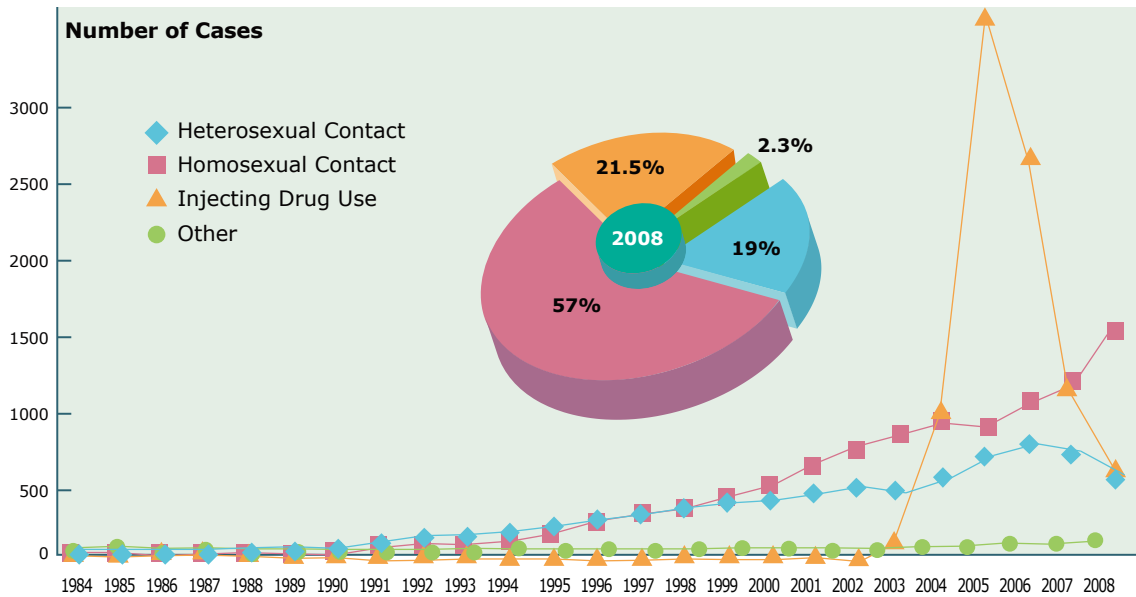


Figure 2. Statistics on Risk Factors of HIV Infections in Taiwan 1984-2008

Goals

1. Protect the uninfected population from HIV infection and effectively control the spread of HIV/AIDS.
2. Provide infected individuals with adequate medical care and enhance the quality of their lives.

Strategies

Organizational Mobilization and Declaration of Will

To control AIDS, the Executive Yuan established an AIDS Control Promotion Committee, composed of 13 ministers and prominent figures in society in December 2001, to oversee a working group charged with mapping out national plans for controlling the AIDS epidemic. When the Executive Yuan was restructured in February 2005, the committee was changed to the Executive Yuan DOH AIDS Prevention and Control Committee chaired by the Health Minister (Figure 3). The new committee seeks to enlist the support of the private sector to control AIDS. To carry out the task, the heads of county and city governments have been asked to create action groups.

Increasing Public Awareness of AIDS

An assortment of media channels, targeting selected groups in the community, are being used to raise AIDS awareness.

(1) Ascertaining paths of infection

The three main paths for HIV infection include unsafe sex, blood transfer (blood infusion and needle sharing), and mother-to-baby infection. HIV is not spread through shaking hands, embraces, or using common toilets.

(2) ABC and CNN to AIDS prevention

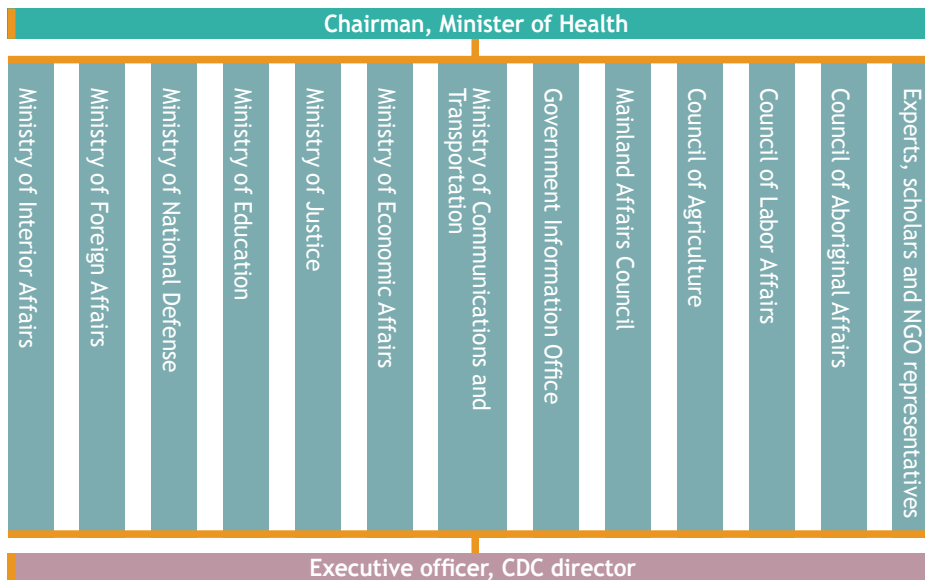
- A. Resist sexual temptation.
- B. Be faithful to your sexual partner.
- C. Use condoms when having sex.
- N. Use clean needles.
- N. Improve negotiation skills.

The purpose of condoms is to prevent infection through sexual contact. The purpose of clean needles and other penetrative instruments is to prevent infection through injection with dirty, bloodied needles. Negotiation skills are needed to negotiate for safe sex or safe injection with partners.

(3) Never share needles, syringes, or diluents with others.

(4) Activities held to demonstrate caring for AIDS patients

With the AIDS epidemic currently facing Taiwan, a series of activities demonstrating how to care for and act towards AIDS patients were held in 2008. On October 31st, the eve of the Halloween, First Lady Mei-Ching, Chou was invited to be the special guest of the party "Angels of Love" held by the Taiwan CDC in order to express care and concern to people suffering from AIDS and support to AIDS control campaigns. Vice President Vincent Siew attended the World AIDS Day activity "Be a Leader in Showing Concern—Work Together to Stamp out AIDS" to appeal for teamwork in controlling AIDS. In addition, a fleet of 100 heavy motorcycles traveled around the island to raise the awareness and expressed their support for AIDS control work.



The first lady, Chou Mei-Ching embraced the AIDS angel

Figure 3. Executive Yuan DOH AIDS Prevention and Control Committee

Target High-risk Behavior Groups

Provide sustainable support to mobile demographic groups, including sex workers, MSM, drug users, and sailors. Furthermore, map out plans for controlling HIV/AIDS among them.

Promote Harm Reduction Programs

Curbing the epidemic of HIV infections among IDUs, a harm reduction plan was implemented in Taipei, Taoyuan, and Tainan Counties as well as Taipei City on a trial basis in 2005. It went nationwide in July 2006 and was strengthened in 2007 and 2008. The programs implemented include "Needle-Syringe Programming (NSP)", "Drug Substitution Treatment", "Information, Education and Communication (IEC)".

A fleet of 100 heavy motorcycles expressed their support for AIDS control work





Provide HIV Patients with Support and Respect

Provide HIV/AIDS patients with appropriate medical treatment, respect their rights, enhance the care system, and render support to patients and their families.

Enhance the Disease Surveillance System

Increase the knowledge and understanding of different population groups in order to formulate culturally appropriate policies and provide them with culturally friendly services.

Engage in Research and Development in Science and Technology

Enhance studies and surveys in the fields of sociology, economics, culture, and medicine for AIDS-related science and technology development.

Accomplishments

1. The Executive Yuan DOH AIDS Prevention and Control Committee held two cross-ministerial meetings in 2008.
2. To ensure the dignity and rights of People Living with HIV/AIDS (PLWHA), the AIDS Prevention and Control Act was revised in 2007.
3. To increase disease surveillance, Taiwan began to screen blood donors in 1988, drafttees in 1989, prison inmates in 1990, and foreign laborers in 1991. Since 1977, ten hospitals have provided anonymous HIV blood-screening services. In order to increase the accessibility of the HIV screening service, nineteen hospitals provided anonymous HIV blood-screening services in 2008. Screening 11,194 people in 2008, with 237 found HIV positive, accounting for 2.15% of the total. Furthermore, coping with the increase in female HIV patients and the problem of mother-to-baby infection, an HIV screening plan was established for pregnant women. Thus far, it has detected 72 positive cases amongst women screened (16 of them were foreign nationals).
4. The Taiwan government has provided HIV/AIDS patients with free medical treatment since 1988 and free highly active antiretroviral therapies (HARRT) since 1997. At the end of February 2009, 37 designated hospitals and 5 designated hospitals for IDUs provided free treatment to HIV/AIDS patients. Nations around the world encourage HIV patients to return to their homes and communities. If HIV patients take their medication according to the prescribed schedule, their immunization systems can be maintained at a certain level, allowing them to avoid coming down with AIDS. They will be able to lead a nearly normal life. The government subsidizes private institutions to take care of HIV patients who are rejected by their families. These institutions, which include the Garden of Mercy Foundation, the Harmony Home Association, and the Lourdes Association etc., provide care and compassion to HIV patients.
5. In the area of scientific research and development, Taiwan CDC conducted 6 projects in 2008 and commissioned the National Taiwan University Hospital to establish an AIDS treatment center to train physicians to build up a specialist medical corps to help bring HIV/AIDS under control.

6. Scholars and experts working in the fields of epidemiology, clinical treatment, health education, prevention strategy, and case management from Americas, Asia, and Europe have been invited to attend the 9th Taipei International Conference on HIV/AIDS organized by Taiwan CDC in September 2008. They gathered together to help fight the global war against HIV/AIDS and discuss effective strategies that prevent susceptible groups from becoming infected with HIV. Through this conference, the epidemic prevention workers had a deeper understanding about this century pandemic and thus were further prepared to face tough challenges await us.

Future Prospects

According to statistics of the National Health Insurance Bureau (NHIB), NT\$300,000 in medical resources is expended on each HIV patient every year. Medical expenses for HIV patients in 2007 totaled about NT\$1.37 billion. Furthermore, other AIDS-related costs (such as popular education and screening) and all other medical costs (clinical examinations and psychological consultations) also increased immensely. The loss to labor and technology, freezes on foreign investment, reductions in exports, and the decline in revenues are inestimable.

At the onset of the world AIDS epidemic, the Executive Yuan's Department of Health rallied medical and health experts and private institutions in an effort to prevent and control AIDS. After years of hard work, they have achieved remarkable results, but have been unable to bring the number of new cases under control. We hope that in the future, the cross-ministerial AIDS Prevention and Control Committee will make prevention of infection the thrust of its efforts and stop the spread of HIV/AIDS.



Dengue Fever

Background

During the first half of the 20th century, there were three island-wide dengue fever outbreaks in Taiwan (1915, 1931, and 1942). After almost forty years of dormancy, a DEN-2 outbreak occurred in Luchiu Township, Pingtung County in 1981. Thereafter, more dengue fever outbreaks took place in Kaohsiung (1987-1988), Chungho, Taipei County (1995), Taichung (1995), Taipei City (1996) and several others in the greater Kaohsiung area, Tainan City, and Pingtung County. In 2002, another dengue fever outbreak occurred in Southern Taiwan. It was similar to the 1988 outbreak which actually started in 1987. The number of dengue fever cases rose rapidly starting in mid-June. The epidemic originated near the border of Chienchen, Kaohsiung City and Fengshang, Kaohsiung County. The epidemic gradually spread to other places, including Pingtung County, Tainan City, and Penghu County. The total number of confirmed cases was 5,336, including 242 cases of dengue hemorrhagic fever (DHF) which caused 21 deaths. Only 86 confirmed indigenous cases occurred in 2003. Of these, 51 were reported in Kaohsiung and Pingtung before March 8. All were considered residual cases of the 2002 outbreak. In 2004, 336 indigenous cases were reported. Five of them were of the hemorrhagic variety, but caused no fatalities. In 2005, there were 202 indigenous cases of dengue fever, of which three were of the hemorrhagic variety, but they led to no deaths. In 2006, there were 965 indigenous cases of dengue fever, including 19 cases of dengue hemorrhagic fever (DHF), which caused four deaths. In 2007, there were 2,000 indigenous cases of dengue fever, including 11 cases of dengue hemorrhagic fever (DHF), which caused four deaths.

In 2008, there were 488 indigenous cases of dengue fever, including 4 cases of dengue hemorrhagic fever (DHF), but no deaths resulted. The cases were concentrated mainly in the South, including Kaohsiung City, Kaohsiung County, Tainan City and Tainan County. Other cases were distributed in Taipei County and Taipei City, Taoyuan County, Changhua County, Keelung City.

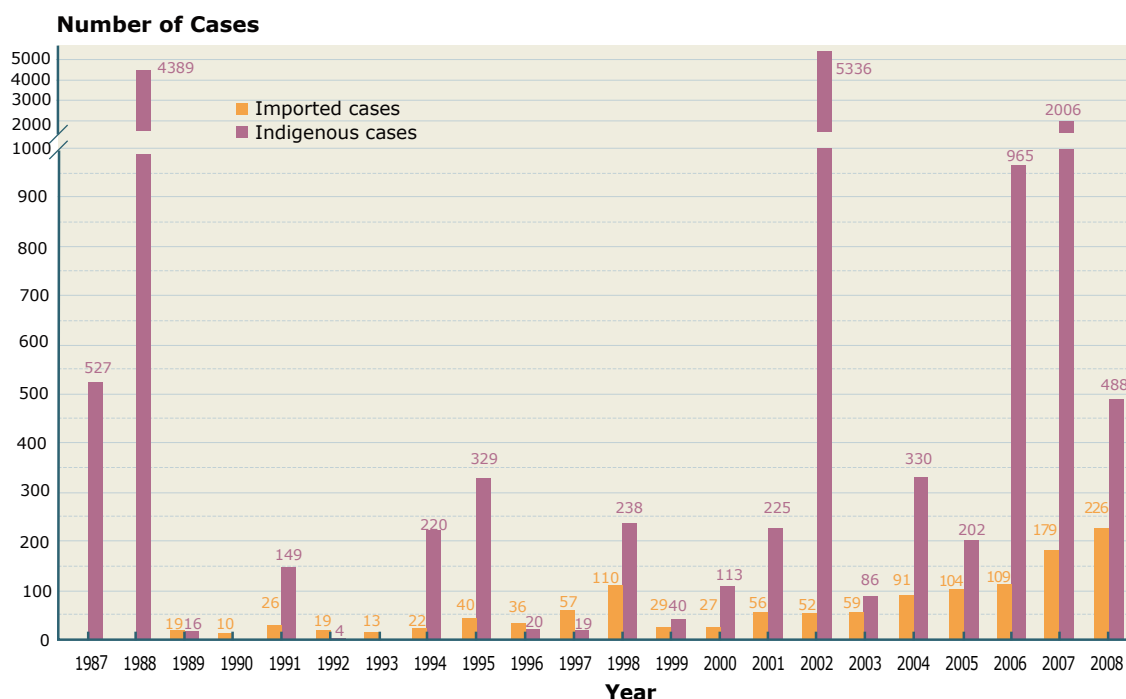


Figure: Numbers of confirmed dengue fever cases reported from 1987 to 2008

Goals

Control dengue fever in Taiwan by thoroughly cleaning up vector breeding grounds and effectively lowering vector (mosquito) density.

Strategies

Taiwan CDC has devised a three-stage prevention strategy in an attempt to control the dengue fever epidemic. Primary prevention measures include source reduction and control of the vector population. Secondary prevention measures cover disease surveillance and an emergency/contingency mechanism. Tertiary prevention involves controlling the number of deaths from the critical illness.

Primary Prevention

- (1) Implement health education through various communication channels to promote dengue fever awareness.
- (2) Involve the community in improving environmental and household hygiene as well as in reducing vector sources through volunteer training.
- (3) Encourage regular inspection and cleaning up of vector breeding sources by cleaning empty houses, vacant lots, and other potential vector breeding sources and keeping a record of these places for future inspections.
- (4) Strengthen education and training of disease prevention workers and volunteers.
- (5) Set up a vector surveillance mechanism to check places with a high mosquito density probability to promptly wipe out vector sources.

Secondary Prevention

- (1) Construct a disease surveillance mechanism for prompt control of suspected cases and strengthen disease surveillance and disease trend evaluation through the use of official epidemic reporting systems, emerging disease surveillance, as well as public reporting and symptom declaration forms.
- (2) Set up an emergency/contingency mechanism to promptly investigate suspected transmission sources and spray insecticide to eliminate those sources. Furthermore, perform health education about the importance of eliminating vector-breeding sites to prevent any possible infections from occurring.

Tertiary Prevention

Establish guidelines for dengue hemorrhagic fever (DHF) diagnosis and treatment and organize continuing education for medical personnel to raise healthcare quality and lower mortality rates.

Accomplishments

In Taiwan, 488 people were infected with dengue fever in 2008. As a result of the joint efforts between central and local governments and the organized mobilization of the community, Taiwan was much better able to bring dengue fever under control when compared with Southeast Asian nations. Below is a list of the major achievements.

Primary Prevention

- (1) Continuation of body-temperature monitoring at international airports. In 2008, 112 cases of imported dengue fever were detected, accounting for 49.5% of the total number of 226 imported cases (Table 1). This measure effectively limited the importation of the disease.

