

Case Reports and Prevention Measures of Waterborne Protozoan Infections in Public Swimming Pools and Other Recreational Waters

Hao-Yu Liu¹, Dar-Der Ji^{1,2*}

Abstract

Apart from notifiable infectious diseases, Taiwan Centers of Disease Control (TCDC) helps the diagnosis of other infectious diseases for hospitals if necessary. TCDC also cooperates with local health bureaus and research institutions for the environmental surveillance in order to reduce and prevent the occurrence of infectious diseases. Here we discuss the surveillance of recreational water and report the cases of granulomatous amoebic encephalitis (GAE) and primary amoebic meningoencephalitis (PAM) caused by free-living amoebae (FLA) in Taiwan since 2006. Guidelines or regulations for correct usage of recreational water and methods for disinfection of water and facilities are introduced. We hope people therefore realize the transmission route and related information of waterborne protozoan infections and know the infection risk of usage of public swimming pools and other recreational waters to prevent the occurrence of disease.

Keywords: Free-living amoebae; Granulomatous amoebic encephalitis; Primary amoebic meningoencephalitis; Waterborne protozoan infection

¹Center for Research, Diagnostics and Vaccine Development, Centers for Disease Control, Ministry of Health and Welfare, Taiwan

²Department of Tropical Medicine, National Yang-Ming University, Taipei, Taiwan

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Corresponding author : Dar-Der Ji^{1,2*}

E-mail : ddji@ym.edu.tw

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Probable Application of Attractive Toxic Sugar Bait (ATSB) for Dengue Fever and Malaria Vector Control

Wei-Tai Hsia^{1*}, Ho-sheng Wu¹, Shiou-Pin Lin¹,
Tien-Ho Kuo², Yong- Fang Wei³

Abstract

There are over 3,000 kinds of mosquitoes in the world and 132 kinds of them have been found and recorded in Taiwan at present. Lots of vector borne diseases transmitted through mosquito bites, such as dengue fever, malaria, Chikungunya fever, Japanese encephalitis, yellow fever, and Rift Valley fever, etc. are currently classified as notifiable diseases in Taiwan. Dengue fever is mainly transmitted by *Aedes aegypti* and *Aedes albopictus*; whereas *Aedes aegypti* are found in southern part of Taiwan and *Aedes albopictus* has widely existed in mountains and plains below 1,500 meters above sea level around this country. Malaria is mainly transmitted by *Anopheles minimus* and *Anopheles sinensis*, which are found in southern and eastern parts of Taiwan.

In the early days, the pesticide was mainly used to control dengue fever, but there are a lot of derivative results such as drug resistance of vectors, environment pollution and complaint from residents. Even though the government has changed the ways for vector control recently and proposes the new policy, which is to keep the residential environment clean firstly and use pesticides secondarily instead of application of pesticides only, the effect of vector control was less efficient than we expected because of misuse of pesticides by the sprayers sometimes.

Researchers have successfully developed a new form of vector control — attractive toxic sugar bait (ATSB), based on sugar-seeking of mosquitoes and a mixture of oral toxin. The ATSB has been proved useful to reduce mosquito populations in Africa and Florida, USA. Although ATSB is an effective method to be used for mosquito control, it takes time to overcome several limitations before the government officially applies the ATSB technique to control dengue fever.

Keywords: Attractive toxic sugar bait; Dengue fever; Malaria; Vector control; Mosquitoes

¹Center for Research, Diagnostics and Vaccine Development, Centers for Disease Control, Ministry of Health and Welfare, Taiwan

²Department of Environmental Engineering, Tung-Nan University, Taiwan

³Department of Public Health, China Medical University, Taiwan

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Corresponding author : Wei-Tai Hsia ^{1*}

E-mail : hwt263@gmail.com

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Weekly Data of Notifiable Infectious Diseases (by week of diagnosis)

