Taiwan Epidemiology Bulletin

April 10 , 2012/ Vol.28 / No.7

Original Article

Review of Acute Infectious Diseases in Taiwan 2010

Shu-Kuan Lai, Yi-Chen Tsai, Chih-Pei Sun, Chiu-Hsiang Lin,
Hung-Wei Kuo, Fang-Tzy Wu, and Jen-Hsiang Chuang

Epidemic Intelligence Center, Centers for Disease Control, Taiwan

Abstract

There were 5,487 confirmed cases of acute infectious diseases in 2010, including 77 deaths. The number of confirmed cases increased by 10% and the deaths decreased by 5% compared with the data in 2009, in which 4,990 were confirmed cases, including 81 deaths. The top five infectious diseases having the highest increase rates in 2010 were botulism, meningococcal meningitis, cat-scratch disease, paratyphoid fever, malaria, and dengue hemorrhagic fever/dengue shock syndrome. The top five diseases having the highest decrease rates in 2010 were measles, acute viral hepatitis C, leptospirosis, typhoid fever, and toxoplasmosis. Forty-four confirmed cases died because of severe complicated influenza, which was the first cause of death, invasive pneumococcal with 12 cases was the second cause of death and nine people died because of melioidosis was the third. In 2010, the most important event was imported NDM-1 *Enterobacteriaceae* infection. The next was the family botulism clusters in Taoyuan County and Miaoli County. Suffers might eat dried bean curds in vacuum bags. The other important clusters of infectious diseases were melioidosis clusters in Kaohsiung City after Typhoon Fanapi in September, the dengue fever epidemic in Kaohsiung City and Tainan City from September to November and the family and school clusters of shigellosis in Hualien County in October.

Keywords: acute infectious disease, NDM-1 *Enterobacteriaceae*, botulism

Background

In 1971, a specific infectious diseases surveillance system was set up by Executive Yuan, Department of Health. A more comprehensive reporting system of national notifiable diseases was established in 1993. The system is responsible for case transport, registry, and the record of diagnosis. Since July 1997, modern information equipments and internet have been used to rebuild the system. Then the system has been integrated into Department of Health Nation

Medical Service Information Network Service Center and then becomes a part of Health Information Network (HIN). Since July 2001, the reporting system of national notifiable diseases has been revised as a web-based system. The data transport is faster and much more comprehensive.

In order to apply the database and analyze the epidemic trend, since 1993, CDC has published “Statistics of Communicable Diseases Taiwan-Fukien Area” annually. Since 1995, CDC has published “Statistics of Communicable Diseases and Surveillance Report in Taiwan area” annually. Since 1996, the two annual reports have been revised to be “Statistics of Communicable Diseases and Surveillance Report” and it is published annually [1]. Currently, not only does CDC publish an annual report but also review some important epidemic events occurring in the past year in the annual epidemiology meeting. This publication summarized the annual report, and described and analyzed the epidemic events in Taiwan 2010.

Materials and Methods

A. Data source

1. Surveillance data of infectious diseases: the data were originally collected from the Surveillance System of National Notifiable Diseases, the Infectious Disease Investigation System, the Surveillance System for Populous Institutions, the Important or Clustering Event Investigation and Report Platform, and the Symptom Surveillance System.
2. Data of viral surveillance in communities: the data were collected from contracted laboratory system for viral diseases.
3. Data of immunization: the data were queried from NIIS prevention and immunization system.
4. Data of population statistics: the population number was defined as the population in mid-year of 2010 from Department of Household Registration, Ministry of Interior.

B. Definitions:

The definition of acute infectious disease: Up to date, there are 69 national notifiable diseases. However, 8 types of chronic diseases, i.e., multi-drug resistant tuberculosis, tuberculosis except the multi-drug resistant type, Hansen's disease, syphilis, gonorrhea, HIV infection including vertical suspected infection, acquired immune deficiency syndrome, acquired immune-deficiency disease, and Creutzfeldt–Jakob disease, were not included in this study because of the long latent period and the unknown onset date of the symptoms of these diseases. Although chicken pox, mumps, and tetanus are listed in the category of acute infectious disease, the diseases were not discussed in this study. The main reason is that the track and confirmation system for these diseases has not been set up. Thus, cases of the other 58 infectious diseases, if they occurred in 2010, were analyzed, including the confirmed and the deaths; the cause of death should be directly associated with or related to the notified disease.

C. Analyses:

After the data were cleaned up, the descriptive statistical analyses were used to understand some basic information, e.g., the number of confirmed cases, the confirmed death number, and the affected age group. The incidence rate per 100 thousand persons was calculated by using the population of the mid-year in 2010 as the denominator. The important diseases were analyzed and compared with the data in 2009. The epidemic pattern was drafted to understand the trend.

Results

There were 5,487 confirmed cases, including 77 deaths, of infectious diseases reported in 2010. The confirmed cases increased by 10% but the death cases decreased by 5% compared with that in 2009, which 4,990 were confirmed, including 81 deaths [2].

Some diseases did not occur in 2009 but occurred in 2010, i.e., Hantavirus infection and NDM-1 *Enterobacteriae* infection has been listed on the national notifiable table since September 2010. Immediately, some confirmed cases have been recorded. Thus, they were sorted into the category of new cases occurred in 2010 only. If the fractional variations of confirmed cases of diseases were compared, the first five diseases increased higher than others in 2010 were botulism, which increased from 1 to 11 cases (1000% increase), meningococcal meningitis, which increased from 2 to 7 cases (250% increase), cat-scratch disease, which increased from 26 to 65 cases (150% increase), paratyphoid, which increased from 5 to 12 cases (140% increase), malaria, which increased from 11 to 21 cases (90.9% increase), and dengue hemorrhagic fever/dengue shock syndrome (DHF/DSS), which increases from 11 to 21 cases (90.9% increase). On the contrast, the first five diseases, whose number of the confirmed cases decreased much more than others, were measles, which decreased from 48 to 12 (75% decrease), acute hepatitis C, which decreased from 130 to 40 cases (69.2% decrease), leptospirosis, which decreased from 203 to 77 cases (62.1% decrease), typhoid fever, which decreased from 88 cases to 33 cases (58.8% decrease), and toxoplasmosis, which decreased from 7 to 3 cases (57.1% decrease).

In 2010, the top five infectious diseases, in case number per 100 thousand persons were dengue fever (8.19), which mainly occurred in age above 65, complicated influenza (3.81), which occurred mainly in age group between 0 and 4 and ages above 65, invasive pneumococcal disease (3.19), which occurred mainly in age group between 0 and 4 and ages above 65, scrub typhus (1.69), which occurred mainly in age group between 45 and 64, and amebiasis (1.12), which occurred mainly in age group between 25 and 44. In 2010, the confirmed cases of severe complicated influenza declined and those of the other 4 increased, when the data were compared with that in 2009. Table 1 lists the incidence of acute infectious diseases in 2010, the trend comparison (2009 - 2010), and the affected age group of each disease.

