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Centers for Disease Control

Annual Report 2011

Centers for Disease Control, Department of Health, R.O.C. (Taiwan)

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Message from the Director-General

Welcome to the 2011 annual report of 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 2010.

Taiwan CDC is a leading public health agency in Taiwan that plays a key role in protecting all people in this country from the threats of communicable 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.

In 2010, we confronted a dengue fever outbreak in Taiwan. In order to deal with the rising dengue fever epidemic and to coordinate and supervise relevant disease control activities, the Central Epidemic Command Center for Dengue Fever (CECCDF) was established on October 21 and an action plan was devised. The action plan was aimed at reducing the number of containers and eliminating vector breeding sites in the community. In addition, an emergency mechanism was set up to strengthen monitoring, evaluate the epidemic trends and promptly investigate suspected transmission sources. Through the joint efforts by the central and local governments as well as the community, the epidemic abated and CECCDF was disbanded at the end of 2011.

In the meantime, we actively seek ways to tackle many new challenges posed by infectious diseases such as pandemic influenza, tuberculosis and HIV/AIDS.

The second wave of the H1N1 epidemic in Taiwan came to an end after strict implementation of relevant disease control policies in 2010. With regard to pandemic influenza control, Taiwan CDC has put the available budget into efficient use, including providing government-funded vaccines, influenza tests, antiviral drugs, personal protective equipment, etc to targeted population. Moreover, we participated in conducting the EU FP7 project called “Health system analysis to support capacity development to respond to pandemic influenza in Asia” and were in charge of the analysis of stakeholders among different countries. The goal of the project is to evaluate the capacity strengths, gaps, and constraints of governance architecture facing the threat of pandemic influenza. Taiwan CDC will continue to re-examine and review pandemic influenza strategies and policies in order to ensure the health of the people in the nation.

For years, tuberculosis (TB) has had the highest incidence and mortality rate among all communicable diseases in Taiwan. In order to bring TB under effective control, Taiwan CDC has launched the “Mobilization Plan to Halve Tuberculosis in Ten Years” (2006-2015). The plan includes strengthening case-finding, upgrading the capacity of laboratory testing, conducting the Directly Observed Treatment Short-Course as well as setting up the Multi-Drug Resistant TB Medicare System. In addition, in order to bring TB under further control, the "Latent Tuberculosis Infection Treatment Program”, which focuses on treating latent infections in children under 13 years old in contact with tuberculosis, was initiated in 2008 and around 4 thousand children were enrolled in this program in 2010. By the end of 2010, the incidence rate declined by 22 percent and the mortality rate by 30 percent. Furthermore the mortality among young adults decreased significantly by 50%.

The harm reduction program and other diversified prevention projects were promoted to combat the HIV/AIDS epidemic among injecting drug users (IDUs) and men having sex with men (MSM). The reported number of HIV infections dropped in 2006. Towards the end of 2010, we effectively reduced HIV infection among IDUs. Taiwan CDC held the 10th Taipei International Conference on HIV/AIDS, echoing the theme for World AIDS Day 2010 “Universal Access and Human Rights” and focusing on our HIV-prevention efforts and protection of MSM and young people from HIV infection. This conference was convened to share Taiwan’s experiences in HIV/AIDS prevention with the rest of the world.

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. Therefore, I would like to dedicate this CDC annual report, detailing our endeavors and accomplishments during 2010, to our partners and supporters. I sincerely hope you will enjoy reading this report and continue to support us.

Feng-Yee Chang, MD, PhD
Director-General
Taiwan Centers for Disease Control


行政院衛生署疾病管制局
Taiwan
nters for Disease Control

About Taiwan CDC

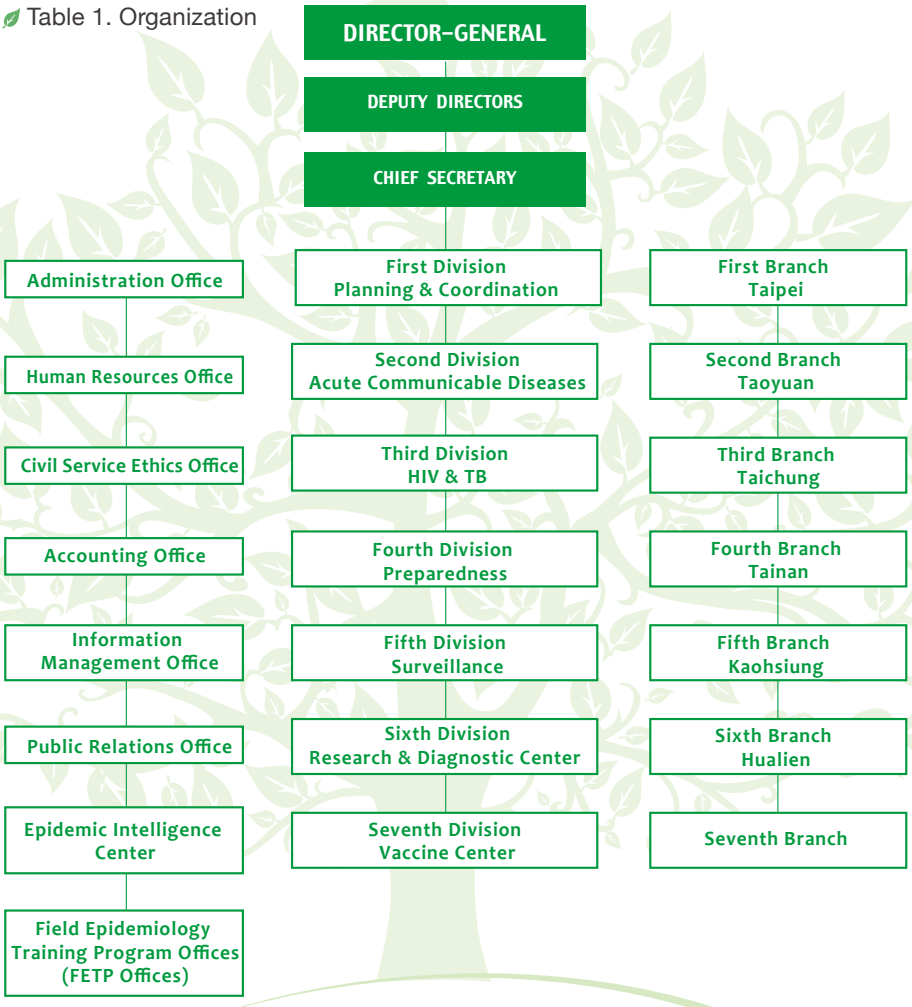
About Taiwan CDC

In 1999, the Taiwan Centers for Disease Control (Taiwan CDC) was established under the Organization Law of the Centers for Disease Control. The mission of Taiwan CDC is to protect people from the threats of communicable diseases. Taiwan CDC strives to accomplish its mission by:

1. Formulating policies, strategies and plans for the prevention and control of communicable diseases;
2. Guiding and assessing local authorities in the execution of matters concerning communicable disease control;
3. Establishing relief funds for compensating vaccine victims and related activities;
4. Conducting quarantines of international and specifically designated ports;
5. Organizing international collaborative projects and exchanges on communicable disease control.

Taiwan CDC is under the command of the director-general, who is assisted by three deputy directors and a chief secretary. It is composed of seven divisions, eight offices and seven branches (Table 1). The jurisdictions of the seven branches are shown in Figure 1.

Table 1. Organization



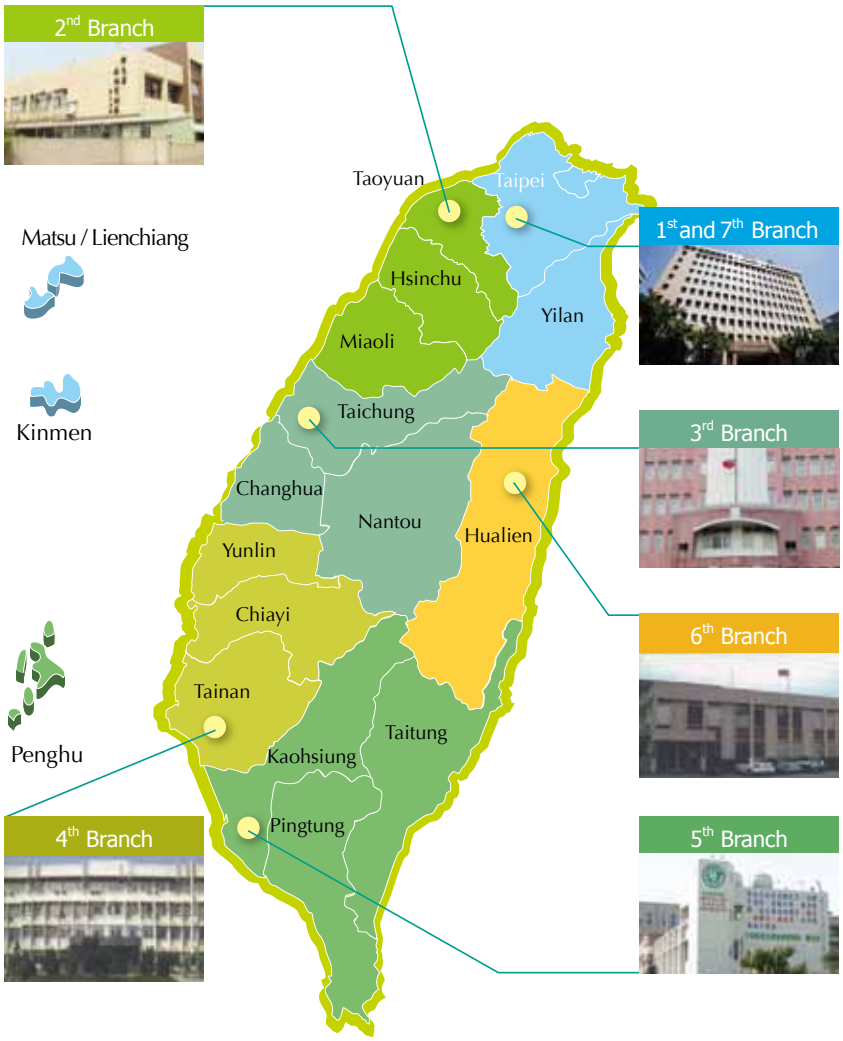


Figure 1. Branch Jurisdictions

Taiwan CDC has 828 employees and a male to female ratio of 1:4.The average age of the employees is 42.8 years old, with 73% younger than 49. In terms of educational background, 47% of the staff have received a college or university education and 37% hold an advanced degree (see Figure 2 and 3). The total budget of Taiwan CDC was NT$6.3 billion (US$218 million) in 2010.

Figure 2. Age Distribution of Taiwan CDC Employees

Under 29 years	30-39 years	40-49 years	50-59 years	60-65 years
8%	28%	37%	24%	3%

Figure 3. Education Level of Taiwan CDC Employees

Graduate school	University	College	High school or under
37%	29%	18%	16%

2010 Focus- Control of Dengue Fever Epidemic

Current Status

The WHO has declared global warming and climate change to be new challenges of public health, and these threats are becoming more serious. Climate change endangers people's health through natural disasters, such as heat waves and floods, which foster communicable diseases and raise the prevalence of dengue fever. The severity of dengue fever in Southeast Asia in recent years has led to an increase in imported cases in Taiwan, with a record high of 304 in 2010. The situation has made it more difficult to control dengue fever locally.

There were 1,592 indigenous cases of dengue fever in 2010 in Taiwan, including 18 dengue hemorrhagic fever (DHF) cases and two deaths. The cases were concentrated mainly in southern Taiwan, including Kaohsiung City and County and Tainan City and County.

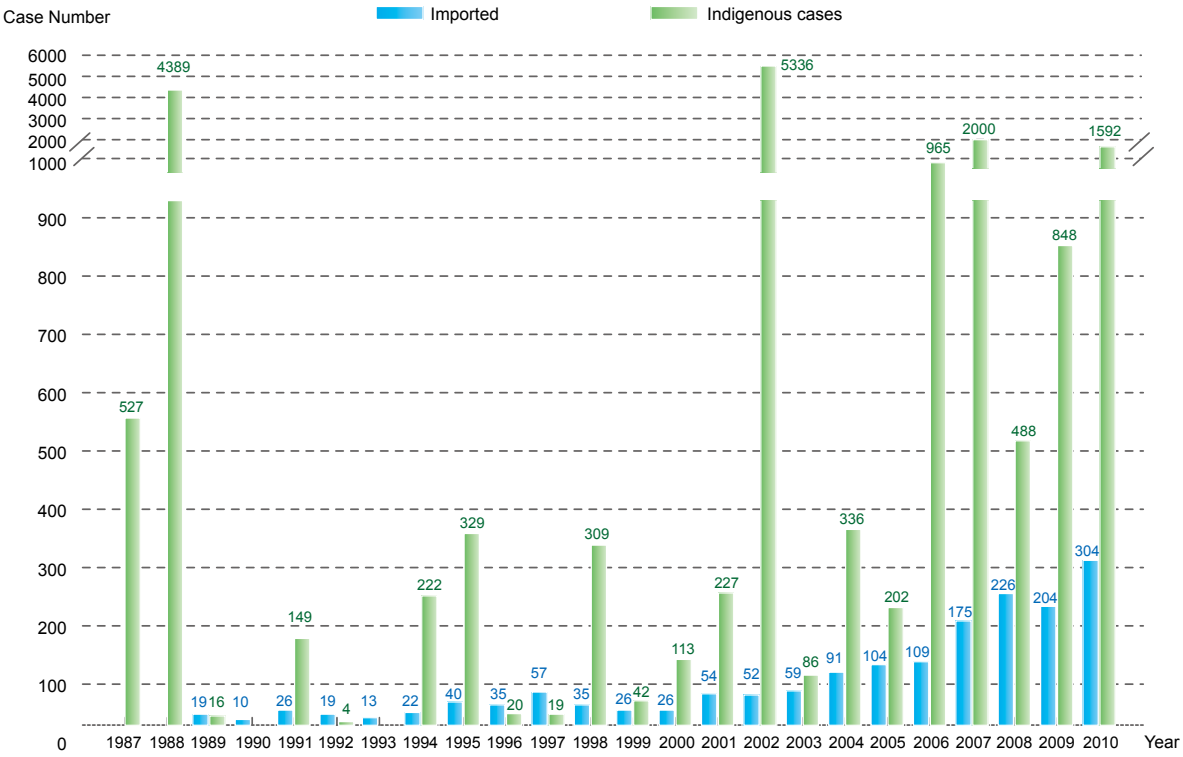


Figure 1. Dengue Fever Cases Reported from 1987 to 2010

Goals & Strategies

Control dengue fever in Taiwan by thoroughly eliminating vector breeding sources and effectively lowering vector (mosquito) density.

Taiwan CDC has devised a three-stage prevention strategy for controlling 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 illness.

Primary Prevention

1. Implementing health education through various communication channels to promote dengue fever awareness.
2. Involving the community in improving environmental and household sanitation along with reducing vector sources through volunteer training.
3. Encouraging regular inspection and eliminating vector breeding sources by cleaning empty houses, vacant lots, and other potential vector breeding sources. Keeping a record of these places for future inspections.
4. Strengthening the education and training to disease prevention workers and volunteers.
5. Setting up a vector surveillance mechanism to check places with a high mosquito density probability and promptly wipe out vector sources.

Secondary Prevention

1. Constructing a disease surveillance mechanism for prompt control of suspected cases. Strengthening disease surveillance and disease trend evaluation through official epidemic reporting systems and emerging disease surveillance, as well as public reporting and symptom declaration forms.
2. Setting up an emergency/contingency mechanism to promptly investigate suspected transmission sources and spray insecticide to eliminate those sources. Furthermore, educating on the importance of eliminating vector-breeding sites to prevent possible infection.

Tertiary Prevention

Establishing guidelines for DHF diagnosis and treatment. Organizing continuing education workshop for medical personnel to raise health care quality and lower mortality rates.

Accomplishments

The 2010 peak season for dengue fever in Taiwan began in August when the infection rate grew. In response to the situation, on Oct. 21 the Cabinet established the Central Epidemic Command Center for Dengue Epidemic, which directs the overall prevention and treatment plan. In addition, in southern Taiwan an advanced command office is found to direct the front line of disease prevention. The center has carried out the work since the foundation, including dengue fever prevention and treatment, vector reduction and a three-level mobilization plan. Moreover, the coordination between the central and local governments, as well as medical institutions and environmental/health organizations, and the cooperation of villages, schools and community members, effectively stopped further spreading of the disease.

Through the prevention and control measures, Taiwan has got more success in bringing dengue fever under control than other Southeast Asian nations. Below is the list of major achievements.

Primary Prevention

1. Continuing body-temperature monitoring at international airports. In 2010, 134 cases of imported dengue fever were detected, accounting for 44.08% of the total number of 304 imported cases (see Table 1). This measure effectively limited importation.
2. Distributing materials of health education and promotion, including leaflets, posters, banners, the Combat Manual for Dengue Fever and VCDs.
3. Producing promotional materials with mass media , such as recordings, epidemic control programming and newspaper ads. These include TV commercials and short films for screening in TV slots reserved for the Government Information Office to make public service announcements. These materials call on the public to eradicate dengue fever vector breeding sources.

Table 1. Serotypes and Origins of Imported Dengue Fever Cases, 2010

	Serotype					
Country of Infection	DEN-1	DEN-2	DEN-3	DEN-4	ND	Total
Indonesia	24	20	14	9	29	96
Vietnam	20	3	3	5	30	61
Thailand	7	13	6	-	10	36
Philippines	4	9	4	2	15	34
Cambodia	6	3	1	-	11	21
Malaysia	5	5	3	1	5	19
India	2	1	2	1	6	12
Myanmar	1	1	1	1	3	7
Singapore	1	3	-	-	1	5
Laos	-	1	-	-	2	3
Bangladesh	-	-	1	-	2	3
Maldives	-	-	-	-	1	1
St. Vincent	-	1	-	-	-	1
Peru	-	-	-	1	-	1
Uncertain	1	2	-	-	1	4
Total	71	62	35	20	116	304

4 Publishing the Guidelines for Dengue Control to assist the health organizations in their fight against the epidemic.

5. Formulating the Community Mobilization Plan for Cleaning Up the Breeding Sources of Dengue Fever Vectors. Taiwan CDC encouraged community organizations in counties and cities in southern Taiwan to propose plans to CDC units, and further organized volunteer teams to exterminate mosquitoes.

6. Inviting scholars and experts in insecticide efficiency and resistance studies of dengue fever vectors. The findings were referenced in the procurement of insecticides.
7. Promoting 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.

Secondary Prevention

1. Establishing an incentive system to encourage physicians and the public to report cases, which facilitaties early detection of disease transmission. NT$2,500 to NT$4,000 was awarded to the physician or other medical worker who reports the year's first indigenous case of dengue fever and to individuals who found an imported case. If an individual volunteers for dengue fever testing and the case is subsequently determined to be an imported case or the first indigenous case in the village or township of residence, the individual is awarded NT$2,500.
2. To understand the shifts in insecticide resistance of vectors, Taiwan CDC sent vector experts to areas where emergency spraying was conducted to evaluate the insecticide resistance of dengue fever vectors.

Future Prospects

To strengthen dengue fever control, Taiwan CDC proposes a five-year program (starting in 2011) for eradicating vector-breeding sources and eliminating indigenous dengue fever. Taiwan CDC, the Environmental Protection Administration (EPA), local governments and NGOs will jointly implement it. Efforts will be made to popularize health education and encourage the general public to get involved in maintaining environmental and household sanitation. Taiwan CDC and the EPA will construct a real-time disease surveillance and response mechanism in an attempt to wipe out vector sources, thereby eradicating indigenous dengue fever.

National Communicable Disease Surveillance Systems

Current Status

Ever since Taiwan CDC was reorganized in July 1999, responsibility for infectious disease surveillance was handed to the National Communicable Disease Surveillance Systems. The systems began with surveillance of notifiable diseases plus sentinel surveillance to detect epidemics, and later on several systems were built to collect timely, complete and precise information on infectious diseases. Taiwan CDC's vision of these systems is to monitor the nation's health status and detect outbreaks rapidly by integrating various infectious disease surveillance networks. The work Taiwan CDC carried out included: (1) Constructing diversified disease surveillance systems; (2) Collecting and monitoring data for disease trend analysis, predictions and alerts; and (3) Providing regular analysis and assessments of global and indigenous infectious diseases.

Accomplishments

Notifiable Diseases Surveillance System

If a doctor treats a suspected patient who has come down with a notifiable infectious disease, the doctor must report the case within a certain time. Taiwan CDC established the Notifiable Disease Surveillance System to give medical personnel across the country and provide a platform for reporting diseases and grasping information related to communicable disease occurrences immediately. By using the system, the medical personnel can make early informed decisions on assigning the appropriate amount of manpower and resources to carrying out disease prevention, thereby keeping diseases from spreading.