- (2) Health education and publicity materials including leaflets, posters, banners, Combat Manual for Dengue Fever (2nd edition) and VCDs.
- (3) Production of publicity materials for the mass media, including publicity recordings, epidemic control programming, newspaper ads. This includes TV commercials and short films for screening in TV slots reserved for the Government Information Office to make public service announcements. All these materials call on the public to eradicate dengue fever vector breeding grounds.
- (4) The second edition of the Guidelines for Dengue Control was published for the various health organizations in their fight against the epidemic.
- (5) Formulation of the Community Mobilization Plan for Cleaning Up the Breeding Grounds of Dengue Fever Vector. The Taiwan CDC encouraged community organizations in counties and cities in Southern Taiwan to propose plans for the CDC subsidiaries and organized volunteer teams to exterminate mosquitoes.
- (6) Engaged scholars and experts in insecticide efficiency and resistance studies of dengue fever vectors. The findings were referenced in procurement of insecticides.
- (7) The Central Trust of China processed joint supply contracts for the centralized purchase of pesticides for special environments.
- (8) Promoted dengue fever vector mosquito surveys and the Dengue Fever Control Plan. Implementation was entrusted to the health bureaus of high risk counties and cities in Southern Taiwan (areas infested with *Aedes aegypti* mosquitos). The frequency of dengue fever vector density surveys and investigations was increased to one per month for every village in and around the areas in Southern Taiwan where dengue fever was prevalent.

Table 1. Serotypes and origins of imported dengue fever cases, 2008

Country of Infection	Serotype					Total
	DF-1	DF-2	DF-3	DF-4	ND	
Vietnam	30	3	4	-	35	73
Indonesia	8	11	3	10	16	48
Thailand	11	2	2	-	15	30
Philippines	-	3	9	-	13	25
Myanmar	3	-	1	-	11	15
Cambodia	1	1	1	-	7	10
Malaysia	3	3	1	-	1	8
Singapore	3	1	-	-	3	7
Tonga	1	-	-	-	3	4
India	1	-	-	-	2	3
Bangladesh	-	-	1	-	-	1
Honduras	1	-	-	-	-	1
Uncertain	1	-	-	-	-	1
Total	63	24	22	10	106	226

Secondary Prevention

- (1) An incentive system was established to encourage physicians and the public to report cases so as to facilitate early detection of disease transmission. NT\$2,500-NT\$4,000 was awarded to the physician or other medical worker that reported the first indigenous case of dengue fever of the year and to the individual that discovered an imported case of dengue fever. If an individual volunteered for dengue fever testing and the case was subsequently determined to be an imported case or the first indigenous case in the village or township of residence, the individual was awarded NT\$2,500.
- (2) To understand shifts in insecticide resistance of vectors after indigenous dengue fever broke out in Southern Taiwan in 2008, Taiwan CDC sent vector experts to areas where emergency spraying was carried out to evaluate the insecticide resistance of dengue fever vectors. They also offered timely advice on the use of insecticide and equipment to make control efforts more effective.

Future Prospects

Taiwan CDC will draw up a reinforced plan for dengue fever control—a four-year program for eradicating vector-breeding sources and eliminating indigenous dengue fever to strengthen dengue fever control. Taiwan CDC, the Environmental Protection Administration (EPA), local governments, and NGOs will implement the plan together. Efforts will be made to popularize health education and encourage the general public to get involved in maintaining environmental and household hygiene. Taiwan CDC and the EPA will construct a real-time disease surveillance and response mechanism in an attempt to wipe out vector sources, thereby stopping the occurrence of indigenous dengue fever once and for all.



Enteroviruses

Background

Enteroviruses belong to a group of small RNA viruses, including polioviruses, Coxsackie A viruses, Coxsackie B viruses, echoviruses, and other enteroviruses (EV68~). EV71 has a significantly higher pathogenicity among known enteroviruses, especially in respect to neurological complications. Enteroviruses are found in the gastrointestinal tract (the stool of infected persons, mouth) and respiratory tract (such as saliva, sputum, or nasal mucus). Infections can be produced by direct contact with the secretions of infected persons or with contaminated surfaces or objects.

According to survey data from several years provided by the Centers for Disease Control, the weekly consultation rate of enterovirus infection cases reported by clinical sentinel physicians increases in late March every year and peaks around mid-June. It decreases after mid-June. There is usually another smaller outbreak of enterovirus infection when schools reopen in September (Figure 1). Many types of enteroviruses exist around the world and they live inside humans. Humans appear to be the only known host and source of transmission. There are currently no preventative vaccines for non-polio enteroviruses and no known highly efficacious medicine to eliminate the virus that lives inside the human body. Therefore, enteroviruses will continue to exist and pose a threat to human health for the foreseeable future.

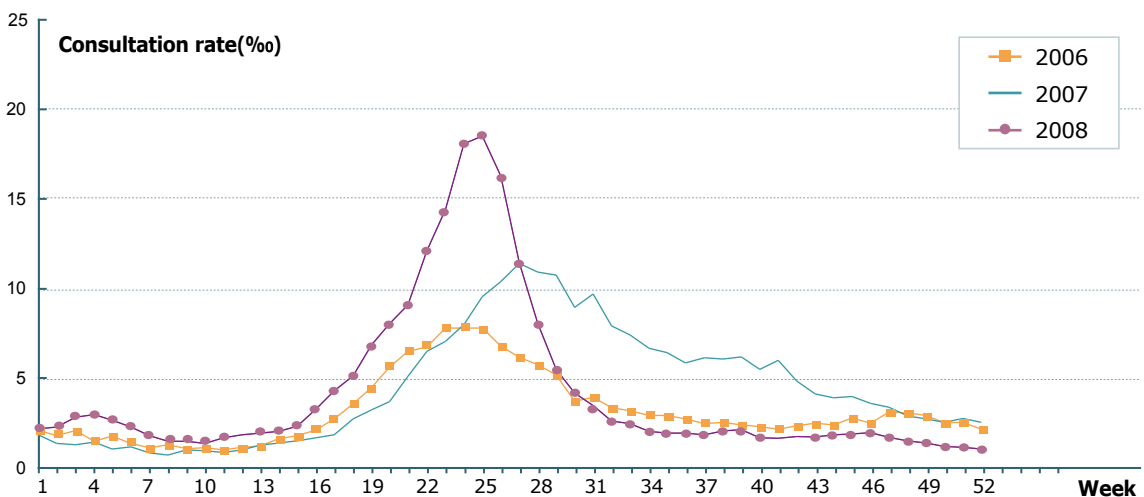


Figure 1. Weekly consultation rate of Enterovirus infections reported from clinic sentinel sites in Taiwan, 2006-2008

The peak season for enterovirus infections in temperate regions is summer. According to various surveys, trends in enterovirus infections suggest that children under the age of 5 are more prone to critical complications and death from enterovirus infections. The major symptoms of enterovirus infection are herpangina and hand-foot-and-mouth disease (HFMD). Enterovirus 71 is the most commonly seen serotype of cases of enterovirus infection with severe complications in Taiwan (Figure 2).

In 2008, enterovirus 71 epidemic was more serious than those that occurred in the past 5 years (Figure 3). The Department of Health established "Enterovirus National Health Command Center" on June 10 to make an overall plan of the control measures and the coordination of medical resources. The peak of the enterovirus epidemic occurred in middle June then declined quickly. There were 373 confirmed cases of enterovirus infection with severe complications, 14 deaths resulted.

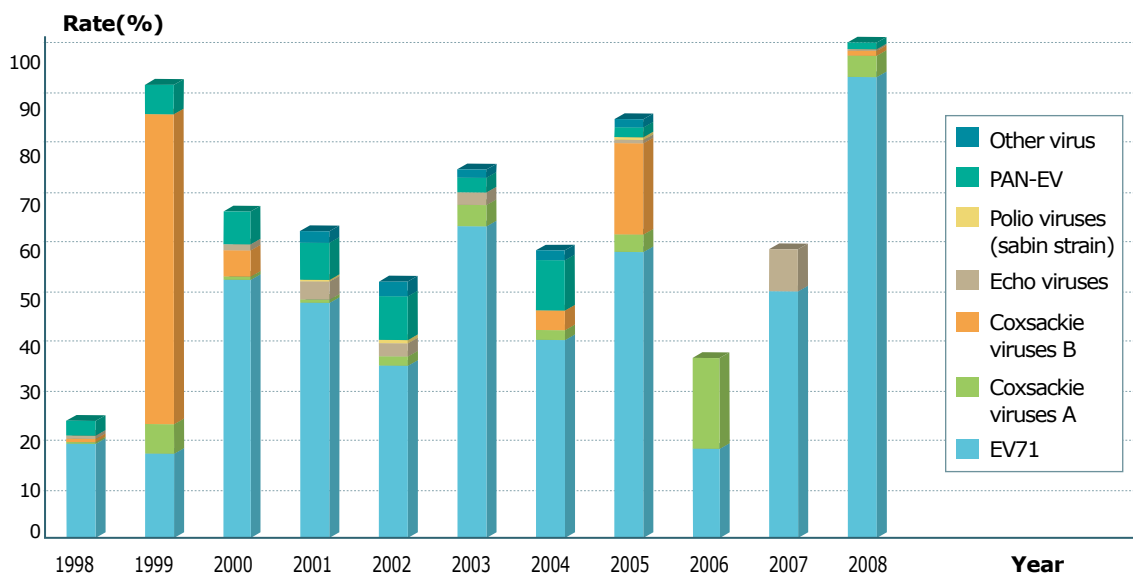


Figure 2. Serotype of cases of enterovirus infection with severe complications in Taiwan.

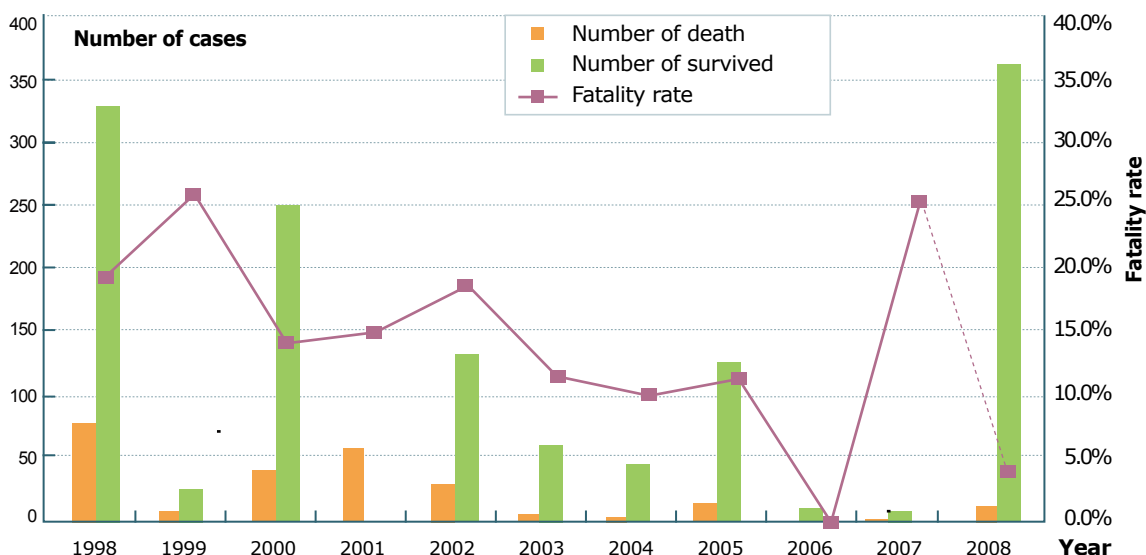


Figure 3. Number of cases and annual fatality rate from enterovirus infection with severe complications in Taiwan.

Goals

1. Control trends in enterovirus infections in Taiwan and set up an active enterovirus database in Taiwan.
2. Lower the number of deaths resulting from enterovirus complications.
3. Establish a consultation channel for the treatment of enterovirus complications.
4. Schedule enterovirus conferences on a regular basis to raise the academic standard in the field of enterovirus studies.
5. Develop an enterovirus 71 prototype vaccine.

Strategies

Enhance Case Surveys and Disease Evaluation Capabilities.

The CDC will continue to collect and analyze enterovirus infection information both abroad and especially at home to build an enterovirus infection database to better understand outbreaks of the disease and to create policies best suited to Taiwan.

Augment Health Education — Knowledge Reduces Fear

The Taiwan CDC consolidates government and public resources to educate the general public, medical personnel, educational organizations, and the media about the basics of enteroviruses through a variety of media. For instance, the following disease prevention information is presented to the public: (1) general cleanliness and frequent hand washing can boost one's immune system; (2) people are encouraged to install proper hand washing facilities both at homes and at public places; and (3) people are urged to seek immediate medical treatment if they develop enterovirus symptoms. Health care workers are trained in the latest treatments. Disease prevention can only be effectively accomplished when everyone practices personal hygiene.

Enhance Emergency Disease Control Mechanisms

Many problems arise from enterovirus infections. Problems involve prevention work, the entire medical system, education, media, economics, and so forth. It is crucial that central and local governments build control centers and enact enterovirus prevention policies in case the disease surveillance system breaks down. Additionally, coordinating the actions of central and local government agencies needs to be preplanned for efficient disease control. This plan means a complete disease prevention network providing timely and adequate medical treatment, research, and case inspection. The plan must also include counseling services for slowing or stopping the spread of the disease, decreasing the number of deaths, and calming fears caused by the disease.

Thorough Research and Personnel Training

Epidemiological research and vaccine development are among some of the programs currently underway. Human resource training improves prevention methods as well as diagnoses and treatment of enterovirus infections. The goal of these programs is to halt the threat of enteroviruses to both the health of individuals and society.



Accomplishments

1. Health Education

- (1) Red banners hung in schools teach about enteroviruses. Talks are given on enterovirus preventative measures for children and related health issues.
 - (2) Local organizations work with the community to promote enterovirus education and prevention.
 - (3) Restaurants, schools, hospitals, clinics, and other public gathering places are required to conduct regular inspections for environmental hygiene and facilities for washing hands.
2. Consultation channels are established by recruiting clinical professionals island-wide. They provide clinical healthcare consultation and construct guidelines for treating enterovirus complications. Providing primary care to patients with complications can effectively lower the mortality rate.
 3. The Manual for Enterovirus Prevention and The Handbook for Enterovirus Prevention for Child Care Workers list all necessary precautions and have been published in large quantities for distribution to local governments in Taiwan.
 4. Workshops on the clinical treatment of critical enterovirus complications enhance doctors' skills in treating the disease, raise treatment quality, and reduce mortality rates and sequelae.
 5. There is no effective medicine for curing enterovirus infections, so beginning in 2000, efforts have been made to develop an enterovirus-71 vaccine to boost the public's immunity to the disease.

Future Prospects

Enterovirus Prevention Enhancement

- (1) Intensify the Household Hand-Washing Activity Drive by asking adults to wash their hands before coming in contact with children.
- (2) Encourage people not to go to school or work when they are sick.

Assessment of Current Prevention Policies

- (1) Assess consequences resulting from suspending classes.
- (2) Conduct research on the integrity of medical facilities throughout the area to assess the treatment criterion of severe enterovirus cases.

Related Research

- (1) Continue research on an enterovirus 71 vaccine (EV-71 Vaccine).
- (2) Continue seroepidemiologic surveys for EV71.
- (3) Study risk factors involved in cases with severe enterovirus complications.
- (4) Study biological characteristics of the enterovirus.

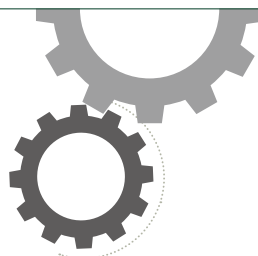


Mortality
due to Notifiable



EMERGENCY PREPAREDNESS & RESPONSE

Emergency Preparedness & Response



National Health

Command Center (NHCC)

Background

Origins (Strategy for Long-term Success)

In 2003, SARS became a global epidemic that severely tested Taiwan's capabilities for public health and medical crisis management. In response, the government here established the National Health Command Center (NHCC), a well-equipped communications facility designed to coordinate officials at all levels and provide decision makers with critical information on public health crises.

The NHCC, based in the Centers for Disease Control (CDC), is a component of a unified central command infrastructure that is designed to deal with the coordination of outbreaks and epidemics, bioterrorism, and other public health emergencies. This joint framework serves as a comprehensive means for preventing major epidemics.

Goals

Framework (Victory through Perfect Teamwork)

The success of the NHCC hinges upon state of the art technology and urgent integration of medical and public health information, as well as a complete command system blueprint. To work toward this goal, the NHCC planning team established a set of standard operating procedures (SOP) that incorporate elements of the US Incident Command System and the SARS Command System SOPs.

In terms of operational framework, the NHCC coordinates district, regional and central government officials. When the scale of a disaster warrants action, the NHCC will set up a crisis command center with a designated chief commander. The job of the chief commander is to form task forces, decide on the government involvement level, and once the crisis has been brought under control, propose to officials to disband the crisis command center. WHO International Health Regulations (2005) [(IHR (2005))] was officially implemented at June 15, 2007. In order to establish a unified communication channel with international organizations and ensure that public health emergencies are reported and responded to as quickly as possible, the NHCC is now responsible for the operation of the IHR Focal Point.

Organizational Layout (Resources at the Ready)

The NHCC houses the following units: Coordination Center, Situation Room, Commander's Office, Administrator Office, Conference Room, Media Watch Room, Operation Room, Data Room, Utility Room, Records Room, Lounge and remaining office space. This organizational design stimulates effective coordination and operations.

Facility Designs (Technology on the Frontlines)

Epidemic prevention attains maximum effectiveness when assisted by information technology. Using cutting edge technology and an advanced communications network, the NHCC plays a vital role in relaying up-to-date crisis information and analyses for decision-making.