Table 1. The incidence, the trend and the main factor of different acute infectious diseases in 2010

Category	Diseases	Comparison of trends	Incidence (1/100,000)	Ages affected
Type I	Smallpox	NA	0.00	NA
	Rabies	NA	0.00	NA
	Anthrax	NA	0.00	NA
	H5N1 influenza	NA	0.00	NA
	Plaque	NA	0.00	NA
	Severe acute respiratory syndrome	NA	0.00	NA
Type II	Acute hepatitis A	▼	0.76	25-44、15-24
	Acute flaccid paralysis (and Poliomyelitis)	▲	0.26	0-4、5-14
	Amebiasis	▲	1.12	25-44
	Chikungunya fever	▲	0.06	25-44
	Poliomyelitis	NA	0.00	NA
	Diphtheria	NA	0.00	NA
	West Nile fever	NA	0.00	NA
	Epidemic typhus Fever	NA	0.00	NA
	Shigellosis	▲	0.74	0-4
	Paratyphoid fever	▲	0.05	25-44
	Dengue fever hemorrhagic manifestations/Dengue shock syndrome	▲	0.09	>=65
	Dengue fever	▲	8.19	>=65
	Malaria	▲	0.09	25-44
	Meningococcal meningitis	▲	0.03	0-4
	Measles	▼	0.05	0-4、15-24
	Typhoid fever	▼	0.14	0-4
Type II	Enterohemorrhagic E. coli infection	NA	0.00	NA
	hemorrhagic fever with renal syndrome, HFRS	NI	0.00	NA
	Hantavirus pulmonary syndrome, HPS	NA	0.00	NA
	Rubella	▼	0.09	25-44、15-24
	Cholera	▲	0.02	0-4
Type III	Japanese encephalitis	▲	0.14	45-64、>=65
	Congenital rubella syndrome	NA	0.00	NA
	Pertussis	▼	0.25	0-4、5-14
	Invasive haemophilus influenzae type b infection	▼	0.05	0-4、5-14
	Acute hepatitis B	▲	0.74	25-44、15-24
	Acute hepatitis C	▼	0.17	>=65、45-64
	Acute hepatitis D	↔*	0.00	NA
	Acute hepatitis E	▼	0.03	25-44、>=65
	Acute viral hepatitis unspecified	▼	0.05	>=65、0-4
	Legionellosis	▲	0.44	>=65、45-64
	Neonatal tetanus	NA	0.00	NA
	Enterovirus infection with severe complications	▼	0.07	0-4
Type IV	New Delhi metallo-β-lactamase 1 enterobacteriaceae	NI	0.00	NA
	Q fever	▼	0.38	45-64、>=65
	Toxoplasmosis	▼	0.01	0-4、45-64
	Endemic typhus fever	▲	0.18	45-64
	Botulism	▲	0.05	>=65
	Tularemia	NA	0.00	NA
	Herpesvirus B infection	NA	0.00	NA
	Invasive pneumococcal disease	▲	3.19	0-4、>=65
	Complicated influenza	▼	3.81	>=65、0-4
	Scrub typhus	▲	1.69	45-64
	Lyme disease	NA	0.00	NA
	Leptospirosis	▼	0.32	45-64
	Cat-scratch disease	▲	0.28	15-24、5-14
	Melioidosis	▼	0.19	≧ 65
Type V	Ebola fever	NA	0.00	NA
	Lassa fever	NA	0.00	NA
	Marburg fever	NA	0.00	NA
	Rift Valley fever	NA	0.00	NA
	Yellow fever	NA	0.00	NA

Note：1. The population data is based on June 2010 census data.
2. Comparison of trends: NA means that there was no confirmed case in 2009 and 2010. NI means that there was no confirmed case in 2009 and only 1 confirmed case in 2010.
3. *Acute hepatitis D: there was only one case in 2009 and 2010, respectively. The incidence rate was approximately 0.
4. Eight chronic diseases, chicken pox, mumps and tetanus are not included.

In 2010, complicated influenza had 44 death cases (57.1%); the figure was the highest among all diseases. The second disease was invasive pneumococcal disease, with 12 deaths (15.6%). The third disease was melioidosis, which had 9 deaths (11.7%). However, in terms of mortality, melioidosis was the top one, with 20%, 9 out of 45 confirmed cases died. The next was

DHF/DSS 9.5% (2/21). The third was Japanese encephalitis, 6.1% (2/22). Table 2 lists the mortality of first three acute infectious diseases in each category in 2010.

In 2010, 343 suspected cluster events were recorded in the Symptom Surveillance System, these are influenza-like, diarrhea, upper respiratory syndrome, unspecified fever and enterovirus. The figure of cluster events related to diarrhea was 134, followed by 123 events of influenza-like clusters. These two diseases occupied 75% of all cluster events in 2010. The notifiable disease reporting system gathered 197 suspected events; most of them were conjunctivitis (56%, 38 events), 37 events of chicken pox, and 35 events of dengue fever (Table 3).

Table 2. The information of the top 3 infectious diseases in each category in 2010

Category	Diseases	Confirmed cases	Confirmed death cases	Mortality (%)	Compared with 2009	Mortality in 2009 (%)
Type I						
Type II	Dengue hemorrhagic fever/Dengue shock syndrome	21	2	9.5	▼	36.4
	Acute hepatitis A	139	1	0.7	▲	0.4
	Dengue fever	1,896	2	0.1	▼	0.4
Type III	Japanese encephalitis	33	2	6.1	▲	5.6
	Legionellosis	102	3	2.9	▲	1.2
	Pertussis	61	1	1.6	▲	0.0
Type IV	Melioidosis	45	9	20.0	▲	4.5
	Complicated influenza	882	44	5.0	▲	4.4
	Invasive pneumococcal infection	737	12	1.6	▼	1.9
Type V	_	_	_	_	_	_

Note：1. Date type: the onset date.
2. Death case is defined as the reason causes the death related directly to the infectious disease evidently.
3. Mortality rate=the confirmed death cases/the confirmed cases * 100
4. Only the 3 highest diseases listed on the table of the notifiable diseases

Table 3. Cluster events reported by symptomatic surveillance & reporting system and notifiable disease surveillance system in 2010