Case diagnosis week		Week 31		Week 1–31	
Classification	Disease Diagnosed ¹	2015	2014	2015	2014
Category I	Plague	0	0	0	0
	Rabies	0	0	0	0
	SARS	0	0	0	0
	Smallpox	0	0	0	0
Category II	Acute Flaccid Paralysis	0	0	10	25
	Acute Viral Hepatitis type A	5	2	61	71
	Amoebiasis	11	7	214	149
	Anthrax	0	0	0	0
	Chikungunya Fever	0	0	4	6
	Cholera	0	0	4	3
	Dengue Fever	231	117	794	562
	Diphtheria	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	0
	Epidemic Typhus Fever	0	0	0	0
	Hantavirus Pulmonary Syndrome	0	0	0	0
	Hemorrhagic Fever with Renal Syndrome	0	0	1	1
	Malaria	0	1	7	11
	Measles	0	0	27	17
	Meningococcal Meningitis	0	0	2	3
	Paratyphoid Fever	0	0	1	6
	Poliomyelitis	0	0	0	0
	Rubella	0	0	6	5
Shigellosis	2	1	103	91	
Typhoid fever	0	0	21	14	
West Nile Fever	0	0	0	0	
Category III	Acute Viral Hepatitis type B	1	4	72	66
	Acute Viral Hepatitis type C ⁴	2	4	129	101
	Acute Viral Hepatitis type D	0	0	1	0
	Acute Viral Hepatitis type E	0	0	1	8
	Acute Viral Hepatitis untype	0	0	2	3
	Congenital Rubella Syndrome	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	4	6
	Haemophilus Influenza type b Infection	0	0	1	2
	Japanese Encephalitis	2	0	25	12
	Legionellosis	2	2	100	76
	Mumps ²	26	21	488	534
	Neonatal Tetanus	0	0	0	0
	Pertussis	0	1	55	29
	Tetanus ²	0	0	6	3
Category IV	Botulism	0	0	2	0
	Brucellosis	0	0	0	0
	Complicated Influenza	15	16	751	1703
	Complicated Varicella ³	0	1	35	37
	Endemic Typhus Fever	0	0	19	14
	Herpesvirus B Infection	0	0	0	0
	Invasive Pneumococcal Disease	8	5	339	393
	Leptospirosis	0	2	31	33
	Lyme Disease	1	0	2	0
	Melioidosis	1	0	17	11
	Q Fever	2	0	26	36
	Scrub Typhus	15	17	215	244
Toxoplasmosis	0	0	6	8	
Tularremia	0	0	0	0	
Category V	Ebola Virus Disease	0	0	0	0
	Ebola-Marburg Hemorrhagic Fever	0	0	0	0
	Novel Influenza A Virus Infections ⁵	0	0	0	0
	Lassa Fever	0	0	0	0
	Rift Valley Fever	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0
Yellow Fever	0	0	0	0	

1. The following 8 chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen Disease and Creutzfeldt-Jakob Disease.
2. Reported cases.
3. Since 2014/1/1, "Varicella" was modified to "Complicated Varicella".
4. Since 2014/3/6, the case definition for confirmed Acute hepatitis C was changed from "meet the clinical and laboratory conditions" to "meet the clinical or laboratory conditions".
5. Since 2014/7/1, various subtypes of human cases of avian influenza are reported as "novel influenza A virus infections", a Category V Notifiable Infectious Disease. The original "H5N1 flu" and "H7N9 flu", which were respectively listed as a Category I Notifiable Infectious Disease and a Category V Notifiable Infectious Disease were removed from the list on the same day.

Suspected Clusters

- Fourteen clusters were reported, including 8 diarrhea clusters, 5 tuberculosis clusters, and 1 influenza-like illness cluster.

Imported Infectious Diseases

- 15 confirmed cases were imported from 8 countries during Week 31 of 2015.

Country \ Disease	Indonesia	Myanmar	Philippines	Congo	Canada	China	Malaysia	Singapore	Total
Dengue Fever		2	1				1	1	5
Amoebiasis	5								5
Toxoplasmosis					1				1
Malaria				1					1
FluSC						1			1
Hepatitis A			1						1
Shigellosis	1								1
Total	6	2	2	1	1	1	1	1	15

Note: The statistics listed in this table include imported cases that were either confirmed or updated^{*} in the previous week.

- A total of 390 confirmed cases were imported from 27 countries in 2015.
- Top 3 imported diseases : Dengue fever (142), Amoebiasis (126), Shigellosis (54).
- Top 3 countries responsible for most imported cases : Indonesia (233), Philippines (31), China (20).

Summary of Epidemic

- **Dengue Fever** : Dengue activity peaked and continued to increase. Heavy downpours caused by Typhoon Soudelor has resulted in an increased number of water-filled containers and elevated the risk of an epidemic outbreak. In Tainan City, the number of new cases reported in Week 31 is 3.1 times higher than that reported in Week 30, reaching a new record over the last decade. The epidemic has continued to show signs of expansion in North District, West Central District, Yongkang District, Annan District and South District in Tainan City. On the other hand, in Kaohsiung City, the number of new cases reported in Week 31 is 2.4 times higher than that reported in Week 30. The epidemic has continued to grow in Zuoying District, Kaohsiung City and clusters have been reported in Sanmin District and Fongshan District, Kaohsiung City. The indigenous cases and clusters in Pingtung County have been reported.
- **Enterovirus** : Although the epidemic is expected to gradually slow down, it is still at its peak. Coxsackie A16 virus is currently the dominant strain circulating in the community. So far, a total of 4 cases of severe enterovirus infection have been confirmed. Of these cases, two died.