- (1) Videoconferencing: Conducts Internet videoconferences on large screen TVs to communicate with domestic authorities and governments worldwide.
- (2) Media reception and satellite communication: Provides a constant flow of first hand information.
- (3) Communication system framework: Integrates NHCC phone networks and maintains accessible hotlines to each command center.
- (4) Environment control and AV equipment: Multiple high-tech visual media sources provide decision makers with up-to-date information.
- (5) Hardware control integration platform: Allows managers to effectively control visual media displays, videoconference settings and network configuration.
- (6) Alternate site support: Activated in the event that forces beyond the NHCC's control result in the loss of operational capabilities.

Information Integration (Command by Grasping the Whole Picture)

The collection and integration of up-to-date information is the key to winning a war against an epidemic. Hence, an important goal of the NHCC is to set up a smooth information exchange system through a complete information platform.

(1) Inter-departmental Information Platform:

Initially utilizes an information framework consisting of current CDC platforms: the Real-time Data Warehouse for Infectious Diseases, the Geographic Information System (GIS), Real-time Outbreak and Disease Surveillance (RODS), National Epidemic Decision Support System (NEDSS), knowledge management system, and other relevant systems. From this framework, the NHCC commander receives integrated data regarding all notifiable infectious diseases, counter bio-terrorism intelligence, as well as medical resources and logistics for prompt decision-making. Future plans call for the incremental development of epidemic prevention/management software. A mission-oriented data center, aiming at value-added data integration and exchange, is being developed to serve for extending the research capabilities and enhancing health policy evaluations.

(2) Decision Support Analysis Using SAS[®] Integrated Solutions:

Powerful analysis capabilities allow this software to process copious quantities of data, placing meaningful information at the decision maker's fingertips.

(3) Meetings and Follow-up Evaluation Management System:

Provide public health and medical crisis meetings with automated reporting and follow-up management.

Establishing Multi-surveillance Systems

International Epidemic Intelligence Collection System

The system was established to filter the up-to-date international epidemic information and afterward relay pertinent information daily to those charged with applying suitable control measures. The filtered information is simultaneously posted on a website accessible to the public. The major information is gathered via internet from the World Health Organization website, various national health department websites, official online publications, public health and epidemiological journals, and news websites. Other sources include diplomatic documents and the media.

A media surveillance section belonged to National Health Command Center is devoted to catch the latest epidemic news round the clock from both international and domestic media that form briefs twice a day for prompt reference. Taking advantage of the rapid publicity of this media and the accuracy of official reports, any potential crisis can be forthwith evaluated to determine any necessary actions.

Real-time Outbreak and Disease Surveillance System

With the assistance from the RODS Laboratory at the University of Pittsburgh, Taiwan CDC has established its own "Real-time Outbreak and Disease Surveillance (RODS)" system since 2004 and renovated entirely in November 2006. By the use of automated transferred hospital emergency department ICD-9-coded diagnosis data, the RODS system, a syndromic surveillance system, shows its excellence in real-time monitoring seasonal enterovirus infection (EVI), influenza-like illness (ILI), acute hemorrhagic conjunctivitis and viral gastroenteritis epidemics. In comparison with sentinel surveillance, RODS yields concordant trends one to two weeks earlier. As of March 2009, there are more than 160 hospitals joining RODS, with the coverage rate of above 80% for nationwide daily emergency department visits. The daily claim data from the National Health Insurance are being adopted as a new information source for RODS.

Accomplishments

Events

Since its establishment in 2005, the NHCC has faced a number of major public health events in Taiwan which have served to enhance Taiwan's ability to deal with epidemics and other public health emergencies.



2005	<ul style="list-style-type: none"> • South Asian earthquake/tsunami aid (01.05-01.28) • Cerebrospinal meningitis outbreak in China (02.02-02.10) • Enterovirus outbreak (06.02-09.25) • "Strange disease" outbreak in Sichuan (07.23-08.21) • Melioidosis outbreak (07.30-08.17)
2006	<ul style="list-style-type: none"> • Individual traveling to Australia suspected of being infected with avian influenza while in transit through Taiwan (01.04-01.05) • Boy suspected of being infected with avian influenza on his return to Jinmen Island (03.01-03.02) • Dengue fever outbreak in Kaohsiung (10.02-12.22)
2007	<ul style="list-style-type: none"> • Incident of registered MDR-TB patient boarding international flight (07.25-07.30) • Nationwide outbreak of acute hemorrhagic conjunctivitis (10.05-10.29) • Taichung City primary school shigellosis outbreak (11.23-11.28)
2008	<ul style="list-style-type: none"> • Nationwide enterovirus outbreak (06.10-08.18) • Melamine-tainted milk and other related products (09.15-11.14)

Future Prospects

Vision (The Power of Uniting as One)

In the post-SARS era, the NHCC employs modern technology, smooth data exchange systems, and complete information platforms to achieve the 3 "I" s: Initiation, Integration and Innovation. This enables the NHCC to successfully respond to any public health and medical crisis and guard the health of the nation. Furthermore, it is our hope that government efforts to improve coordination will raise the public's epidemic prevention awareness level and create a better tomorrow for the whole nation.



Influenza

Pandemic Preparedness

Background

The next influenza pandemic threat most likely comes from the influenza virus of avian origin, currently the H5N1 virus. Since 2003, the virus has spread from South-East Asia to Central Asia, Europe, the Eastern Mediterranean and Africa. Accompanied by the outbreaks in poultry, human cases of H5N1 occur from time to time increasing; thus the viruses could become more adaptive to the human body or could exchange their genetic material, hence forming the pandemic virus. By the end of 2008, according to data reported to WHO, there had been approximately 400 confirmed human cases of H5N1 (in 15 countries) and among them 250 died.

Goals

1. Avoid the occurrence of any domestic human case of avian influenza during pandemic alert period.
2. Prevent the further spreading from imported human cases of avian influenza during pandemic alert period.
3. Reduce the health impact and maintain social functions and economic activities during pandemic period.
4. Recover social psychology and economic development during postpandemic period.

Strategies

The “4 major strategies and 5 lines of defense” form the main framework for pandemic preparedness.

Four Major Strategies

(1) Strategy I—Early Detection

Surveillance systems have been built up to a. detect suspected human case of avian influenza, b. monitor any unusual cluster of influenza-like illness, c. discover abnormal clinical manifestations in flu cases, and d. trace the activities of flu viruses.

(2) Strategy II—Interruption of Transmission

Several non-pharmaceutical public health interventions, such as enhancement of personal hygiene practices, isolation of patients, quarantine of contacts and imposition of social distancing have been formulated and will be used to interrupt the transmission of pandemic flu virus.

(3) Strategy III—Antivirals

Neuraminidase inhibitors have been stockpiled and will be used to contain the avian flu virus or pandemic flu virus at early stage of pandemic. Furthermore, the antivirals are expected to reduce morbidity and mortality during pandemic period.

(4) Strategy IV—Influenza Vaccine

In order to maintain essential social functions and protect high-risk groups, the pre-pandemic flu vaccines have been stockpiled and the capacity of domestic flu vaccine manufacturing are under development.

Five Lines of Defense

(1) First Line of Defense—Containment Abroad

In order to assist in containing the pandemic virus as early as possible, Taiwan CDC tries to proactively participate in the global collaboration plan and tracks the updated international epidemic situation.

(2) Second Line of Defense—Border Control

Should the virus' transmission ability continue to increase, intercept the invasion of virus at border by reinforcement of quarantine inspection at airports and seaports is crucial to protect citizen's health. Health monitoring and management of incoming passengers will be gradually upgraded depending on the global epidemic situation.

(3) Third Line of Defense—Community Epidemic Control

During pandemic phase, community epidemic control will become the major tool used to lessen the pandemic's impact. The government will combine forces with civil groups and volunteers to provide public with the correct information, thus ensuring the public's level of compliance with community epidemic control measures.

(4) Fourth Line of Defense—Maintaining Normal Medical System Functions

"Communicable Diseases Control Medical Network" has been established to centralize the management of infectious patients, thus to prevent the interruption of necessary medical care for the patient with chronic diseases and patient needing emergency operation and to cope with the surge capacity during pandemic. Strict hospital infection control is required to secure the medical care system.

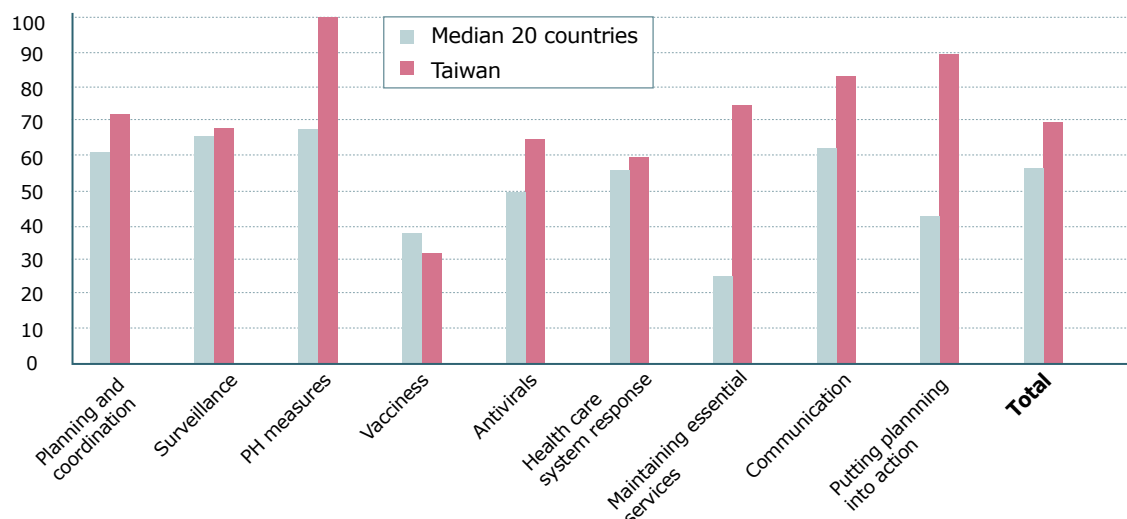
(5) Fifth Line of Defense—Individual and Family Protection

During pandemic phase, people should be instructed to stay home as far as possible and then to reduce unnecessary social interaction. In addition, any person with a mild illness should be encouraged to recuperate at home. Therefore, higher levels of personal and household hygiene will be requested during a pandemic.

Accomplishments

1. Three hierarchical plans have been developed: the National Influenza Pandemic Preparedness Plan, the Influenza Pandemic Strategic Plan, and the Influenza Pandemic Response Plan. These plans have been revised regularly.
2. A three-tier administrative hierarchy has been established for pandemic response: the Office of the President, Executive Yuan and the Department of Health. And a multi-ministerial operation mechanism is set up and maintained.
3. The current neuraminidase inhibitors stockpile has been maintained at a coverage rate of at least 10% of the population.
4. 190,000 doses of H5N1 vaccines have been prepared to be used on medical and health workers.
5. Central and local governments have conducted 22 exercises for pandemic responses.

6. In order to objectively assess Taiwan's readiness of pandemic preparedness, Dr. Richard Coker from the London School of Tropical Medicine and Hygiene has been authorized to review Taiwan's preparedness plan. The overall score was assessed to be 70%, which was well above the median of the previously-evaluated 28 countries and indicates a high level of preparedness.



Source: Coker R, Mounier-Jack S. Pandemic influenza preparedness in the Asia-Pacific region. *Lancet* 2006;368(9538): 886-9.

Figure. Taiwan scores by area in % of maximum score for completeness

Future Prospects

Based on the past experiences of influenza pandemics, it will cause high morbidity, excess mortality, and social and economic disruption, so the efforts for preparedness should not be limited in health aspects. In addition to all central and local governments, the private sectors and even individuals should also be involved. How to engage all the partners to further strengthen our preparedness will be the future goal.



Personal Protective

Equipment Management

Background

During the SARS crisis in 2003, there was a shortage of personal protective equipments (PPEs) in Taiwan. However, as the epidemic ended, large quantities of PPEs were left behind to be managed.

Recognizing the importance of the logistics management on PPEs supply chain, Taiwan CDC then took charge of the task in Autumn 2003.

Goals

The task was to provide sufficient quantities of PPEs to ensure protection of the front-line health care workers and the public if there is a public health emergency, such as pandemic flu. The primary work included establishing a safe stockpile, and developing logistics and distribution strategies of PPEs.

In 2008, Taiwan CDC made notable progress on stockpile strategy. For reasons of risk management and logistical flexibility, we set up five separate warehouses for storage of the central government's stockpile. We also developed and signed several types of flexible supply contracts of related PPEs items, such as replacement contracts of N95 respirators and inter-entity supply contract of surgical masks. Our strategies included the following four main aspects:

Establishment of a Safe PPEs Stockpile

To estimate the potential demand of PPEs at a national level, we used FluAid2.0 and FluSurge1.0 software developed by the USCDC, to predict the curve of infections under the scenario of an influenza pandemic, with an attack rate of 25% to 35%. According to the estimation result of PPEs demand, and the survey of PPEs supply, a three tiers of safe stockpile was established. The central government's stockpile is for epidemic control and emergency dispatch. Local governments' stockpile is for local public health and epidemic control needs, and medical facilities' stockpile is for control of nosocomial infections. Table 1 shows the safe stockpiles and the distribution list.

Table 1. Safe and Current Stockpiles of PPEs, 2008

Levels Items	Safe stockpile				Current stockpile ^a
	Central government	Local governments	Medical facilities	Total	
N95 respirators	500,000	500,000	1,000,000	2,000,000	2,848,339
Surgical mask	1,750,000	1,750,000	3,500,000	7,000,000	9,667,548
Procedure mask	75,000,000	-	-	75,000,000	10,346,251*
Protective Apparel	200,000	200,000	400,000	800,000	2,458,062

^aData was downloaded from MIS on 2008/12/31.

*The remaining gap between the current and safe stockpile is prepared by using an open ended contract.

Information Management and Monitoring

To grasp real-time data about dynamic changes in PPEs stockpiles, we established a Management Information System (MIS) to provide accurate and complete information for decision making. Updated information from 927 MIS users including 534 hospitals, 378 local health agencies, 20 CDC offices, and other government agencies were regularly uploaded on the website. According to a recent survey, the average number of visits per day to the MIS website is 560, which translates to approximately 204,000 visits per year.

Stockpile Management

To assure safety and quality of the central government's stockpile, all the PPEs stock is kept in air-conditioned warehouses in five separate locations. To rotate the stock and keep it fresh, the storage is arranged using FIFO (first in-first out), and call options contracts and vendor managed inventory (VMI) are also being developed for the purpose of achieving better PPEs supply chain management.

Ensure Swift Delivery

To ensure an effective deployment, the stock can be delivered within 24 hours for the main Island, and two days for off-shore islands by a professional logistics company. In 2009, we also planned for periodic exercises to test and evaluate stockpile deployment.

Envision Regional Preparedness

In the next five-year long-term plan from FY2009 to FY2013, Taiwan CDC will try to promote the experience sharing of emergency preparedness on PPEs stockpile in the Pacific Asia, for the purpose of regional cooperation in the future.

Field Epidemiology

Training Program

Background

The Field Epidemiology Training Program (FETP) is designed to train professional epidemiologists out of different health related fields. It is similar to the training program provided by the Epidemic Intelligence Service (EIS) of the Centers for Disease Control and Prevention of the United States (USCDC). The FETP was established in 1984 and has collaborated with the USCDC. Its main purposes are to train persons who have basic public health concepts to independently conduct surveys and participate in the investigation and control of disease outbreaks. The program emphasizes the importance of hands-on experience in field investigation and analysis of practical cases. Originally, the FETP was supervised by the Bureau of Communicable Disease Control (BCDC) of the Department of Health. For more effective cooperation with other public health agencies, the FETP merged with the National Institute of Preventive Medicine (NIPM) in 1988. Having gone through the nationwide enterovirus outbreak in 1998, the FETP, along with BCDC, NIPM, and Disease Surveillance and Quarantine Service, were reorganized into the Centers for Disease Control in 2000. The three major functions of the FETP are described in the following sections.



Goals

Discipline of Epidemiology Professionals

Each year, 8-12 trainees with a variety of educational backgrounds such as medicine, dentistry, veterinary medicine, nursing, and other health related fields are recruited for the two-year training program. At the beginning is an eight week classroom training period when the trainees are taught fundamental courses including epidemiology, biostatistics, public health ethics and law, evaluation of surveillance systems, scientific writing, and prevention effectiveness. After completing this basic discipline, each trainee participates in different outbreak investigations. In the second year of training, the trainees conduct their own long-term research projects. These projects focus on current health problems in Taiwan. Currently, a total of 22 classes, 120 graduates, have successfully finished their training. Each graduate receives a certificate and becomes an FETP consultant. In addition, another 1 classes, 8 trainees, are currently undergoing basic training.

Field Epidemiology Investigation and Long-Term Research Projects

In the past, the FETP trainees have investigated 282 disease outbreaks and completed 120 long-term research projects. Corresponding papers regarding these outbreak investigations and projects were published in major national and international journals. Among these, several outstanding papers are listed as follows: Measles outbreak in an elementary school in Chimei Island, Penghu County; Outbreak of paralytic shellfish poisoning in the Kaohsiung area; Acute hemorrhagic conjunctivitis in Taipei City; Suicide trends in the Taiwan area in the last ten years; An analysis of traffic injuries in Taiwan in relation to alcohol use and economic losses; Outbreak of type A botulism due to commercially preserved peanuts in Changhwa County; A school waterborne outbreak involving both *Shigella sonnei* and *Entamoeba histolytica*; Investigation of the pathogenic factors of sauropus androgynus poisoning; A nosocomial outbreak of malaria associated with contaminated catheters and contrast medium of a computed tomographic scanner; An epidemic of enterovirus 71 infection in Taiwan; Outbreak of Stevens-Johnson syndrome/toxic epidermal necrolysis associated with mebendazole and metronidazole use among Filipino laborers in Taiwan; Outbreak of beriberi among illegal mainland Chinese immigrants at a detention center in Taiwan; The public health response to the Chi-Chi earthquake in Taiwan, 1999; Transmission of SARS on aircraft; Hydrogen peroxide poisoning associated with eating spaghetti among school children in northern Taiwan.