Source of reporting	Diseases	Cluster No.	Cluster type								
			Populous Institutions	School	Hospital	Military	Others	Family	Imported	Working place	Geographical
Symptom Surveillance System	Diarrhea	134	49	55	23	1	6				
	Influenza-like	123	52	34	24	7	6				
	Upper respiratory infection	76	26	28	12	4	6				
	Fever with unknown origins	7		6			1				
	Enterovirus	3	1		1		1				
	Total	209	79	68	37	11	14				
Notifiable Disease Surveillance System	Conjunctivitis	38	2	33		3					
	Chicken pox	37	8	22	1		1	1	1	3	
	Dengue fever	35						6	22		7
	Shigellosis	20	3	1	1			7	8		
	Pertussis	17	2	1	1			13			
	Amoebiasis	13	8					3	1	1	
	Complicated influenza	9	1					8			
	Measles	4						2	2		
	Scrub typhus	4						3			1
	Botulism	3						3			
	Leptospirosis	3						1			2
	Rubella	3				1				1	1
	Q fever	2									2
	Meoliodosis	2									2
	Typhoid fever	2						2			
	Chikungunya fever	1							1		
	Malaria	1							1		
	Acute hepatitis A	1						1			
	Paratyphoid	1							1		
	Food poisoning	1			1						
	Total	197	24	57	4	4	1	50	37	5	15

The main cluster events from October to next February were associated with diarrhea, influenza-like illness and upper respiratory infection. Above 70% of clusters reported from Populous Institutions and schools. Moreover, chicken pox, and conjunctivitis mainly occurred in schools and Populous Institutions. The two areas had more than 80% of cluster events. Dengue fever cases were mainly associated with family clusters; either the index case was imported or indiginous. Pertussis, complicated influenza, shigellosis, scrub typhus, and botulism mainly occurred as family clusters. Amebiasis mainly occurred in Populous Institutions, such as nursing homes, psychiatric centers, and hospitals. Leptospirosis, melioidosis, and Q fever were location related. Chikungunya fever and malaria were mainly of imported cases and then the cases resulted in cluster events. The must see information of important infectious diseases in 2010 was present as follows.

The analytic results of important infectious diseases

1. NDM-1 *Enterobacteriaceae*:

NDM-1 *Enterobacteriaceae* infection is defined as a person who is infected by *Enterobacteriaceae* carrying New Delhi metallo-β-lactamase 1 (NDM-1) gene. The gene resists to many antimicrobial agents. The first strain of this type was identified in 2008 from an Indian Swiss, who had a history of staying in an Indian hospital. In July 2009, UK announced that the percentage of detecting NDM-1 gene from *Enterobacteriaceae* increased [3]. In June 2010, US CDC reported that NDM-1 *Enterobacteriaceae* isolates had been identified from 3 people, who went to Indian for medical reasons [4]. Moreover, sporadic reports have been reported in Canada, Netherlands, Australia, Sweden, France, Japan, and Hong Kong [5]. In order to surveillance this disease, Taiwan government has classified NDM-1 *Enterobacteriaceae* infection in the 4th category of notifiable diseases and asks all medical centers should report cases, if the cases fit the criteria, to CDC within 24 hours. The suspected isolate should be sent to CDC for further identification [6].

On 19th Sep 2010, a journalist, while worked in India, underwent an emergency surgery because of a gunshot. Because the place where the surgery was performed, CDC decided to get the case's sample as early as the case entered Taiwan. An isolate of *Klebsiella pneumonia* contained NDM-1 gene was identified. However, the case was defined as a non-symptomatic carrier because the case did not show any clinical sign and the condition of the wound was healthy as well. Hence, it was not reported in the notifiable surveillance system. CDC found that the isolate in the patient had been replaced by other gut's bacteria and then it had disappeared, after many samples were collected sequentially [7].

On 14th January 2011, a first local case of NDM-1 *Enterobactericeae* infection was confirmed by CDC. The case was 56 years old and had a medical history of uremia. In October 2010, the case went to JiangXi, China for kidney transplantation. The case returned in the late October. The case went to see a doctor for the symptoms i.e., chill and hypogastralgia. Fluid in abdomen was discovered by MRI. After the fluid was collected, carbapenem resistant

Klebsiella pneumonia was identified. The hospital that the patient visited screened drug resistant genes for the isolate and highly suspected that the isolate may carry NDM-1 gene. On 10th January 2011, the hospital reported the case to CDC and then the isolate was confirmed carrying NDM-1 gene. The case was registered as NDM-1 *Enterobactericeae* confirmed case on 14th January 2011. The case recovered on 31st January 2011 after treatment.

Till April 2011, there were 261 confirmed cases of NDM-1 *Enterobacteriaceae* worldwide. Out of these, 7 cases died. Most confirmed cases (118 cases) occurred in India. The country had the second most reported cases was United Kingdom (51 cases). The third country was Pakistan, with 25 cases reported. The other countries had cases less than 10. Most infected cases had travelling or medical history related to India [8].

2. Botulism:

Nine people got *Clostridium* botulism type A infection in 1986 because they ate pickled peanut cans made by an unlicensed factory in Zhanghua County. Two out of nine people died. This is the first full record botulism event [9]. In 1987, 1990, 2006 and 2008, there were *Clostridium* botulism type B infections occurred in aboriginal tribes in Nantou County, Ilan County and Maioli County, respectively. The cause might relate to the intake of pickled foods, e.g., Formosan barking dear meat, pickled goat meat, or pickled bird meat [10-12]. Since 1990, botulism has been listed on the notifiable diseases. From 1991 to 2006, the reported cases were less than 3 every year. Since October 2007, the disease has been categorized into Category 4 of notifiable diseases. In 2008, there were 11 confirmed cases. In 2009, one case was reported. In 2010, as high as 11 cases were reported, including 2 family clusters and 1 case died (Figure 1).

A family cluster event related to botulism in 2010 was reported from Taoyuan County, involving mother, daughter and son-in-law., and from Miaoli County, where a mother and her daughter-in-law were suffered, respectively. The event in Taoyuan County was occurred as members in a family ate some vegetarian meat when they travelled to Southern Taiwan to