The first stage of the Notifiable Diseases Surveillance System was to establish a web-based version. This was finished in July 2001, enabling easier and more detailed transmission of reported information. The second stage, completed in September 2004, was to strengthen the surveillance system. In September 2006 the third stage, integrated the Notifiable Disease Surveillance System, was accomplished. Syndrome Surveillance System and Symptom Surveillance System. The fourth stage, finished in June 2008, built a single reporting gateway and increased user-friendliness of the systems. In 2010, Taiwan CDC maintaining these systems and increasing their user-friendly functions.

The following table shows the five categories of notifiable diseases in Taiwan.

Table. List of Notifiable Diseases in Taiwan.

Category	Disease	
I	Smallpox	Plague
	SARS	Rabies
	Anthrax	H5N1 Influenza
II	Diphtheria	Typhoid Fever
	Paratyphoid Fever	Dengue Fever
	Meningococcal Meningitis	Acute Flaccid Paralysis and Poliomyelitis
	Shigellosis	Amoebiasis
	Malaria	Measles
	Acute Hepatitis A	Enterohemorrhagic E. coli Infection
	Hantavirus Syndrome	Cholera
	Rubella	Multi-drug Resistant Tuberculosis
	Chikungunya Fever	West Nile Fever
	Epidemic Typhus Fever	
III	Pertussis	Tetanus
	Neonatal Tetanus	Japanese Encephalitis
	Tuberculosis	Hansen's Disease
	Congenital Rubella Syndrome	Acute Hepatitis B
	Acute Hepatitis C	Acute Hepatitis D
	Acute Hepatitis E	Acute Hepatitis Unspecified
	Mumps	Legionellosis
	Invasive Haemophilus Influenzae Type B Infection	Syphilis
	Gonorrhea	Enteroviruses Infection with Severe Complications
	HIV Infection	AIDS
IV	Herpesvirus B Infection	Leptospirosis
	Melioidosis	Botulism
	Invasive Pneumococcal Disease	Q Fever
	Endemic Typhus Fever	Lyme Disease
	Tularemia	Scrub Typhus
	Varicella	Cat-Scratch Disease
	Toxoplasmosis	Severe Complicated Influenza Case
	Creutzfeldt-Jakob Disease	New Delhi metallo--lactamase 1 Enterobacteriaceae*
V	Rift Valley Fever	Marburg Fever
	Yellow Fever	Ebola Fever
	Lassa Fever	

NDM-1 Enterobacteriaceae infection was listed as a Category IV notifiable disease on Sept. 9, 2010, for taking precautions against antimicrobial resistance.

Sentinel Surveillance System

Plans were made for the Sentinel Surveillance System in 1989 and it was established the following year. This system can be used to measure prevalence trends and treatment rates of influenza while acting as an important reference for preventive measures, vaccine strain selection and health care. In December 2009, 800 doctors (676 in clinics and 124 in hospitals) had volunteered to become sentinels for the system, covering about 87% of cities and towns in Taiwan. Medical issues monitored by the system include influenza-like illness (ILI), hand-foot-and-mouth disease (HFMD), herpangina and diarrhea. The system also collects information weekly from stationary monitoring networks, analyzes regional and national epidemic trends and provides reports to sentinel doctors via newsletters and the Internet.

School-Based Surveillance System

Taiwan CDC implemented the School-Based Surveillance System in 2001. As of December 2010, 634 elementary schools (24% of the country's total) had joined the program, covering students from kindergarten to grade 6 in 96% of cities and towns. Medical issues monitored under the system include ILI, HFMD, herpangina, diarrhea, fevers and acute hemorrhagic conjunctivitis (AHC). Through the system, Taiwan CDC collects information from schools weekly, analyzes trends at the regional level and in each school, and regularly provides reports to participating schools as well as educational and public health authorities.

The School-Based Surveillance System enables Taiwan CDC to understand epidemic trends at schools and predict possible outbreaks. Through early surveillance of communicable diseases and epidemics, appropriate epidemic prevention measures can be adopted promptly to prevent the spread of communicable diseases on campus.

Symptom Surveillance System

International contact and travel by Taiwan nationals are on the rise, easing transmission of communicable diseases across borders and challenging disease prevention workers. For example, in the summer of 2008, 10 out of 11 people in a religious group were shown to have come down with dengue fever on a trip to Myanmar. To prevent the entry of emerging communicable diseases like dengue fever, and to facilitate early public health monitoring and implement epidemic prevention measures, Taiwan CDC established the Symptom Surveillance System. In addition, in 2006 Taiwan CDC integrated several active surveillance systems to enhance the monitoring of the travelers at airports and harbors for diseases contracted abroad. These steps strengthened the efforts to battle communicable diseases from the outside while controlled cluster incidents and launched prompt disease prevention mechanisms.

Disease categories under surveillance include persons under investigation for H5N1 influenza, clusters of influenza-like illness cases, fevers of unknown etiology, diarrhea, coughing persisting for more than three weeks, upper respiratory tract infections, and clusters of enterovirus infection cases.

The Symptom Surveillance System monitors inbound passengers at airports and seaports to prevent entry of communicable diseases. It enables Taiwan CDC to effectively control epidemic events and quickly launch epidemic prevention measures.

Surveillance System for Populous Institutions

The Surveillance System for Populous Institutions is aimed at early cluster detection of infectious diseases among institution inhabitants or workers. It applies to elderly homes, long-term care facilities, apartments for the elderly, facilities for the disabled, juvenile

protectories, veterans' homes, prisons, nursing homes and outpatient centers for mental rehabilitation. If an individual or a cluster respiratory disease case is found among inhabitants or workers, the facility must file weekly online reports, confirm the data reported and report the number of people under its care.

Establishing Support Systems for Management and Analysis

1. Taiwan CDC used the Geographical Information System (GIS) in conjunction with the Notifiable Diseases Surveillance System, Syndrome Surveillance System and Sentinel Surveillance System to analyze epidemic data and develop a disease prediction model for estimating the distribution of predicted diseases.
2. In July 2005, Taiwan CDC completed the Emerging Infectious Disease Hospitalization and Management System. It is a flexible system, permitting disease category adjustments and extension of variable fields for keeping daily hospitalization records when required.
3. Taiwan CDC installed surveillance systems for data acquisition and analysis.
4. On Feb. 24, 2004, Taiwan CDC outsourced the establishment of the Disease Reporting and Consulting Center to the telecom industry. The public can dial 1922 to report communicable diseases and obtain consultation and information on communicable disease policies. Taiwan CDC assigned full-time personnel to answer calls and take caller messages, developing the center into a communication platform.

Reporting via the Internet

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

Systems Integration

To enhance presentation and application, Taiwan CDC combined information and analysis and improved integration of its surveillance systems, including the Notifiable Disease Surveillance System, the Symptom Surveillance System and the Syndrome Surveillance System. This task was completed in September 2006.

Information Exchange

1. Along with collating updated endemic data from the Sentinel Surveillance System, Taiwan CDC publishes weekly reports that are distributed to sentinel physicians, school nurses and other

related personnel for reference. To increase visibility, the contents of the weekly reports are posted online. Weekly reports include the Sentinel Surveillance Weekly Report, the School-based Surveillance Weekly Report and the Influenza Express.

2. To understand the effectiveness of surveillance material, Taiwan CDC collaborates with academics to conduct research projects every year.

3. The hardware, software and database developments that have brought new users to the Geographic Information System (GIS) partly explain its diffusion into the public health sphere. For example, when geographical data is available, health officials use the system to integrate, the close relationship between pathogens, geographical factors, the distribution and spread of infectious disease cases based on location. The officials frequently analyze spatial and epidemiological data as a guide for further applications and research worldwide with GIS. Although GIS provides disease distribution and map display applications, more advanced research correlating to disease and spatial data in Taiwan is needed to analyze temporal and geographic trends in disease outbreaks. Such research would help Taiwan CDC estimate the risk and spread of infectious diseases. Since the disease surveillance systems work closely with disease prediction and GIS, Taiwan CDC regularly organizes symposiums of GIS and disease prediction model for the staff and other professionals. This exchange program provides a better understanding of GIS and the potential applications.

Information Sharing

Taiwan CDC generates daily updated reports on international epidemics and forwards them to related authorities. The collection, evaluation and dissemination of information to the public, local health departments and governing authorities, along with information sharing, are key to completing this task.

Training and Education

Every year, Taiwan CDC offers training to system users so they keep remain informed of new epidemic surveillance information.

Important Communicable Diseases Prevention and Control

Tuberculosis

Current Status

Tuberculosis has always been Taiwan's most dangerous communicable disease. Taiwan's per capita GDP has reached US$18,000, but there are still about 14,000 new cases of tuberculosis every year, making it a greater threat than all other communicable diseases combined.

Tuberculosis is not only damaging 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 been reduced. However, compared with other advanced countries, Taiwan is still decades behind and needs to accelerate reforms to catch up. Taiwan has a dense and mobile population. However, its highly developed character has distanced personal relationships. With the abundance of medical resources, patients have many options when they come to medical care. These two factors make the detection and the management of patients more difficult compared to rural societies. Recently, tuberculosis again began to rise globally, and factors such as tourism, foreign labor, international travel and AIDS-related complications make it more difficult to deal with the disease locally. Therefore, to protect the health of the general public, Taiwan needs to use more active and aggressive methods when facing with new challenges in tuberculosis prevention.


ON THE MOVE AGAIN
2010世界結核病日
ON THE MOVE AGAINST TB
抗結核動起來

Incidence

There were 16,472 and 13,336 tuberculosis cases in 2005 and 2009, respectively. The incidence rate went from 72.5 to 57.8 persons per 100,000 over this time. This indicates that the number of tuberculosis cases is gradually decreasing with more active control measures, such as directly observed treatment (see Table 1). In 2009, the proportion of smear-positive and laboratory confirmed new TB cases were 41% and 80%, respectively. The detection rate of sputum smear-positive case was 71%. On average, a new tuberculosis patient in Taiwan is detected every 39 minutes.

Table 1. Taiwan Tuberculosis Incidence and Mortality, 2005-2009

Year	Cases	Incidence	Death	Mortality
2005	16,472	72.5	970	4.3
2006	15,378	67.4	832	3.6
2007	14,480	63.2	783	3.4
2008	14,265	62.0	762	3.3
2009	13,336	57.8	748	3.2

A tuberculosis patient registry was implemented in 1957, but was limited to infected 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 did not reflect the true number of patients. It was only after the Bureau of National Health Insurance adopted the policy of “no-notification, no-reimbursement” and the notification fee in July 1997, and the inspections of tuberculosis-related deaths conducted by Taiwan CDC since 2001, that the number of tuberculosis patients reported by medical institutions dramatically increased. The difference between the data and reality started to lessen. There were two to three times more male tuberculosis patients than female, and the incidence rate in males was also two to three times higher than female. Furthermore, the data showed that the incidence rate of tuberculosis rose with age. Among new patients, 53% were over 65 years old. New tuberculosis cases tended to appear in urban areas. In 2009, the cities or counties with the highest number of new tuberculosis patients were Taipei County (2,104 cases, 16%), Taipei City (1,110 cases, 8.%), Kaohsiung County (1,007 cases, 8%) and Taoyuan County (921cases, 7%). Also, the incidence rate in eastern Taiwan was higher than the west, and the south higher than the north. The incidence rate was the highest in Taitung County in 2009, at 113.3 per 100,000 people. In Hualien County, it was 109.0 and Pingtung County 89.8 persons per 100,000. In mountainous regions, the incidence rate of tuberculosis was 236.3 per 100,000 people, which was 4.1 times higher than all regions (57.8 per 100,000).

Taiwan’s incidence rate in 2009 of 57.8 per 100,000 people was 16.5 times higher than the United States and 2.8 times more than Japan. The main goals of Taiwan’s TB policies are to lower the incidence rate of tuberculosis and protect residents’ health, thereby improving quality of life.

Morbidity Rate

Since infants and children in Taiwan have to receive the Bacillus Calmette-Guerin vaccine (BCG), 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 who test positive, morbidity can be estimated. The BCG

vaccination rate among infants and children in recent years has reached 98%, effectively reducing the incidence of tubercular meningitis among children. However, the test sample group 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.

Mortality Rate

Tuberculosis claimed 748 lives in Taiwan in 2009, giving a mortality rate of 3.2 per 100,000 people. The disease also caused 0.53% of total deaths, making it the 16th leading cause of death. The mortality rate of tuberculosis dropped by 24% from 2005 to 2009.

Among tuberculosis-related deaths, the number of deaths among males was 566, 3.1times higher than that of females, which was 182. The mortality rate of tuberculosis also rose with age, with 81% (609) of deaths in people aged 65 years and above. This shows that in Taiwan, the population group threatened most by tuberculosis is the elderly. Geographically speaking, the mortality and morbidity rates of tuberculosis were positively correlated. Furthermore, rates in eastern Taiwan were higher than in the west, while the south was higher than the north. The rates were lower in cities. The mortality rate of tuberculosis was the highest in Taitung County, at 10.8 per 100,000 people. Hualien County followed at 8.2 per 100,000. In mountainous regions, the mortality rate was 14.6 per 100,000, which was 4.5 times higher than all regions (3.2 per 100,000).

Our current goals are:

1. To provide active strategies and enhance contact tracing investigation to detect infected persons early, reducing the opportunity for mycobacterium tuberculosis to spread.
2. To provide comprehensive medical treatment for TB patients and latent TB infection (LTBI) patients under 13 years old. Prevent LTBI patients from developing into active TB and halve the number of reported TB cases.
3. To implement the directly observed treatment short-course (DOTS) and the directly observed preventative therapy (DOPT) to increase the complete treatment and cure rate along with stopping TB bacteria from spreading.

Accomplishments

Improving Epidemic Reporting and Monitoring

The National Tuberculosis Reporting and Management System collects and keeps track of information on tuberculosis patients, such as diagnosis, reporting, registration, treatments, examination and management, along with recording the people who encounter the patients. It also provides the information required for case management and epidemic analysis.

Establishing a High Quality and Rapid TB Testing Network

The tuberculosis laboratory testing network was launched in October 2001. In the early stages, its main goals were to establish a laboratory testing network, provide feedback, and create a testing procedure. Currently, the network stresses the certification and improvement of laboratories, monitoring and training of staff members, and organization of reports on in vitro susceptibilities of drugs. 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 10 years was implemented in April 2006. The DOTS coverage rate was 100% in Taiwan, and the quality of treatment has greatly improved, with constant supervision and reviews. In addition, treatment success rates for smear positive TB cases increased gradually (see Table 2).

The execution of a treatment program requires corresponding strategies. These strategies, especially the five key factors suggested by the WHO, require evaluation and correction of mistakes to improve the quality and effect of treatment.

Table 2. Treatment Success Rate for Smear Positive TB in Taiwan

Year	DOTS coverage	Smear positive treatment success rate (12 months)
2005	0	64%
2006	100%	67%
2007	100%	67%
2008	100%	67%

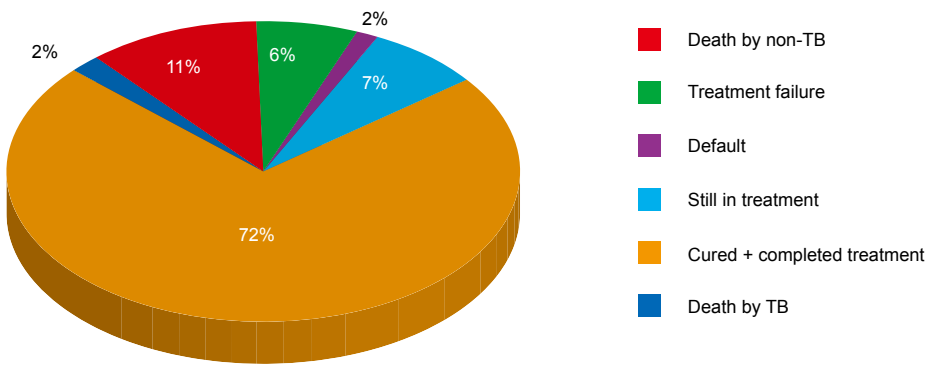
Improving Quantity and Quality of TB Diagnosis and Treatment; Nosocomial Infection Control

To maintain and improve diagnosis and treatment, Taiwan CDC worked with medical associations. It also worked with the Bureau of National Health Insurance on the prescription drug inspection system to strengthen the evaluation of nosocomial infection control. The program included regular X-ray screening, education and training, examination of people who encounter 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 evaluation program of nosocomial infection control .

Establishing the Multi-Drug Resistant TB (MDR-TB) Medicare System

The Multi-Drug Resistant TB (MDR-TB) Medicare System was established in May 2007. It consists of five medical teams which specialize in treating MDR-TB patients. The responsibilities of Taiwan CDC are to provide resources and direct each team to offer treatment according to the WHO clinical guide. After admission, the teams actively treat each patient for two years, and community health workers provide personal care via the DOTS Plus program. The goal of the system is to provide continuous and comprehensive care. A total of 247 (88%) cases were managed under the medical MDR-TB system through the end of December 2010, leading to a steady decrease in the number of

Table 3. Treatment Outcome of Second Line Anti-TB Drugs at 24 months



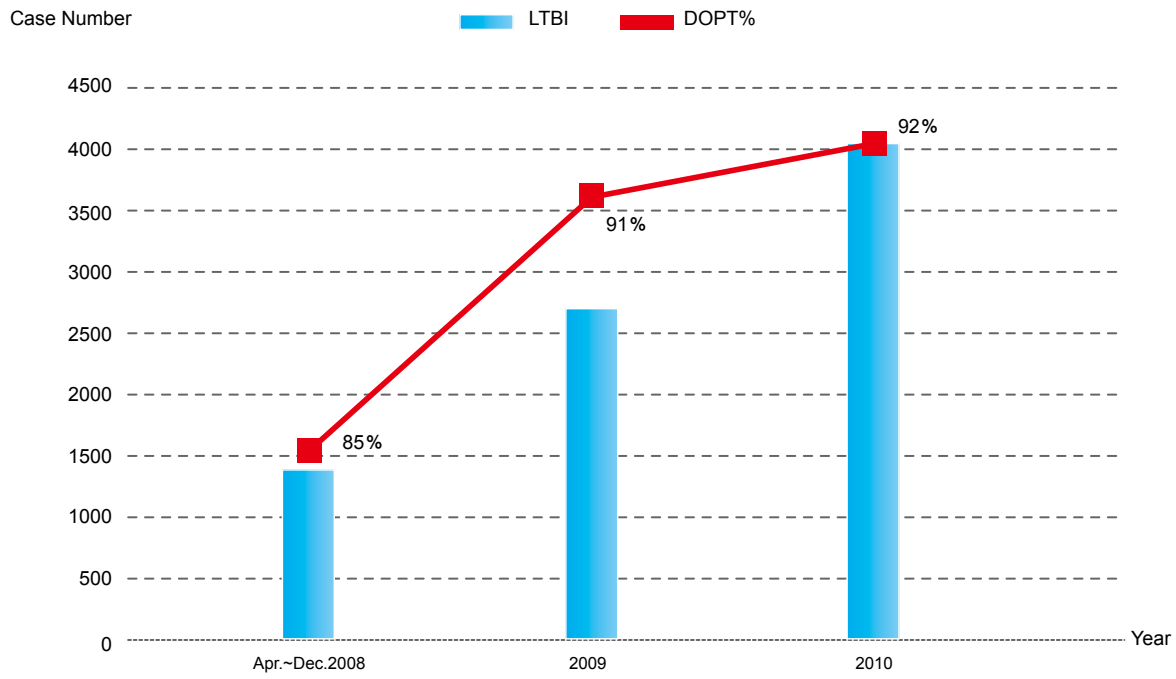
There were 407 cases under analysis, in which 30 patients had no clinical outcome and 28 achieved sputum conversion. The favorable outcome was 79%.

MDR-TB cases and a favorable outcome of about 80% at 24 months for patients who received treatment (see Table 3). In addition, the number of MDR-TB cases in registry decreased from 440 in May 2007 to 310 in December 2010. Thus, the system seems to be effective. Moreover, cooperation between Taiwan CDC and the Bureau of National Health Insurance on fluoroquinolone control and random clinical treatment prescription inspection has decreased the drug-resistant rate of fluoroquinolone from 50% before 2008 to 10% in 2010 and lowered the occurrences of XDR-TB cases. Taiwan CDC works hard at controlling and improving laboratory quality and introducing second line tuberculosis drugs. Its advanced medical team gives difficult-to-treat MDR-TB patients a chance at full recovery.