Collaboration with National and International Training Institutions

Faculty members from various universities and research institutions are appointed to teach the trainees on a regular basis. Distinguished scholars or experienced public administrators are also invited to advise on trainees' long-term research projects. Furthermore, visiting specialists from the USCDC provide technical consultation for the trainees regarding their field investigations.

Results of some field investigation or long-term research projects have been presented at the annual conference held by the Taiwan Public Health Association, the Chinese Society of Immunology, Infectious Diseases Society of Taiwan, the USCDC, the International Clinical Epidemiological Network (INCLIN), and the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET). By attending these conferences, trainees can share their experience of practical field-based or "learning-by-doing" approaches to public health with field-trained epidemiologists from other countries.

Accomplishments

In 2008, there were eight people enrolled in FETP. In the same year, 18 outbreak investigations were completed. These investigations include "Shigellosis outbreak in a day care center in Taipei County", "Shigellosis in Jen-Ai Township, Nantou County", "Shigellosis outbreak at Bei-Tun Elementary School", Taichung, "MDR-TB in a Nepalese passenger who transited through Taiwan", "Taiwanese student from Kaohsiung aboard a flight from the United States to Taiwan", "Norovirus outbreak among residents at a psychiatric center, Bali, Taipei County", "Novovirus outbreak at one veterans hospital, Yilan County", "Rubella outbreak among Filipino workers at a construction company, Taoyuan County", "Rubella outbreak among Thai workers at a construction company, Miaoli County", "An Outbreak Investigation of Unknown Cause Respiratory or GI Symptoms at a Secondary School Located in Hualien City", "First Sapovirus Outbreak in Taiwan", "Coxsackie A24 Conjunctivitis at Ba-Do Junior High School, Keelung", "Varicella outbreak among Filipino workers at a hard disk trace company, Hsinchu", "Enterovirus outbreak at one mother-baby care center in Hsinchu County", "Investigation of a suspected avian influenza pneumonia patient, Penghu County", and "Sudden death of baby and infant at a mother-baby care center, Kaohsiung". Trainees had one oral and two poster presentation at the 5th TEPHINET Global Scientific Conference, held in Kuala Lumpur, Malaysia during November 1-6, 2008.

In addition, FETP hosted the Fourth TEPHINET Southeast Asia/Western Pacific Bi-Regional Scientific Conference at the Taipei Grand Hotel from November 26 to 30, 2007. A total of 306 persons attended the conference including not only persons from Taiwan, but also persons from Argentina, Australia, Austria, Cambodia, China, India, Indonesia, Kenya, Korea, Lebanon, Malaysia, Philippines, Singapore, Thailand, United Kingdom, United States, and Vietnam. There were 61 oral and 98 poster presentations at the conference.

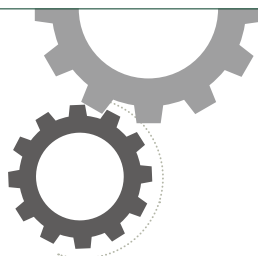
Future Prospects

In the future, the FETP will strengthen its connections and interactions with other similar training programs nationally and internationally. It also plans to establish cooperative programs with academic and research institutions around the world. Finally, it intends to strengthen its coordination among FETP graduates and trainees. Through these efforts, the program trainees not only can refresh and advance their knowledge in the field of epidemiology but also make better contributions to peoples' health in Taiwan.



NOSOCOMIAL INFECTION CONTROL

Nosocomial Infection Control



Background

The impact of the SARS outbreak highlighted the importance of infection control in hospitals. In order to improve patient safety, protect against the occurrence of infections in hospitals, and strengthen measures to control nosocomial infections, Taiwan CDC is actively promoting an inspection program intended to promote control of nosocomial infections, is monitoring antimicrobial resistance, and has drafted nosocomial infection control guidelines.

Goals

1. Planning effective interventions and continuing to formulate infection control guidelines which have a direct bearing on reducing instances of nosocomial infection and fulfilling WHO patient safety.
2. Boosting the quality of the nosocomial infection control inspection program and giving advice or sharing experience on nosocomial infection control mechanism and experience through on-site audits to improve infection control in hospitals.
3. Promoting international collaboration in hand hygiene and the implementation of WHO hand hygiene toolkits to reduce the occurrence of nosocomial infection effectively.
4. Establishing international nosocomial infection indicators to assess domestic epidemiological trends to guide the drafting of infection control policies.

Accomplishments

Compilation of Infection Control Guidelines and Publication of an Infection Control Journal

- (1) In order to establish infection control guidelines meeting domestic needs and providing a reference for medical institutions, Taiwan CDC has continued to sift through relevant domestic and foreign literature and solicit the recommendations of specialized medical associations as part of its effort to determine infection control guidelines. During 2008, Taiwan CDC compiled new surveillance definitions of health care-associated infection, surveillance definitions of invasive medical device-associated infection, infection control guidelines of sharp injury and blood/body fluid exposure, guidelines on hand hygiene and isolation precautions. In addition, Taiwan CDC established a dedicated nosocomial infection page on its web site; this page provides relevant guideline documents and teaching materials including health education and awareness materials and multimedia videos for download.

- (2) In order to improve nosocomial infection control skills, Taiwan CDC has continued to commission the Nosocomial Infection Control Society of Taiwan to publish the bimonthly Infection Control Journal providing infection control personnel with new domestic and foreign knowledge, relevant research results, policy propaganda, and feedback of surveillance outcomes.

Nosocomial Infection Control Inspection

- (1) Based on the need to protect patient safety and guard against nosocomial infections, Taiwan CDC is actively promoting the amendment of the Communicable Disease Control Act and strengthening nosocomial infection control regulations. Revised articles of the Communicable Disease Control Act were announced in July 2007; Regulations Governing Inspection of the Implementation of Infection Control Measures in Medical Care Institutions is formulated in accordance with regulations of Paragraph 2, Article 32 of the Communicable Disease Control Act, and explicitly states infection control measures to be implemented by medical institutions and criteria for inspection by the competent authority. This set of Regulations was promulgated in January 2008.
- (2) In order to thoroughly implement medical institutions infection control policies and improve the consistency of infection inspection results, Taiwan CDC commissioned the Taiwan Joint Commission on Hospital Accreditation to implement a 2008 infection control inspection quality improvement project which included three major parts: a. hiring and training inspectors, b. improvement of the quality of inspection work, and c. enhancement of infection control matters performed by medical personnel. Among the 495 hospitals inspected in 2008, only nine failed to meet standards; after the follow-up by local health departments, except for one hospital which has gone out of business, all the remaining failing hospitals have been brought up to standard.
- (3) In order to provide consulting services concerning infection control measures to hospitals and health agencies, Taiwan CDC provided telephone, e-mail, and mail communication channels via the Taiwan Joint Commission on Hospital Accreditation, Nosocomial Infection Control Society of Taiwan, and Taiwan Community Hospital Association in 2008. Users could send their questions or requests through these channels and the Taiwan Joint Commission on Hospital Accreditation would ask for the specialists to respond. All the answers will be summarized and be put on the Centers for Disease Control website in the future as reference materials for anyone needed.

Promotion of Hand Hygiene

- (1) In order to boost hand hygiene awareness and compliance in healthcare workers, Taiwan CDC commissioned the Taiwan Joint Commission on Hospital Accreditation to implement the 2008 nosocomial infection control workshop, which was offered to physicians specializing in infection and other infection control personnel at medical institutions nationwide to introduce to them the concepts about the five moments for hand hygiene and the importance of availability of hand hygiene products at the point of care.
- (2) Taiwan CDC invited Dr. Didier Pittet of Geneva University Hospital a well-recognized authority on infection control and hand hygiene to Taiwan in July 2008. Dr. Pittet visited many hospitals and shared practical experience with infection control specialists and workers here. Dr. Pittet also provided information on the focal points and trends about WHO's hand hygiene and antibiotic control projects.

Nosocomial Infection Surveillance and Reporting

- (1) The Taiwan Nosocomial Infection Surveillance System (TNIS) officially went online in 2007 and has allowed hospital users to voluntarily report data through either web-based entry or electronic data interchange. In 2008, about 330 hospitals reported data, and more than 70 hospitals helped in the process of establishing electronic data interchange modules. The number of nosocomial infection

reports jumped from over 45,000 person-times in 2007 to more than 93,000 person-times in 2008 (including make-up reporting of past data). Taiwan CDC also produced a nationwide nosocomial infection report quarterly in order to strengthen communication and guidance with hospitals.

- (2) To publicize the updated surveillance definitions of healthcare associated infection and to improve case enrollment consistency, Taiwan CDC published a handbook of surveillance definitions as a reference for case enrollment, as well as commissioned the Taiwan Joint Commission on Hospital Accreditation to implement the "Project of Updated Health Care-Associated Infection Definition Promotion and Case Enrollment Consistency Assessment."

Future Prospects

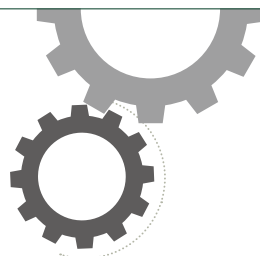
1. Taiwan CDC will continue to draft and implement nosocomial infection control regulations, and revise Taiwan's infection control guidelines on the basis of recommendations announced by the WHO or leading countries. Taiwan CDC will also gather information on international relevant policies, laws and regulations, and implementation results; this information will serve as the reference for policies making.
2. To constantly improve the quality of nosocomial infection control inspection, Taiwan CDC will draft the 2009 nosocomial infection control inspection quality improvement project based on the implementation experience in 2008 and the recommendations from various organizations. Moreover, the inspection schedule will be arranged according to the DOH's medical investigation consolidation policy in 2009.
3. Promotion of hand hygiene
 - (1) To advertise WHO's global "Save Lives Clean Your Hands" activity by publicizing the five moments for hand hygiene in health care and promoting the use of alcohol-based handrubs.
 - (2) To establish a culture of hand hygiene by conducting hospital hand hygiene audits relying on opinions from unbiased third party groups and a wide range of information sources.
4. Taiwan CDC will continue to promote hospital participation in the Taiwan nosocomial infection surveillance system, and to strengthen surveillance of nosocomial infections and antimicrobial resistance. Taiwan CDC will try to develop nosocomial infection quality indicators derived from different databases to construct indicators which are comparable and could represent nosocomial infection trends in Taiwan.





INTERNATIONAL HEALTH

International Health



International Ports Quarantine Activities

Background

Being situated in the subtropical zone, Taiwan is vulnerable to the invasion of various tropical diseases. This is especially true because of our thriving international tourism and trade. To ensure quarantine, the government has set up quarantine offices at airports (Songshan, Taoyuan, Taichung and Kaohsiung-Xiaogang), seaports (Keelung, Kaohsiung, Taichung, Hualien, Suao, and Mailiao), and the three terminals (Kinmen, Matsu and Makung) of the “Mini-Three-Links” with China. This prevents the import of diseases and protects the public’s health. The planning and supervision of quarantine work at these airports and seaports is the responsibility of the Taiwan CDC Second Division.

To meet the International Health Regulations (2005) [(IHR (2005))] requirements and prevent the importation of diseases by aircraft and ships, the Taiwan CDC has revised the Regulations Governing Quarantine at Ports. These regulations authorize the quarantine units to take all necessary quarantine measures against inbound ships, aircrafts, their crew, passengers, and cargo for national security and public health protection.

Goals

Improving Information Management

Improving the one-stop information system for quarantine operations, making the quarantine process and the information management more efficient.

Streamlining and Standardizing Process Operations

Calling for timely revision and standardization of the operational process by reacting to the latest epidemic information while benefiting from historical precedence.

Quarantining Procedure Follow Through

All inbound aircraft and ships, including their crew, passengers and cargo, are subject to quarantine to prevent the import of diseases. After release from quarantine, follow-up health checkups may be performed.

Accomplishments and Strategies

1. One-stop information service: Establishing a one-stop information system for all information regarding quarantine operations. This includes quarantine operations for aircraft, ship quarantine, ship sanitation certificates, vaccinations, fee collection, online check and statistics, etc.
2. Maintaining the standard operational process: Employing ISO 9001 international quality to keep the standardized process of ship quarantine by review at international seaports.
3. Aircraft and ships quarantine:
 - (1) Quarantine by review: Any craft destined for a Taiwan port is required to report the state of its sanitation and the passengers' health prior to landing via telegraph, telex, fax, mobile phone, or e-mail. Permission to enter the port is granted after reviewing the report and confirming there is no danger of importing a diseases. The procedure is intended to shorten the time of any quarantine.
 - (2) On-board quarantine: There are five possible scenarios for on-board quarantine: a. an inbound ship or aircraft has not been applied for quarantine, b. it has been applied but failed to meet the quarantine requirements, c. it has reported a passenger/crew member suspected of suffering from a communicable disease, d. there is abnormal death of animals, and e. there is a suspected patient or death on craft. In these cases, quarantine officers may board the ship or aircraft to quarantine it. The following table shows the state of quarantine in 2008:

Table. Statistics on quarantine work at international ports in 2008

Quarantine unit	Ships	Passengers	Aircraft	Passengers	Cargo Planes	Tonnage of cargo
1 st Branch Office (Keelung)	6,756	13,0149				
1 st Branch Office (Suao)	470					
1 st Branch Office (Kinmen)	6,391	661,102				
1 st Branch Office (Matsu)	1,391	52,502				
1 st Branch Office (Songshan)			446	66,494		
2 nd Branch Office (Taoyuan)			57,290	9,884,888	11,000	3,521,365
3 rd Branch Office (Taichung)	5,573	22	2,395	224,864		
3 rd Branch Office (Mailiao)	3,029	41				
5 th Branch Office (Kaohsiung)	15,461	2,4021				
5 th Branch Office (Xiaogang)			10,530	1,417,695	93	30,547
6 th Branch Office (Hualien)	902	888	28	2,167		
Total	39,973	868,725	70,689	11,596,108	11,093	3,551,912

4. Crew and passenger quarantine: Early detection and prevention of communicable diseases requires all arriving passengers to have their body temperature scanned with using an infrared thermal apparatus. Only passengers showing symptoms are required to fill out the Communicable Disease Survey Form. Depending on the severity of the symptoms and travel history, those individuals reported with possible symptoms are required to give an onsite specimen and/or follow up with local health authorities.

Of the 12,464,833 passengers who arrived in Taiwan last year, only 16,473 showed symptoms and were put on the local quarantine tracking list. Arriving passengers who become ill after entry are encouraged to seek medical advice and inform their doctors of their recent travel history. The Taiwan CDC installed a nationwide toll-free hotline (1922) for consultation purposes. Last year, using data from completed forms and body temperature scans, the Taiwan CDC found 112 cases of dengue fever, 27 cases of shigellosis, 9 cases of Chikungunya, 20 cases of Salmonella and 17 cases of *Vibrio parahaemolyticus*.

5. Control of disease vectors in ports: The purpose is to control the vector density (i.e., any infectious disease carrier such as rats, mosquitoes, etc.) at the ports to stop the spread of communicable diseases. The following measures have been taken to stop the breeding of vectors.

(1) Rat control:

- a. Anticoagulant bait is placed year round where rats are most active. The bait is replenished every 10-15 days to ensure its efficacy.
- b. Monitoring the parasites and infectious serum of rats in port areas (including Kinmen, Matsu and Makung, the three "Mini-Three-Links" terminals with the mainland) was performed. The rats caught were examined for parasites to understand the variety and quantity of the parasites. Furthermore, the rats' blood serum was examined for evidence of plague and Hanta virus.

(2) Mosquito Control:

Mosquitoes are vectors of several communicable diseases, including yellow fever and dengue fever. The mosquito population density is closely related to the development of an epidemic. Therefore, it is necessary to understand the variety and quantity of mosquitoes. Controlling the population can prevent an epidemic. The following methods have been adopted:

- a. Controlling the breeding of dengue fever vectors: Empty containers that are prone to retain water (bottles, jars, tires, etc.) are checked monthly to track the breeding of vector mosquitoes. Any larvae are killed.
- b. Setting ovitraps: Traps are placed around the port/airport for mosquitoes to lay eggs. They are pieces of coarse cloth moistened with Temephos. After the eggs hatch, the larva are killed with insecticide. The traps are replaced monthly, and the number of eggs laid is used for calculating the mosquito index in the port areas.
- c. Surveying mosquitoes: Lamps are hung in selected places to trap mosquitoes to identify their types and track their activities.
- d. Organizing the international port sanitary groups: They are selected by the Taiwan CDC's branch offices from personnel of the port authority, the port police, the customs office, the cargo transportation station, and other related organizations. Depending on the circumstances, these representatives meet every three to six months, to plan, coordinate, and implement matters concerning sanitation.