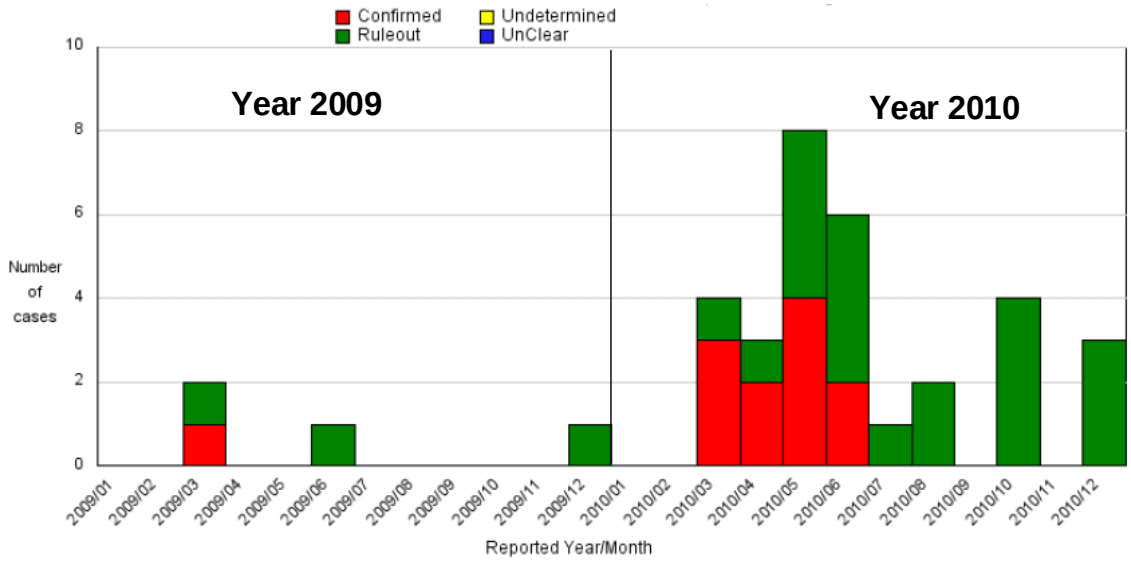

Figure 1. The trend of botulism cases from 2009 to 2010.

sweep a grave. Their symptoms occurred between 29 and 30 March. The hospital reported the event to CDC and experts in CDC confirmed that they were infected by *Clostridium* botulism type A. The patients recovered after treatment. In Maioli County, the patients ate some dried bean curds in a vacuum package. They had symptoms on 11th April, 2010. They went to see doctors many times but conditions were not improved. The hospital reported the cases to CDC and then laboratory confirmed that they suffered from *Clostridium* botulism type A. However, the daughter-in-law, who was 44 years old, died on 14th April. The cause of death was classified as "others". The appendix of the case marked as "unknown". The mother, who was 71 years old, recovered after treatments.

In 2010, 9 out of 11 confirmed botulism cases were type A, 1 was type B, and 1 was type E. In 2009, only one confirmed case was reported and it was not classified because the quantity of serum was not enough. There were 11 confirmed cases in 2008; 8 out of them were type A and 3 were type B.

The epidemic investigation pointed out that 9 out of 11 confirmed cases ate dried soybean products, e.g., dried bean curds, vegetarian meats, or vegetarian ham. The curds in vacuum packages, which 8 cases ate, were made in Daxi Town. A retrospective study, which studied 20 botulism cases, pointed out that the most suspected food, which might contain botulism toxin, was soybean products, including fermented bean products, e.g., fermented soybean curds, strong-smelling preserved soybean curds, soybean curd in vacuum packages or soybean materials for processing, tofu, and soybean milk. The next possible products were pickles, e.g., vegetables, braised bamboo shoot, or spiral shell meat. The results showed that not only can foods, but also any vacuum packed products may become the main reason of botulism, because it may be contaminated by spores during the manufacturing processes and the products may be contained in an anaerobic environment.

3. Complicated influenza

During the epidemic period of influenza (from July to next June), there were 28 confirmed cases in 2008- 2009, 1,312 cases in 2009-2010. From 2010 to January 31, 2011, there were 1,294 cases. The confirmed cases in the last two influenza epidemic seasons (2008-2009 and 2009-2010) increased dramatically, compared with the data in the 2008-2009 epidemic season. The main reason was that an H1N1 epidemic occurred in 2009. In the epidemic season of July 2009, H1N1 was the main type. In April 2010, a small epidemic was associated with influenza type B. From June, the seasonal influenza was mainly associated with type AH3 and minor associated with type H1N1 and type B. Till December, the main type was H1N1 again (Figure 2).

The confirmed cases in the influenza epidemic season from 2010 to 2011 had increased since April 2010. The confirmed cases increased from about 10 to the peak, which was at least 50 cases, in August. The number of cases declined slightly from the middle of September. Since January 2011, the confirmed cases had increased dramatically again. The main type was H1N1. During this period, more than 150 confirmed cases reported every week.

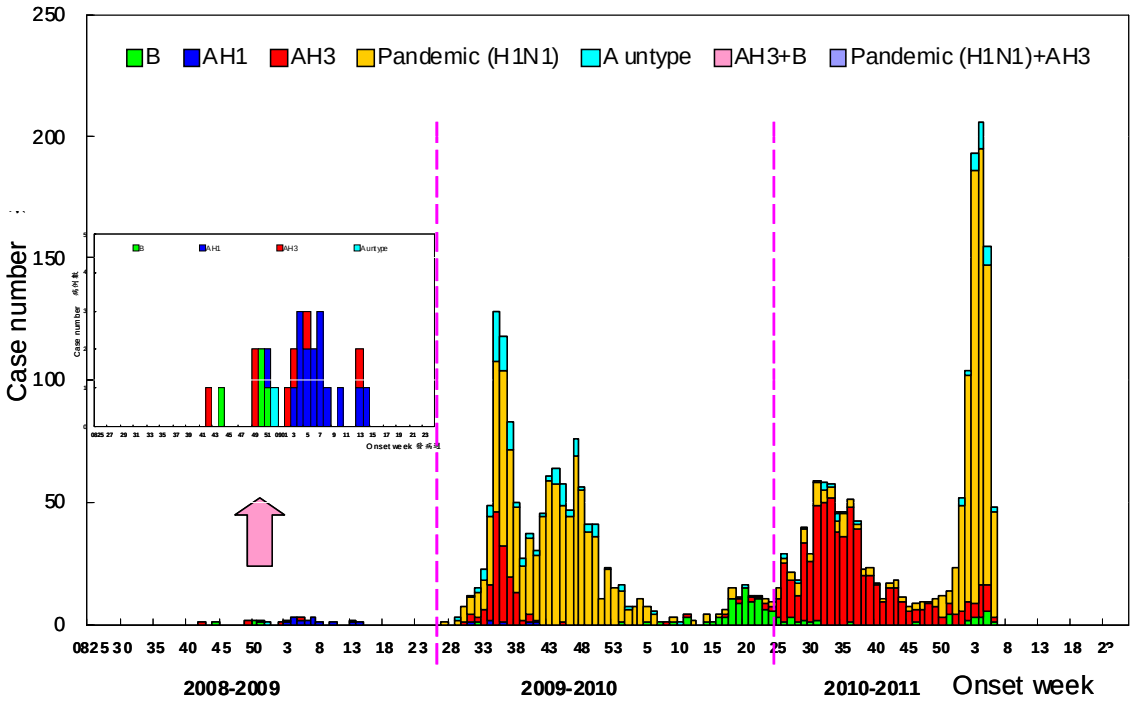

Figure 2. Genotypes of influenza virus in the complicated influenza cases from 2008 to 2011

According to the surveillance data of influenza virus strains in communities, the seasonal influenza type B and type AH3 usually took place by turns. From 2009 to 2010, the virus strain changed from H1N1 to B and then to AH3. The main type caused the epidemic in July 2009 was H1N1. From August to September, the minor epidemic related to AH3. Around the lunar New Year's days, the epidemic declined. The next epidemic occurred between April and July was associated with influenza type B. Then, the epidemic period was postponed as well and then the epidemic period was connected to the epidemic from 2010 to 2011. The seasonal influenza virus changed from AH3 to H1N1 at the 52nd week.