Latent TB 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 while inducing the least possible amount of drug side-effects. It is targeted at children under 13 years old in contact with tuberculosis and is carried out in conjunction with DOPT, or directly observed preventive therapy. In 2010, a total of 3,874 persons were enrolled, of which 92% were also enrolled in DOPT. LTBI treatment and DOPT rates from 2008 to 2010 increased gradually (see Table 4).

Table 4. LTBI and DOPT Rates in Taiwan



Exit Control of TB Patients Traveling by Air

The WHO suggests patients with infectious pulmonary tuberculosis or MDR tuberculosis should delay 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, based on 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 the responsibilities of international public health. Due to the completeness of 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 eight hours; and (2) infectious MDR-TB patients from traveling altogether. All tuberculosis patients are informed of the travel restrictions by mail and should have a full understanding of the situation. Since the restrictions were implemented on Sept. 1, 2007, there hasn't been a single violation, showing that air travel restrictions have been very effective.

Quarantining of Infectious Pulmonary TB 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 it is the most favorable course of action or if the patient does not take his or her medicine regularly and refuses to enter into quarantine willingly, based on the Communicable Disease Control Act. The patient and family members are 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 assistance and strengthen diplomatic relations. Taiwan CDC has also sent representatives overseas to participate in conferences and acquire knowledge and experience to improve its own ability in the fight against tuberculosis. In addition, it has invited foreign experts to Taiwan to participate in academic conferences, facilitating the exchange of knowledge and experience (see Figure).

Future Prospects

Achieve annual reduction of new tuberculosis cases and lower the incidence rate to 36 per 100,000 people by year 10 (2015).

Figure. Contact Investigation Training, 2010

HIV/AIDS

Current Status

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

The loss of immune functions can lead to AIDS (acquired immunodeficiency syndrome), which 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 2010, the number of HIV patients had risen to 20,057 (7,333 of whom had developed full-blown AIDS with 2,904 deaths). The number of HIV infections surged in 2005 due to a major increase in infections among injecting drug users (IDUs). Faced with this serious situation, Taiwan CDC dedicated a tremendous amount of effort and resources to harm reduction programs. Total reported cases dropped in 2006, which was the first trend reversal since 1984. Toward the end of 2010, Taiwan had effectively reduced the number of HIV infections (see Figure 1).

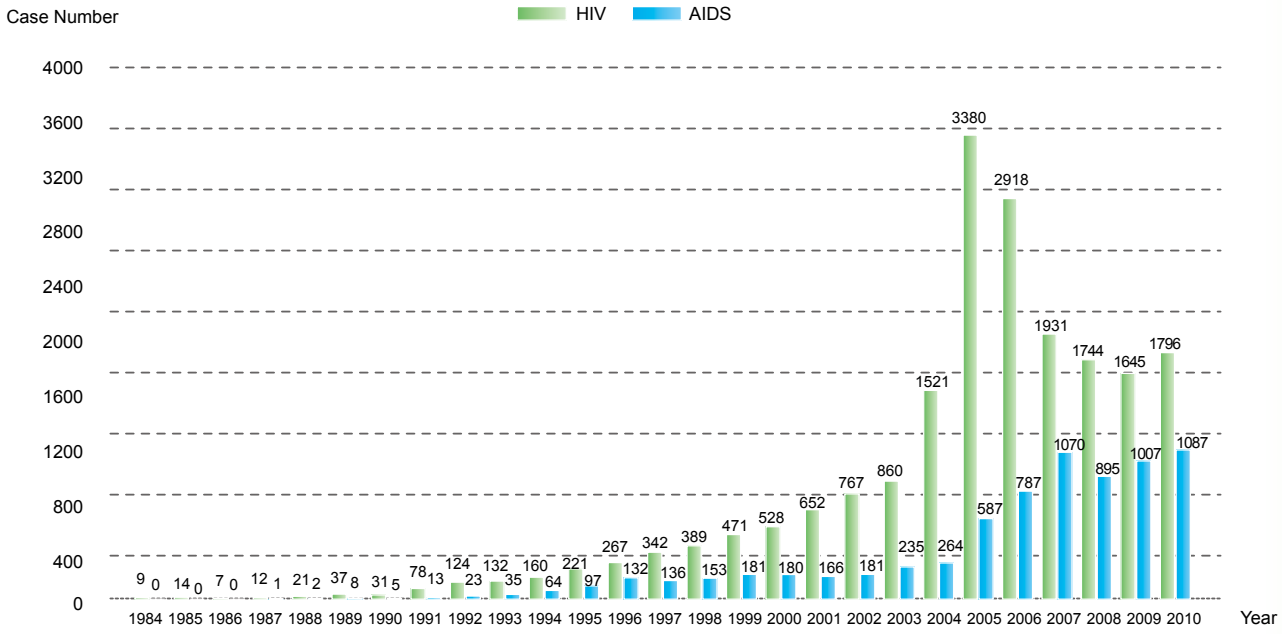


Figure 1. Reported Cases of HIV/AIDS by Year of Diagnosis in Taiwan, 1984-2010

Table 1. Age Distribution of HIV Patients in Taiwan 2009/2010/1984-2010

	2009		2010		1984-2010	
Age	Cases	Percentage	Cases	Percentage	Cases	Percentage
0-9	1	0.1%	0	0.0%	38	0.2%
10-19	54	3.3%	55	3.1%	487	2.4%
20-29	722	43.9%	847	47.2%	7,682	38.3%
30-39	485	29.5%	543	30.2%	7,041	35.1%
40-49	245	14.9%	224	12.5%	3,180	15.9%
50-59	103	6.3%	78	4.3%	1,100	5.5%
60-69	26	1.6%	36	2.0%	359	1.8%
70-79	8	0.5%	9	0.5%	148	0.7%
Over 80	1	0.1%	4	0.2%	22	0.1%
Unknown	0	0.0%	0	0.0%	0	0.0%
Total	1,645	100.0%	1796	100.0%	20,057	100.0%

The largest number of infections in 2010 was in the 20 to 29 age group, accounting for 847, or 47.2%, of all cases. The second largest group was the 30 to 39 age group, numbering 543, or 30.2%, of all cases (see Table 1). An analysis of risk factors showed that in 2010, the highest percentage of HIV infections was a result of sexual transmission, with men having sex with men (MSM) accounting for 70% of all cases. The second largest percentage of infections was heterosexual contact, accounting for 16% (see Figure 2). Of Taiwanese nationals infected by HIV in 2010, 1,730, or 96%, were males and 66, or 4%, were females. The ratio of infected males to females was 26:1.

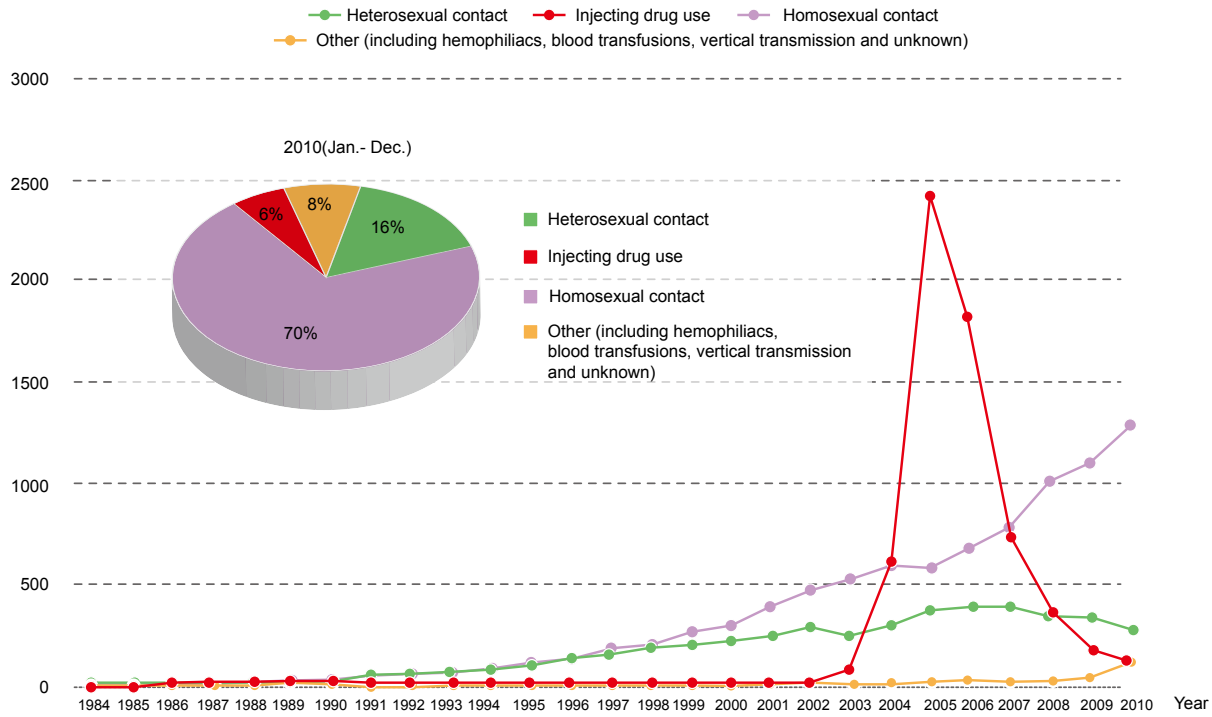


Figure 2. Statistics on Risk Factors of HIV Infections in Taiwan, 1984-2010

Accomplishments

1. The Committee for HIV Infection Control and Patient Rights Protection (The administration structure is in Figure 3) held two cross-ministerial meetings in 2010.
2. To ensure the dignity and rights of people living with HIV/AIDS (PLWHA), the AIDS Prevention and Control Act was amended in 2007. Regulations were also amended and announced.
3. The harm reduction program has made significant progress.The reported number of HIV infections dropped in 2006, reversing a 20-year growth trend. Toward the end of 2010, In Taiwan there was effective reduction in the number of HIV infections, with the largest decline among IDUs. In addition, the percentage of all newly reported cases attributable to IDU fell from a high of 72% in 2005 to only 5.8% in 2010.
4. Taiwan CDC promotes a diversified prevention project for homosexuals to confront the epidemic among MSM. The project includes innovative educational materials advocating safe sex between homosexuals, an educational website, and community health service centers for homosexuals. The centers provide correct prevention information and resources and make services more accessible through the help of peers and NGOs.
5. To increase disease surveillance, Taiwan began to screen blood donors in 1988, draftees in 1989, prison inmates in 1990, and foreign laborers in 1991. Ten hospitals have provided anonymous HIV blood-screening since 1997. To increase accessibility of HIV screening, 22 hospitals provided anonymous HIV testing in 2010. They screened 20,397 people, with 539 found to be HIV positive, accounting for 2.64% of the total. Furthermore, to handle the increase in female HIV patients and the problem of mother-

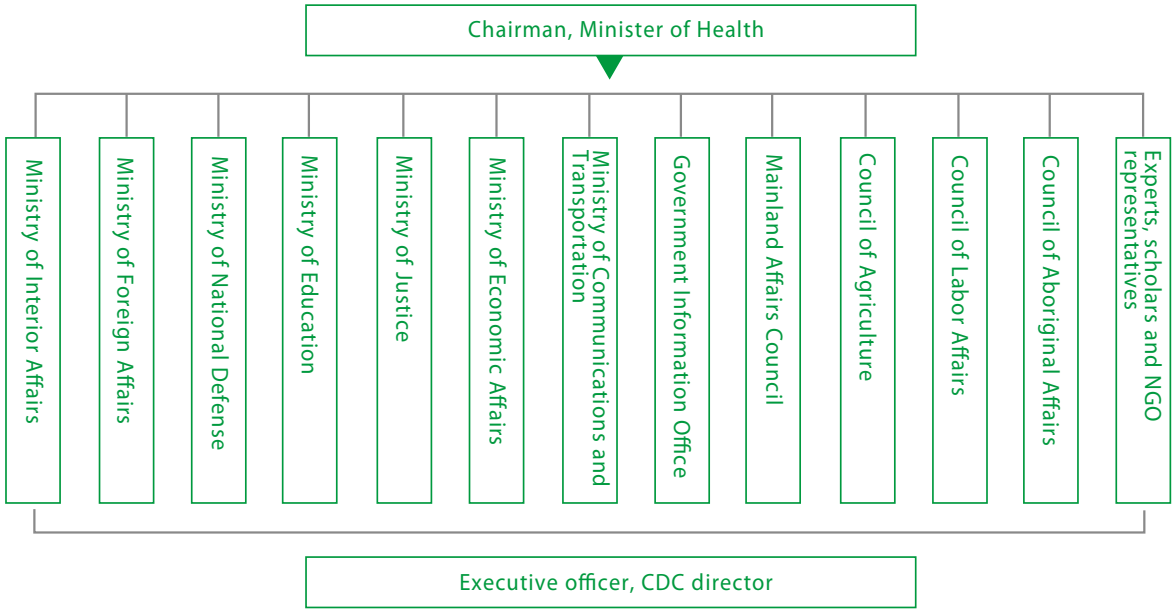


Figure 3. Committee for HIV Infection Control and Patient Rights Protection, DOH, Executive Yuan

to-baby transmission, an HIV screening plan was established for pregnant women. Thus far, it has detected 75 positive cases (20 were foreign nationals).

6. In coordination with World AIDS Day, a project for universal HIV screening was conducted from Nov. 26 to Dec. 3, 2010. A total of 798 service stations were set up throughout the country to provide screening and counseling for HIV and syphilis, with the cooperation of government agencies, anonymous screening hospitals, and NGOs. Positive cases were referred to care systems for treatment with follow-up contact.
7. The Taiwan government has provided HIV/AIDS patients with free medical treatment since 1988 and free highly active antiretroviral therapies (HAART) since 1997. At the end of 2010, 45 designated hospitals provided 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 immune 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, provide care and compassion to HIV patients.
8. In the area of scientific research and development, Taiwan CDC conducted six projects in 2010 and commissioned National Taiwan University Hospital to establish an AIDS treatment center. The center trains physicians to build a specialist medical corps for bringing HIV/AIDS under control.

Future Prospects

According to statistics from the Bureau of National Health Insurance (NHI), medical expenses for HIV patients in 2009 totaled about NT$1.89 billion. Furthermore, other AIDS-related costs, such as popular education and screenings plus other medical costs (clinical examinations and psychological consultations) also increased immensely. The loss to labor and technology, freezes on foreign investment, reduction in exports, and decline in revenues are inestimable.

At the onset of the world AIDS epidemic, the Department of Health rallied medical and health experts and private institutions to prevent and control the disease. After years of hard work, it has achieved remarkable results, but has been unable to bring the number of new cases under control. Taiwan CDC hopes that in the future, the cross-ministerial Committee for HIV Infection Control and Patient Rights Protection will make prevention the thrust of its efforts to stop the spread of HIV/AIDS.

Pandemic Influenza

Current Status

When the H1N1 pandemic struck in 2009 and 2010, based on determination of the Executive Yuan, Taiwan formed the H1N1 Influenza Central Epidemic Command Center. The center was formed on April 28, 2009, near the beginning of the pandemic and when the WHO raised the level of the influenza pandemic alert to Phase 4. A total of 28 agencies joined the center. Since then, two commander-in-chiefs (vice premiers Eric Chu and Paul Chiu) and directors (health ministers Yeh Ching-chuan and Yaung Chih-liang) have been appointed. The center had been in operation for 303 days and met 43 times before the Executive Yuan disbanded it on Feb. 24, 2010. It received approval and made payment of NT$8.7 billion into the secondary reserve fund and the special budget, using NT$7.8 billion.

Accomplishments

As part of its response to the global H1N1 influenza pandemic of 2009 and 2010, Taiwan implemented extensive border control measures. After 9,830 confirmed cases (and 79 deaths) in 41 countries, on May 20, 2009, Taiwan had its first confirmed case of imported H1N1. It responded by mobilizing personnel from various agencies, monitoring the pandemic situation, providing appropriate medical treatment plus antiviral drugs, carrying out inoculations, communicating with citizens, and conducting community pandemic control work. These efforts meant Taiwan could minimize the threat H1N1 posed to local communities.

Different goals were set at different stages in the face of the 2009 influenza pandemic. From April to the middle of June 2009, the goal was containment, followed by mitigation through the end of October and herd immunity for the final stage. The second wave of the epidemic subsided toward the end of February 2010. On Aug. 10, based on pandemic situation monitoring and expert recommendations, the WHO announced that the H1N1 influenza situation had reached post-pandemic stage. Key elements of Taiwan's disease prevention and treatment efforts are listed below:

1. Enhancing Border Control: On April 29, 2009, Taiwan CDC launched on-board quarantine inspections for certain incoming flights, and on May 20 it changed to only conducting on-board inspections when it received abnormal reports. Altogether, it conducted on-board inspections of 282 flights, tracing almost 1,000 passengers who were on the same flight as people with confirmed cases of H1N1. The strategies successfully slowed transmission.
2. Using TV to Strengthen Publicity: Taiwan CDC recorded 88 disease prevention messages, inviting 69 leaders, well-known public figure and entertainers to film one-minute short videos. The messages were broadcasted on TV to raise acceptance of epidemic prevention work and provide people with accurate influenza information. A public opinion poll suggested that the disease prevention messages were the government's most popular disease prevention policy.
3. Releasing Face Masks in Response to Shortage Fears: To avoid face mask shortages during the epidemic period leading to unnecessary anxiety, Taiwan CDC made 24 million face masks available. The masks were provided through the four main convenience stores, chemists (including pharmacists, the Pharmacist Association of R.O.C. and pharmaceutical associations), and clinics. The influx maintained market supply, achieving Taiwan CDC's goal of controlling prices.

4. Suspension of Classes: In September 2009, Taiwan CDC introduced its "325 Standard" for canceling classes. The rule applied to high schools and lower. The standard was modified by the "814 Principle" on Dec. 1, 2009, which said that only individual students who developed flu-like symptoms needed to take off school if 80% of the student body had been inoculated against H1N1 at least 14 days before. These two policies effectively made sure classes that needed to be canceled were and encouraged people to get inoculated, thereby helping to control the epidemic. Peak implementation occurred at the end of November 2009, with close to 1,500 classes, or about 1% of the country's total, canceled from more than 700 schools. After students were inoculated in the middle of November, the number of canceled classes plummeted. By Jan. 11, 2010, only two classes, or about 0.001% of the country's total, from two schools were called off. They were the last.
5. Start of H1N1 Influenza Inoculations: H1N1 inoculations began on Nov. 1, 2009, with vaccinations provided to children at schools, and on Dec. 12 the vaccinations were expanded to include the entire population. By the final stage of the flu season (February 2010), approximately 5.65 million people had been inoculated, for a coverage rate of 24.5%, fifth best in the world. In addition, 76% of doctors were inoculated, which was top in the world, and 75% of students were inoculated, tied with South Korea for the top ranking. As the vaccination program took place, the epidemic situation in Taiwan quickly decreased. Afterward, in line with WHO recommendations, more than 500 medical centers in Taiwan continued to provide vaccination services. In addition, owing to group outbreaks of H1N1 influenza in the military, Taiwan CDC along with the Ministry of National Defense launched a vaccination program for new recruits in May 2010. Through Nov. 30, 2010, when the vaccination period ended, a total of 5.695 million people were vaccinated, for a coverage rate of 24.7%.