6. Other measures of sanitation control:

- (1) Shipboard sanitation control: To prevent the spread of disease on ships on international routes, the Taiwan CDC imposes control of such ships in accordance to the WHO International Health Regulations and the Regulations Governing Quarantine at Ports.
 - a. IHR (2005) had been entered into force by the required sanitary document for international shipping including the Ship Sanitation Control Exemption Certificate/Ship Sanitation Control Certificate since 15 June 2007. The Taiwan CDC now uses this document for carrying a six month period of validity, to identify and record all areas of ship-borne public health risks, together with any required control measures to be applied.
 - b. To prevent rats from running to the shore along the mooring cable, a rat guard must be hung on the cable. If a ship is found as having failed to do so, it will be immediately corrected and put on record for quarantine reference when it called on the port next time.
- (2) In coordination with "Mini-Three-Links" from the mainland to Kinmen, Matsu, and Makung, the Taiwan CDC has installed quarantine units on the three offshore islands.
- (3) The quarantine for illegal mainland immigrants caught at various fishing ports is entrusted to the local health authority.
- (4) The Taiwan CDC's quarantine units have invited the various related organizations to establish an "international port sanitary group."

Future prospects

1. Increase manpower and equipment, strengthen quarantine function, and perform the quarantine conscientiously to stop the import of disease.
2. Strive to develop professional quarantine personnel, encourage the development of new quarantine techniques, and raise the quality of quarantine officers and their work.
3. Improve the eradication of vectors on ships, and the rat and mosquito population monitoring in port areas to avoid the spread of communicable diseases.



The Global Outbreak Assistance

Corps of Taiwan (GOACT)

Background

As public health and medical science advances, many infectious diseases have become less of a threat. However, as the frequency of international travel rises and the environment changes, scientists are noting increased threat of emerging and re-emerging infectious diseases. Whenever an epidemic occurs, the whole world needs to be on the alert.

In order to construct global disease prevention system, the World Health Organization's Global Outbreak Alert and Response Network (GOARN) has dispatched 400 experts to more than 40 countries worldwide to assist in various diseases. Furthermore, the USCDC sends medical teams to deal with outbreaks all over the world from its headquarters in Atlanta, and has stationed 200 experts in 40 countries to provide technical assistance in controlling diseases. In 1982, 1984, and 2003, during the outbreaks of polio, enterovirus, and SARS in Taiwan, the USCDC immediately dispatched experts to provide assistance.

In order to gain a preemptive advantage in the fight against diseases, Taiwan CDC established the Global Outbreak Assistance Corps of Taiwan (GOACT) on June 27, 2007. It consists of preventive medicine physicians, epidemiologists, laboratory scientists, vector control specialists and epidemic investigators. The team likens disease prevention to war, and is always ready to fight on behalf of other countries to prevent diseases from invading Taiwan.



Taiwan relief work in Thailand after South Asia tsunami, 2004.



Rift Valley fever control in January 2007.



Goals

With their professional expertise and experience, GOACT participates in disease prevention operations worldwide, providing assistance and guidance, and improves Taiwan's disease prevention capabilities. During overseas operations, GOACT can learn more about diseases and gain more experience in disease prevention, and in turn reduce the threat of disease to Taiwan's residents.

Furthermore, by participating in operations with other nations, Taiwan will be one step closer to the goals of preventing epidemics and stopping disease at the border, protecting the health of Taiwan residents, and becoming a permanent part of global disease outbreak defenses.

Accomplishments

Prior to forming a regular team, GOACT participated in numerous international epidemic control missions such as the South Asia tsunami disaster in 2004, Kenya's Rift Valley fever outbreak in 2007 and Paraguay's dengue fever control in 2007.

Since its official formation in mid-2007, GOACT has participated in the following activities: finding and tracking the extensively drug resistant tuberculosis patient in Nanjing, China; preventing outbreaks in Ecuador after a flood; monitoring the flu epidemic in Hong Kong and exchanging related information; aiding the earthquake disaster medical service in Sichuan, China, and assisting in the cyclone Nargis disaster in Myanmar.

To ensure completion of their missions, Taiwan CDC provided all required resources, modern communication equipment and mobile labs. Related training sessions were completed by December 2007, which included international disease prevention and equipment operation. The team members also received all necessary vaccinations. In addition, Taiwan CDC has created a set of regulations regarding the team's responsibilities and rights.



Aiding the earthquake disaster medical service in Sichuan, China.



Assisting in the cyclone Nargis disaster in Myanmar.

Future Prospects

With professional expertise and state-of-the-art equipments, GOACT is able to quickly acquire all important information and emerge victorious in any battle against disease. Diseases do not stop at national borders all on their own. With the high frequency of international travel, an epidemic from other parts of the world may spread around the globe in a single day. To avoid a repeat of the SARS epidemic, which was an imported epidemic, GOACT will engage in operations wherever required to fulfill its responsibilities as a member of international society. By participating in international operations, the establishment of GOACT will surely become a milestone in Taiwan's history of disease prevention.

Travel Clinics

Background

An increasing number of Taiwan's citizens have engaged in international travel in recent years. This may pose potential health risks not only to the travelers, but also to the public. Diseases that have been eradicated in Taiwan and certain rare diseases still occur in some countries. If citizens fail to take appropriate preventive measures before and while traveling abroad, they might acquire illness and endanger their health. Therefore, Taiwan CDC established a Travel Health Center on June 11, 2007 to provide pre-travel consultation and vaccination. In order to expand the center's services, Taiwan CDC further established the Travel Medicine Education and Training Center at the National Taiwan University Hospital on January 25, 2008. This center offers geographically-specific information on preventable diseases to travelers, and provides training in clinical practice and decision-making skills to medical personnel. The center's main services are as follows:

1. Pre-travel health education: Because every country has different hygiene conditions and prevalent diseases, travelers must receive health education specific for their destinations. Doctors at the Travel Medicine Education and Training Center provide travelers with individualized consultation for disease prevention depending on travel time, destination, and season. Information provided by the center is consistent with the latest information from the World Health Organization and the US Centers for Disease Control and Prevention. Vaccinations and prophylactic drugs are also provided.
2. Recommendations for international preventive vaccinations and prophylactic drugs: Some infectious diseases—such as yellow fever still prevalent in certain areas can be prevented through vaccination. Malaria can be prevented by taking prophylactic drugs. The appropriate preventive vaccinations administered at the center enable citizens to travel and live overseas with good health and peace of mind.
3. Pre-travel consultation and health education: The center offers other travel-related health consultation services, and can provide referrals for more extensive health checkups at various regional hospitals.
4. Establishment of a domestic travel medicine outpatient demonstration center: The center has expanded outpatient travel medicine and international preventive vaccination services once limited to the Taipei area to 11 hospitals around the country. These facilities are actively promoting travel medicine-related research and education.

Goals

Because WHO considers infectious disease consultation for international travel an important issue, the Travel Medicine Education and Training Center has the mission to provide citizens with thorough preparation before leaving the country, as well as follow-up upon their return via health consultation, medical services, professional training for medical personnel, and research. The center provides

specialized training to health personnel, conducts research, analyzes collected data, and provides relevant agencies with information to guide the formulation of policies. In the future, the center will lead the development of travel medicine in Taiwan and the Asia-Pacific region.

Accomplishments

Since January 2008, the Travel Medicine Education and Training Center has provided outpatient services 2,724 person-times and telephone consultation 2,154 person-times. In addition, the center also provided pre-departure health education services to Taiwan's overseas volunteer teams and conducted group health education sessions.

Furthermore, apart from regularly scheduled classes, the center also provides teaching demonstrations and holds workshops providing medical personnel with travel medicine training. The center held 23 workshops in 2008; each workshop consisted of two hours of core instruction. Doctors participated in basic travel medicine classes roughly 800 person-times, and nurses participated 400 person-times. The center further held several large academic seminars, including an international seminar on vaccination and a seminar on new progress in travel medicine and vaccination. Travel medicine-related personnel took part in each seminar approximately 50-100 person-times. The foregoing activities are ensuring the diversified professional development of travel medicine in Taiwan.

For travel medicine research, the center focused on surveys in 2008, and collected and analyzed approximately 2,600 completed questionnaires during the year. This work led to a better understanding of the population using travel medicine services, destinations, purposes of foreign travel, and medical services received by travelers. In addition, the center also conducted a survey focusing on knowledge of mosquito-transmitted travel diseases. This survey, which collected 318 questionnaires from citizens and medical personnel, provided valuable first-hand information for further development of travel medicine research in Taiwan.

Because medical professionals must possess knowledge and skills when providing travel medicine services, and because there is still a need for travel medicine textbooks specifically written for Taiwan, the center jointly published the "Travel Medicine Slide Set" in conjunction with other domestic experts. This slide set is an important reference for Taiwan's travel medicine. Furthermore, in order to provide the public with travel-related information, and to ensure citizens conduct overall assessments before embarking and know how to protect their health while abroad, the center has published the "Pocket Physician Travel Health Guide." This compact volume gives the public an easy-to-understand specialized guide to travel medicine.

Future Prospects

Taiwan CDC's original travel health center has now been expanded to the "Travel Medicine Education and Training Center." Apart from its office at National Taiwan University Hospital, the center has also signed contracts with Keelung Hospital, the Taipei branch of Mackay Memorial Hospital, the Taoyuan International Airport clinic of Landseed Hospital, Hsinchu Hospital, Taichung Hospital, the Wuci branch of Tungs' Taichung MetroHarbor Hospital, National Cheng Kung University Hospital, the Museum of Fine Arts branch of Kaohsiung Municipal Hsiao-Kang Hospital, and Hualien Hospital to provide travel medicine services and international preventive vaccinations throughout Taiwan.

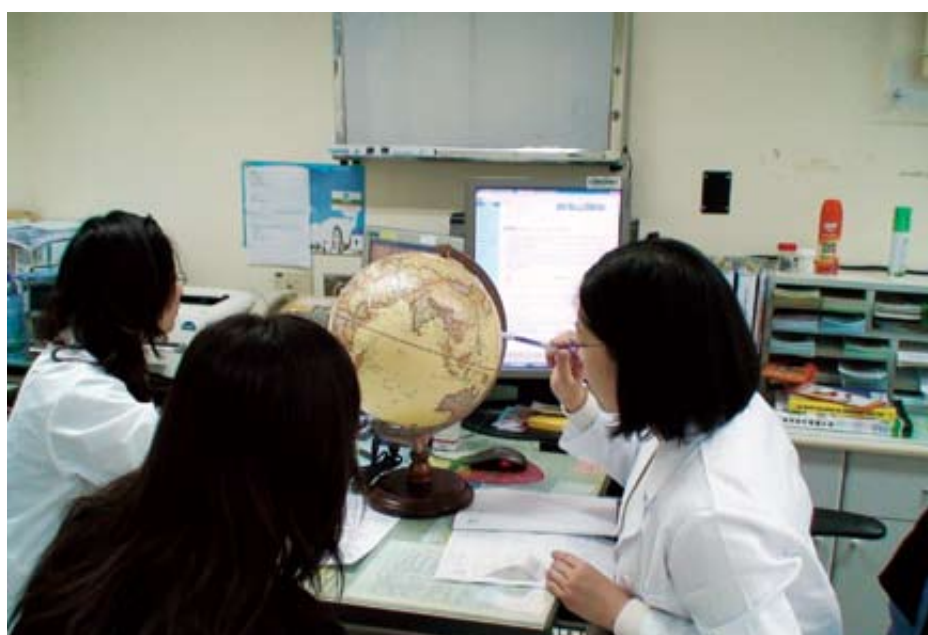
The Travel Medicine Education and Training Center's goals consist of providing integrated international travel health consultation, tracking the health of travelers after their return to Taiwan, conducting travel medicine training and research, and training travel medicine instructors and providing in-service training in travel medicine to domestic doctors. The center believes that it can ensure that the public will obtain superior medical care, stimulate interchange between domestic travel medicine professionals, and ensure

that medical personnel continue to obtain knowledge and professional growth opportunities, while promoting further development of travel medicine research.

After Taiwan CDC's travel health center completed its mission, Taiwan CDC ceased to provide in-house travel medicine outpatient consultation services. The Taiwan CDC does provide regular hypertension, diabetes, cholesterol, and triglyceride tests to its personnel out of concern for their health. These services provided a total of 102 person-times in 2008. In addition, Taiwan CDC also provides three self-service sphygmomanometers and a scale for the use of personnel at any time. In order to boost employees' knowledge of emergency medical procedures and response skills, Taiwan CDC purchased an automated external defibrillator (AED) in 2008, and conducted training, such as CPR and AED operation workshops. In the future, Taiwan CDC plans to establish an employee mental health center to provide personnel with mental health consultation services.



Opening ceremony for the Travel Medicine Education and Training Center, jointly established by Taiwan CDC and National Taiwan University Hospital, was held on January 25, 2008.



Travel medicine clinic consultation provided to the public.

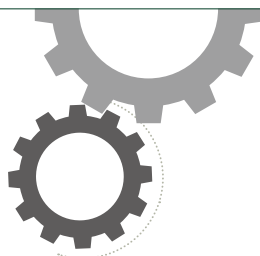


The "Pocket Physician Travel Health Guide" is a pocket guide to travel medicine for the public.



NATIONAL IMMUNIZATION PROGRAMS

National Immunization Programs



National Immunization Information System (NIIS)

Background

In 1992 the Department of Health began a drive to computerize health center operations, setting up the DOS-based Primary Health Information System (PHIS) which includes immunization management. After years of hard work, more than 300 health centers in Taiwan have come online. To handle a variety of situations, including immunization work demands and the enhancement of data bank efficiency and to keep pace with rapid advances in information and network technologies, the Centers for Disease Control, under the Executive Yuan's Department of Health, began making plans for a National Immunization Information System (NIIS) in 2001. The objective is to utilize the Internet to consolidate all immunization data scattered between the various health centers into the Centers for Disease Control. Overall operations, which commenced in 2004, have served to effectively integrate and upgrade immunization data, making it more comprehensive, while enhancing the efficiency of vaccine inoculation and management operations.

Current State of Immunization

In an effort to prevent outbreaks and to curb the spread of various communicable diseases, the government provides routine infant immunization (schedules are shown in Figure 1). Hospitals and clinics in various counties and cities have been contracted to offer full spectrum immunization to make it more convenient and raise immunization rates. So far, there are more than 1,600 contractual hospitals and clinics across Taiwan. In 2008, more than 4,000 hospitals and clinics participated in the flu immunization program (including vaccination for children).

Age Vaccine	>24 hrs	2-5 days	1 month	2 months	4 months	6 months	9 months	12 months	15 months	18 months	24 months	27 months	30 months	6 years	>65 years		
BCG	1st																
Hepatitis B	1st		2nd		3rd												
Diphtheria, Tetanus, Pertussis					1st	2nd	3rd					4th					Tdap ^{&}
Polio					1st	2nd	3rd					4th					5th
Varicella	1st																
Measles, Mumps, Rubella ^α									1st							2nd	
Japanese Encephalitis [*]									1st 2nd						3rd	4th	
Influenza ^α	← Vaccinations every October → yearly																
Hepatitis A [#]													1st		2nd		

* Two weeks interval between dose 1 to dose 2.

□ 2008, October—flu immunization program for schoolchildren in grades 1-4.

In selected aboriginal areas.

& 2009, March—start of vaccination first graders using the Tdap vaccine.

Figure 1. Current Immunization Schedule in Taiwan

Goals and Strategies

1. County and city health departments continue to use NIIS to put their signed hospital contracts online. The usage rate (98%) can be used as part of their performance reviews and evaluations.
2. Household data is obtained from the Department of Civil Affairs of the Ministry of the Interior. The information is updated daily and is collected for transmission to the National Immunization Information System (NIIS). Then the data (including change of address, birth, and death information) is passed to health stations for referral consolidation. This immunization data distributed throughout the health stations can be consolidated for registration, elimination of the need for separate data storage, lower referral consolidation expense, and cost effectiveness.

Accomplishments

1. Completion of immunization electronic reportage operations for contractual medical facilities (about 1,600).
2. Progressive replacement of magnetic strip cards with National Insurance IC cards used by medical facilities to report preventive inoculation data. Approximately 600 contractual medical facilities have completed the changeover.
3. Actively enhancing the functions and efficiency of the central database to handle rapid increases in data quantities over the years. Management efficiency has improved markedly.
4. The vaccine coverage rate is 95% (with the exception of JE2). This has greatly increased the efficiency by which relevant authorities directly manage operations that take place within their jurisdictions.
5. The computerization of immunization data has enhanced referral and management efficiency.
6. Vaccine-related operational procedures, performed manually in the past, have been computerized, greatly increasing efficiency.

Future Prospects

The NIIS digitalized its connections with household registration departments, health agencies, and medical institutions through provision of a comprehensive, rapid, online database. Electronic referral forms reduce the amount of referral slips ("yellow cards"), reduce staff workloads, and increase convenience. Urging people to receive immunization can facilitates the work of disease control.

In the future, we'll continue to enhance real-time online reporting of immunizations administered outside of medical facilities.

Although Taiwan has consistently maintained a high immunization rate for routine vaccines, Taiwan CDC will continue to strengthen management of atypical cases, such as foreign spouses of citizens, children who follow their parents working abroad, and children who fail to complete their immunizations due to family factors, and will seek out feasible channels for completing immunization of the affected persons. Taiwan CDC is thus striving to boost the immunization rate and realize the goal of disease prevention.

Immunization reminders are sent via mobile phone, text message, and email to make the NIIS database as complete and effective as possible. This is to be linked to the Communicable Disease Information System to be used in epidemic prevention and control.

The Central Database Subsidiary System can be used to support strategic policy decisions, to evaluate vaccine efficacy, to supervise disease control through immunization, and to obtain disease control information instantly. In the future, Taiwan's health and medical operations will be internationalized. The 21st century requires for health and medical information to be disseminated via the Internet.

Expanded Immunization

Program (EIP)

Background

Vaccination is one of the most cost-effective strategies in the fight against disease. Since 1948, the government of Taiwan has provided free-of-charge child immunization, including BCG vaccine, diphtheria, whooping cough, tetanus (DTP), polio, hepatitis B, chicken pox, measles, mumps, German measles (MMR), Japanese encephalitis, and influenza. Twelve types of vaccines are available to Taiwanese children, as a result, the aforementioned communicable diseases have been brought under control and in some cases eradicated.