The information collected from the incidence of confirmed cases pointed out the epidemic period between 2008 and 2009 was caused by a seasonal influenza virus; the highest incidence occurred in the age of above 65, next was the age between 1 and 6. Regard to the issue of the H1N1 influenza virus caused the epidemic between 2009 and 2010; age lower than 18, especially age from 0 to 6, had the highest incidence; next was at the age of above 65 years old. The AH3 influenza caused the epidemic in the year of 2010. During the epidemic period between 2010 and 2011, the AH3 was the main genotype before December 2010; the highest incidence was recorded in the age above 50 years old. From the first month of 2011, the type became to be H1N1 and the incidence in the age lower than 6 years old increased gradually. It is worth of mention that the incidence in infants younger than 1 year old increased the fastest. The incidences between seasonal influenza and the type H1N1 were different in their affected age group. However, the two types of influenza mainly attacked age group between 0 and 6 and age above 65 years old.

The analysis of influenza mortality indicated that 7 out of 28 confirmed cases died (25%) during the epidemic period in 2008 - 2009. From 2009 to 2010, and from 2010 to 31st January 2011, there were 1,312 and 1,294 confirmed cases, with 49 and 91 death cases, respectively. The confirmed and death cases were higher in these influenza epidemic seasons. Compared to the epidemic from 2008 to 2009, the mortalities in the last two epidemic periods were similar.

4. Dengue fever hemorrhagic manifestations/Dengue shock syndrome

In total 1,896 dengue fever cases occurred in 2010. The number was 80% higher than that in 2009 (1,052 cases). The number was the third high among recent 10 years; the highest figure was reported in 2002 with 5,388 cases and the next was 2,179 cases reported in 2007. 1,592 out of 1,896 cases were indigenous, which was 87.7 percent increase compared with that in 2009. 304 cases were imported, which was 49.0% increase compared with that in 2009. In 2009, there were 848 indigenous cases and 204 imported cases (Figure 3). In 2010, there were 21 cases of DHF/DSS. Among them, 2 cases died; they occurred at the 34th and 39th week separately. In 2009, there were 11 cases with 4 deaths. The cases occurred between the 45th and 49th weeks. The number of the confirmed cases of DHF/DSS was higher than that in 2009 but the number of the death cases was lower. The reason might relate to high alertness of people and doctors, and then early diagnoses could be achieved. In 2010, the indigenous cases increased gradually and higher than 600. CDC expected that the epidemic could not be stopped without any intervention. Then, at the 42nd week, 21st October, the Central Epidemics Command Center was established in order to manage the surveillance and prevention issues. The 10 villages in two districts of Tainan City, where lots of cases were reported, were implemented with mass spray to prevent the outbreaks spreading. Because the interventions were useful, the epidemic was controlled. On 31st December, the center was dismissed under the agreement of Executive Yuan, Taiwan.

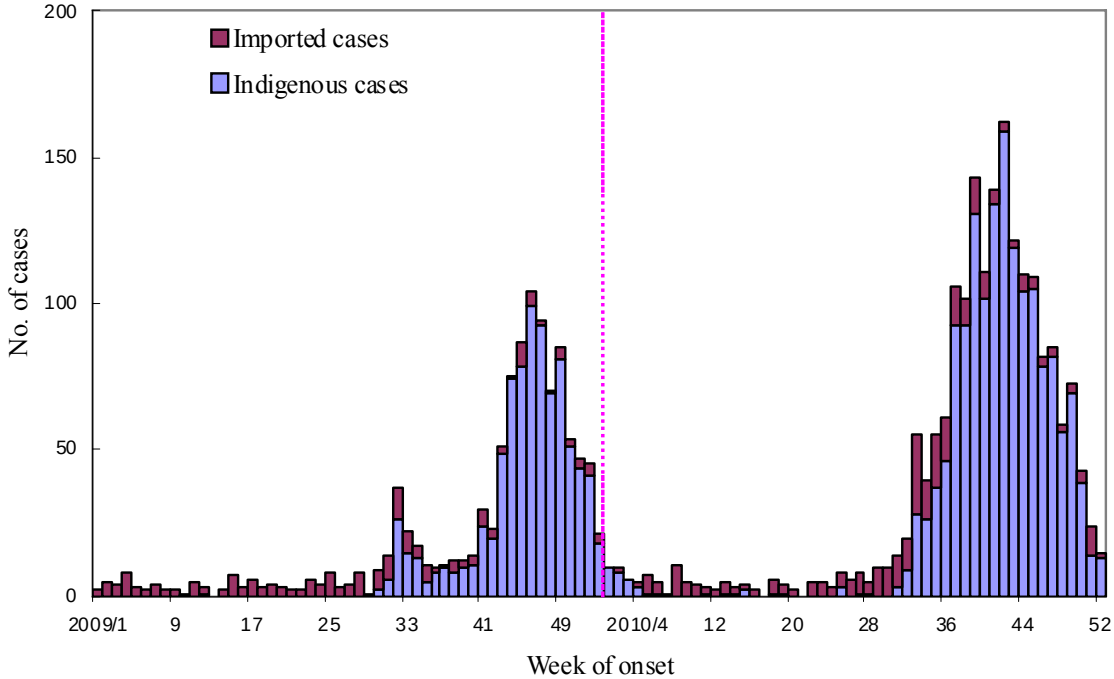

Figure 3. The trend of dengue fever virus of imported and indigenous cases from 2009 to 2010

In 2010, the local cases mainly occurred in Kaohsiung Area and Tainan Area. In 2009, the cases mainly occurred in Kaohsiung Area and Pingtung County. The epidemic areas during the two years still occurred in Kaohsiung Area.

The exploration of the virus types pointed out that DN-III was the main type distributing in Kaohsiung Area. DN-IV type was identified mainly from Tainan City. In Tainan County (now: Tainan City), the type was mainly DN-I. In 2009, Kaohsiung Area, DN-III was the main type and DN-II was the main type identified from Pingtung County.

In 2010, 43% of imported cases were screened out by the airport fever screening surveillance system. Compared with the data in 2009, a decrease of 56% was noted. In the confirmed cases screened by airports, the majority of cases was DN-II (43 cases, 32.6%) and the followings were DN-1 (33 cases, 23.5%), and Untype (23 cases, 17.4%). In 2009, the major type was DN-1 (34 cases, 29.8%) and the followers were DN-II (26 cases, 22.8%) and Untype (24 cases, 21.1%), by sequence.