Looking at the overall epidemic situation from April 2009 to August 2010, Taiwan's H1N1 mortality rate was one-third of the average among Organization for Economic Co-operation and Development (OECD) members and one-fifth of America's average (see Figure 1). Moreover, there was a noticeable improvement in epidemic control work when compared to the SARS outbreak. Several serious problems encountered then were avoided, including insufficient coordination between central and local governments, unclear information, population anxiety caused by resource shortages, and serious nosocomial infections. In addition, people's everyday lifestyles and society functioning remained stable while economic activities were not affected. The results were outstanding. Moreover, this was the first round of epidemic control where Taiwan was a member of the World Health Assembly (WHA) and the International Health Regulations (IHR). In addition, it was the first time that Taiwan carried out epidemic control work under the IHR (2005) framework. With abundant information and extensive preparation, Taiwan achieved

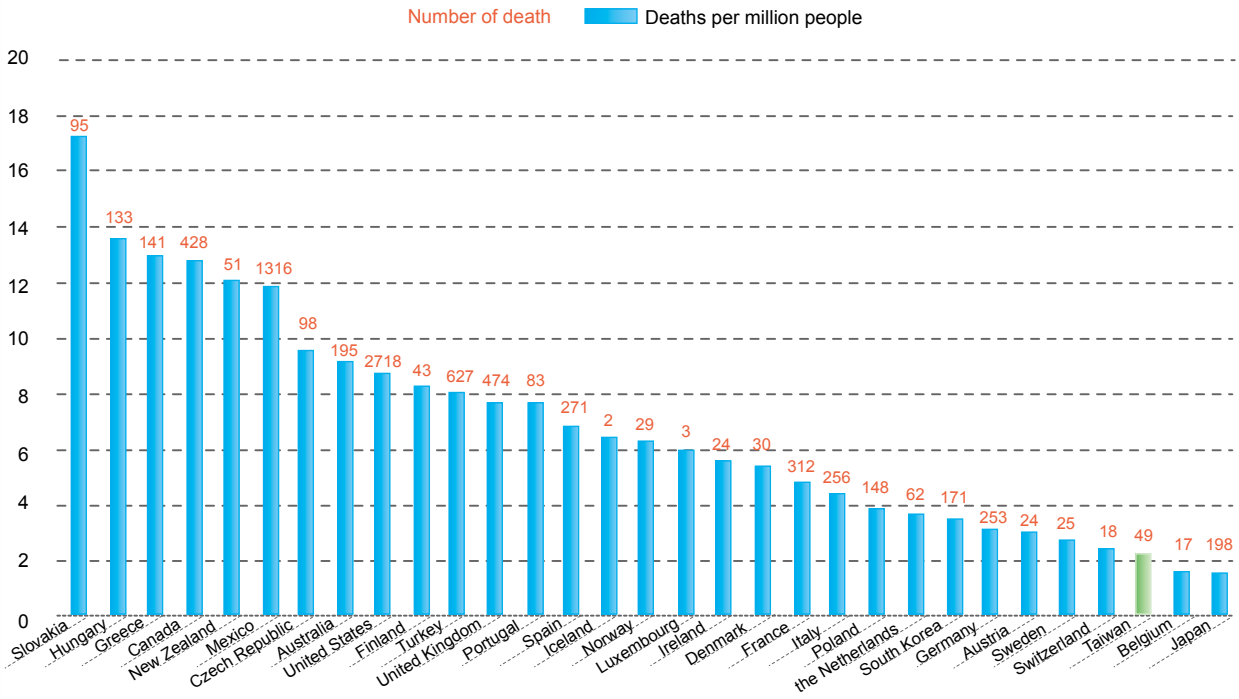


Figure 1. H1N1 Mortality Rates of Taiwan and OECD Members

excellent results in disease prevention and had the opportunity to share its experience with countries around the world. The result was a further evidence of Taiwan's importance as a WHO member.

Future Prospects

The WHO recommends that each country continue monitoring the disease situation during the post-pandemic period to detect potential outbreaks and lower the impact of pandemic events. It also encourages each country to evaluate its emergency preparations and capacity.

Using these recommendations, Taiwan monitors mild and severe complication influenza cases along with virus and mortality developments during non-pandemic periods, so it can control disease situations from the start. It also maintains close contact with the IHR and WHO and works to strengthen its capacity for monitoring and evaluating viruses. In addition, Taiwan CDC added its experiences from the 2009 – 2010 H1N1 pandemic into its National Influenza Pandemic Preparedness Plan – Phase II, which received approval from the Executive Yuan on May 18, 2010. In the future, it will continue taking advantage of its experiences to raise its ability to prepare for influenza pandemics.

One of the key areas of preparing for a pandemic is vaccinations. Taiwan has vaccine manufacturers that can develop and produce vaccines for domestic use, but it will continue encouraging them to raise manufacturing capacity. The government has policies to promote locally manufactured vaccines that are aimed at satisfying recipients. Other areas for development include antiviral drug stockpiling, promotion of influenza vaccination plans, purchasing level three products, integration of the communicable disease control medical network and emergency medical treatment system, and bringing together community epidemic control personnel.

Enteroviruses

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.

Current Status

According to survey data from several years provided by Taiwan CDC, the weekly consultation rate of enterovirus infection cases collected by the real-time outbreak and disease surveillance system (RODS) 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. That appear to be the only known host and source of transmission. There are currently no preventive 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.

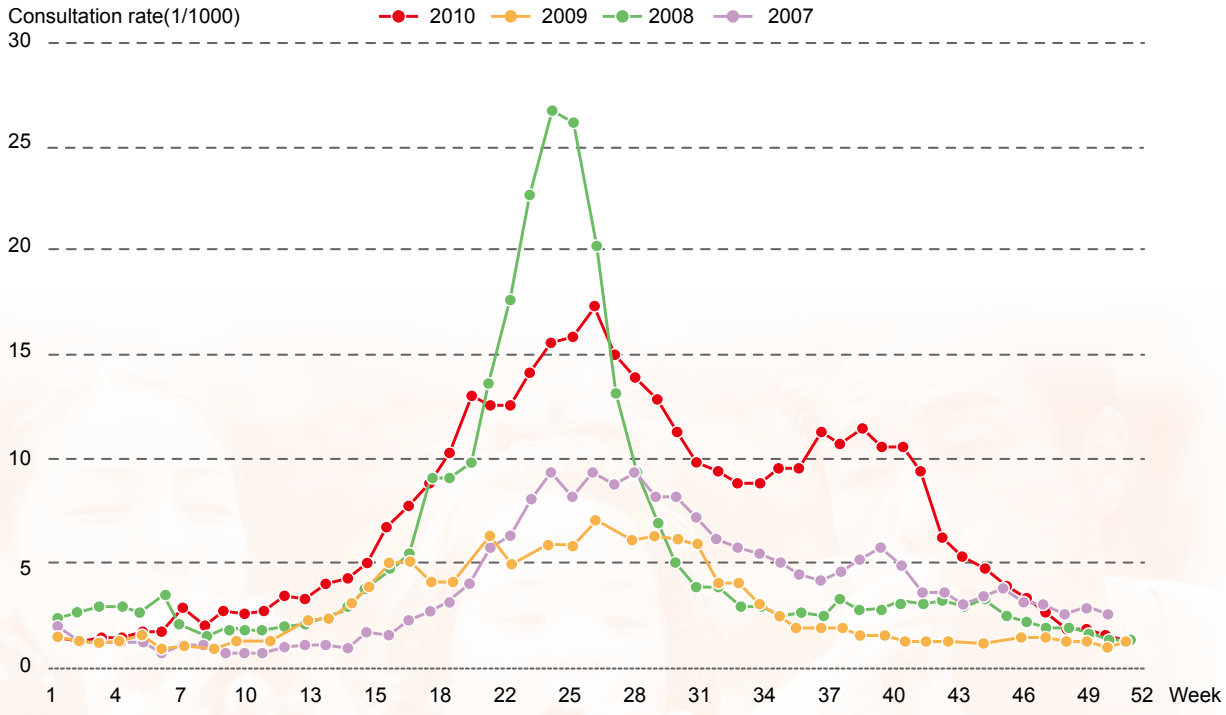


Figure 1. Weekly consultation rate of enterovirus infections by RODS in Taiwan, 2007-2010

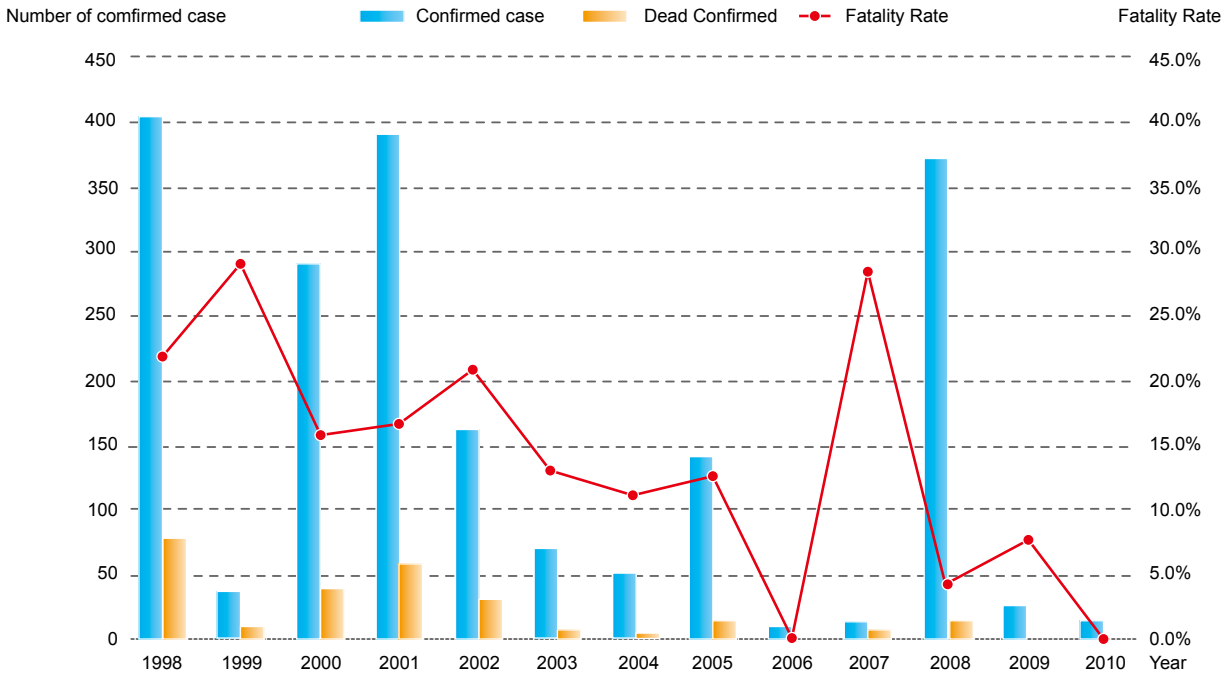


Figure 2. Case number and annual mortality rate from enterovirus infection with severe complications in Taiwan

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.

In 2010, the enterovirus 71 epidemic was less serious than in 2009 (Figure 2). There were 16 confirmed cases of enterovirus infection with severe complications.

Accomplishments

1. Established multiple and real-time surveillance systems for enterovirus infection, on HFMD and herpangina, severe cases, clustering, virus isolation and typing
2. Constructed a medical service network, including six regional commanders, 69 responsible hospitals and 10 contract laboratories, island-wide.
3. The progress of the EV71 vaccine entered phase one clinical trials in 2010.
4. Health Education
   - Local organizations work with the community to promote enterovirus education and prevention.
   - Restaurants, schools, hospitals, clinics, and other public gathering places are required to conduct regular inspections for environmental sanitation and facilities for washing hands.

5. Consultation channels have been 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.
6. "The Manual for Enterovirus Prevention" and "The Handbook for Enterovirus Prevention for Child Care Workers" lists all necessary precautions and has been published on the Taiwan CDC website and updated annually.
7. Workshops on the clinical treatment of critical enterovirus complications enhance doctors' skills in treating the disease, raising treatment quality and reducing mortality rates and sequelae.

Future Prospects

1. Enterovirus prevention enhancement
   - Intensify the Household Hand-Washing Activity Drive by asking adults to wash their hands before coming in contact with children.
   - Encourage people not to go to school or work when they are sick.
   - Augment awareness among caregivers for prodromal complications of enterovirus infection with severe complication.
2. Assessment of current prevention policies
   - Assess consequences resulting from suspending classes.
   - Conduct research on the integrity of medical facilities throughout the area to assess the treatment criteria of severe enterovirus cases.
3. Accelerate development of an EV71 rapid test kit and vaccine
   - Complete the development of the EV71 rapid test kit, provide first line medical staff to shorten the time for diagnosis of EV71 infection.
   - Finish the Investigate New Drug (IND) process for EV71 vaccine to get the vaccine license.

National Immunization Programs

Expanded Program on Immunization Surveillance Systems

Current Status

Vaccination is one of the most cost-effective strategies in the fight against communicable disease. Immunizations have been available since 1948, and now the Taiwan government provides free immunizations to children, including BCG, 5-in-1 (diphtheria and tetanus toxoid with acellular pertussis, haemophilus influenzae type b, and inactivated polio, DTaP-Hib-IPV), oral polio vaccine, hepatitis B, varicella, measles, mumps, rubella (MMR), Japanese encephalitis, tetanus, diphtheria toxoids, acellular pertussis vaccine (Tdap) and influenza. Nine kinds of vaccines are available to Taiwanese children by 6 years of age. (The current immunization schedule is shown in the table below.

The international health community is constantly increasing funding and manpower to develop new and combined vaccines and vaccines with longer efficacy. Governments are also using their resources to provide effective and safe mandatory vaccines, introduce new vaccines, promote policies on immunization and vaccination, establish a stable and comprehensive vaccine supply system, and improve immunization coverage. The ultimate goals of vaccination are to achieve maximum benefit and effectiveness and to protect the health of citizens through effective immunization and vaccination strategies.

Taiwan CDC works to enhance the effectiveness of immunization and health care for children. Parents of newborns are given a children's health handbook with a recommended immunization schedule. User-friendly immunization-related materials are included to ensure that information is accessible and clear.

Providing convenient immunization services helps to improve the coverage rate. To date, children can receive vaccinations at 372 health stations and more than 1,600 contracted hospitals and clinics across Taiwan. In 2009, more than 4,000 hospitals and clinics participated in the influenza immunization program, including providing vaccinations for children.

Health stations across the country regularly carry out health promotion programs for improving national immunization coverage. The programs include mailing reminder postcards, making notification phone calls, scheduling home visits and providing media announcements, all aimed at informing parents of the importance of completing their child's immunization. Moreover, public health nurses at the health stations where children are registered regularly monitor immunization records and follow up on children who have not received up-to-date immunization to ensure those children complete the vaccination series. Convenient service and policy promotion have helped improve the immunization coverage rate, which is now as high as 95%. The immunization coverage rates for children are shown in the following figure.

Data were calculated from the National Immunization Information System (NIIS), January 2010.

	≥24hr	2-5days	1months	2months	4months	6months	12months	15month	18months	24months	27month	30months	36months	6years	≥65years
BCG	BCG														
Hepatits B		HepB1	HepB2			HepB3									
Diphtheria. Tetanus. Pertussis, Hib,Polio※				DTaP-Hib-IPV1	DTaP-Hib-IPV2	DTaP-Hib-IPV3			DTaP-Hib-IPV4					Tdap · OPV	
Varicella*							Var								
Measies, Mumps, Rubella.							MMR1							MMR2	
Japanese Encephalitis**								JE1、JE2			JE3			JE4	
Influenza						Influenza(yearly)									
Hepatitis A#										HepA1		HepA2			

Figure 2. Case number and annual mortality rate from enterovirus infection with severe complications in Taiwan

* Varcilla vaccine is given to children born after January 2003 and aged 12 months or older

** Two-week interval between dose1 to dose2

\# In selected aboriginal areas

※ From March 2010, DTap-Hib-IPV vaccine replaced the routine use of DTP and OPV for children aged2.4.6.and 18 months.

Accomplishments

1. To ensure vaccine quality and maintain effectiveness of immunizations, Taiwan CDC launched a vaccine fund in 2010 after founding it the previous year based on Article 27 of the Communicable Disease Control Act. With a stable source of support from the vaccine fund, over the next few years Taiwan CDC will gradually introduce new vaccines into the routine immunization schedule on the basis of cost effectiveness and recommendations of the Advisory Committee on Immunization Practices.
2. Taiwan CDC will continue to promote immunization policies of various routine vaccines. In March 2009, new enrollees in primary schools began to receive Tdap, and the immunization coverage rate was as high as 95%.
3. Children under 5 years of age in high-risk groups have been given pneumococcal conjugate vaccine (PCV) since July 2009. In addition, children under 5 who live in mountainous areas and offshore islands or are from low-income families have been given PCV since January 2010.
4. The 5-in-1 (DTaP-Hib-IPV) vaccine was launched to replace the traditional DTwP (diphtheria, tetanus toxoid with whole cell pertussis) vaccine in March 2010. The switch reduces the chance of adverse reactions such as fever and local reaction such as redness or swelling where the shot was given.
5. Local health bureaus and health stations received subsidies to renew and replace their cold chain and storage facilities to ensure the quality of vaccines and maintain the effectiveness of immunization.
6. Taiwan CDC held training seminars on the cold chain system, storage management and immunization practices to ensure vaccine quality and professional knowledge of medical personnel.

Future Prospects

1. Build a safe vaccine supply system and increase coverage by implementing immunization services to reach eradication goals.
2. Include new vaccines on the EPI-recommended vaccine list after: (1) Reviewing communicable disease control; (2) Assessing the affect on public health, social economics and medical costs; (3) Updating vaccine R&D, production and supply information; and (4) Allocating the health fiscal budget for vaccine purchase.
3. Promote e-management of immunization programs to strengthen information management and analysis, improve service capabilities, integrate information on immunization, accelerate resource sharing and enhance efficiency, in order to be on par with other advanced nations.
4. Develop and promote an appropriate immunization program for the elderly to reduce mortality and morbidity rates from complications of vaccine-preventable diseases.
5. With a stable source of support from the vaccine fund, Taiwan CDC will gradually add new vaccines to the routine immunization schedule based on cost effectiveness and recommendations of the Advisory Committee on Infectious Diseases. In the future, new vaccines to be added include:
   - Pneumococcal conjugate vaccine (PCV) for routine children immunization.
   - Pneumococcal polysaccharide vaccine (PPV) for elderly persons over 65 years of age.

National Immunization Information System

Current Status

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, Taiwan CDC established the National Immunization Information System (NIIS). In 2004, Taiwan CDC used the system and the Internet to consolidate immunization data scattered among various health stations into one database. This has greatly improved work efficiency because authorities can directly manage operations that take place within their jurisdictions.

NIIS, together with household registration authorities and medical institutions, has used functions such as the computerization of case referrals and allocations, along with real-time establishment of databases, to improve the management of immunization operations and the efficiency of storage and retrieval of immunization information.

Household data are obtained from the Department of Civil Affairs, Ministry of the Interior. The information is updated daily and collected for transmission to NIIS. Then the data (including changes of address, birth, and death) are passed to health stations for referral consolidation. This immunization data distributed throughout the health stations can be consolidated for registration, eliminating the need for separate data storage, lowering referral consolidation expenses and raising cost effectiveness.

Through NIIS, authorities can contact parents by text and e-mail to remind them of their children's immunization time, thereby improving immunization coverage rates.

Accomplishments

1. Completion of immunization electronic reporting operations for contracted medical institutions (about 1,600).
2. Progressive replacement of magnetic strip cards with the National Insurance IC cards used by medical institutions to report preventive inoculation data. Approximately 900 contracted medical institutions have completed the changeover.
3. Enhancing the functions and efficiency of the central database to handle yearly increases in data quantities, improving management efficiency.
4. The immunization coverage rate has reached over 95%. This has greatly increased the efficiency of authorities managing operations within their jurisdictions.
5. Computerization of immunization data has enhanced referral and management efficiency.
6. The National Immunization Information System (NIIS) uses different ways to trace and urge the unvaccinated people to get vaccinated, reducing delays and raising the coverage rate. Also, when Taiwan CDC personnel (such as: public health nurses) find a high-risk household cases, they referred to social welfare agencies to take over. To understand the effectiveness of the reminder system, one can take the MMR vaccine as an example. Among children born in 2008, 83.2% had been vaccinated by 15 months of age. By December 2010, the coverage was raised to 97.7%.

   For children entering the country, Taiwan CDC compared entry information from the National Immigration Agency, Ministry of the Interior with NIIS data on children who had not received the MMR vaccine. It then informed local health agencies to find these children and arrange for vaccination. From February 2009 to May 2010, a total of 9,961 such children were found, with 5,185 having been vaccinated for a coverage rate of above 52%

7. Vaccine operational procedures, performed manually in the past, have been computerized to increase efficiency.

Future Prospects

1. Taiwan CDC will continue to enhance real-time online reporting of immunizations administered outside of medical institutions. In addition, it will strengthen the functions of NIIS and classification of information on immunization target groups to improve the accuracy, completeness and timeliness of immunization data.
2. 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. Taiwan CDC will seek feasible channels for completing immunization of such affected persons.
3. Taiwan CDC will integrate various databases and systems (household registration, foreign spouses, reporting of communicable diseases) to improve the coverage rate, conduct follow-up efficacy assessments after immunization, report adverse reactions due to immunization and monitor the efficacy of vaccines in disease prevention.
4. Diversify NIIS immunization reminders. Through text messages and e-mails, parents are reminded of the immunization time for their children, thus improving immunization coverage rates.

Polio, Measles,Congenital Rubella Syndrome, and Neonatal Tetanus Eradication Programs

Current Status

Taiwan launched polio, measles, congenital rubella syndrome (CRS), and neonatal tetanus (NT) 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 deficiency in the polio control network. Until the virus is eradicated, 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 2010, three minor cluster events occurred; two of them were due to the imported cases from Vietnam and Philippines. The outbreaks were efficiently controlled.

No confirmed NT case has been reported since 1996. The sole exception was in 2001 and was an isolated case involving a child born to a foreign mother.