Weekly Data of Notifiable Infectious Diseases (by week of diagnosis)

Case diagnosis week		Week 32		Week 1 – 32	
Classification	Disease Diagnosed ¹	2015	2014	2015	2014
Category I	Plague	0	0	0	0
	Rabies	0	0	0	0
	SARS	0	0	0	0
	Smallpox	0	0	0	0
Category II	Acute Flaccid Paralysis	0	1	10	26
	Acute Viral Hepatitis type A	2	1	63	72
	Amoebiasis	6	6	220	155
	Anthrax	0	0	0	0
	Chikungunya Fever	0	0	4	6
	Cholera	0	0	4	3
	Dengue Fever	482	161	1276	723
	Diphtheria	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	0
	Epidemic Typhus Fever	0	0	0	0
	Hantavirus Pulmonary Syndrome	0	0	0	0
	Hemorrhagic Fever with Renal Syndrome	0	0	1	1
	Malaria	0	0	7	11
	Measles	0	0	27	17
	Meningococcal Meningitis	0	0	2	3
	Paratyphoid Fever	0	0	1	6
	Poliomyelitis	0	0	0	0
	Rubella	0	0	6	5
	Shigellosis	6	0	109	91
	Typhoid fever	0	0	21	14
West Nile Fever	0	0	0	0	
Category III	Acute Viral Hepatitis type B	4	4	76	70
	Acute Viral Hepatitis type C ⁴	0	3	128	104
	Acute Viral Hepatitis type D	0	1	1	1
	Acute Viral Hepatitis type E	0	0	1	8
	Acute Viral Hepatitis untype	0	0	2	3
	Congenital Rubella Syndrome	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	4	6
	Haemophilus Influenza type b Infection	0	0	1	2
	Japanese Encephalitis	1	1	26	13
	Legionellosis	3	2	103	78
	Mumps ²	19	8	507	542
	Neonatal Tetanus	0	0	0	0
	Pertussis	1	5	56	34
	Tetanus ²	0	0	6	3
Category IV	Botulism	0	0	2	0
	Brucellosis	0	0	0	0
	Complicated Influenza	7	10	758	1713
	Complicated Varicella ³	1	0	36	37
	Endemic Typhus Fever	2	2	21	16
	Herpesvirus B Infection	0	0	0	0
	Invasive Pneumococcal Disease	6	9	345	402
	Leptospirosis	3	1	34	34
	Lyme Disease	0	0	2	0
	Melioidosis	0	2	17	13
	Q Fever	1	0	27	36
	Scrub Typhus	10	16	225	260
	Toxoplasmosis	0	0	6	8
Tularremia	0	0	0	0	
Category V	Ebola Virus Disease	0	0	0	0
	Ebola-Marburg Hemorrhagic Fever	0	0	0	0
	Novel Influenza A Virus Infections ⁵	0	0	0	0
	Lassa Fever	0	0	0	0
	Rift Valley Fever	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0
Yellow Fever	0	0	0	0	

1. The following 8 chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen Disease and Creutzfeldt-Jakob Disease.
2. Reported cases.
3. Since 2014/1/1, "Varicella" was modified to "Complicated Varicella".
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5. Since 2014/7/1, various subtypes of human cases of avian influenza are reported as "novel influenza A virus infections", a Category V Notifiable Infectious Disease. The original "H5N1 flu" and "H7N9 flu", which were respectively listed as a Category I Notifiable Infectious Disease and a Category V Notifiable Infectious Disease were removed from the list on the same day.

Suspected Clusters

- Thirteen clusters were reported, including 5 diarrhea clusters, 4 tuberculosis clusters, and 3 upper respiratory tract infection clusters, and 1 enterovirus infection cluster.

Imported Infectious Diseases

- 19 confirmed cases were imported from 6 countries during Week 32 of 2015.

Country Disease	Indonesia	Philippines	Vietnam	Cambodia	Thailand	UK	Total
Dengue Fever	2	2	1		2		7
Amoebiasis	6						6
Hepatitis A				2			2
Shigellosis	2						2
Melioidosis			1				1
Lyme Disease						1	1
Total	10	2	2	2	2	1	19

Note: The statistics listed in this table include imported cases that were either confirmed or updated^{*} in the previous week.

- A total of 409 confirmed cases were imported from 28 countries in 2015.
- Top 3 imported diseases : Dengue fever (149), Amoebiasis (132), Shigellosis (56).
- Top 3 countries responsible for most imported cases : Indonesia (243), Philippines (33), Vietnam (21).

Summary of Epidemic

- **Dengue Fever** : Dengue activity peaked and continued to increase. Heavy downpours has resulted in an increased number of water-filled containers and elevated the risk of an epidemic outbreak in the Kao-Ping area. 86% of the indigenous dengue cases reported thus far this summer were confirmed in Tainan City. The speed at which the number of cases grows in Tainan City this summer is the highest compared to the same period in the previous years. Approximately 56% of the cases in Tainan City were reported in North District. The outbreaks in West Central District, Yongkang District, South District, East District and Shanhua District, Tainan City have increased. On the other hand, in Kaohsiung City, the number of new cases reported in Week 32 is 2.2 times higher than that reported in Week 31. Notably, the outbreak in Sanmin District, Kaohsiung City has increased rapidly. The number of indigenous cases has continued to be reported in Pingtung County. The newly reported cases in Taoyuan City and Chiayi City have no travel histories to the Kao-Ping area.

- **Enterovirus** : The outbreak is expected to gradually slow down. During Week 32, the ER consultation rate for enterovirus infection was almost the same as the epidemic threshold. Coxsackie A16 virus is currently the dominant strain circulating in the community. Taiwan CDC will continue to closely monitor the outbreak for the upcoming semester.

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