The figure of imported cases was similar to that in 2009. By country, the number of imported cases from Indonesia was the highest, which was 96. The second country was Vietnam (61 cases). There were 36 cases imported from Thailand, 34 cases imported from the Philippines and 21 cases imported from Cambodia. The number of the imported cases from Philippines was 1 time higher than that in 2009, when there were 19 cases imported. The imported cases from Cambodia had been increased three times higher than that occurred one year prior, when 8 cases were reported. It is worth of paying more attention to the trends of infectious diseases occurred in those countries.

5. Melioidosis:

Melioidosis has been listed as a notifiable disease since 2000. Since October 2007, it has been announced as a Category IV notifiable disease. It should be reported to CDC according to regulations. The first melioidosis in Taiwan occurred in 1982, which was an imported case original from Philippines. The case got the infection because of drowning [14]. From 2000 to 2007, there were 167 confirmed cases recorded. Out of the figure, most cases occurred in Kao-Ping area, where 96 cases were recorded (57.5%), and in Southern Taiwan, where 51 cases were recorded (30.5%). Before 2005, less than 6 confirmed cases were reported from each county or city. All cases were sporadic. Between July and September 2005, cluster events (16 cases) were reported from Southern Taiwan around Erren Creek, mainly in Jiading Township (Now: Jianding District, Kaohsiung City), and in South district, Tainan City (14 cases), because of the attacks by Super Typhoon Haitang and Typhoon Talim [15]. The two districts still have confirmed cases every year since 2005.

Although only 17 confirmed cases occurred in 2007, from 2008 to 2010, more than 40 confirmed cases were reported every year. The confirmed death cases increased gradually annually. In 2010, nine out of 45 cases died; the mortality was 20%, which was the highest record. From the historical trends (Figure 4), the peak of confirmed cases was reported during the typhoon seasons. In addition, most cases reported from the area of Kaohsiung City,

including the original County and City, and Tainan City, including the original County and City. The attacked age group was people higher than 45 years old. Most cases had some chronic disease history, e.g., diabetic mellitus, and hypertension.

Nine of 45 confirmed cases died in 2010. Among all cases, 25 cases occurred after 19th September, when the Typhoon Fanapi attacked, and located in Kaohsiung City (original Kaohsiung City and County). In 2009, the phenomenon was the same. All confirmed cases were 44. Among them, 34 cases were reported from 8th August, the date of Typhoon Morakot attacked. Most cases were located in Kaohsiung County and City (now: Kaohsiung City); mainly in Zuoying District and Nanzih District. The confirmed cases lived near Lan-hwa Lake. It is believed that it was a geographical cluster.

6. Shigellosis:

Shigellosis in Taiwan usually occurred in aboriginal tribes or in populous institutions. *S. flexneri* is the usually identified strain from aboriginal tribes. *S. sonnei* is usually isolated from open areas [16-17]. Usually, the incidence in aboriginal tribes is 10 times, or 100 times, higher than that in ground areas. The main reason might relate to contaminated water or unqualified environmental hygiene. Cluster events in ground areas may occur in schools, families, wardens of a psychiatric department or populous institutions, i.e., disability welfare services institutions and nursing homes.

There were 172 shigellosis confirmed cases in 2010. Among them, 90 were indigenous cases and 82 were imported cases. The number was 2 times higher that in 2009, when 91 cases, including 39 indigenous and 52 imported cases, were recorded (Figure 5). The main reason was there were many cluster events.

There were 16 cluster events in 2010. Out of the figure, 10 events related to indigenous cases and 6 events related to imported cases. In 2009, there were 9 cluster events, in which 2

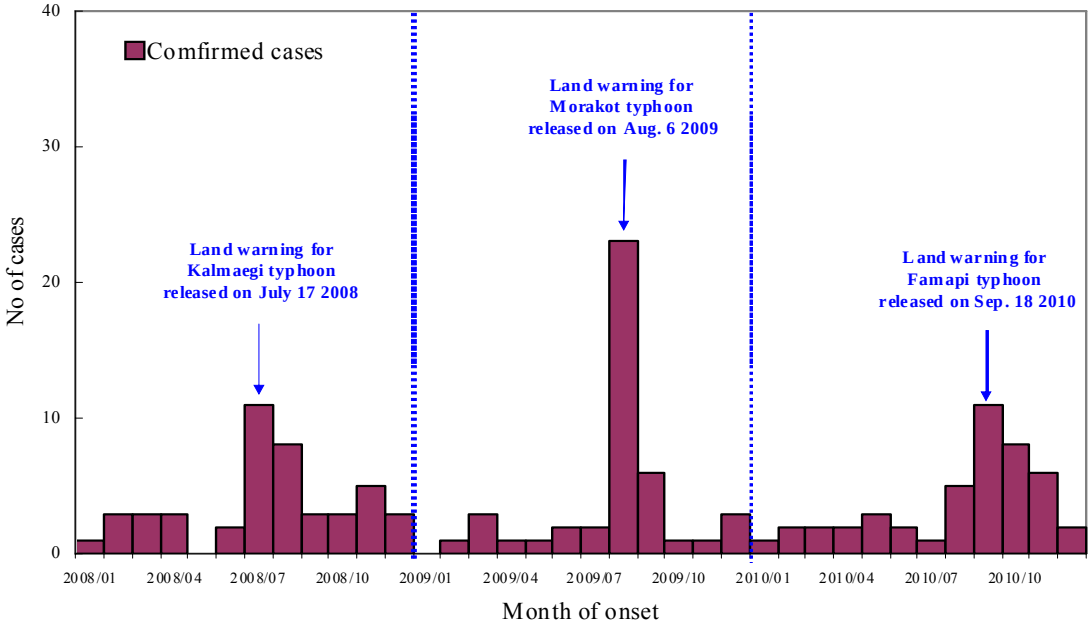

Figure 4. Trend of melioidosis confirmed cases from 2008 to 2010.