Since 1994, five cases of congenital rubella syndrome (CRS) have been confirmed, three in 2001 and one each in 2007 and 2008. Four of five patients' mothers were foreigners. In 2010, three suspected cases were reported but no confirmed case was found.

Rubella, commonly known as German measles, occurs worldwide. In 2008, four cluster events occurred; one of them was caused by an overseas student and three of them were due to imported cases. The outbreaks were promptly controlled. In 2010, there were 71 reported cases and 20 of them were confirmed cases.

This indicates that the latent danger of communicable diseases cannot be ignored, especially in view of frequent business exchanges, booming tourism, 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, CRS, and NT.

Accomplishments

1. In 2010, 48 AFP cases under the age of 15 were reported and investigated. The investigation completion rate within 48 hours was up to 100%. None of the cases were polio or polio compatible.
2. In 2010, three minor cluster events occurred; two of them were due to imported cases that were from Vietnam and the Philippines. However, the outbreak was soon controlled. There were 112 suspected cases reported and 12 of them were confirmed as measles. The investigation rate as well as the sampling rate was 100%.
3. Three suspected CRS cases were reported but no one was confirmed in 2010. All needed investigation and sampling collection have been accomplished.
4. In 2010, no suspected NT case was reported, and all the babies who were born out of hospitals have been investigated.
5. Since January 1, 2009, all foreigners applying for a residence or settlement are required to submit an antibody positive of measles/ rubella report or immunization certificate. Since September 1, 2009, the physical check for foreign laborers before entry has included an item of “an antibody positive report of measles/ rubella or the 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.

Hepatitis Immunization Program

Current Status

From 1982 to 2007, five five-year plans had 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. Taiwan CDC will move in the following directions: early detection and screening of hepatocellular carcinoma and seeking effective hepatitis treatment.

Accomplishments

Immunization

Hepatitis A

Confirmed cases of acute viral Hepatitis A in aboriginal regions were reduced from 183 in 1995 to 0 in 2010 and the incidence rate was lowered from 90.74 out of 100,000 people in 1995 to 0 in 2010.

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.
2. The coverage rates of second and third doses of HBV for babies born in 2009 are 97.83% and 96.59%, respectively.
3. A review of the vaccination records of new elementary school students shows that Hepatitis B vaccination rates are 99.8% for the second dose and 99.55% 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.

Hepatitis study and research:

Research programs focus on hepatitis policy assessment including HBIG policy, Hepatitis B vaccination booster issue and all types of hepatitis incidence rate, sequela, mechanisms, treatments and hepatitis B seromarkers screening for infants born to hepatitis B surface antigen carrier mothers and the prevalence and risk factor for hepatitis E in Taiwan, etc.

Promotion of Hepatitis B and C Trial Treatment Program:

Between October 2003 and December 2010, the program treated 67,411 and 36,641 Hepatitis B and C patients, respectively.

Future Prospects

1. Among infants born to a mother who is e antigen positive, there is a 10% chance that they will become chronic carriers of hepatitis B even after receiving hepatitis B immunoglobulin (HBIG) and three doses of immunoprophylaxis. For these children at a high risk of vertical transmission, Taiwan CDC has begun offering free hepatitis B screenings at age 1 and is working to understand the effectiveness of the vaccination series. It will continue to provide information to parents to raise the percentage of children who are screened.
2. Establishment of the Platform of Integrated Screening Information for Chronic Hepatitis B and C. To promote the surveillance of chronic hepatitis B and vaccine cost-effectiveness assessment, to formulate and operate policies concerning hepatitis and hepatoma, and to minimize expenditures for the repeated screening of high-risk groups, the Platform of Integrated Screening Information for Chronic Hepatitis B and C has been set up.
3. 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 continued to promote an Enforce Hepatitis B and C Trial Treatment Program. In addition, it maintained funding for the program so more people could benefit.

Emergency Preparedness & Response

Emergency Preparedness & Response

Current Status

At the end of 2003 when avian influenza epidemic emerged, Taiwan began to prepare for a potential pandemic influenza. Because the country had recently passed through the SARS epidemic, government agencies gave strong support to the effort, appropriating necessary funding for each aspect of preparations.

Currently, two documents are used to guide preparedness planning: the Influenza Pandemic Preparedness in Taiwan and the Strategy Plan for Execution of Influenza Pandemic Response. These include four major strategies: epidemic monitoring and evaluation, interruption of transmission, antiviral drugs, and influenza vaccine; and five lines of defense: containment abroad, border control, community epidemic control, maintaining medical system functions, and individual and family protection. These measures minimize the death toll, economic losses and impact of new influenza viruses.

Accomplishments

Taiwan is accustomed to preparing for influenza pandemics. However, the prevention and treatment associated with influenza pandemics require full government support, the Executive Yuan Avian Influenza Control Cross-departmental Meetings that started on Oct. 25, 2005, continue to date. At the meetings, different government agencies discuss, negotiate and formulate policies on key influenza pandemic topics. Sixty-one cross-ministry meetings had been held through the end of December 2010. Considering epidemic prevention and treatment needs, the Infectious Disease Control Advisory Committee holds influenza control group meetings. These meetings provide consultations on epidemic prevention and preparation.

The major tasks in preparing for a potential influenza pandemic include: stockpiling and using vaccines and antiviral drugs; maintaining the medical system and raising its capacity; building up disease prevention resources; and enhancing overall disease prevention capacity. Overall disease prevention capacity includes public risk communication, mobilizing communities and international information exchanges.

Future Prospects

Taiwan CDC will continue referring to the Influenza Pandemic Preparedness along with the Strategy Plan for Execution of Influenza Pandemic Response publications to compile control guidelines for front line medical practitioners and other epidemic control personnel. In addition, it will provide advices of focused health education while communicating with the media. Through these measures, it will enhance the effectiveness of disease prevention and treatment.

Stockpiling and Usage of Influenza Antiviral Drugs

Current Status

Antiviral drugs are one of Taiwan's main weapons in the battle against influenza pandemics. Before the H1N1 pandemic of 2009 , Taiwan CDC had already stockpiled enough antiviral drugs for 10% of the population. One type of antiviral drug it stockpiled was Roche's Tamiflu, an orally administered drug with oseltamivir phosphate as its main component. It was stockpiled in both capsule and powder (active pharmaceutical ingredient, or API) form. Another drug it stockpiled was GlaxoSmithKline's neuraminidase inhibitor Relenza. It is WHO-recommended, comes in powder form for inhalation and has zanamivir as its main component. Stockpiling different types of antiviral drugs makes Taiwan CDC better prepared to respond to virus resistance and provides flexibility for patients who might not be able to take a particular kind of medicine. Moreover, to quickly understand the distribution and the usage of medicines, these antiviral drugs are managed using the antiviral subsystem of the Communicable Disease Control Resources Management Information System.

When the 2009 H1N1 pandemic was underway from August 2009 to March 2010, Taiwan CDC expanded the accessibility of antiviral drugs by providing medicine through the National Health Insurance system. Stockpiled drugs eased market supply deficiencies.

Accomplishments

Taiwan raised its stockpile of antiviral drugs to cover 25% of the population in 2010. In addition, it began to stockpile the newly approved antiviral drug Rapiacta. Peramivir is Rapiacta's main component. It is administered as an intravenous injection and is suitable for severe influenza patients who are unable to take oral or inhaled drugs due to fainting or other reasons.

In line with WHO and international recommendations along with local influenza epidemic needs, starting from April 2010, Taiwan CDC began increasing targeted users for stockpiled medicine during seasonal influenza epidemics to provide prompt treatment and slow the spread of epidemics.

Future Prospects

Taiwan CDC will maintain the country's stockpile of antiviral drugs while monitoring international drug developments to assess the need for stockpiling new types of drugs. In addition, based on epidemic conditions, it will continue to review appropriate times to allocate and use its stockpiles.

Stockpiling and Usage of Influenza Vaccines

Current Status

Vaccines are another Taiwan's main weapons in the fight against influenza pandemics. Before the 2009 H1N1 influenza pandemic, Taiwan had already stockpiled 190,000 doses of human vaccines for influenza A(H5N1). In line with recommendations by Taiwan's Advisory Committee on Immunization Practices (ACIP) and the WHO, Taiwan CDC also worked to gradually increase usage of seasonal influenza vaccinations. Starting from 2007, it added first to fourth grade primary school students, severely ill or injured patients, and children from ages 3 to 6 as priority recipients. Moreover, Taiwan CDC uses the Influenza Vaccine Information System to quickly understand vaccine distribution and usage.

Seasonal influenza vaccinations laid the foundation for the 2009 H1N1 influenza vaccination plan. Taiwan purchased 15 million doses of the vaccine and began administering them on Nov. 1, using ACIP recommendations to determine the order of vaccine recipients and conducting vaccinations based on shipments received and the number of people receiving the vaccines. On Dec. 12, health authorities made the vaccinations available to all groups of people and held national immunization day activities, achieving a single-day record of 560,000 people vaccinated.

Accomplishments

To respond to changes in the H1N1 situation, vaccinations lasted through the end of November. Approximately 25% of the population was vaccinated.

A voluntary human vaccination plan for A(H5N1) took place between August and November owing to the international avian influenza virus H5N1 situation. Under the plan, the government provided vaccinations to epidemic control personnel and high-risk people who frequently traveled to areas with A(H5N1) infections.

Taiwan CDC launched its seasonal influenza vaccination plan on Oct. 1. Primary groups included seniors aged 65 and above, patients and workers at long-term care centers, children from 6 months to age and fourth grade, patients suffering from rare or serious diseases and severe injuries, medical and epidemic prevention personnel, poultry and livestock industry workers, and people engaged in animal disease control. In November, the first round of in-school vaccinations for fifth and sixth grade students began. Taiwan CDC made the vaccinations available to all people starting from Dec. 1 and continued to administer them until supplies were exhausted.

Future Prospects

Taiwan CDC will continue to conduct the seasonal influenza vaccination plan while maintaining its inoculation capacity. It will enhance knowledge of influenza and vaccinations among medical workers while monitor international vaccine research and epidemic situations. Hence a suitable amount of vaccines will be stockpiled before potential influenza pandemics. Moreover, Taiwan CDC plan to implement advanced purchase agreements for pandemic vaccines.

Personal Protective Equipment (PPE) Management

Current Status

Establishment of PPE Stockpiles

The H1N1 pandemic of 2009 and 2010 and the corresponding surge in demand for masks and respirators revealed the need for a PPE stockpile. To protect front-line health care workers and the public during flu pandemics, a hierarchical framework with three tiers of PPE stockpiles was established. The central government stockpile is for nationwide epidemic control and emergency dispatch, the local government stockpiles fulfill local public health and epidemic control needs, and the medical institution stockpiles are for handling nosocomial infections.

Accomplishments

Optimization of PPE Safety Stock

To optimize the inventory of these three tiers of stockpiles and prepare for a potential flu pandemic, Taiwan CDC evaluated PPE demand on a national scale. The balance between expected surge demand and PPE supply was modified according to experiences from the SARS and H1N1 pandemics plus the results of a survey on domestic PPE manufacturing capacity.

A Long-Term Solution for PPE Supply and Logistics

To improve the efficiency of PPE stockpile management and maintain stability of the domestic PPE supply chain, Taiwan CDC proposed a five-year procurement program. Buffering with the massive inventory of the central government, the program uses joint procurement by local governments and hospitals to assure PPE quality and maintain steady supplies during flu pandemics. The program also boosts usage efficiency to avoid expirations in the central inventory while maintaining a system for contingencies to deploy the central stockpile during a flu pandemic.

Table 1. Three-Tier PPE Stockpiles, 2010

Items \ Levels	Safety Stock (Unit: 10,000)			
	Central government	Local governments	Medical institutions	Total
N95 respirators	90	10	50	150
Surgical masks	300	100	600	1,000
Protective apparel	14	20	16	32
Flat masks(for the general public)	3,400	-	-	3,400

Prospects

Policy Research and Training Program Development

Taiwan CDC will conduct research to identify risk assessment issues and develop certification and standard procedures for PPE use. In addition, it will develop more training programs to assist health care workers in responding to flu pandemics, and such program in particular as improving front-line staff's professional skills, especially for respirator fit testing.

Communicable Disease Control Medical Network

Current Status

Objectives

The communicable disease control medical network has brought together the medical and public health systems to provide safer, more effective treatments for communicable disease patients and strengthen Taiwan's capacity to handle contingencies in the prevention and control of communicable diseases.

Structure

Serves as a foundation for sub-bureau, local health departments and medical treatment centers.

1. 137 hospitals with designated isolation wards, 25 responding hospitals are assigned from them.
2. 19 support hospitals
3. Regional commanding officers assist sub-bureaus with communicable disease control.
4. Regional commanding offices shall review, supervise and evaluate plans connected to the communicable disease control medical network of each region.
5. During pandemics, regional command officers assist with case analysis plus investigation of expropriation, requisition, and allocation of medical resources in the region.

Quantitative Respirator Fit Testing for a CDC Employee

Operations

There are six sub-regional medical networks nationwide that coordinate and support one another with medical resource allocation. When necessary, responding hospitals activate these networks.

Strategies

1. Enhance operation mechanisms and cooperation between the sub-regions to prevent diseases. Regions in the network hold regular meetings and establish support mechanisms.
2. Strength response capabilities and preparations of responding hospitals to handle emergencies: Personnel education and training/drills, maintenance and inspections of facilities and equipment, formation of an emergency response plan.
3. Integrating medical resources: Integrating communicable disease control medical networks, emergency medical networks, and National Health Insurance hospitals.

Accomplishments

1. Held 17 central and regional consultation meetings.
2. In response to H1N1, revisions were made to four articles of the Regulations Governing Operation of the Communicable Disease Control Medical Network.
3. Designated negative pressure isolation wards in responding hospitals to admit and treat highly contagious patients.
4. Provided assistance and inspected designated negative isolation wards. In the first stage hospitals conducted their own inspections, and in the second stage re-evaluation was conducted at 13 hospitals.
5. Enhanced capacity of responding hospitals for emergency preparedness and response by offering 136 education and training courses, 25 drills, and 27 review meetings.
6. Held a demonstration full exercise with Taitung County that involved examining the area's influenza pandemic prevention and treatment capacity along with its ability to transfer patients cross county.

Prospects

1. Improve the communicable disease control medical network performance.
2. Enhance the emergency response capacity of the communicable disease control medical network.
3. Strengthen inspections and drills of the communicable disease control medical network.

2010 Communicable Disease Control Medical NetworkReview Meeting

The geographical distribution of 25 Infectious Disease Hospitals

Taipei infectious disease Hospitals	Cooperating hospitals
Taipei city Hospital (Ho-ping Area)	National Taiwan University Hospital
DOH Kee-Lung Hospital	Taipei city hospital
New Taipei County Hospital (San-Chung branch) LienJian County Hospital	Tri-service general Hospital
National Yang-Ming University Hospital DOH Kinmen Hospital	Taipei Veterans General Hospital

Northern infectious disease hospitals	Cooperating hospitals
DOH Tao-Yuan Hospital	DOH Tao-Yuan Hospital
DOH Hsin-Chu Hospital DOH Chu-Tung Hospital	Linkou Chang-Gung Memorial Hospital
DOH Miao-Li Hospital	HsinChuMackay Memorial Hospital

Central infectious disease hospitals	Cooperating hospitals
DOH Tai-Chung Hospital	ChinaMedical University Hospital
DOH Nantou Hospital DOH Fong-Yuan Hospital	Tai-Chung Veterans General Hospital
DOH Chang-Hua Hospital	Chang-Hua Christian Hospital

Southern infectious disease hospitals	Cooperating hospitals
National Taiwan University Hospital (Yun-Lin branch) DOH Tainan Hospital	National Cheng Kung University Hospital
DOH Chia-I Hospital	Chia-I Christian Hospital
DOH Shinying Hospital (Pai-man branch)	ChiMei Hospital

Eastern infectious disease hospitals	Cooperating hospitals
DOH Hualien Hospital	DOH Taitung Hospital Taitung Mackay Memorial hospital
Buddhist Tzu Chi general hospital	Taitung Mackay Memorial hospital

Kaokaoping infectious disease hospitals	Cooperating hospitals
Kaohsiung Municipal Min-Sheng Hospital	Chung-Ho Memorial Kaohsiung Medical University Hospital
DOH Chi-Shan Hospital	Kaohsiung Chang-Gung Memorial Hospital
DOH Pintung Hospital	Pintung Christian Hospital
Tri-service General Hospital (Penghu branch)	Kaohsiung Verterans General Hospital

Infection Control

Nosocomial Infection Control

Current Status

The SARS outbreak highlighted the importance of infection control in hospitals. To improve patient safety, protect against infections in hospitals and strengthen measures to control nosocomial infections, Taiwan CDC coordinates annual inspection programs, gathers surveillance data on the occurrence of nosocomial infections and antimicrobial resistance, and drafts nosocomial infection control guidelines.

Our current goals are:

1. **To plan effective interventions and formulate infection control guidelines for reducing nosocomial infections and to fulfill WHO patient safety principles.**
2. **To boost the quality of the nosocomial infection control inspection program and share experiences on nosocomial infection control practices through on-site audits. These audits improve the performance of infection control programs in hospitals.**
3. **To promote international collaboration in hand hygiene and implement WHO hand hygiene toolkits for reducing nosocomial infections.**
4. **To establish internationally recognized nosocomial infection indicators to assess domestic epidemiological trends and guide the drafting of infection control policies.**

Accomplishments

1. Compilation of Infection Control Guidelines and Publication of the Infection Control Journal

   - To provide medical institutions with infection control guidelines conforming to domestic needs, Taiwan CDC investigated local and foreign literature and solicited recommendations of specialized medical associations. In 2010, Taiwan CDC revised health care personnel vaccination recommendations and guidelines for disinfection and sterilization, as well as guidelines for infection control in psychiatric facilities and populous institutions. Furthermore, Taiwan CDC compiled guidelines for environmental sampling strategies and legionella control in health care facilities. And new guidelines, along with teaching materials and multimedia videos, were posted on the nosocomial infection page of the Taiwan CDC website for easy access and free downloads.
   - To improve nosocomial infection control techniques, Taiwan CDC commissioned the Nosocomial Infection Control Society of Taiwan to publish the bimonthly Infection Control Journal. The journal provides infection control personnel and health care workers with new information from here and abroad, along with research results, policy information and surveillance outcome results.

2. Nosocomial Infection Control Inspections

   - To protect patient safety and guard against nosocomial infections, Taiwan CDC promoted strengthening regulations through amendment of the Communicable Disease Control Act. An amendment to the act was announced in July 2007. Moreover, in accordance with Paragraph 2, Article 32 of the act, the Regulations Governing Inspection of the Implementation of Infection Control Measures in Medical Care Institutions were formulated. The regulations, which were promulgated in January 2008, explicitly state infection control measures to be implemented by medical institutions and criteria for inspections by competent authorities.
   - Starting in 2008, Taiwan CDC commissioned the Taiwan Joint Commission on Hospital Accreditation to implement an infection control inspection quality improvement project. On-site inspection work was conducted by experienced infection control practitioners and medical officers, together with local health authorities. Among the 495 hospitals inspected in 2010, only three failed to meet standards. After the follow-up by local health departments, except for one hospital which has gone out of business, hospitals that failed the inspection were brought up to standard.
   - To offer consulting services for infection control measures to hospitals and health agencies, in 2008 Taiwan CDC provided telephone, e-mail and mail communication channels via the Taiwan Joint Commission on Hospital Accreditation, the Nosocomial Infection Control Society of Taiwan and the Taiwan Community Hospital Association. Users sent their questions or requests through these channels and the Taiwan Joint Commission on Hospital Accreditation had specialists respond. All the answers were summarized and put on the Taiwan CDC website for reference.

3. Hand Hygiene Promotion

   - Taiwan CDC popularized the WHO's Save Lives: Clean Your Hands initiative by publicizing the “My 5 Moments for Hand Hygiene” approach and promoting the use of alcohol-based hand rubs by health care workers.
   - To implement its Second Phase to Strengthen Infection Control Project–Hand Hygiene Improvement Program, Taiwan CDC has funded three medical centers. Furthermore, 325 hospitals have applied for the hand hygiene certification program.

4. Nosocomial Infection Surveillance and Reporting

- The Taiwan Nosocomial Infection Surveillance System (TNIS) officially went online in 2007, allowing hospital users to voluntarily report data through either web-based entry or electronic data interface. In 2010, 385 hospitals reported data, 27 of which reported by electronic data interchange modules. Taiwan CDC also produced a nationwide nosocomial infection quarterty report to provide periodic data feedback and strengthen communication with hospitals.
- To update enrollment criteria for the surveillance of health care-associated urinary tract infections and to improve case enrollment consistency, Taiwan CDC publicizes revised surveillance definitions on its website as a reference for case enrollment. In addition, Taiwan CDC provided nine education and training sessions for infection control personnel and health care workers.