The international health community is constantly increasing funding and manpower in order to develop new and combination vaccines and vaccines with longer efficacy. Various governments are also making full use of their resources to provide effective and safe mandatory vaccines, introduce new vaccines, promote policies on immunization and vaccination, establish a stable, comprehensive vaccine supply system, and improve immunization coverage. In other words, the ultimate goals of vaccination are to achieve maximum benefit and effectiveness of the vaccine and to protect the health of citizens through effective immunization and vaccination strategies.

Strategies

1. In order to vigorously promote Taiwan's preventive immunization policy, Taiwan CDC has taken advantage of legal revisions to establish a vaccine fund. In the future, Taiwan CDC will use funds from this stable and independent source, which is also earmarked and offers use flexibility, to purchase various vaccines.
2. Continue routine immunization services. Observe global disease control strategies. Improve the immunization system. Promote a supplementary plan.
3. Increase immunization coverage and quality of services.
4. Develop a high-quality supply and vaccine management program.

5. Provide an appropriate evaluation program for the routine promotion of the EPI program.
6. Review and modify EPI strategic plans to control national and international infectious diseases, meet immunization needs, and enhance capabilities.

Goals

1. Manage and maintain the purchase, distribution, and cold chain system of the vaccines recommended by the EPI program.
2. Increase immunization coverage by improving immunization services and promoting the supplementary plan.
3. Hold training seminars on the cold chain system, storage management, and immunization practices to ensure vaccine quality and professional knowledge of medical personnel.
4. Promote e-management of immunization programs to increase the efficiency of information management and analysis, improve service capabilities, integrate information on immunization, accelerate resource sharing, and enhance our efficiency to be on a par with other advanced nations.

Future Prospects

1. Build up a safe vaccine supply system and increase immunization coverage of all vaccinations by implementing immunization services to reach eradication and elimination goals.
2. Include a new vaccine to the EPI-recommended vaccine list after: (1) reviewing the current situation of communicable disease control; (2) assessing its impact on public health, social economics, and medical costs; (3) updating any vaccine R&D, production and supply information; (4) allocating the health fiscal budget for vaccine purchase.
3. Develop and promote an appropriate immunization program for the elderly to reduce mortality and morbidity rates from complications of vaccine-preventable diseases.
4. With a stable source of funds from the vaccine fund, over a period of years the CDC will gradually add new vaccines to the routine immunization schedule on the basis of cost effectiveness and the recommendations of the Advisory Committee on Infectious Diseases.

The new vaccination items include:

- (1) Tdap vaccines will in place of the routine use of Td vaccines for the first grade students.
- (2) Pneumococcal conjugate vaccine (PCV) for children under 5 years old who is in high-risk group.
- (3) Combination vaccine (5-in-1 or 6-in-1) for routine children immunization.
- (4) Pneumococcal conjugate vaccine (PCV) for routine children immunization.
- (5) Pneumococcal polysaccharide vaccine (PPV) for elderly person aged over 65 years old.

Hepatitis Immunization Program

From 1982 to 2007, five five-year plans have been completed under the Hepatitis Control Program. The sixth five-year-plan began in 2008 and will end in 2012. The priorities are: improving the surveillance system for acute cases, severing Hepatitis A infection paths, enhancing health education on liver disease control, improving blood transfusion management, and raising hepatitis examination quality. The Taiwan CDC will move in the following directions: early detection screening of hepatocellular carcinoma and seeking effective hepatitis treatment.

Objectives and Strategies

The main objectives and strategies are to raise the Hepatitis B immunization coverage rate to above 95%; increase the rate of free Hepatitis B screening for pregnant women to above 90%; promote the inclusion of two-year-olds in Hepatitis A immunization in aboriginal regions; reduce the acute Hepatitis A incidence rate in aboriginal regions to 5 per 100,000 people; improve quality control for hepatitis diagnosis; and raise the hepatitis diagnostic accuracy rate to at least 90%.

Accomplishments

Immunization

Hepatitis A

Confirmed cases of acute viral Hepatitis A in aboriginal regions were reduced from 183 in 1995 to 1 in 2007 and the incidence rate was lowered from 90.74 out of 100,000 people in 1995 to 0 out of 100,000 in 2008.

The Taiwan CDC have recently carried out "Hepatitis A prevention and immunization pilot plan targeting night market food vendors" in 2008. Under the plan, food vendors were screened for hepatitis A antibody and will be issued with a certificate of hepatitis A immunization. The plan is implemented not only to reduce hepatitis A transmission, but also to ensure food safety at the night markets.

Hepatitis B

- (1) This study shows that yearly carrier rates have declined significantly and steadily from 10.5% in 1989 to 0.8 % in 2007 (Figure 2).
- (2) The coverage rates of second and third doses of HBV for babies born in 2007 are 98.08% and 96.51%, respectively.
- (3) A review of the vaccination records of new elementary school students shows that Hepatitis B vaccination rates are 99.5% for the second dose and 99.26% for the third dose.

Quality Control of Laboratory Diagnosis of HBV and HCV Serum Markers

Taiwan CDC supervised and monitored the quality control of laboratory diagnosis of HBV and HCV serum markers tested in hospitals and private clinics. The consistency rate of HBsAg, anti-HBs, HBeAg and anti-HCV in 2008 were 94%, 97.7%,98.7% and 95.8%,respectively.

Hepatitis Study and Research

The research program focus on hepatitis policy assessment including HBIG policy, Hepatitis B vaccination booster issue and all types of hepatitis incidence rate, sequela, mechanisms, and treatments,etc.

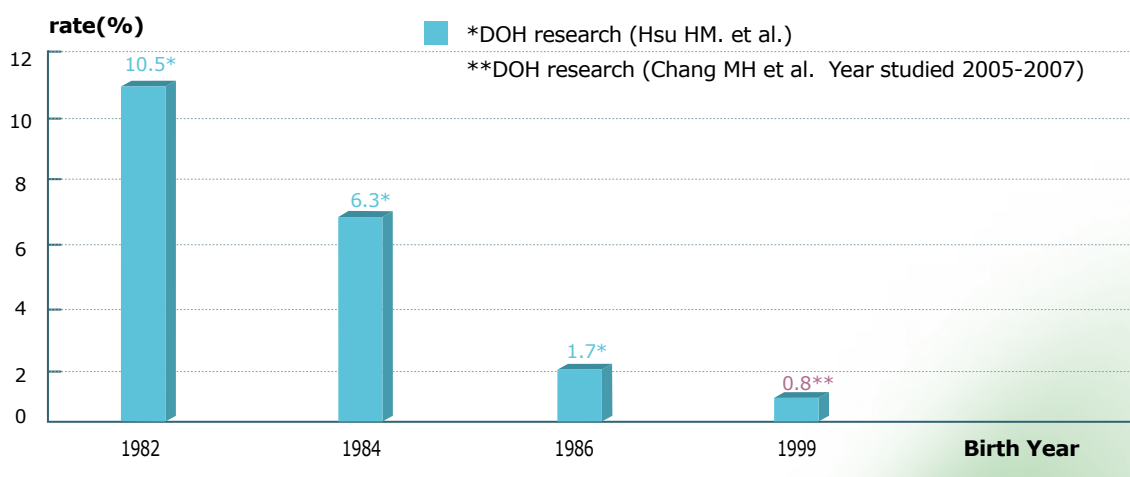


Figure 2. Hepatitis B carrier rate (HBsAg) at age six in Taiwan

Promotion of Hepatitis B and C Trial Treatment Program

There are approximately 2.5 million Hepatitis B carriers and 700,000 people infected with Hepatitis C in Taiwan. To give appropriate treatment to the infected population and reduce the incidence rate of liver cirrhosis and hepatoma, the Bureau of National Health Insurance began promoting an Enforce Hepatitis B and C Trial Treatment Program. Between October 2003 and December 2008, the program treated 34,530 and 17,861 Hepatitis B and C patients, respectively.

Future Prospects

To promote public awareness about hepatitis risk factors, increase the immunization coverage rate, improve laboratory diagnosis ability of HBV and HCV serum markers and treatment research to reduce incidence rates and mortality rates of all kinds of hepatitis, liver cirrhosis and hepatoma.

Polio, Measles, Congenital Rubella

Syndrome, and Neonatal Tetanus

Eradication Programs

Background

Taiwan launched polio, measles, congenital rubella syndrome, and neonatal tetanus eradication programs in 1991. The goal of polio eradication was achieved on October 29, 2000. Currently, the epidemic areas are confined to only four countries worldwide.

In Taiwan, more than 95% of infants receive three doses of polio immunization, but 5% still fail to do so in time. This is a loophole in the polio control network. Before the virus is eradicated in the world, it could still invade Taiwan. Although Taiwan has eradicated polio, it has to maintain vigilance.

Measles can be eliminated through vaccination. It is the primary elimination target after polio. In recent years, around ten measles incidence has been registered except 2002 when 24 cases were reported.

No cases of neonatal tetanus have been reported since 1995. The sole exception was reported in 2001 and was an isolated case involving a child born to a foreign mother.

Since 1994, five cases of congenital rubella syndrome have been confirmed, three in 2001 and one in 2007, 2008, respectively. Four of the patients had foreign mothers.

This indicates that the latent danger of communicable diseases cannot be ignored, especially in view of frequent business exchanges, booming tourism, the import of foreign labor, and the increasing number of marriages between Taiwanese and foreigners or Mainland Chinese. It is, therefore, necessary to continue the eradication program for polio, measles, congenital rubella syndrome, and neonatal tetanus.

Goals

Maintain High Immunization Rates for All Diseases

This involves coordination with contracted immunization hospitals and clinics to improve service quality. Furthermore, we need to conduct immunization completion rate surveys to ensure appropriate remedial measures are taken for all women of childbearing age (especially foreigners) to protect against rubella, to maintain the cold chain system, and to shore up the immunization information system.

Improve Disease Surveillance

We need to focus on continuously tracking AFP, measles, rubella, and congenital rubella syndrome—analyzing this data immediately and improving the reporting and tracking system for babies who are not born in hospitals so as to fully understand neonatal tetanus cases. Furthermore, we must continue the zero-tolerance reporting system and follow-up telephone interviews and continue regular evaluations of county and city tracking operations. If shortcomings are discovered, the local health authorities are to be asked to propose plans for improvement. Furthermore, a rewards plan should be made to encourage excellent reporting.

Augment Lab Examination Capabilities

In addition to using the traditional serum methods to identify clinical cases, Taiwan should establish molecular biology technology for diagnosis in line with the WHO measles eradication strategy. To examine antigens and separate viruses, samples need to be collected in reported cases. Sampling quantities and timing should be regulated.

Enhance Completeness Rates and Correctness of Case Surveys

In addition to correct sampling, good case surveys must include immunization history, travel history, and information on whether or not contacted persons also display symptoms. This should all be part of the standard operational procedure for improving training for local health workers.

Conduct Health Education and Publicity

This should be done through different media channels to remind people of the need to immunize infants, especially those born to spouses from mainland China.

Research and Surveys

This involves a larger study of virus separation and assessment technology for measles and rubella; a molecular biological study of the genomic sequence; an evaluation of serum epidemiology; a cost effectiveness study of the immunization information system; and increases in immunization completion rates.

Accomplishments

1. In 2008, 78 AFP cases under the age of 15 were reported and investigated. Investigations were completed within 48 hours for 100% of them. All cases were neither polio nor polio compatible case.
2. In 2008, 70 measles cases were reported. The investigation rate was 100% and the sampling rate was 100%. 16 of these cases were confirmed to be measles.
3. Two suspected CRS cases were reported in 2008. Investigations and complete samplings were made. One case was confirmed.
4. No suspected neonatal tetanus case was reported in 2008. None of the cases involving babies not born in hospital were tracked down.
5. Since 2002, foreign (and mainland Chinese) female spouses have been required to obtain an updated rubella/immunization certificate.

Future Prospects

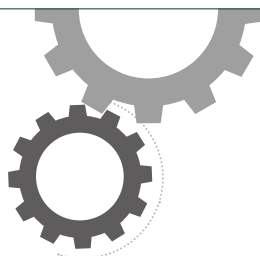
1. The eradication of polio must be maintained by preventing the importation of the disease.
2. Complete strategic planning of the global polio eradication program.
3. Implement active surveillance for measles and identify cases of measles infection.
4. Complete measles elimination certification in accordance with the WHO schedule.
5. Complete neonatal tetanus elimination certification.





RESEARCH, DEVELOPMENT AND MANUFACTURE

Research, Development and Manufacture



Research and Diagnostic Center

Background

In 2008, the Center employed 184 individuals, and the number of diagnostic specimens received and processed was 154,047. Facing the challenge of continuously emerging and re-emerging communicable diseases, the Center emphasized international collaboration with special focus on information exchange and new advances in laboratory technology. In addition, Center laboratories took proficiency tests (CAP) regularly, to assure the quality and accuracy of their diagnostic results. The Center consists of ten laboratories and four service sections, namely Viral Enteric and Emerging Diseases Laboratory, Viral Respiratory Diseases Laboratory, Vector-Borne Viral and Rickettsial Diseases Laboratory, Vector Biology Laboratory, Bacterial Respiratory Diseases Laboratory, Bacterial Enteric and Emerging Diseases Laboratory, Mycotic Diseases Laboratory, Mycobacterial Diseases Laboratory, Parasitic Diseases Laboratory, Pathology Laboratory, Administrative Section, Biological Resources Section, Quality Assurance Section, and Biosafety Section.

Goals

The primary objectives of the Center are to conduct research in achieving more efficient and comprehensive diagnostic methods, to perform laboratory-based epidemiological studies, and to study communicable disease pathogenesis. Other minor goals of the Center are to establish national reference laboratories, perform diagnostic services and technical support for the purpose of putting legally notifiable communicable disease incidents under control, and to assist national and international health agencies to consolidate such control strategies and policies.

Accomplishments

National Influenza Center (NIC)

July 5, 2006 marks the third anniversary of Taiwan's removal from the WHO list of SARS-affected areas, and Taiwan CDC has chosen this very day to hold the opening ceremony of a new affiliate called Taiwan National Influenza Center (Taiwan NIC) at its Kunyang facility. Taiwan NIC has so far achieved the following five major goals:

- (1) Having integrated all current efforts of influenza surveillance and notification with laboratory analysis systems throughout Taiwan to enhance our epidemic data collection process.
- (2) Monitored carefully new types of flu virus and viral antigen variation trends, and provided references to vaccine strain selection.
- (3) Prepared antibodies against local flu virus strains to facilitate the monitoring of virus diagnoses and typing.
- (4) Published a periodical entitled Influenza Express in both Chinese and English during every flu season.
- (5) Provided a platform for exchanges with other NICs across the world.

PulseNet Taiwan

PulseNet Taiwan, a national molecular subtyping system for surveillance of bacterial infectious diseases was established for early detection of infection clusters by comparison of DNA fingerprints of bacterial isolates. The system can be applied in food safety surveillance systems for early detection of food-borne disease outbreaks, and can serve as a platform for academic study and disease surveillance for domestic and international public health institutes.

Viral Enteric and Emerging Diseases Laboratory

- (1) Conducted HIV-1 genotyping and drug-resistant surveillance among different risk groups such as IDU, MSM, and Heterosexual group.
- (2) Molecular epidemiology study of EV71 infections and investigation on host cross-protection between different sub-genotypes of EV71 infections.
- (3) Strengthened links between laboratory diagnostic results with epidemiological investigations so as to positively impact infectious disease prevention.
- (4) Established a primer bank for emerging viral diseases such as HBoV, CoV, HoKo, Parechecoviruses, etc.
- (5) Executed an acute flaccid paralysis surveillance system to comply with WHO Global Polio Eradication Initiative.
- (6) Replaced NT test with IgM Capture Assay to confirm EV71 infections.
- (7) Implemented a quality assurance program for serological detection of HIV-1 and hepatitis B/C virus infections amongst teaching hospitals and medical laboratories.
- (8) Expanded the virus diarrhea surveillance system to include norovirus, astrovirus, and adenovirus 40 & 41 infections.
- (9) Established HIV-1, enterovirus 71, hepatitis B/C virus, and rotavirus genomic sequences database.
- (10) Cooperated with teaching hospitals, scholars, life science research institutes, and international public health research institutes such as CDC in the USA and NIID in Japan for the prevention of emerging infectious diseases.



Viral Respiratory Diseases Laboratory

- (1) Performed routine diagnoses of respiratory viruses including SARS, Influenza virus, Measles virus, Rubella virus, Mumps virus and VZV.
- (2) Tracked down the influenza virus evolution in Taiwan, including its antigenic and genetic changes.
- (3) Prepared ferret antisera against local flu virus strains and facilitated the virus diagnoses and typing.
- (4) Maintained close contact with WHO Collaborating Influenza Centers and delivered current influenza virus isolates of Taiwan to aid the latter in surveillance, epidemiology, and control of influenza.
- (5) Investigated the genotypes of measles viruses and rubella viruses in Taiwan.
- (6) Used ELISA and PCR technologies to perform routine diagnoses of respiratory viruses.
- (7) Designed real-time PCR primers and probes to enhance the specificity and sensitivity of our lab tests.
- (8) Established a multiplex diagnostic technology, a microarray method, to detect unknown infections.