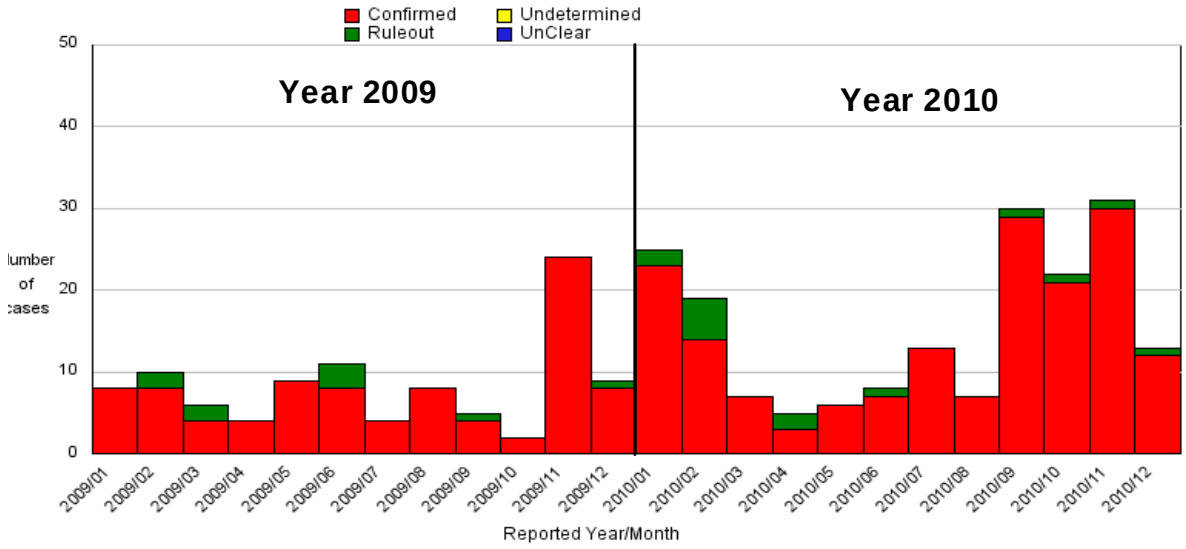

Figure 5. Trend of shigellosis confirmed cases from 2009 to 2010.

events related to indigenous cases and 7 events related to imported cases. In 2010, the cluster events related to indigenous cases increased 2 times higher than that in 2009. That was the main factor causing the increase of the confirmed cases. The 10 local cluster events included 4 events related to family members, 2 events related to populous institutions, 2 events related to hospitals, and 2 events related to the combination of schools and families. The cases were located in Hwalan County (4 events of 43 cases), Ilan county (2 events of 7 cases), Taipei county (now New Taipei City; one event of 2 cases) and Nantou County (1 event of 2 cases), Taichung County (2 events of 4 cases). In 2009, the two local cluster events were of hospital, locating in Maioli County (1 event of 2 cases) and Taichung City (1 event of 18 cases).

There were 82 imported cases in 2010. The number was 57.7% increased, when compared with 52 cases in 2009. The 6 imported cluster events related to Indonesia (4 events of 14 cases), Cambodia (1 event of 10 cases) and Philippines (1 event of 2 cases). In 2009, there were 7 events; 5 events (10 cases) from Cambodia, 1 event (2 cases) each from Vietnam, and India, respectively. The top three countries related to the imported cases were Indonesia (38 cases), Cambodia (16 cases), and China (8 cases).

7. Imported infectious diseases.

The imported confirmed cases were 661 in 2010, accounted for 12.0% of all confirmed cases in this year. The top three diseases on the list were dengue fever, which had 304 cases and occupied 46.0%; amebiasis, which had 139 cases and 21.0%; and shigellosis, which had 82 cases and 12.4%. The order of the first two was the same as that in 2009. However, in 2009, the third one was typhoid, which had 64 cases. Because the policy of hiring foreigners has been strengthened, which includes the examination of typhoid, it was replaced by shigellosis in 2010.

The sources of imported cases were mainly from Southern Asia. 96, 61, and 36 out of 304 dengue fever cases were from Indonesia, Vietnam, and Thailand, respectively. 108, 12,

and 5 out of 139 imported amebiasis cases were from Indonesia, Philippines, and Vietnam, respectively. 38 out of 82 shigellosis imported cases were from Indonesia, which had the highest proportion among all amebiasis cases. In 2010, the top three countries, where the cases came from, were Indonesia (272 cases), Vietnam (83 cases), and Philippines (59 cases), by orders. In 2009, they were Indonesia (213 cases), Vietnam (83 cases), and Thailand (57 cases).

Discussion and suggestion

1. To establish a comprehensive multidrug resistant bacterial surveillance system and to enforce an instruction of control program of nosocomial infections.

Multidrug resistant bacteria (MRB) may result in severe nosocomial infections. Thus, it has been a concerned issue worldwide how to manage the resistant trend of MRB and set up a preventive method against MRB as soon as possible. In 1998, NHRI set up Taiwan Surveillance of Antimicrobial Resistance, TSAR, and in 2007, CDC set up Taiwan Nosocomial Infections Surveillance System, TNIS, in order to investigate multidrug resistance bacterial and nosocomial infectious reports. However, only medical centers and regional hospitals involve in TSAR. TNIS could not survey a case, if it is not categorized as a nosocomial infection.

Because the quality, the representativeness and the sensitivity of surveillance systems will affect the precise trends of antimicrobial resistant bacteria, it is necessary to establish a much more comprehensive surveillance system in order to manage the trends of antimicrobial resistant bacteria. Then, Taiwan government can find a proper intervention to manage MRB problems.

On the other way, except to strengthen the current surveillance systems, it is necessary to instruct the prevention methods of nosocomial diseases, e.g., a campaign of hand hygiene, to establish the guidelines of using different antimicrobial agents., and to evaluate the precise and accurate time when antimicrobial agents are used, in order to avoid the damage caused by multidrug resistant bacteria.

2. To cross the barriers of organizations and to work together with other co-workers in order to investigate the suspected foods while events of food poisoning are occurred.

There are many pathogens which relate to food poisoning, e.g., *Vibrio cholerae*, Norovirus, *Clostridium* botulism, and *E*. coli. Among them, botulism is the severest problem. The reason is if no proper treatment, the mortality will be high. Moreover, cluster events may occur when people share foods together.

In 2010, there were many suspected botulism. CDC and FDA release press releases, provided education and training, and published media news to instruct people and medical care personnel separately. The Departments of Health should re-enforce the strengths to investigate the suspected foods and to help dealers to pack food properly according to standard operation procedures. Because the patients, when they suffered from botulism, are often seriously ill or

uncomfortable, they could not state a full eating history during the latent period of botulism. Hence, the left food may not be provided, or the left food is not able to find the toxin. Finally, the correct reason of causing botulism may not be found.

Another possible reason relates to hard to find the possible suspected food is the different recognition of suspected foods for investigators. In the past, the surveys of botulism mainly focused on pickled foods or can food that the cases ate. However, according to the surveys did from 2007 to 2009, soybean products, e.g., dried bean curds in vacuum packages and materials for processing, were the most suspected food, according to the frequencies of these appeared in the investigation reports. The second suspected food was pickled food. In 2010, 82% of the 11 confirmed cases had the history of eating soybean products in vacuum packages. The above surveys pointed out that even the food is packed in a vacuum bag, if the product has not been sterilized accurately and the product is not stored properly, *Clostridium* botulism may grow and then the toxin will contaminate the products. The authors point out, when a case is surveyed, it is necessary to reserve or record the foods the patient ate and the food waste, to record the manufacturing methods and the storage methods of the foods in order to increase the detection rate.