Future Prospects

1. Taiwan CDC will continue to draft and implement nosocomial infection control regulations and revise infection control guidelines based on recommendations announced by WHO or leading countries. In addition, it will gather information from around the world on policies, laws, regulations and implementation results to serve as a reference for policy making.
2. To improve nosocomial infection control inspections, Taiwan CDC will draft the 2011 nosocomial infection control inspection quality improvement project based on its implementation experiences from 2008 to 2010 and recommendations from various organizations. Moreover, an inspection schedule will be arranged according to the DOH's 2010 medical investigation consolidation policy.
3. Taiwan CDC will continue promoting hand hygiene programs to achieve its aim of establishing a hand hygiene culture in the health care system. External assessment of hand hygiene infrastructure and compliance plus a wide range of information will be used for evaluation.
4. Taiwan CDC will continue to promote hospital participation in the Taiwan Nosocomial Infection Surveillance System while strengthening surveillance of nosocomial infections and antimicrobial resistance. It will develop indicators from different databases which are comparable and represent nosocomial infection trends in Taiwan or reflect the quality of infection control measures.

Laboratory Biosafety Management

After a SARS laboratory infection occurred in Taiwan in December 2003, laboratory biosafety became a major area of concern. Taiwan CDC realized that regulations and the management system for laboratory biosafety were inadequate; therefore, it created laws to regulate infectious materials. In addition, these new laws strengthened the inspection of biosafety level 3 (BSL-3) laboratories, improved the training and drills for accidents, and established an autonomous biosafety management system. These measures helped to build a more complete oversight mechanism for laboratory biosafety. Despite two more laboratory infections (a dengue fever infection at a laboratory in central Taiwan in April 2004 and a shigellosis infection in the same region in August 2006), there were no deaths in either case and the contamination did not spread. Taiwan CDC believes that Taiwan's laboratory biosafety record can reach its goal of zero infections if industry, government and academia work together; moreover, a first-rate biosafety culture, which is on par with advanced European and North American countries, can be fostered.

Current Status

Legislative and Regulatory Changes

To meet regulatory needs for infectious materials, Taiwan CDC drafted an amendment to Article 4 of the Communicable Disease Control Act. The draft amendment aimed to revise the legal definition of "infectious materials" to include Risk Group-1(RG-1) infectious materials. In addition, changes to Article 34 called on central government authorities to establish a laboratory biosafety oversight and information system, a laboratory biosafety oversight classification mechanism and a response mechanism for abnormal incidents. In addition, the draft amendment added authorization in the parent law for establishing oversight mechanisms within organizations practicing biosafety while laying out the scope of their duties and operations. This is to provide a legal basis for the scope, authority and responsibilities of the Regulations Governing Management of Infectious Biological Materials and Collection of Specimens from Patients of Communicable Diseases. This amendment process for this draft will be completed as early as 2011.

The Regulations Governing Management of Infectious Biological Materials and Collection of Specimens from Patients of Communicable Diseases was promulgated on Sept. 26, 2005, and remains in effect. As the regulations were used to oversee infectious materials and laboratory biosafety, many situations indicated that the regulations were inappropriate for or did not cover some cases. Therefore, Taiwan CDC undertook a review to revise these regulations, starting in 2009. The changes included adding a list of some RG-1 infectious materials, strengthening biosecurity measures among units holding infectious materials, establishing a laboratory biosafety training system with a time component, and introducing a laboratory biosafety oversight and information system. After amendment is made to the Communicable Disease Control Act, these revisions can be jointly announced.

To increase awareness of laboratory biosafety, Taiwan CDC has been working to compile and revise biosafety standards and guides in Taiwan while translating those from abroad starting from 2004. Publications from 2004 include Safety Guidelines for Biosafety Level 3 Laboratory as well as Management and Work Standards for Laboratories Handling Invertebrate Animals. In 2005, the third edition of the WHO's Laboratory Biosafety Manual was translated. In 2010, the latest editions of the WHO's Laboratory Biosecurity Guidance and its Guidance on Regulations for the Transport of Infectious Substances were also translated, which can be used by microbiology and biomedicine laboratories. In addition, in line with WHO calls for better security and management of infectious materials and to safely handle bacteria containing drug-resistant genes, Taiwan CDC established the Laboratory Biosecurity Management Regulations and the Laboratory Biosafety Regulations for Handling Bacteria with the NDM-1 Gene. These guidance manuals and regulations are available for download from the Taiwan CDC's website (home page > examination information > biosafety).

Registration of Organizations Practicing Biosafety

To implement an autonomous management mechanism for biosafety, any organization that holds or uses infectious materials belonging to RG-2 or above and installs five or more laboratory personnel to handle the materials must establish a biosafety committee. Laboratories with fewer than five laboratory personnel handling the materials need to designate a specific person to be responsible for laboratory biosafety management. By the end of 2010, 484 organizations registered biosafety mechanisms to Taiwan CDC, of which 338 set up biosafety committees and 146 designated a specific person. The units that applied included 10 central regulatory agencies, 78 local health departments and health centers, 195 medical institutions, 45 academic research institutions and 156 other groups.

Biosafety Inspections of High-Containment Laboratories

To ensure operations and safety of Taiwan's high-containment biosafety laboratories, Taiwan CDC began to inspect BSL-3 and above laboratories in 2005. Moreover, in 2009, inspections on negative pressure laboratories handling the BSL-3 infectious material mycobacterium tuberculosis were added. Using the Laboratory Biosafety Inspection Form to conduct on-site inspections, Taiwan CDC conducted on-site inspections on 51 high-containment biosafety laboratories run by 42 organizations, which included 32 negative pressure laboratories that handle mycobacterium tuberculosis, 18 BSL-3 laboratories and one BSL-4 laboratory. All laboratories that were found to have deficiencies must improve or upgrade hardware within a set timeframe. Organizations that have registered to Taiwan CDC for inspection run a total of 1,365 biosafety laboratories, including 400 BSL-1 laboratories, 913 BSL-2 laboratories, 32 negative pressure laboratories that handle mycobacterium tuberculosis, 19 BSL-3 laboratories and one BSL-4 laboratory.

Laboratory Biosafety Education and Training

The main cause of laboratory infections that occurred in Taiwan over the past several years was lack of laboratory biosafety awareness among lab workers. For this reason, every year starting from 2005, Taiwan CDC has held professional training courses and conferences for staff in BSL-2 and above laboratories. To assist local health departments to understand the biosafety situation among organizations in their localities, officials from six health departments at the city and county level were invited to the training course in 2010. In addition, to raise the scope and effectiveness of the training course, laboratory workers who completed the six-course, 10-hour series of biosafety digital coursework in 2010 were welcomed to take part in additional training as they saw fit.

Management of Infectious Materials

Organizations have reported a total of 137 types of RG-2 infectious materials to Taiwan CDC authorities, including 69 bacterium, 39 viruses, 24 parasites and 11 fungi. For RG-3 infectious materials, organizations have reported 27 types, including 19 bacterium and eight viruses.

For export and import of infectious materials, Taiwan CDC established the Infectious Materials Customs Approval System in 2007, in line with the Ministry of Economic Affairs' policy of making trade faster and more convenient. By using this system, local bureaus are able to carry out inspections for import and export. 195,557 cases, 149,912 cases and 82,689 cases were handled in 2009, 2010 and 2011, respectively.

Organizations that transport infectious materials belonging to RG-3 or above must first receive permits from their own biosafety committee and then apply for examination from the responsible central government authority. For organizations applying for transporting infectious materials belonging to RG-3 or above, Taiwan CDC handled 100 cases in 2008, 118 in 2009 and 116 in 2010.

Future Prospects

Taiwan's laboratory biosafety management started small but has grown into a stable, robust system. Taiwan CDC hopes that through legal revisions, it can provide regulations that fit the country's needs by 2011. Organizations that practice biosafety still have room for improvement. Through inspections, discussion and education, Taiwan CDC will effectively raise management functions of these organizations. For laboratory biosafety oversight, in addition to continuing inspections and training of negative pressure laboratories that handle mycobacterium tuberculosis and BSL-3 laboratories, Taiwan CDC will add practical drills and observations to strengthen the accident response at BSL-3 laboratories in 2011. Meanwhile, for infectious materials oversight, Taiwan CDC will enhance the function of information systems to raise efficiency of transport inspections and information updates.

International Health

Conducting the IHR

WHO International Health Regulations

WHO's International Health Regulations (IHR) are a vital instrument to help the international community prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide. The main purpose of the IHR is to implement a public health response that can prevent, avoid and control the spread of diseases across borders while limiting interference with international transport and trade. The IHR also require that state parties investigate, evaluate and report public health risks and emergencies while reacting promptly to these dangers.

Over the years, international transportation has become more convenient, which leads to frequent movement of people and goods. Diseases can spread far and wide via international travel and trade. A health crisis in one country can impact livelihoods and economies in many parts of the world, such as the severe acute respiratory syndrome (SARS) outbreak in 2003. For these reasons, in 2005 the WHO's World Health Assembly (WHA) revised and passed the new IHR, inviting countries around the world to join. The regulations, which took effect in 2007, cover public health incidents and emerging or re-emerging diseases, such as SARS, influenza and polio. Meanwhile, the IHR establish a (code of) number of procedures and practices for assessing whether an affected country or region is facing a public health emergency of international concern (PHEIC). The purpose of this model is to prevent the time when an epidemic occurs in a place where it is not yet comfirmed to be a communicable disease. The new IHR also strengthen the National Focal Point (NFP) system for each country. The NFP is the state-designated center responsible for communicating with the WHO on public health incidents that have the potential to become an international concern.

Following the IHR, Taiwan CDC works with the WHO and other countries to conduct prevention and control measures for communicable diseases and other major public health events.


衛生署疾病管制局

Operations of IHR Focal Point in Taiwan

1. Receiving information on epidemics or public health incidents that meet WHO IHR standards for reporting:

   WHO established the Event Information Site for IHR National Focal Points and gave Taiwan access. If an epidemic or public health incident occurs that meets IHR standards for reporting, WHO uses IHR channels to alert each country, Taiwan also receives direct notification and keeps record of information.

2. Establishing a national, cross-departmental contact channel for prompt forwarding of IHR information:

   A cross-departmental contact point has been established to facilitate timely correspondence to WHO IHR information on major public health incidents helping relevant departments and agencies to respond. Agencies that already have a single contact point for transmitting such information include central health supervisory agencies, the Food and Drug Administration, the Atomic Energy Council, the Ministry of Foreign Affairs, the Bureau of Animal and Plant Health Inspection and Quarantine, and local health departments. The system ensures prompt reports, contact, interaction, communication and action responded to new information.

3. Case referral and reporting diseases or public health events that meet IHR standards:

   Items managed by IHR focal point include an international referral system for communicable disease cases (each country's IHR focal point serves as the channel for handling cases). Through the IHR channel, relevant countries are informed of follow-up investigation results to assist in attending to and monitoring referral cases. If Public Health Emergency of International Concerns occurs, Taiwan informs WHO IHR focal point. For communicable disease case referrals, such as tuberculosis cases, reporting procedures have been established. These standards assist frontline health units in quickly gathering investigation results and enable smoothly handling of cases at each country's IHR focal point. As for reporting PHEIC, on Dec. 23, 2010, Taiwan sent information related to a highly probable case of new variant Creutzfeldt-Jakob disease to WHO IHR focal point.

International Ports Quarantine Activities

Current Status

Situated in a subtropical zone, Taiwan is vulnerable to the invasion of various tropical diseases. This is especially obvious because of its 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, Suao, Taipei, Taichung, Mailiao, Kaohsiung, and Hualien), and the three terminals (Kinmen, Matsu and Makung) of the "Mini Three Links" with China. This prevents the import of diseases and ensures the public's health. The planning and supervision of quarantine work at these airports and seaports is the responsibility of the 7th Branch of Taiwan CDC.

To meet WHO's International Health Regulations (IHR, 2005) and prevent the importation

of diseases by aircraft and ships, Taiwan CDC has revised the Regulations Governing Quarantine at Ports. These regulations authorize quarantine units to take all necessary quarantine measures against inbound ships and aircraft together with their crew, passengers, and cargo for national security and public health protection, including:

1. Improving Information Management: Improving the one-stop information system for quarantine operations along with making the quarantine process and information management more efficient.
2. Streamlining and Standardizing Process Operations: Calling for timely revision and standardization of operational procedures by reacting to the latest epidemic information while benefiting from historical precedence.
3. Quarantine Procedure Follow Through: All inbound aircraft and ships, including their crew, passengers and cargo, are subject to quarantine to prevent disease importation. After release from quarantine, follow-up health checks may be performed.
4. Developing IHR Core Capacities at Designated Points of Entry (PoE): Assessing progress in implementing core capacities at PoE and making efforts to meet IHR (2005) requirements in this field before June 15, 2012.

Accomplishments

1. One-Stop Information Service: Establishing a one-stop information system for all information regarding quarantine operations. This included quarantine operations for aircraft and ships, ship sanitation certificates, vaccinations, fee collection, online checks statistics,and etc.
2. Maintaining Standard Operational Procedures: Employing ISO 9001 international quality standards to maintain ship quarantine procedures through reviews at international seaports.
3. Aircraft and Ship Quarantine:

   - Any aircraft with crew or passengers exhibiting communicable disease-like symptoms or dead is required to notify Taiwan CDC and document the event. Taiwan CDC will take adequate measures according to the situation.
   - Any ship arriving at a port in Taiwan is required to report the state of its sanitation and the passengers' health before arrival via telegraph, telex, fax, mobile phone, or e-mail to apply for review. Permission to enter the port is granted after reviewing the report and confirming there is no danger of importing a disease. The procedure is intended to shorten the time of quarantine.
   - There are some possible scenarios for on-board quarantine:

     a. For aircrafts: according to the event and the emergency, Taiwan CDC may decide to execute aircraft on-board quarantine or other control measures.

     b. For ships: (a) An inbound ship has not applied for quarantine, (b) It has 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 the ship.

In these cases, quarantine officers may board the ship or aircraft to implement quarantine measures.

Quarantine Work at International Ports in 2010						
Quarantine Unit	Ships	Passengers	Aircraft	Passengers	Cargo Planes	Tonnage of Cargo
1st Branch Office (Keelung)	5,940	176,085				
1st Branch Office (Suao)	547					
1st Branch Office (Taipei)	1,974	1				
1st Branch Office (Kinmen)	9,632	682,614	1	4		
1st Branch Office (Matsu)	1,584	29,947				
1st Branch Office (Songshan)			3,593	491,361		
2nd Branch Office (Taoyuan)			65,233	11,670,251	12,783	4,190,303
3rd Branch Office (Taichung)	6,553	21,273	2,907	288,805		
4rd Branch Office (Mailiao)	2,790	76				
5th Branch Office (Kaohsiung)	15,763	19,489				
5th Branch Office (Xiaogang)			9,007	1,344,202	1	285
5th Branch Office (Makung)	316	1,747				
6th Branch Office (Hualien)	1,128	4,413	208	9,853		
Total	46,227	935,645	80,949	13,804,476	12,784	4,190,588

Source: Taiwan CDC Quarantine Information System

4. Crew and Passenger Quarantine: Early detection and prevention of communicable diseases requires all arriving passengers to have their body temperature scanned with 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 are required to give an on-site specimen and/or submit to follow-up tests by local health authorities.

   Of the 14,980,936 passengers who arrived in Taiwan last year, only 18,513 showed symptoms and were put on the local quarantine follow-up list. Arriving passengers who become ill after entry are encouraged to seek medical advice and inform their doctor of recent travel history. Taiwan CDC installed a nationwide toll-free hotline (1922) for consultation. Last year, through body temperature scans, Taiwan CDC found 134 cases of dengue fever, 43 cases of shigellosis and 11 cases of chikungunya. In addition, in the section of communicable diseases not included on the list of notifiable communicable diseases, Taiwan CDC found 16 cases of Vibrio parahaemolyticus, eight cases of salmonella and one case of Vibrio cholerae (Vibrio cholerae serogroup non-O1, non-O139).

5. Control of Disease Vectors in Ports: The purpose is to control vector density (i.e., any infectious disease carrier such as rats or mosquitoes) at ports to stop the spread of communicable diseases. Taiwan CDC takes the following measures to stop the breeding of vectors.

   • Rat Control

   a. Placing anticoagulant bait year round where rats are most active. The bait is replenished every 10 to 15 days to ensure its efficacy.

b. Monitoring the parasites and infectious serum of rats in port areas (including Kinmen, Matsu and Makung). The rats caught are examined for parasites to understand the variety and quantity. Furthermore, the rats' blood serum is examined for evidence of plague and hantavirus.

- 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 because 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 larvae 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 for trapping mosquitoes to identify their types and track their activities.

  d. Organizing International Port Sanitary Groups: The groups are selected by 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 circumstances, these representatives meet every three to six months to plan, coordinate and implement matters concerning port sanitation.

6. IHR Core Capacities at Designated PoEs: The first step is to review the assessment tool published by the WHO to clarify the implication of each item. After collecting required information from developed countries and building a consensus from government authorities, a proposal on how to develop core capacities at designated PoEs is submitted to the Executive Yuan.

7. Other Sanitation Control Measures:

   - Shipboard Sanitation Control: To prevent the spread of disease on ships on international routes, Taiwan CDC imposes control of ships in accordance with the WHO IHR (2005) and the Regulations Governing Quarantine at Ports.

     a. IHR (2005) has been entered into force since June 15, 2007, through the required sanitary documents for international shipping, including the Ship Sanitation Control Exemption Certificate/Ship Sanitation Control Certificate. Taiwan CDC gives these documents a six-month period of validity to identify and record all areas of ship-borne public health risks together with any required control measures.

     b. To prevent rats from running to shore along the mooring cable, a rat guard must be hung on the cable. Ships that fail to do so will be immediately corrected and put on record for quarantine reference the next time they call on the port.

- In coordination with the "Mini Three Links" between mainland China and Kinmen, Matsu and Makung, Taiwan CDC has installed quarantine units on the three offshore islands.
- Since direct voyage routes were permitted between several authorized fishery ports

in Taiwan and China, local health authorities have conducted necessary quarantine work at the ports to prevent transmission of communicable diseases.

Future Prospects

1. Increasing manpower and equipment, strengthening quarantine functions, and conscientiously conducting quarantines to stop the import of disease.
2. Fostering professional quarantine personnel, encouraging the development of new quarantine techniques, and raising the quality of quarantine officers and their work.
3. Improving the eradication of vectors on ships and the monitoring of rat and mosquito populations in port areas to avoid the spread of communicable diseases.
4. Building core capacities at designated PoEs based on the IHR (2005).

The Global Outbreak Assistance Corps of Taiwan (GOACT)

Current Status

As the frequency of international travel rises and the ecological environment changes, scientists have noticed that the threat of emerging and re-emerging infectious diseases is also increasing. To take pre-emptive measures in the fight against diseases, Taiwan CDC established the Global Outbreak Assistance Corps of Taiwan (GOACT) on June 27, 2007. It consists of physicians, epidemiologists, laboratory scientists, vector control specialists and epidemic investigators. With its professional expertise and experience, GOACT's aims are to participate in disease prevention operations worldwide, provide assistance and guidance, and improve Taiwan's disease prevention capabilities. Besides joining short-term international outbreak control, GOACT launched the three-year Haiti Epidemic Prevention Project in 2010 to reinforce post-earthquake reconstruction and achieve long-term reconstruction, disease control and public health improvement in Haiti.

Accomplishments

Before forming GOACT, Taiwan CDC 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 establishment in mid-2007, GOACT has participated in the following activities:

GOACT Commander Dr. Bin-Sheng Ho meets with Dr. Alex Larsen, the director of the Ministry of Public Health and Population (MSPP) in Haiti.

Year	Activities
2007	Finding and tracking patients with drug-resistant forms of tuberculosis in Nanjing, China
2008	1.Preventing outbreaks in Ecuador after a flood 2.Aiding earthquake disaster medical services in Sichuan, China 3.Assisting in the Cyclone Nargis disaster relief in Myanmar 4.Monitoring the flu epidemic in Hong Kong
2009	1.Monitoring the flu epidemic in China 2.Surveillance of pandemic influenza A(H1N1) in Mexico 3.Pandemic influenza A(H1N1) surveillance and intervention information exchange in Australia 4.Typhoid outbreak investigation of foreign laborers in Indonesia 5.Managing a pandemic influenza A(H1N1) outbreak in a student travel group in Jeju, Korea
2010	1.Aiding the earthquake disaster medical services in Haiti 2.Sending cholera disease outbreak supplies to Haiti

As a massive earthquake struck Haiti in early 2010, Taiwan CDC responded to appeals for international humanitarian aid and outbreak control, sending three levels of GOACT professionals to assist post-earthquake reconstruction. Meanwhile, the three-year Haiti Epidemic Prevention Project was proposed, including the establishment of a Taiwan technical team, the signing of a cooperation agreement between Taiwan and Haiti, the bilateral visit of public health professionals, holding of laboratory/epidemiology training programs and the reinforcement of laboratory equipments in Haiti. To meet needs during the major cholera outbreak, supplies were sent to Haiti by a representative of the Taiwan embassy in Haiti on behalf of Taiwan CDC.