Vector-borne Viral and Rickettsial Diseases Laboratory

- (1) Established a flavivirus reference laboratory to provide laboratory standards and diagnostic services to domestic and international health agencies.
- (2) Established a rickettsia reference laboratory to provide laboratory standards and diagnostic services to domestic and international health agencies.
- (3) Conducted routine diagnoses of dengue fever, Japanese encephalitis, yellow fever, West Nile fever, chikungunya, hantavirus, scrub typhus, and typhus fever using serological methods (ELISA and/or immunofluorescence assay), molecular methods (real-time PCR), and isolation methods (cell culture).
- (4) Established molecular method to diagnose spotted fever group of rickettsial infections.
- (5) Conducted an airport fever screening program for the surveillance of importation of dengue, chikungunya, and other arboviruses.
- (6) Applied dengue nonstructural protein 1 antigen rapid test for on-site detection of imported dengue cases at airports.
- (7) Built genomic databases for molecular epidemiologic studies of dengue virus, Japanese encephalitis virus, and Orientia tsutsugamushi.
- (8) Conducted an international cooperation program with Japan's NIID entitled "Characterization of Dengue Viruses Prevalent in Taiwan and Other Mosquito-borne Viruses Prevalent in Asia."

Bacterial Respiratory Diseases Laboratory

- (1) Performed routine diagnoses and identification of Bordetella pertussis, Neisseria meningitides, Streptococcus pyogenes, invasive Streptococcus pneumoniae, Legionella spp., invasive Haemophilus influenzae type b, and Bacillus anthracis by conventional and/or molecular methods.
- (2) Identified respiratory bacterial pathogens using electron microscopy.
- (3) Conducted outbreak investigations for respiratory bacterial pathogens.
- (4) Developed real-time PCR detection methods for respiratory bacterial pathogens.

- (5) Conducted molecular genotyping of *Legionella* spp., *Bordetella pertussis*, and *Streptococcus pyogenes* that caused scarlet fever in northern Taiwan.
- (6) Monitored serotypes and antimicrobial susceptibility for invasive *Streptococcus pneumoniae*.
- (7) Participated in CAP tests and an internal quality assurance program.

Bacterial Enteric and Emerging Diseases Laboratory

- (1) Conducted conventional diagnoses of *Vibrio Cholera*, *Salmonella typhi*, *paratyphi*, *Salmonella* spp, *Shigella* spp, *Escherichia coli* O157, *Burkholdera pseudomallei*, *Yersinia pestis*, *Leptospira interrogans*, *Borrelia burgdorferi*, *Bartonella henselae*, and *Francisella tularensis*.
- (2) Established a national and international reference laboratory.
- (3) Established a genomic database for *Burkholdera pseudomallei* by molecular genotyping (PFGE and MLVA).
- (4) Participated in outbreak investigations.
- (5) Developed real-time PCR detection methods for emerging bacterial *Leptospira interrogans* and *Borrelia* spp.
- (6) Performed surveillance of *Leptospira interrogans* and *Borrelia* spp. in ectoparasites and field rodents in Taiwan.
- (7) Initiated relevant international collaborations.

Mycobacterial Diseases Laboratory

- (1) Provided diagnosis and identification services.
 - a. Standardized conventional and molecular diagnostic methods.
 - b. Developed and evaluated new molecular diagnostic and genotyping methods.
 - c. Provided species identification and confirmation services.
- (2) Involved in outbreak and pseudo-outbreak investigations of cases at schools, hospitals, long-term care facilities, etc.
- (3) Conducted needed molecular epidemiological studies.
 - a. Analyzed trends of population structure of *Mycobacterium tuberculosis* strains
 - b. Investigated transmission of multiple-drug resistant *Mycobacterium tuberculosis* isolates.
- (4) Established a mycobacteria genomic database.
 - a. Conducted molecular genotyping of *Mycobacterium tuberculosis* isolates using RFLP, spoligotyping, and MIRU-VNTR.
 - b. Carried out sequence analyses of nontuberculous mycobacteria.
 - c. Did sequence analyses of drug resistance and virulence genes.
- (5) Maintained a mycobacteria strain banking system.
- (6) Implemented a laboratory external quality assessment program.
 - a. Conducted AFB-smear, identification, and drug susceptibility rechecking.
 - b. Provided proficiency tests for drug susceptibility investigating.
 - c. Carried out on-site evaluation of clinical laboratories.

- (7) Provided technical training and education programs.
- (8) Maintained a mycobacterial laboratory surveillance system
 - a. Monitored drug-resistant Mycobacterium tuberculosis isolates.
 - b. Tracked Mycobacterium bovis in Taiwan.
 - c. Watched Mycobacterium bovis-BCG complications in Taiwan.
- (9) Carried out international collaborative activities
 - a. Analyzed genomic data with leading experts from Japan and France, ie from Research Institute of Tuberculosis of Japan's Anti-Tuberculosis Association and the Pasteur Institute of France.
 - b. Continued the PETTS-Taiwan program with the US Centers for Disease Control and Prevention.
 - c. Initiated a collaborative genotyping project with the UK Health Protection Agency.

Parasitic Diseases Laboratory

- (1) Applied a molecular diagnostics system for routine enteric amebiasis examination of reported patients and alien workers.
- (2) Continued the molecular epidemiology project of amebic infection for high-risk groups, such as institutionalized psychiatric patients.
- (3) Applied a molecular surveillance system for malaria through microscopic examination.
- (4) Organized short amebiasis and malaria laboratory training courses for lab workers from local health departments and hospitals.
- (5) Attended CAP tests (Parasitology and Blood Parasite Surveys) for professional evaluation.
- (6) Applied a serological diagnostic system for routine toxoplasmosis examination of reported patients.
- (7) Studied in the molecular epidemiology of Toxoplasma infection for high risk groups, such as pregnant women and HIV/AIDS patients, and their disease control.
- (8) Collaborated with Sao Tome for their malaria control program to monitor the efficacy of antimalarial drug treatment and drug resistance problems.
- (9) Discovered the first Granulomatous Amebic Encephalitis case in Taiwan and developed molecular diagnostic systems for free-living ameba, such as Acanthamoeba and Naegleria.



Mycotic Diseases Laboratory

- (1) Conducted routine diagnostic services for fungal pathogens in general as well as some particular pathogens such as Chlamydia pneumoniae and Mycoplasma pneumoniae.
- (2) Developed a real-time quantitative diagnostic system to deal with common fungal and those specific pathogens.
- (3) Conducted molecular epidemiology studies of Candida spp. in ICU patients as well as longitudinal surveillance isolates by multilocus sequence typing (MLST) and pulse-field gel electrophoresis (PFGE).
- (4) Conducted epidemiology studies for C. Pneumoniae and M. Pneumoniae infections.

- (5) Performed Molecular typing of *Chlamydia trachomatis* infections in Taiwan by MOMP genotyping.
- (6) Developed NAAT assays for *C. Trachomatis* and *Neisseria gonorrhoeae*.
- (7) Carried out a molecular epidemiology study of *N. Gonorrhoeae* by multiple antigen sequence typing (MAST) and identified clonal clusters with distinct susceptibilities associated with specific groups at high risk of contract HIV and syphilis.
- (8) Established novel multiplex beads array platform to rapidly detect clinically important fungi, such as *Chlamydia trachomatis* and other important nosocomial pathogens.
- (9) Built a PFGE fingerprint collection as well as an MLST database of *Candida* spp. in Taiwan and participated in international studies through exchanges of typing data.
- (10) Participated in the CAP tests (Yeast and Mycology Surveys) for our proficiency evaluation.

Vector Biology Laboratory

- (1) Conducted surveillance of spotted fever rickettsia group in ectoparasites and field rodents in Taiwan.
- (2) Assessed habitat relations of Trombiculid mites and explored environmental factors leading to geographical variation in scrub typhus cases in Taiwan.
- (3) Conducted routine mosquito surveillance for Dengue fever and malaria.
- (4) Conducted routine diagnostic services for mosquito infections of arboviruses and conducted mosquito species identification through microscope.
- (5) Developed diagnostic methods to understand mosquito blood sources.
- (6) Established genomic databases of *Aedes aegypti* for commonly used insecticides.
- (7) Conducted technology research in chemical control.
- (8) Evaluated the efficacy of emergency control.

Establishment and Application of Pathogen Genome Sequence Database in Taiwan

- (1) The collection of Taiwan Pathogenic Microorganism Genome Database (TPMGD), which was revised by this CDC and Advanced Bioinformatics Core of National Yang Ming University in January 2007, now already stands at some 40,000 genotyping data from viruses, bacteria, and fungi, and over 30,000 other epidemiological data. The total number of person-times browsed this website has reached 1,440 so far.
- (2) Based on the principles of government information disclosure and resources sharing, we have provided since the beginning of 2008 new application procedures for gene sequences of enterovirus, influenza virus, and relevant epidemiological data to the public in a cooperative way. Up to now, over ten outside scholars and professors have had the access of this database; and approximately 25,000 data have been shared with them through the channel.
- (3) In addition, we have established a TPMGD-open version (http://tpmgd.cdc.gov.tw/tpmgd_public/), which is now available for common users. Anyone can search for pathogen sequence data (including influenza virus, enterovirus and adenovirus) and simple epidemiological information in this database or some other international databases (such as NCBI), and download pathogen sequence information through this database. The detailed epidemiological information is available only after an application procedure.

Future Prospects

1. To develop a multiplex detection system.
2. Develop a rapid detection method for identification of vaccine derived poliovirus or OPV in the era of polio eradication.
3. Establish an internationally recognized flavivirus reference laboratory.
4. Establish the National Tuberculosis Research Center—the Integrated Tuberculosis Surveillance System.
5. Build up the capability to identify imported mycoses.
6. Apply advanced high-throughput and multiplexing diagnostic techniques such as bead array or microarray system to improve diagnostic and genotyping capability.
7. Establish a genotype databank and participate in global surveillance.
8. Establish collaboration programs with renowned international research institutes.
9. Isolate rickettsiae from ticks and mites collected from rodents.
10. Assess habitat relations of Trombiculid mites and explore environmental factors leading to geographical variation in scrub typhus cases in Taiwan.
11. Develop a rapid test for detection of Enterovirus 71 infection.
12. Integrate the existing viral diarrhea disease surveillance networks to identify the viral causative agents more efficiently.
13. Provide Clinical report form based on HIV-1 genomic mutations to anti-retroviral treatment failure patients as a reference for selection of new regimens.
14. Enhance laboratory ability to identify unknown viral pathogens based on molecular mutiplex detections.
15. Assure HIV-1 viral load testing ability by participate CAP HIV-1 viral load proficiency test.
16. Establish high throughput full genome sequencing technique for unknown pathogen detection and surveillance.
17. Establish a surveillance network and a bank for collection of newly emerging infectious pathogens.
18. Develop surveillance technology platforms for various unknown/newly emerging infectious pathogens.
19. R&D or technical transfer rapid diagnostic kits for selected infectious pathogens in the hope to increase the output and information exchanges within the domestic medicine and health technology industries.



Manufacturing of Serum

and Vaccines

Biological Products Manufacturing

- (1) In 2008, a total of 1,808,005 biological products were manufactured, including vaccines, toxoids, antitoxins, and antivenins. Furthermore, 1,594 antivenin of *B. Multicinctus* & *N. Naja atra* lyophilized, 3,010 antivenin of *Tr. Mucrosquamatus* & *Tr. Gramineus* lyophilized, 587 antivenin of *D. Acutus* lyophilized, 208 lyophilized tetanus antitoxin (1500 IU), 794,700 freeze-dried BCG vaccine (1.5mg), 694,720 (40 doses) tetanus toxoid alum precipitated, 190,428 (6 doses) tetanus toxoid alum precipitated, 27,640 (40 doses) tetanus & diphtheria toxoids adsorbed (adult use), 82,690 (6 doses) tetanus & diphtheria toxoids adsorbed (adult use), and 12,420 (6 doses) diphtheria & tetanus toxoids adsorbed were also produced.
- (2) Completed 3 batches of antivenin serum testing extract, four batches of final products, and 12 batches of source plasma; completed 12 batches of semi-finished BCG vaccines and 5 batches of final product; completed 1 batch diphtheria-tetanus final product and 4 batches of tetanus toxoid final product; 130 samples of pure water and 11 samples of pharmaceutical ingredients were tested.
- (3) In 2008, 15,401 mice, 244 guinea pigs, 66 rabbits, 138 poisonous snakes, and 17 ferrets were reared and provided for experimental use. Horses were used to produce antivenin serums, and a total of 293 liters of serum were produced in 2008.

Development of Biological Products

(1) Influenza Research and Development Plan

- a. Six influenza virus strains prevalent in Taiwan were chosen to induce ferret immunity. The serum resulting after inducing immunity was used to appraise newly-extracted Taiwan influenza virus serum types.
- b. Established and increased the application of new bioinformation technology in the forecasting of influenza virus evolution trends, assisting the selection of appropriate influenza virus for the preparation of influenza vaccines.
- c. Established 12 and 8 plasmid reverse genetics systems, and used the PR8 or Taiwan influenza virus strains as a genetic framework to provide four vaccine seed strains.
- d. Used H1N1 and H3N2 subtype influenza virus strains from Taiwan to establish a localized reverse genetics gene framework for Taiwan.
- e. Designed a vaccine for a highly conserved sequence of the HA gene of the H5N1 virus, and also successfully used this method to design a DNA vaccine that has been shown to confer very good protection against various virus strains in mice. Also, addition of the newly-developed glycolipid C34 to the HA DNA vaccine as an adjuvant was found to dramatically reduce the amount of DNA vaccine needed after mice had received IM/EP vaccination.
- f. The Development Center for Biotechnology has developed a new type of influenza DNA vaccine process technology. The procedures and platforms established using this technology can be used within a half year to produce DNA needed to combat sudden disease outbreaks.

- g. Established an immune analysis platform employing the micro-neutralization (micro-NT) assay method based on the combination of flow cytometry with ELISA.
 - h. Established a Taiwan influenza virus vaccines clinical testing research team and analyzed the preventive titer of persons immunized with existing influenza vaccines against local virus strains and vaccine strains.
 - i. Established the "Taiwanese Vaccine R&D (Including Mass Production Technology) Project" clinical testing law and regulation consulting and assistance mechanism and completed preclinical CMC review check list/key points needed for early clinical testing.
 - j. Established strain libraries for two H5N1 vaccine strains and one seasonal influenza vaccine strain. Completed serum and antibody titer and protective titer testing for four H5N1 prototype vaccines.
 - k. Completed challenge models and effectiveness assessment platform for major new types of influenza animals, including mice and ferrets. Completed use of Baculovirus to express various gene proteins, including HA, NA, NP, and NS1, as monoclonal antibody specificity confirmation standards.
- (2) Production of an IgY Antibody from Duck Eggs
The research of antivenim IgY antibody continues. The IgY antibody, which is an anti- *Trimeresurus mucrosquamatus* antibody, is mainly produced by ducks. After 4 weeks, the potency of the IgY antibody is over 100IU/ml, and at 18 weeks its potency is still above 200IU/ml.
- (3) The Bureau of Pharmaceutical Affairs, Department of Health issued the license for the antivenin of *D. Russellii* developed by vaccine center of CDC.

Domestic Vaccination Research System

- (1) Continued implementation of an enterovirus type 71 virus particle vaccine development plan
- a. Successfully improved ELISA experimental method in order to detect proteins with particle structure.
 - b. Established reactor production procedures for VLP; yield per liter exceeded 10 mg. Highly concentrated (900 g/ml) VLP samples were purified from one-liter batches of cellular fluid.
 - c. A total of 15.3 mg of VLP (1.528 mg/ml, 10 ml) has been produced and purified thus far, and is being used in monkey experiments.
- (2) Continued signing of numerous domestic and foreign biological materials transfer agreements (MTAs) and technology transfer contracts.

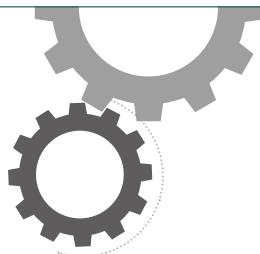




看不見的敵人
毒
病

HEALTH MARKETING

Health Marketing



Background

In order for the general public to become more knowledgeable about communicable diseases, understand related policies, and support Taiwan CDC's actions, a health marketing program has been created. It is hoped that through a series of interactive events, Taiwan CDC can promote disease prevention.

Goals

To strengthen communication between the government and citizens on the risks of communicable diseases, improve the knowledge level amongst the general public, and make everyone a part of the battle against epidemics.

Accomplishments

Integrated Marketing of Disease Prevention

The purpose of these press conferences is to create awareness of Taiwan CDC's major policies and achievements. By holding conferences on a specific issue, Taiwan CDC hopes to attract the attention of the mass media, and in turn spread its message to every household in the nation.

In 2008, Taiwan CDC held the following campaigns about disease prevention policies:

(1) Integrated Marketing of AIDS Prevention

"AIDS Angel" party activity: The First Lady, Chou Mei-ching, attended the "AIDS Angel" party on the day before Halloween in order to lend her support and affirmation to care about AIDS carriers and AIDS prevention work.

- a. The "AIDS Prevention Corps" pledge press conference: In order to publicize AIDS prevention and raise the level of social concern for AIDS patients, heavy motorbike riders nationwide were invited in 2008 to form the "AIDS Prevention Corps", which held four pledge activities throughout Taiwan. Finally, all the heavy motorbike riders converged on Chiang Kai-shek Memorial Hall on November 30, the day before World AIDS Day, and held a national gathering to draw attention to AIDS control and the plight of AIDS patients.
- b. World AIDS Day: Vice President Vincent Siew attended the "Concern from Leaders—Stamp out AIDS" World AIDS Day awareness activity on November 30, the day before World AIDS Day. Apart from expressing personal concern for HIV-infected patients and praising the dedicated AIDS prevention efforts of private groups, the vice president also stated that the government will continue to strengthen cooperate with private groups and organizations in implementing prevention policies intended to help people escape the menace of AIDS.