People have paid more attention to the food safety due to the frequency of the events of food poisoning have occurred more than before. FDA not only signs regulations of the standard of food hygiene but also set up a website, which provides people to surf the relative information about how to prevent food poisonings. When CDC traced the suspect food, which might induce botulism, CDC found that regulation related to food processing or management is defect or weak. The truth results in the food contaminated as a bacterial bed and then outbreaks would be continued. To break the limitation among organizations, and to cooperate with other organizations will enhance the investigation of the sources of the food toxins. Hence, it is possible to control the outbreaks of food poisonings.

3. To increase the number of diseases surveyed and to modify the definition of the diseases reported fast and flexibly, in order to response to the constant change of international epidemics

Because the frequency of international communication is increasing, the opportunity of getting infectious diseases outside the home country climbs up dramatically. Sometimes, an infectious disease, which is epidemic outside Taiwan, could spread in Taiwan very fast by an imported case. To understand the current epidemics of the international infectious diseases become the key factor to prevent epidemic diseases to occur in domestic. Moreover, they are necessary to build the international communication in order to response immediately against outbreaks and to contact with other countries closely in order to get the newest information of the infectious disease outbreaks occurring worldwide everyday through the International Health Regulation Focal Point.

To face the threaten of emerging and re-emerging infectious diseases, a surveillance system not only needs to be professional, fast and international, but also different

surveillance systems for different purposes needs to be integrated into a system. Hence, different disease control units can get the information they need in the shortest time and then, they are able to use the information to implement disease control programs efficiently. In addition, regard to the issue of surveying different infectious diseases, if we found the newest trend, we should have a meeting in which we should invite the specialists to attend to, revise the definition of reporting diseases or confirm cases in proper time and then we can survey diseases and react the trend of any infectious diseases exactly. Hence, the government can add the infectious diseases to the surveillance of the reporting system to cope with the temporary needs. Finally, the surveillance system will have its real function.

4. To reenforce the survey and prevention of infectious diseases associated with disasters prior and post typhoon.

The historic data showed that clusters relating to melioidosis, leptospirosis, water-borne or insect-borne diseases occurred after heavy rain or flood. For example, in 2005, after Typhoons Haitang and Tailim, the melioidosis confirmed cases reported from the area of Er-Jen River increased. In August 2009, after Typhoon Morakot, geographical cluster events occurred in Zuoying District and Nanzih District of Kaohsiung City. In the same year, Wandan Township and Xinyuan Township of Pingtung County also had cluster events of leptospirosis. In 2010, after Typhoon Fanapi, the melioidosis confirmed cases also increased. Thus, the authors suggested that if Central Health Bureau of Meteorology alarms the possible event of heavy rain or typhoon, the responsible departments should implement some prevention interventions, especially in the areas where melioidosis or leptospirosis clusters have been reported previously, in order to prevent such events occur again.

Although Taiwan's prevention policy against infectious diseases could be modified according to the epidemic trend, threatens from more and more emerging and re-emerging diseases is present. Except the government efforts against infectious diseases, ordinary people should recognize and understand different infectious diseases and then are able to participate in prevention automatically. Thus, the spread and outbreak of diseases could be avoided. Moreover, it is necessary to combine NGOs to encourage people to involve in disease prevention. In order to enhance citizens' professional abilities against infectious diseases, it is necessary to educate children, as small sentinel, some knowledge of infectious diseases as early as possible. Only get help from all citizens, and get help from the functional detective system, outbreaks would be stopped and prevented. Then, the loss of life and society could be minimized.

Limitation

The report has two significant limitations. Firstly, the data are collected from passive surveillance systems operated by CDC, e.g., the notifiable report system. All events were reported from medical centers. Hence it is possible to underestimate the number of report cases

and the confirmed cases. Secondly, some cases were not included because they were reported after the download date of 2011/1/31; the cases may still occur in 2010 but need more information to do the diagnoses.

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Outbreak Investigation Express

Norovirus Cluster in an Elementary Schoolin Changhua, 2012

Shih-Tse Huang[1] Chen-Pei Lin[2] Yi-Chun Lo [1] Dah-Shyong Jiang[1]

1. Field epidemiologist Training Program, Centers for Disease Control, Taiwan
2. Third Branch, Centers for Disease Control, Taiwan

Abstract

Since afternoon of February 22, 2012, an elementary school informed authorities of possible food-poisoning cluster in Changhua. Many people presented vomiting, diarrhea and abdominal pain. To estimate the scope, identify the etiological pathogen, determine the responsible food item and provide recommendation, the public health authorities conducted an epidemiologic investigation.

The investigation method including: (1)interview with teachers; (2)questionnaire for teachers and 3 to 6 grades students; (3)anal swab and stool from cases; and (4)suspected residual foods and water sampling. Laboratory examination included *Bacillis cereus*, *Staphylococcus aureus*, *pathogenic Escherichia coli*, *Vibrio parahaemolyticus*, *Salmonella*, and Norovius.

The definition of investigated case was having one of the gastroenteritis symptoms (diarrhea, vomiting and abdominal pain) after lunch on February 21, 2012. However, case accompanied with rhinorrhea was excluded. Among eighty investigated cases, 56.2% presented diarrhea, 66.3% presented vomiting and 8.8% presented fever. The median incubation time was 34 hours. Questionnaire analysis did not find out responsible food. Stool sample from one cook and two students revealed norovirus.

According to the symptoms, incubation time and stool analysis, we concluded the cluster was related to norovirus gastroenteritis. The school lunch contaminated directly or indirectly by norovirus-infecting cook was the source.

We recommend the school to enforce preventing manners as following: (1)Clean hands with soap and dry hands after toilet and before cooking. (2)Teachers and students should clean

hands with soap and dry hands before meal and after toilet. (3)If cook has gastroenteritis symptoms, stop food management. He could start to work 48 hours after symptoms resolving.

Key words：Norovirus, Cluster

The Taiwan Epidemiology Bulletin series of publications is published by Centers for Disease Control, Department of Health, Taiwan (R.O.C.) since Dec 15, 1984.
Publisher : Feng-Yee Chang
Editor-in-Chief : Yi-Chun Wu **Telephone No :** (02) 2395-9825
Executive Editor : Li-Gin Wu, Hsiu-Lan Liu **Website :** http://teb.cdc.gov.tw/
Address : No.6, Linshen S. Road, Taipei, Taiwan 100 (R.O.C.)
Suggested Citation :
[Author].[Article title].Taiwan Epidemiol Bull 2012;28:[inclusive page numbers].