Future Prospects

With professional expertise and advanced equipment, GOACT is able to quickly obtain important information and achieve positive results in the battle against diseases. In the three-year Haiti Epidemic Prevention Project, professional trainers and modern facilities are being provided for laboratory/epidemiology specialist training programs. In addition, laboratory equipment will be sent to LNSP. The Haiti Epidemic Prevention Project presents an opportunity to evaluate the foreign aid achievements of Taiwan government by means of the country's advantageous techniques. It also provides a path for cooperation in the field of public health, which is helpful for enhancing diplomatic relationships between the two countries. Therefore, Taiwan CDC looks forward to further cooperation with international organizations and NGOs. Meanwhile, in Haiti, it continues to conduct research projects on major infectious diseases, improve bilateral interactions and share its experiences and resources for public health and disease control improvement.

Haiti's National Public Health Laboratory (LNSP), sponsored and established by the Taiwan government, remains undamaged after the immense earthquake.

Taiwan CDC medical officer Dr. Allen Lien discusses infectious diseases surveillance problems in the disaster area with foreign medical corps, after a meeting with the UNOCHA Health Cluster.

Health Marketing

Current Status

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

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


抗結核
點子王

Accomplishments

Integrated Marketing of Disease Prevention

Taiwan CDC holds press conferences to create awareness of its major policies and achievements. By focusing on specific issues, Taiwan CDC aims to attract media attention and spread its message to every household in the nation.

In 2010, Taiwan CDC held the following disease prevention campaigns:

Integrated Marketing of Influenza Prevention

Following the H1N1 influenza pandemic, Taiwan set up and operated the Central Epidemics Command Center from April 28, 2009, to Feb. 23, 2010. The center's epidemic prevention efforts can be broken down into three stages: containment, mitigation and vaccinations. After the center closed, officials held a news conference on April 21, 2010, to use objective data to review the effectiveness of Taiwan's efforts to control the disease.

Seasonal Influenza Vaccine

Every year on Oct. 1, Taiwan begins its subsidized seasonal flu vaccine program by offering inoculations to priority groups. To encourage people to get vaccinated, in 2010 Taiwan CDC invited Taiwanese tennis star Yen-hsun Lu to serve as spokesman. Lu recorded a series of promotional videos and audio tracks. In a commercial, Lu demonstrated his exceptional tennis form. He stood on a court showing different angles and techniques for swinging a racket and hitting the ball, signifying that when people face different influenza viruses every year, they need to receive a shot annually.

Call for Creative Submissions

Taiwan CDC launched a call for creative influenza control materials in 2010 called "Preventing Influenza and Aiming for Health." It sought submissions to choose 10 top slogans and creative posters based on three main themes: 1. Encouraging people at high risk of infection or transmission to get vaccinated, 2. Adhering to hand hygiene and manners for coughing, and 3. Carrying a handkerchief. The response was enthusiastic, with more than 3,000 submissions. By encouraging people to think of and produce creative materials, Taiwan CDC reminded people of flu prevention, bringing it closer to its goal of having everyone participate in flu prevention work.

Integrated Marketing of Tuberculosis Prevention

World Tuberculosis Day

The WHO chose the slogan "On The Move Against TB" for World TB Day 2010, and Taiwan CDC followed suit and created the slogan "You can stop TB. Join us." On March 24, it called on people to use innovative actions to support TB patients and encourage them to remain committed to taking their medicine and overcoming the disease. It invited

former TB patient Ke Mama (the mother of the well-known author Jiu Ba-dao) to share her experiences of adhering to her drug regiment for nine months and beating the disease.

Furthermore, to bring everyone together in the fight against TB and build a strong support network for the sick, Taiwan CDC announced five innovative actions, including: 1. Forwarding its tuberculosis action plan, 2. Sending MSN emoticons, 3. Making calls to alert patients to take their medicine on time, 4. Sending care text messages, 5. Offering blog sticky threads.

TB Control Campus Campaign

Every year approximately 300 students and youths come down with TB, with some of the infections taking place on campus. In 2010, Taiwan CDC declared March 22 to 26 to be TB prevention week in schools. It encouraged schools to launch a series of promotional activities and invited Zi-Yang Deng, a former basketball school team captain, to share his experiences in overcoming the disease during his third year in high school.

Traveling Community Show

Taiwan CDC integrated TB announcements into traditional Taiwanese gezai opera and brought shows on a countrywide tour. Every performance had an audience of more than 100 people and provided accurate information on TB control. The show called on everyone to join in doing a better job in the fight against TB.

Integrated AIDS Prevention Marketing

World AIDS Day

For 2010 World AIDS Day, Taiwan CDC used the WHO theme of “Universal Access and Human Rights.” CDC Director Feng-Yee Chang said: “There can only be respect if there is understanding, and there can only be compassion if there is respect.” Chang also said that the rights of people infected with HIV are as important as the right of healthy people to avoid the disease.

To strengthen the message of AIDS prevention and treatment among youths, Taiwan CDC held “Action for AIDS” activities on Nov. 20, 24 and 25. The activities included a show featuring models wearing outfits adorned with 365 condoms and interacting closely with spectators. The purpose of the event was to promote AIDS awareness and encourage people to practice safe sex and get tested for the disease.

Health Minister Goes Clubbing to Promote AIDS Prevention Among Young Adults

On the night before 2010 World AIDS Day, members of Taiwan CDC and the Department of Health visited a popular night club to hold the “Action for AIDS Party.” Former Health Minister Chih-liang Yaung joined in the event to promote AIDS awareness among the clubbers. Yaung said that while enjoying their youth, people should understand the need to protect themselves and respect others by properly using a condom and regularly getting tested for AIDS. Only by doing so, Yaung said, could they stop spread of the disease.

Integrated Marketing of Dengue Fever Prevention

Community Messages

In 2010, the number of indigenous cases of dengue fever in southern Taiwan continued to rise. To confront this problem, the Executive Yuan opened the Central Epidemic Command Center for Dengue Fever between Oct. 21 and Dec. 24. The center coordinated and oversaw each aspect of dengue fever control. Themes of the center's disease prevention efforts included community action to dispose of containers and reduce vector breeding sites. It encouraged people to look in and around their homes for vector breeding sites and to conduct searching, dumping, cleaning and scrubbing work. Through these efforts, people worked together to maintain cleanliness of their living environment.

School Messages

To promote the idea of getting rid of containers and encourage people to take action, Tainan and Kaohsiung cities conducted a school container reduction plan. The plan helped students and teachers recognize the need to dispose of water-holding containers such as bottles and cans along with objects not always thought of as holding water, such as canvas and tires. The students and teachers were also encouraged to share these ideas in their households and communities. In addition, on Dec. 22 Taiwan CDC held an awards ceremony and a news conference. It honored top schools, giving students the chance to enjoy the credit that comes with contributing to disease prevention efforts.

Integrated Marketing of Enterovirus Prevention

Taiwan CDC improved its enterovirus prevention efforts in 2010, concentrating on kindergartens and preschools, parents, and medical practitioners. Considering the needs of each group, Taiwan CDC produced three types of focused promotional handouts and posters. These materials took inexpensive forms of print media and turned them into handy tools for integrating disease control work into target groups' everyday lives.

Communicable Disease Reporting and Counseling Hotline: 1922

To provide a convenient channel for communicable disease reporting and counseling, Taiwan CDC has operated the easy-to-remember, toll-free "1922" hotline since 2003. It provides 24-hour, round-the-year service for disease reporting, counseling and information on prevention policy control measures.

The 1922 hotline received 77,000 calls in 2010 and referred 43,000 for handling. To measure customer satisfaction, starting at the beginning of the year a survey was conducted covering four main topics: waiting time, service attitude, explanation clarity and response time. Among 3,842 responses gathered in 2010, 96% of people said they were either extremely satisfied or satisfied.

Social Marketing Media

To influence different groups, Taiwan CDC constantly looks for new marketing formats. In 2010, it not only continued to improve marketing via traditional channels such as print media and TV, but also developed interactive marketing on the Internet. Taiwan CDC's marketing channels include:

1. The Internet: The Internet's influence is far-reaching and powerful, and it has become an important marketing channel for Taiwan media. Moreover, it was Taiwan CDC's focus in 2010.
2. Media and Other Promotion Channels: When announcing disease prevention measures, new communicable diseases, or important dates, Taiwan CDC sends press releases to print and electronic media along with releasing posters, fliers and airport advertisements.

Featured Multimedia & Tools

In the past, conventional personal websites signified "Web 1.0" by mainly providing one-way publishing. Now, however, Web 2.0 allows user participation.

Real-Time Online Interactive Platform

Responding to Internet trends, Taiwan CDC uses popular online social media tools to promote healthy living and disease prevention. Its efforts include establishing an online disease prevention community and 1922 hotline disease prevention information banks on Facebook, Plurk, Twitter and blogs. These sites promote communicable disease control and have become a bridge for Taiwan CDC to communicate over the Internet.

The 1922 disease prevention information banks have proven to be popular, with more than 20,000 people having accessed the blog and another 6,800-plus listed as fans of the Facebook page. Every day Taiwan CDC provides new information on current disease situations, and, when the need arises, fan events are held in conjunction with disease prevention campaigns. Moreover, the agency publishes weekly articles on the blog to stimulate discussion among disease prevention workers.

Target Group Communication

Taiwan CDC uses different promotions to target different groups while considering the needs and special characteristics of media or other channels. The promotions pass on disease prevention information and other news, enhancing disease prevention knowledge

1. Promoting Influenza Vaccinations

Senior Edition

Student Edition

Family Edition

2. Hand Hygiene

To coordinate with the WHO's May 5 "Save Lives: Clean Your Hands" activity, the health minister signed an agreement on May 4 promising to work toward controlling healthcare associated infections (HAI). Medical institutions and personnel from around the country were invited to join hand hygiene efforts and were encouraged to place high importance on avoiding HAI.

3. Medical Correspondence Letters

To provide up-to-date information on communicable diseases, clinical treatments and disease prevention policies to medical personnel, Taiwan CDC sends special correspondence letters. It passes on important information through its newsletters and the

Bureau of National Health Insurance, medical hospitals, schools and guilds. These communication methods serve as an immediate channel for communicating with people in the medical field. In 2010, Taiwan CDC sent out 45 medical correspondences. The response was positive, with 7,000 regular subscribers, including 36 hospitals, schools and guilds.

Soliciting Kuso Ideas on the Internet
Innovative Ideas to Fight TB - Call for Submissions

To encourage schools to join tuberculosis control campaigns and provide students with proper information, Taiwan CDC called for innovative submissions as part of its On the Move Against TB campaign. Through games, people were able to gain a better understanding of TB prevention and treatment efforts. In addition, public figures and singers Lien Chia-en, Van Fan and Rachel Liang recorded a TB control message to be broadcast at schools, calling on students to join TB control efforts.

A total of 508 entries were gathered in the campaign, with great enthusiasm shown among school groups and other participants. The effort showed people's resolve for fighting TB and demonstrated how deeply integrated the On the Move Against TB campaign was in schools and other places.

Video News Reports

With media broadcasts focusing on video now more than ever, Taiwan CDC has developed and promoted disease prevention videos. By adding video to its news reports, Taiwan CDC better serves media's needs and meets the demands of online broadcasts. The aim is to convey disease control ideas faster and more effectively.

Disease Prevention Comics

Communication problems often exist between disease prevention professionals and the general public. To break down these barriers, Taiwan CDC invited popular online comic artists to present communicable disease control messages in a popular format. Humorous and cute drawing styles with amusing and sometimes even absurd jokes helped Taiwan CDC spread its messages to elementary school students. Its goal was to foster disease prevention ideas at a young age so people naturally develop good habits from the start.

E-card

On New Year's Eve, Taiwan CDC sent a red e-card to local and international disease control partners to thank them for their support over the past year and to wish them good health and a happy coming year.

Creative Promotional Materials

To promote disease prevention, Taiwan CDC has created many creative, stylish and useful promotional materials.

1. Pili Reusable Cups

Together with the locally developed Pili hand puppet show, Taiwan CDC promoted dengue fever control. It offered a limited edition Pili reusable cup to encourage people to work together in fighting the disease by cleaning and managing water-collecting containers in their surrounding environment.

2. Health Pouches (Soap, Masks, Tissues)

Taiwan CDC offered health pouches that had a Chinese New Year theme and reminded people to be careful of influenza while celebrating the holiday season. The pouches were well received and brought creativity to disease prevention work.

3. Human-like USB Hub

Hand hygiene concepts were added to USB hubs, including carrying around a handkerchief, cupping one's hands instead of shaking hands, and frequently washing with soap.

4. Battling against Influenza Dart Board/Pen Holder

Taiwan CDC used a darts game to promote good lifestyle and hand hygiene habits such as getting influenza vaccinations, wearing masks, washing hands, and cupping one's hands instead of shaking hands. Its purpose was to motivate people to take action against influenza.

Disease Prevention Awards

To encourage people who made major contributions to disease prevention research, strategies, and efforts along with groups or individuals who were particularly successful in conducting communicable disease control work, on Nov. 9 Taiwan CDC held the "2009-2010 Disease Prevention Awards Ceremony." In total, it gave disease prevention awards to 120 public and private organizations and individuals. The theme of this year's awards ceremony was "working as one to prevent disease." The ceremony focused on the hard work each award winner put into disease prevention and praised grassroots personnel who spared no effort in preventing disease.

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 the exhibit won widespread praise and made it a favorite attraction for schoolchildren.

Together with the National Science and Technology Museum, in 2010 Taiwan CDC held the 2nd Disease Prevention High School Summer Camp. Besides giving students the chance to see what college life is like, the camp provided disease prevention information and let students experience disease prevention work. More important, the camp cultivated students' interest and gave them a chance to influence family and friends. Providing the students with strong individual health habits and concern for the community enabled proper disease prevention ideas to flourish everywhere.

Corporate Cooperation

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

Future Prospects

Taiwan CDC will continue to promote disease prevention, develop new marketing channels, and improve communication on infectious disease risks to protect the health of Taiwanese citizens.

International Cooperation

Current Status

Over the past several years, Taiwan CDC has worked hard to enhance international exchanges on health affairs. Its efforts include participating in international public health programs and conferences, strengthening bilateral and multilateral relationships, helping allies raise their capacities for infectious disease control, taking part in international humanitarian relief activities, and exchanging advanced technology with other countries. As a result, Taiwan CDC has many impressive achievements in disease control. Furthermore, Taiwan CDC has been able to share its unique experiences with the rest of the world as it endeavors to achieve health for all.

Accomplishments

Organizing International Conferences

1. Taiwan CDC hosted the AsiaFluCap Consortium Meeting & Stakeholder Analysis Workshop. Forty people took part, including 18 foreign experts in AsiaFluCap research groups from seven countries along with Taiwan CDC personnel.
2. Taiwan CDC also hosted the 10th Taipei International Conference on HIV/AIDS. Eleven foreign experts were invited to give a speech and about 550 people from Taiwan and abroad took part. Conference attendees discussed the study of epidemic diseases as well as policies and ways to prevent AIDS among MSM and sex workers.

Promotion of Bilateral or Multilateral Cooperation

1. For the Cooperative Program in Public Health and Preventive Medicine with USCDC, Taiwan CDC continued Arrangement No. 2 (the MRSA program), Arrangement No. 3 (a TB prevention project) and Arrangement No. 4 (a Taiwan-US EIS training plan).
2. In a joint effort with the America's Johns Hopkins School of Public Health, Taiwan CDC continued the project titled "Evaluation of the Control of HIV after a Prison Amnesty" in Taiwan.
3. Taiwan CDC continued work on the EU FP7 project titled "Rapid System Analyses of the Health System and Pandemic Influenza Preparedness and Response." This plan is divided into eight sub-plans. Taiwan CDC was responsible for the fourth sub-plan, Stakeholder Analysis. While conducting its analysis, Taiwan CDC interviewed officials from the health departments in Australia, the Netherlands, the United Kingdom and France, along with the Health Protection Agency in the UK, Paul Ehrlich Institute in Germany, and National Institute for Infectious Diseases in Italy.
4. Reciprocal personnel exchanges with Austria were continued for long-term training. Taiwan CDC also signed a new Arrangement No. 1, sending staff to Austria to assist in communicable disease surveillance.
5. Around 60 experts took part in the 7th Taiwan-Japan Bilateral Symposium on Immunization and Travel Medicine, hosted by Taiwan CDC. Symposium attendees discussed vaccination policies, immunization systems, status in their respective countries, and travel medicine.
6. Taiwan CDC hosted the 1st Taiwan-Austria Workshop on Infectious Diseases-Molecular Typing and Epidemiology of Infectious Pathogens. Participants discussed TB, invasive pneumococcal disease, meningococcal disease and food-borne illnesses.

7. Taiwan maintained membership in the International Society of Infectious Diseases (ISID) and the International Harm Reduction Association (IHRA).

International Exchanges in 2010

1. A total of 117 guests from 14 different countries visited Taiwan CDC.
2. Taiwan CDC participated in WHO conferences and related activities, including attending the 63rd World Health Assembly (WHA) as an observer, the 61st Regional Committee for the Western Pacific and an International Health Regulations implementation course.
3. It joined three APEC Conferences, including the 2010 1st APEC Health Working Group Meeting, the APEC Capacity Building Workshop on Vaccination Against Avian Influenza and the APEC Emerging Infections Network (EINet) Hot Topic Videoconference.
4. It participated in 46 international conferences, sending 58 staff overseas.
5. Taiwan CDC also published 76 papers in international journals, including 74 SCI papers.

Future Prospects

Increasing international contact and transport have made global cooperation even more vital in the fight against communicable diseases. Taiwan CDC strives to strengthen cooperation with other countries and international health care institutes. Encouraged by the accomplishments of training and educational programs, Taiwan CDC will cooperate with other countries in forming a global surveillance network for the prevention and control of communicable diseases. In addition, the next stage for Taiwan CDC is to train personnel specializing in international public health and emerging infectious disease prevention and to seek full involvement in international communicable disease prevention projects. Future efforts include:

1. Continuing to participate in conferences or other events organized by international institutes and forums, including the WHO and APEC.
2. Establishing more bilateral or multilateral cooperation projects with other countries.
3. Taking part in international humanitarian relief efforts and dispatching more epidemiologists and experts to needy areas to provide disease prevention support.

Scientific Research and Development

Current Status

To meet administrative plans by the Department of Health, Taiwan CDC develops policies and tasks to guide its technological research. When planning yearly technological research themes, each professional unit evaluates the need and importance of key tasks and then analyzes and researches in needed topics. Through this work, the units consider how to best combine research and disease control practices with policy goals.

Taiwan CDC covered 11 key technological themes in 2010, including the National Research Program for Genomic Medicine, Integrated Research Plan of TB Prevention and Treatment, the Establishment and Formation of the Communicable Disease Surveillance and Prediction System, the Communicable Disease Diagnostic Techniques and Drug Resistance Research Project, and the Laboratory Surveillance and Testing Quality Control System EstablishmentProject. It placed high value on both internal research and outsourcing to conduct its technological development research projects. In addition, Taiwan CDC's main administrative units for research, development and manufacturing are Research and Diagnostic Center and Vaccine Center.

Research and Diagnostic Center

In 2010, the Research and Diagnostic Center employed 172 individuals and received and processed 175,196 diagnostic specimens. Facing emerging and re-emerging communicable diseases, the center emphasized international collaboration, focusing on information exchange and laboratory technology advances. In addition, center laboratories regularly took proficiency tests (CAP) to assure the quality and accuracy of their diagnostic results. The center consists of 10 laboratories and three service sections.

The primary objectives of the center are to research more efficient and comprehensive diagnostic methods, perform laboratory-based epidemiological studies, and study communicable disease pathogenesis. Secondary goals include establishing national reference laboratories, performing diagnostic services and technical support to control notifiable communicable disease incidents, and assisting national and international health agencies in consolidating control strategies and policies.

Accomplishments

National Influenza Center (NIC)

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

1. Integrated influenza surveillance and notification with laboratory analysis systems throughout Taiwan to enhance epidemic data collection capacity.
2. Monitored the occurrence of new types of flu viruses and viral antigen variation trends, also provided references for vaccine strain selection.
3. Prepared antibodies against local flu virus strains to facilitate virus diagnoses and typing.
4. Published the Influenza Express periodical in both Chinese and English during every flu season.
5. Provided a platform for exchanges with its global counterparts.