(2) Integrated Marketing of Tuberculosis Prevention

In order that the public better understand TB, and to further realize the goals of the "Mobilization Plan for Halving TB Incidence in Ten Years," Taiwan CDC held the "Beat TB Amusement Park Touring TB Prevention Exhibition" in 2008. This theme park-style activity uses a relaxed, lively approach to help the public to understand how to prevent tuberculosis. The exhibition kicked off at the Taipei Railway Station on April 25, and made stops all across Taiwan. The exhibition commended outstanding tuberculosis DOTS personnel care workers at local health departments, and awards were given out by local mayors and county chiefs. The event created a good opportunity for the central and local governments to work together to control TB.

- a. In order to boost students' TB prevention knowledge and ensure that everyone is aware of the need for disease prevention, Taiwan CDC invited well-known celebrity Sonia Sui to serve as a TB prevention teacher at the "TB IQ Test" held at a junior high school on October 24. This activity employed a question-and-answer test format to enhance understanding of TB and appeal to youngsters not to ignore the threat posed by tuberculosis-causing bacteria.
- b. In order to strengthen the public's tuberculosis prevention knowledge, Taiwan CDC produced three TB prevention videos in 2008. These videos are entitled "Symptoms to Look for", "Support from Friends and Family", and "Immunization". Taiwan CDC also conducted the "Song of TB Prevention" creative song-writing online activity.

(3) Integrated Marketing of Enterovirus Prevention

- a. "Don't Fear Enterovirus—New Mother's Secret Weapon" press conference: Although enterovirus posed a more serious threat in 2008 than in the previous few years, Taiwan CDC reminded citizens that a few simple hygiene safeguards can significantly reduce chance of infection. The most important secret is conscientious hand washing. The new mothers at the press conference reminded viewers that, to prevent enterovirus, not only must children wash their hands, but the whole family must get in the habit of conscientiously washing their hands. If everyone follows



Observation hot air balloon



The Beat TB Amusement Park



The Beat TB Maze

the five hand-washing steps of “wetting, rubbing, rinsing, splashing the faucet, and drying,” the threat enterovirus poses to young children will be significantly reduced.

b. Mobilizing the Whole Family in the Fight Against Enterovirus—Online K Singing and Dancing Contest: Taiwan CDC mobilized kindergarten and daycare center teachers, and relied on the “Beat Enterovirus Song” to teach children and adults enterovirus prevention concepts. This activity was conducted in cooperation with the ETMC Family Channel's YoYo TV. The top ten dance contest winners performed on the Family Channel; the top group was selected on this program and awards were presented.

c. Global Handwashing Day: The WHO designated October 15 “Global Handwashing Day” starting in 2008. Taiwan CDC invited five major companies—McDonald's Home of Children, Benesse Corp. (Japan), Chunghwa Biomedical Technology Corp., An-Shin Food Service Co., Ltd. (Mos Burger), and Kimberly-Clark (Taiwan) to support the global “hand washing with soap” movement.

(4) Integrated Marketing of Dengue Fever Prevention

“Drain the Puddles after Rain” dengue fever prevention awareness press conference: The fact that dengue fever is a growing problem worldwide has threatened to worsen Taiwan's dengue fever problem. Taiwan CDC held the “Drain the Puddles after Rain” dengue fever prevention awareness press conference on September 7 in order to ensure that dengue fever prevention work is carried out at the grassroots level. The CDC invited Legislative Yuan President Wang Chin-ping and a hundred local neighborhood chiefs to show their determination to fight dengue fever in conjunction with central and local government agencies.

(5) Disease Prevention Awards

In line with Article 73 of the Communicable Disease Control Act, Taiwan CDC has presented awards to 60 individuals or groups for their contributions to policy implementation, disease prevention, treatment, and services. The annual ceremony took place on October 8, 2008, during which the winners shared their experiences and thoughts.



Global Hand washing Day



International Travel Fair



Consultation hotline 1922

Communicable Disease Reporting and Consultation Hotline: 1922

To provide the public with a convenient channel for communicable disease reporting and consultation, Taiwan CDC has operated an easy-to-remember, toll-free hotline "1922" since 2003, which provides a 24-hour service on disease report, communicable disease consultation, prevention policy promotion and control measure education to the public throughout the year.

In order to increase the interaction with the public and to promote disease prevention policy, from the beginning of 2009, "1922" will integrate the organization of health education campaigns related to communicable diseases education issues to hold different activities from time to time. "1922" Taiwan CDC urges everyone to come together and participate in the campaigns to be held.

Publishing The Taiwan CDC News (bimonthly)

In order to boost the cohesion of disease prevention personnel, promote the sharing of disease prevention, and realize the goal of unified disease prevention, the Taiwan

CDC began publishing the the Taiwan CDC News (bimonthly) in June 2008. Each printing consists of 3,000 copies, which are issued chiefly to disease prevention teams at health agencies, hospitals, and clinics. Four editions were published in 2008, and were well-received by readers.



Taiwan CDC News

The Taiwan CDC News consists of four pages, and includes the sections "disease prevention focal points" (front page), which reports on disease prevention policies, measures, and important control actions, "disease prevention mobilization" (page 2) which reports on disease prevention actions in various localities and health education and awareness news, "disease prevention who's

who" (page 3), which reports on the interesting, special, or frustrating experiences of front line disease prevention personnel, and "disease prevention topics" (page 4), which reports on corporate participation in disease prevention awareness and corporate social responsibilities, the general public's impressions of disease prevention work, and recommendations.

To ensure that disease prevention information is circulated even more widely, the printing runs of Taiwan CDC News will be increased to approximately 6,500 copies in 2009. The additional copies will be distributed in schools at various levels, disseminating disease prevention knowledge broadly throughout society.

Multichannel Marketing

In order to promote Taiwan CDC's cause to different groups, we are constantly looking for new marketing channels. In 2008, CDC not only continued to improve marketing via traditional channels such as the print media and TV, but also developed interactive marketing on the Internet. Taiwan CDC's marketing channels include:

- (1) Internet: The Internet's influence is far-reaching and powerful, and it has become an important marketing channel for Taiwan's media. In 2008, Taiwan CDC has focused on the Internet as a marketing channel. Taiwan CDC has created Flash animation to promote travelers' Health.

In the "TB—Let's Say Goodbye to Tuberculosis" Beat TB Amusement Park online marketing activity, Taiwan CDC used the "TB IQ—Sonia Sui Test" as the centerpiece of online interactive instructional

campaign. This contest challenged Internet users' level of tuberculosis knowledge. In the past, the conventional personal web sites composing the "Web 1.0" mainly provided a one-way information publishing function. Now, however, Web 2.0 allows users to really participate. Taiwan CDC is using the newest Web 2.0 audiovisual interactive technologies in the real-time fill-in the lyrics feature "Song of TB". This feature has boosted participation by Internet users and earned a warm welcome.

CDC's Internet marketing strategies have been a success because they are able to introduce the concepts of disease prevention and treatment to many people, and initiated much discussions and feedback on the Internet.

- (2) International Travel Fair: Many people relax by traveling overseas, but tend to ignore their health during their travels. Therefore, during the 2008 Taipei International Travel Fair, Taiwan CDC promoted the importance of avoiding illness while traveling. With brochures, posters and fun games, Taiwan CDC was able to show would-be travelers how to avoid getting sick when traveling overseas.
- (3) Documentary: On the day before World AIDS Day, Taiwan CDC issued the first-ever documentary video showing NGOs in Taiwan caring for AIDS patients: "Being Together". This video appeals to the public to accept and embrace AIDS sufferers.
- (4) Creative Promotional Materials: To promote concepts of disease prevention, Taiwan CDC has created many creative, stylish and useful promotional materials.
- (5) Media and Other Promotion Channels: When announcing disease prevention measures, new communicable diseases, or important dates, Taiwan CDC sends out press releases to both the print media and the electronic media along with advertising with posters, fliers and advertisements on the MRT to improve people's knowledge on a subject.



CDC Exhibition Center

Taiwan CDC established the country's first "CDC Exhibition Center" with the theme of infectious disease prevention at its Taipei office in 2000. The playful yet educational approach of this exhibit has won widespread praise and made it a favorable attraction for schoolchildren.

In order to promote disease prevention education in southern Taiwan, Taiwan CDC has teamed up with the National Science & Technology Museum to establish the "Disease Prevention Combat Camp", which is a permanent exhibit occupying more than 860 square meters. This exhibit promotes prevention of five major infectious diseases in Taiwan—dengue fever, enterovirus, tuberculosis, HIV/AIDS, and the H5N1 flu strain. Visiting schoolchildren are asked to transform themselves into "disease prevention warriors" and learn about disease prevention in a virtual, interactive space providing many opportunities for hands-on doing and learning. The "Disease Prevention Boot Camp" The Disease Prevention Combat Camp opened on July 1, 2008, and uses fun, entertaining methods to transmit correct disease prevention knowledge.

Corporate Cooperation

Taiwan CDC has sought to work with private companies or foundations that are also involved in disease prevention in order to maximize resource efficiency, creativity, and marketing opportunities and to improve awareness on related issues.

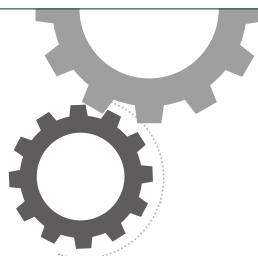
Future Prospects

In the future, Taiwan CDC will continue to promote disease prevention, develop new marketing channels, and improve communication on infectious disease risks in order to protect the health of Taiwan's citizens.



INTERNATIONAL COOPERATION

International Cooperation



Background

Communicable diseases know no national boundaries. In today's world, globalization facilitates the spread and transmission of communicable diseases. Building a responsive worldwide disease surveillance and prevention network is a critical prerequisite for protecting the health of the people in Taiwan. As a member of the global village, the Taiwan CDC has the responsibility to cooperate with international partners as well as provide adequate disease-control resources to needy countries to enhance the health quality of human life.

In recent years, Taiwan CDC has made a lot of efforts to enhance international exchanges on health affairs. Its efforts include increasing disease prevention cooperation with advanced nations, helping allies raise the capacity of infectious diseases control, fulfilling its responsibilities as a member of the international community, participating actively in international conferences, learning and introducing advanced medical technology from other countries, as well as exchanging advanced technology with other countries. As a result, Taiwan has seen many impressive achievements in the area of disease control. Furthermore, Taiwan has been able to share its unique experiences with the rest of the world as it has endeavored to realize the ideal of health for all.

Goals

Actively participating in international public health programs and conferences, strengthening bilateral and multilateral relationships with other countries, participating in international humanitarian relief activities, building up more channels for exchanging information and technology in order to promote Taiwan CDC's capacity in communicable disease control and to achieve the ultimate goal of rejoining the global public health system.

Accomplishments

International Events in 2008

- (1) 175 international guests from 35 countries visited Taiwan CDC.
- (2) Participated in two WHO technical conferences "Joint WHO-CDC International Conference on Health Laboratory Quality Systems" and "Global Vaccine Research Forum," and the 59th WPRO committee conference.

- (3) Participated in five APEC conferences, including the 1st and 2nd conferences of the APEC Health Working Group, APEC Health Working Group Policy Dialogue and Risk Assessment Seminar, APEC SMEWG Pandemic Influenza Train the Trainer's Workshop, and APEC EINet 2008 Virtual Symposium-Pandemic Influenza Preparedness. Taiwan CDC successfully proposed that "strengthening prevention of vector-borne infectious disease" be listed as one of the health working group's three high-priority issues, and also proposed the projects entitled "APEC Workshop for the Control Practice of Dengue Fever" and "APEC Conference for the Surveillance, Treatment, Laboratory Diagnosis and Vaccine Development of Enteroviruses," which passed APEC's review.
- (4) Participated in 45 international conferences. 121 staff in total went overseas for conferences or training.
- (5) Published 96 papers in international journals, including 58 SCI papers.

International Conferences

- (1) Taiwan CDC organized the "APEC Workshop for the Control Practice of Dengue Fever" at the Garden Villa in Kaohsiung on June 5-6, 2008. The workshop gathered 40 delegates from 12 APEC member economies and local public health officers working on dengue control.
- (2) Taiwan CDC held the "9th Taipei International Conference on AIDS" during September 27-28, 2008, and invited numerous prominent domestic as well as foreign experts, including David Ho, to share their valuable experiences; approximately 750 people attended.

Promotion of Bilateral or Multilateral Cooperation

- (1) The effectiveness of Taiwan's AIDS Harm Reduction Program drew favorable attention from the Asian Harm Reduction Network, which sent a team to Taiwan in November to film a documentary and visit the premier. The documentary was distributed to relevant international organizations, and increased awareness of harm reduction results in Taiwan and Asia.
- (2) Continued to conduct Arrangement No. 2 (the MRSA program) in the Cooperative Program in Public Health and Preventive Medicine with USCDC and signed Arrangement No. 3 (a TB Prevention Project); sent staff to the EIS training program.
- (3) Taiwan CDC conducted jointly the project "Evaluation of the Control of HIV after a Prison Amnesty in Taiwan" with Johns Hopkins School of Public Health.
- (4) Invited experts from the US to Taiwan for on-site inspection and discussions on tuberculosis prevention.
- (5) Taiwan CDC sent lecturers to the "Central American Regional Health Care Training Center" in cooperation with the US Department of Health and Human Services.
- (6) Taiwan CDC was invited for the first time to participate in the EU FP7 project entitled "Rapid System Analyses of the Health System and Pandemic Influenza Preparedness and Response."
- (7) Continued to conduct reciprocal exchanges of personnel with Austria for long-term training.
- (8) Held the "5th Taiwan-Japan Bilateral Symposium" in 2008; the topic of this event was "International Collaboration and TB." Fourteen experts from Japan attended. Taiwan CDC continued to participate in two cooperative projects on bacillary dysentery and dengue fever, and was invited to send lecturers to FETP training programs in Japan.
- (9) Maintained membership in the international associations such as International Society of Infectious Diseases (ISID) and the International Harm Reduction Association (IHRA).

Participating in International Aid Efforts

(1) 2008.03.08 - 2008.03.19

In cooperation with Taiwan International Health Action (Taiwan IHA), Taiwan CDC provided medical assistance to Ecuador.

(2) 2008.05.20 - 2008.05.25

In cooperation with "The Red Cross Society of the Republic of China," Taiwan CDC provided medical assistance to the victims in Sichuan, China after the tremendous earthquake.

(3) 2008.05.23 - 2008.06.01

In cooperation with "The Red Cross Society of the Republic of China" and "Ling Jiou Mountain Buddhist Society," Taiwan CDC provided medical assistance to the victims in Myanmar, after the cyclone Nargis disaster.

Future Prospects

In view of increasing international interchange and transport, the issue of global cooperation has become more vital than ever in the fighting against disease. Taiwan CDC will do its best to strengthen cooperation with other countries as well as international healthcare institutes. Encouraged by the accomplishments of training and educational programs, Taiwan CDC will cooperate in setting up a global surveillance network for the prevention and control of communicable diseases with other countries. In addition, training personnel specializing in international public health and emerging infectious disease prevention, and seeking full involvement in international communicable disease prevention projects will be the next stages of Taiwan CDC. Future efforts are detailed as follow:

1. To actively participate in conferences or other events organized by international institutes and forums, including WHO and APEC.
2. Exchange information with WHO, its regional offices, and other nations via the IHR Focal Point.
3. Continue to establish bilateral or multilateral cooperation projects with other countries.
4. Take part in international humanitarian relief efforts and dispatch epidemiologists and experts to needy areas to provide support in disease prevention.

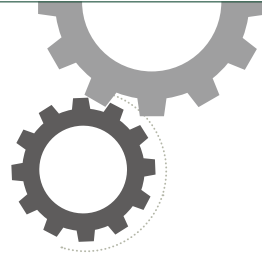




PUBLICATIONS SHARE CUTTING- EDGE RESEARCH AND RECOMMENDATIONS

Publications Share Cutting-edge Research and Recommendations

Periodicals and Books



01
Combat Manual
for Dengue Fever



02
Guidelines for
Dengue Control



03
Taiwan Tuberculosis
Control Report 2008



04
CDC Annual
Report 2008



05
Statistics of
Communicable
Diseases and
Surveillance Report,
2007



06
Guidelines
for Malaria
Chemoprophylaxis
and Treatment



07
Guidelines for
Communicable
disease
Surveillance



08
Collection of
Communicable
Disease Control Acts
and Regulations



09
Influenza
Pandemic
Strategic Plan



10
Taiwan
Guidelines for
TB Diagnosis
and Treatment



11
Epidemic
Prevention
Pioneer



12
News Eye on
Protection Against
Epidemic in 2007



13
Communicable
Diseases Control
Workbook



14
CJD and Other
Human Transmissible
Spongiform
Encephalopathies-
Guideline on Patient
Management and
Infection Control



15
Practical Guideline
for Prevention
and Control of
Seasonal Infection



16
Guidelines for
Diagnosis and
Treatment of
HIV/AIDS



17
Strategy Plan
for Execution of
Influenza Pandemic
Response



18
Education
Videos for BCG
Vaccination and
PPD Testing



19
Demonstration of
Chemical Control of
Adult Vector
Mosquito of Dengue



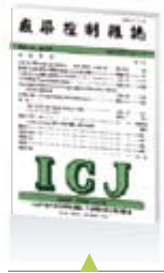
20
Disease
Prevention Live
Show



21
Leptospirosis
Symptoms,
Diagnosis and
Treatment
Guideline



22

CDC Surveillance
Guideline

23

Infection Control
Journal

Taiwan CDC's Journal Papers, 2008

2008.12.22

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