Pulse Net 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 institutions.

Viral Enteric and Emerging Diseases Laboratory

1. Conducted HIV-1 genotyping and drug-resistant surveillance among different risk groups such as IDUs, MSMs, and heterosexuals.
2. Provided HIV DR testing services for HIV (+) patients with no significant reduction in HIV viral loads after antiretroviral treatment.
3. Developed an EV71 IgM ICT to shorten the screening time for EV71 infections in the field.
4. Strengthened links between laboratory diagnostic results and epidemiological investigations, benefiting infectious disease prevention.
5. Applied molecular diagnosis to discover novel viral pathogens and successfully identify parechovirus and HBoV from samples without definite detection results.
6. Executed an acute flaccid paralysis surveillance system to comply with the WHO Global Polio Eradication Initiative.
7. Replaced NT test with in-house IgM capture assay to confirm EV71 infections and improve identification of different subgenotypes of EV71 infections.
8. Implemented a quality assurance program for serological detection of HIV-1 and hepatitis B/C virus infections at teaching hospitals and major medical laboratories.
9. Expanded the virus diarrhea surveillance system to include norovirus, sapovirus, astrovirus, and adenovirus 40 and 41 infections.
10. Strengthened lab-surveillance and molecular epidemiology of viral diarrheal diseases to evaluate and provide up-to-date information for preventing diarrhea diseases.
11. Conducted outbreak investigations for virus diarrhea pathogens.
12. Established genomic sequence databases of HIV-1, enterovirus 71, hepatitis B/C virus, and rotavirus.
13. Cooperated with domestic teaching hospitals, scholars, life science research institutes, and international public health research institutes such as U.S. CDC and Japan's NIID for the prevention of emerging infectious diseases.

Viral Respiratory Diseases Laboratory

1. Performed routine diagnoses of respiratory viruses, including the viruses that cause SARS, influenza, measles, rubella, and mumps, plus adenovirus, human respiratory syncytial virus (RSV) and varicella zoster virus (VZV).
2. Tracked influenza virus evolution in Taiwan, including its antigenic and genetic mutations.
3. Prepared ferret antisera against local flu virus strains and facilitated their diagnoses and typing.
4. Maintained close contact with the WHO Collaborating Centers for Influenza and delivered prevailing influenza virus isolates from Taiwan to help in surveillance, epidemiology studies and control of influenza.
5. Investigated genotypes of measles 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 laboratory tests.
8. Established an active surveillance network for pneumonia, encephalitis and sudden death with unknown pathogens and integrated various detection technologies, multiplex real-time PCR panels, high-throughput sequencing systems and microarrays for detecting possible pathogens.

Vector-Borne Viral and Rickettsial Diseases Laboratory

1. Established an arbovirus 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 a molecular method to diagnose rickettsial (Rickettsiaceae and Anaplasmataceae) infections.
5. Conducted an airport fever screening program to look for dengue fever, chikungunya, and other arbovirus diseases.
6. Developed rapid test kits for early diagnoses of dengue and chikungunya.
7. Built genomic databases for molecular epidemiologic studies of the dengue, Japanese encephalitis, and chikungunya viruses, plus Orientia tsutsugamushi.
8. Conducted an international cooperation program with Japan's NIID, titledCharacterization of Dengue Viruses Prevalent in Taiwan and Other Mosquito-borne Viruses Prevalent in Asia.

Bacterial Respiratory Diseases Laboratory

1. By using bacterial isolation along with serological and molecular methods, conducted diagnoses and identification of pathogens causing notifiable bacterial respiratory diseases, including Bordetella pertussis, Neisseria meningitides, invasive Streptococcus pneumoniae, Legionella spp., invasive Haemophilus influenzae type b, Bacillus anthracis, and Streptococcus pyogenes.
2. Performed diagnoses and identification of respiratory bacterial pathogens in autopsy specimens for legal cases.
3. Investigated outbreaks caused by respiratory bacterial pathogens.
4. Developed molecular methods for detection of respiratory bacterial pathogens.
5. Monitored serotypes and antimicrobial susceptibility for invasive Streptococcus pneumoniae isolates.
6. Conducted molecular genotyping of Legionella spp., Bordetella pertussis, and Streptococcus pneumoniae.
7. Participated in CAP tests and an internal quality assurance program.
8. Established international collaborations.

Bacterial Enteric and Emerging Diseases Laboratory

1. Conducted conventional diagnoses of Vibrio cholerae, Salmonella typhi, paratyphi, Salmonella spp, Shigella spp, Escherichia coli O157, Burkholdera pseudomallei, Yersinia pestis, Leptospira interrogans, Borrelia burgdorferi, Bartonella henselae, Francisella tularensis and NDM-1 producing enterobacteriaceae.
2. Established a national and an 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. Established multiplex real-time PCR methods for detection of pathogens causing severe respiratory and neurologic illnesses.
8. Employed high-throughput sequencing for unknown pathogen discovery.

Mycobacterial Diseases Laboratory

1. Strengthened the laboratory system for better diagnostic services.
   - Standardized conventional and molecular diagnostic methods.
   - Developed, evaluated the improved conventional tests and new molecular diagnostic and genotyping methods.
   - Provided species identification and confirmation services.
   - Provided rapid confirmation for multidrug resistant (MDR) isolates.
   - Provided rapid molecular diagnosis for sputum specimens.
2. Involved in tuberculosis outbreak and pseudo-outbreak investigations of cases at schools, hospitals, long-term care facilities, and etc.
3. Conducted needed molecular epidemiological studies.
   - Analyzed population structure trends of Mycobacterium tuberculosis strains.
   - Investigated characteristics and transmission of multiple-drug resistant Mycobacterium tuberculosis isolates.
4. Established a mycobacteria genomic database.
   - Conducted molecular genotyping of Mycobacterium tuberculosis isolates using restriction fragment length polymorphism (RFLP), spacer oligonucleotide typing (spoligotyping), mycobacterial interspersed repetitive units-variable number tandem repeats (MIRU-VNTR), and single nucleotide polymorphisms (SNPs) analysis.
   - Performed sequence analyses of drug resistance associated genes and virulence genes.
5. Maintained a mycobacteria strain banking system.
6. Implemented a laboratory external quality assessment program.
   - Conducted acid fast bacilli (AFB) smear and drug susceptibility rechecking.
   - Provided proficiency tests for drug susceptibility testing and molecular assays.
   - Carried out on-site visits of contracted clinical laboratories.
7. Provided technical consultation and educational programs.
8. Maintained a mycobacterial laboratory surveillance system
   - Monitored drug-resistant Mycobacterium tuberculosis isolates.
   - Tracked down Mycobacterium bovis in Taiwan.
   - Watched for Mycobacterium bovis-BCG complications in Taiwan.
9. Carried out international collaborative activities.
   - Accepted invitations to speak at international meetings, workshops, and conferences.
   - Continued the international MDR tuberculosis PETTS study with the U.S. CDC.
   - Participated in an international collaborative molecular epidemiology of tuberculosis study organized by the Research Institute of Tuberculosis, Japan Anti-Tuberculosis Association.

Parasitic Diseases Laboratory

1. Developed and applied a new one-tube multiprobes real-time PCR diagnostics system to routine enteric amebiasis examination of notifiable patients and alien workers.
2. Continued the molecular epidemiology project of amebic infection for high-risk groups, such as foreign laborers, men who have sex with men and institutionalized psychiatric patients.
3. Applied microscopic examination and a molecular surveillance system to malaria diagnosis.
4. Participated in CAP tests (parasitology and blood parasite surveys) for professional evaluation and accreditation.
5. Applied serological and molecular diagnostic systems for routine toxoplasmosis examination of notifiable patients.
6. Studied molecular epidemiology and disease control of Toxoplasma infections for high risk groups, such as pregnant women and HIV/AIDS patients.
7. Applied molecular diagnostic systems of free-living amebas for the surveillance of Acanthamoeba and Naegleria in rice paddies.
8. Investigated parasite-related gastroenteritis in a Taipei emergency department.
9. Participated in the molecular cloning and characterization of the circumsporozoite protein gene of Plasmodium inui isolated from Formosan macaques (Macaca cyclopis) in Taiwan.

Mycotic Diseases Laboratory

1. Conducted routine diagnostic services of fungal and Nocardia pathogens, sexually-transmitted pathogens, and special cases, such as Chlamydia pneumoniae, Chlamydia psittaci, and Mycoplasma pneumoniae.
2. Developed real-time quantitative diagnostic methods to deal with fungal pathogens as well as Chlamydia pneumoniae and M. pneumoniae.
3. Conducted molecular epidemiology studies of Candida spp. in ICU patients as well as longitudinal national surveillance by multilocus sequence typing (MLST) and pulse-field gel electrophoresis (PFGE).
4. Established diagnostic assays for imported mycoses.
5. Conducted epidemiology studies on C. pneumoniae and M. pneumoniae infections.
6. Performed molecular typing of Chlamydia trachomatis infections in Taiwan by MOMP genotyping.
7. Developed NAAT assays for C. trachomatis and Neisseria gonorrhoeae and conducted screening programs among specific high risk groups.
8. Carried out G-NICE (gonococci-National Isolate Collection for Epidemiology) to survey resistance trends and a molecular epidemiology study on N. Gonorrhoeae by multiple antigen sequence typing (MAST). Also identified clonal clusters with distinct susceptibilities associated with specific groups at high risk of contracting HIV and syphilis. Characterized the transmission of multiple drug resistant (MDR) clones with reduced cephalosporin susceptibility among high-risk sexual networks in Taiwan.
9. Finished the whole genome sequence of a MDR N. Gonorrhoeae strain and a MDR Acinetobacter baumannii strain.

10. Established novel multiplex bead array platforms to rapidly detect clinically important fungi, differentiate Chlamydia trachomatis genotypes and identify clinically important nosocomial pathogens and their resistant determinants.
11. Built PFGE fingerprint and MLST databases of Candida spp. in Taiwan and participated in international studies through exchanges of typing data.
12. Participated in the CAP tests (Mycology and Chlamydia trachomatis/Neisseria gonorrhoeae NAATs Surveys) for proficiency evaluation.

Vector Biology Laboratory

1. Conducted surveillance of spotted fever rickettsia groups in ectoparasites and field rodents in Taiwan.
2. Identified ectoparasites on rats captured at seaports.
3. Conducted routine mosquito surveillance for dengue fever and malaria.
4. Carried out routine diagnostic services for mosquito infections of arboviruses and conducted mosquito species identification through microscope.
5. Conducted chikungunya virus infection studies in laboratory mosquitoes.
6. Established a genomic database of Aedes aegypti for commonly used insecticides.
7. Established a database for dengue vector chemical control.

Establishment and Application of Pathogen Genome Sequence Databases in Taiwan

1. The collection of the Taiwan Pathogenic Microorganism Genome Database (TPMGD), which was revised by Taiwan CDC and the Advanced Bioinformatics Core of National Yang Ming University in January 2007, already stands at 56,000 genotyping data from viruses, bacteria, and fungi, and over 56,000 other epidemiological data. The total number of hits on the website has reached 2,400.
2. Based on the principles of government information disclosure and resource sharing, since the beginning of 2008, Taiwan CDC has provided new application procedures for gene sequences of enterovirus and influenza virus, along with relevant epidemiological data. Over 20 scholars and professors have accessed this database, and approximately 25,000 data have been shared with them through the channel.
3. In addition, Taiwan CDC established a TPMGD-open version (http://tpmgd.cdc.gov.tw/tpmgd_public/), which is accessible to the general public online. Anyone can surf and download from the website or do contrastive analysis of 15,577 pathogen sequence data (regarding influenza virus, enterovirus, and adenovirus) and simple epidemiological programs for primer design, genotyping enterovirus 71, and blast

search with influenza vaccine strains information are also available on website . Website hits have reached 20,000． 200 people did a sequence download, and 321 registered their names. Detailed epidemiological information and biological materials stored by Taiwan CDC are also available following application, with the procedure explained online.

Future Prospects

1. Develop a multiplex disease detection system.
2. Develop a rapid detection method for identification of vaccine derived poliovirus or VDPV in the era of polio eradication.
3. Establish an internationally recognized flavivirus reference laboratory.
4. Enhance capability to identify imported mycoses.
5. Apply advanced high-throughput and multiplexing diagnostic techniques such as bead array or microarray systems to improve diagnostic and genotyping capability.
6. Establish a genotype databank and participate in global surveillance.
7. Establish collaboration programs with renowned international research institutes.
8. Establish molecular epidemiological surveillance for tick-borne emerging and zoonotic diseases.
9. Develop a rapid test for detection of enterovirus 71 infections.
10. Integrate existing viral diarrhea disease surveillance networks to better identify viral causative agents.
11. Provide clinical report forms based on HIV-1 genomic mutations to anti- retroviral treatment failure patients as a reference for selection of new regimens.
12. Enhance laboratory ability to identify unknown viral pathogens based on molecular mutiplex detections.
13. Assure HIV-1 viral load testing ability by participating in CAP HIV-1 viral load proficiency tests.
14. Establish a high throughput full genome sequencing technique for unknown pathogen detection and surveillance.
15. Establish a surveillance network and a bank for collection of newly emerging infectious pathogens.
16. Develop surveillance technology platforms for various unknown/emerging infectious pathogens.
17. Develop R&D or technical transfer rapid diagnostic kits for selected infectious pathogens to increase information output and exchanges within the domestic medicine and health technology industries.

Vaccine Center

Accomplishment

Manufacture of Biological Products

1. The Vaccine Center manufactured 1,738,134 biological products in 2010, including vaccines, toxoids, antitoxins and antivenins. Sales revenue of biological products was more than NT$58.5 million.
2. In 2010, the center manufactured and supplied 338.4 liters of hyperimmune plasma for venom.
3. The center completed three batches of antivenin serum testing extract, four batches of finial product, two batches of BCG vaccine finial product, 11 batches of diphtheria-tetanus finial product, and one batch of tetanus toxoid finial product. It also tested 51 samples of pure water and 48 samples of pharmaceutical ingredients.
4. Mice, guinea pigs, rabbits, poisonous snakes and ferrets were reared and provided for experimental use.

Development of Biological Products

1. Development and testing of the seed bank, production process and titer tests needed for the new influenza vaccine:

   The Vaccine Center established a seed bank for four different H1N1 influenza vaccine strains and three local influenza vaccine strains. It also completed mass production of a prototype vaccine (each batch used about 400 eggs), showing that the local influenza vaccine strain could effectively produce high levels of antibodies.

2. Evaluation and research of benefits from using different rearing facilities for antivenin manufacturing:

   Research shows that the Dajiaosi Forest Management Area is able to produce the yearly supply of Viridovipera stejnegeri stejnegeri that is needed to extract

sufficient venom for horse immunization. The structure of venom, however, has local characteristics. Considering the need to expand venom sources, the Vaccine Center will launch a pilot scheme to expand the program to other regions. Apart from expanding venom sources, it will be able to reduce its reliance on poisonous snake groups from just a single region. In addition, when the animals are reared by humans, sufficient cover and ground bedding can be provided to boost the size of enclosure-raised poisonous snakes and increase production of the snakes.

3. Establishing an antivenin potency rapid testing system:

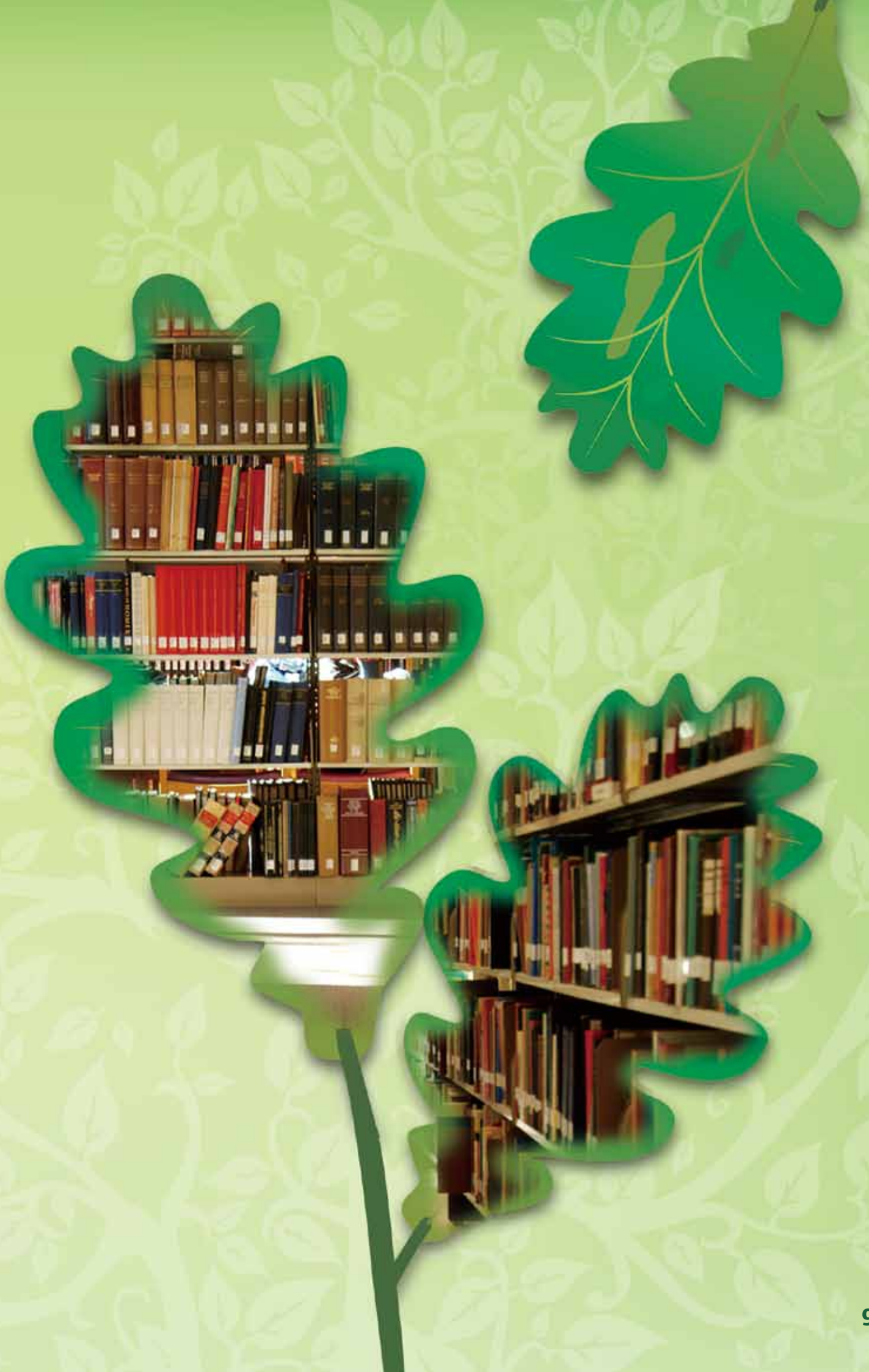
   Research shows that using the enzyme-linked immunosorbent assay (ELISA) technique to evaluate antivenin of N. naja atra potency gives consistent, accurate results. After the Vaccine Center establishes this assay system, it will be able to replace laboratory animal neutralizing antibody testing methods, reducing laboratory animal usage and testing time. Through rapid testing and prompt gathering of blood samples, raw material quality is improved, enhancing Taiwan CDC's ability to ensure a consistent domestic supply of antivenin, thereby ensuring top-quality biologics of antivenin.

4. Investigation of different adjuvants effects on antivenin potency, inflammation and immune response:

   Research shows that cobratoxin can activate the expression of IFN, TNF and IL10, but when it is mixed with S6233 adjuvant, expression of IL11 is reduced, raising the function of antigen presenting cells and increasing antibody titers. In the future, Vaccine Center will work to select the best immune adjuvant for stimulating immunity, thereby producing higher-titer, more concentrated antivenin.)

5. The Vaccine Center produces tetanus adsorbed toxoid that is highly stable. It remains potent after seven years of being preserved at 4 degrees Celsius, and a 6-month accelerated test shows that it remains effective when preserved under abnormal conditions (at 37 degrees Celsius). Based on these results, the center considers its tetanus adsorbed toxoid to be of high quality, which aids in ensuring that biological products produced in the future will meet WHO standards.

Publications: Sharing Cutting Edge Research and Recommendations



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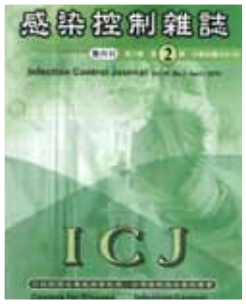

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