APEC Workshop
for the Control Practice of Dengue Fever

Chinese Taipei
5-6 June 2008

APEC Health Working Group

July 2010

APEC Project No. HTF 05/2008A

Prepared by:
Centers for Disease Control, Chinese Taipei

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CONTENTS

Welcome Message

Welcome to the APEC Workshop for the Control Practice of Dengue Fever and beautiful Kaohsiung City.

Dengue fever primarily occurs in the tropical and subtropical areas. Among APEC economies, dengue epidemics are seen in Thailand, Indonesia, Vietnam, Malaysia, the Philippines, and Mexico, where tens of thousands of people become infected with dengue virus every year. More specifically, dengue fever does not only influence the health status of the people living in these economies, but also results in a heavy economic burden to the economies. Since dengue fever is a vector-borne disease, as long as any breeding sites are present, the possibilities of dengue outbreaks remain.

In Chinese Taipei, dengue epidemics still occur every year, especially in Kaohsiung. As a result, Chinese Taipei has had years of fighting dengue epidemics in Kaohsiung. The lessons we learned from containing epidemics in Kaohsiung are also applicable to other cities in the island, which are collectively known as the Kaohsiung Model . To share our Kaohsiung Model with the workshop participants, the workshop is held in Kaohsiung.

Besides sharing our own experiences in dengue control, this workshop is aimed to assist APEC economies to strengthen capacity building by sharing information and practices on vector control, risk communication, and community mobilization on dengue fever and other vector-borne diseases. Moreover, an innovative, multilingual supporting and effective tool designed by Chinese Taipei for management and identification of vector breeding sites and dengue cases will be introduced during the workshop. In addition, experts on dengue and vector control field workers have been invited to the workshop to share their views and explore alternative control measures for dengue fever prevention.

I hope you will find this workshop enjoyable and productive. Thank you all for your participation and contributions to the event.

Steve H.S. Kuo, MD, MPH, PhD
Project Overseer
APEC Workshop for the Control Practice of Dengue Fever
Director
Centers for Disease Control
Chinese Taipei

Workshop Information

Date

5-6 June, 2008

Venue

Garden Villa
102 Meeting Room
Address: No.801, Chongde Rd., Zuoying District, Kaohsiung City 813, Taiwan
Tel: 886-7-341-3333
Fax: 886-7-349-7448

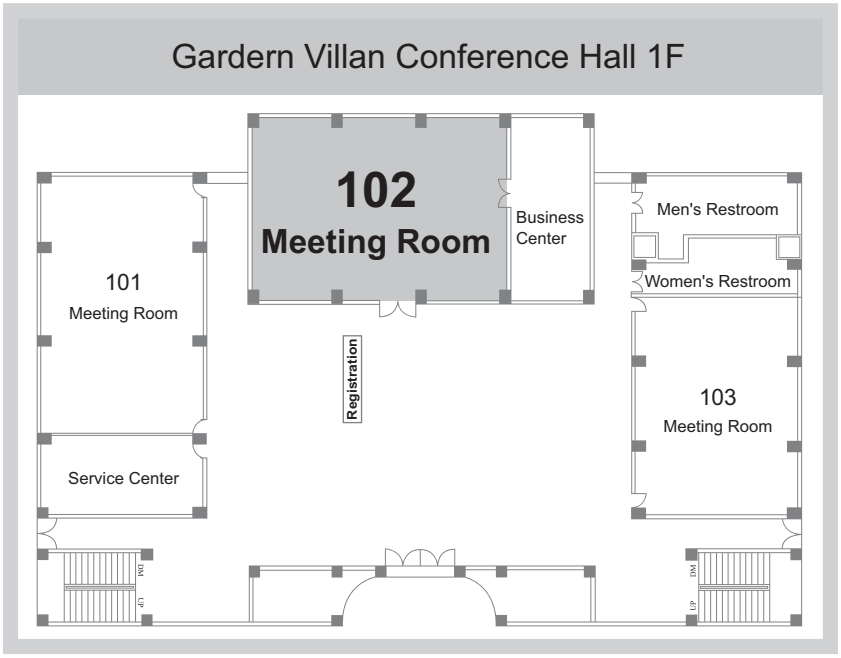
Organizer

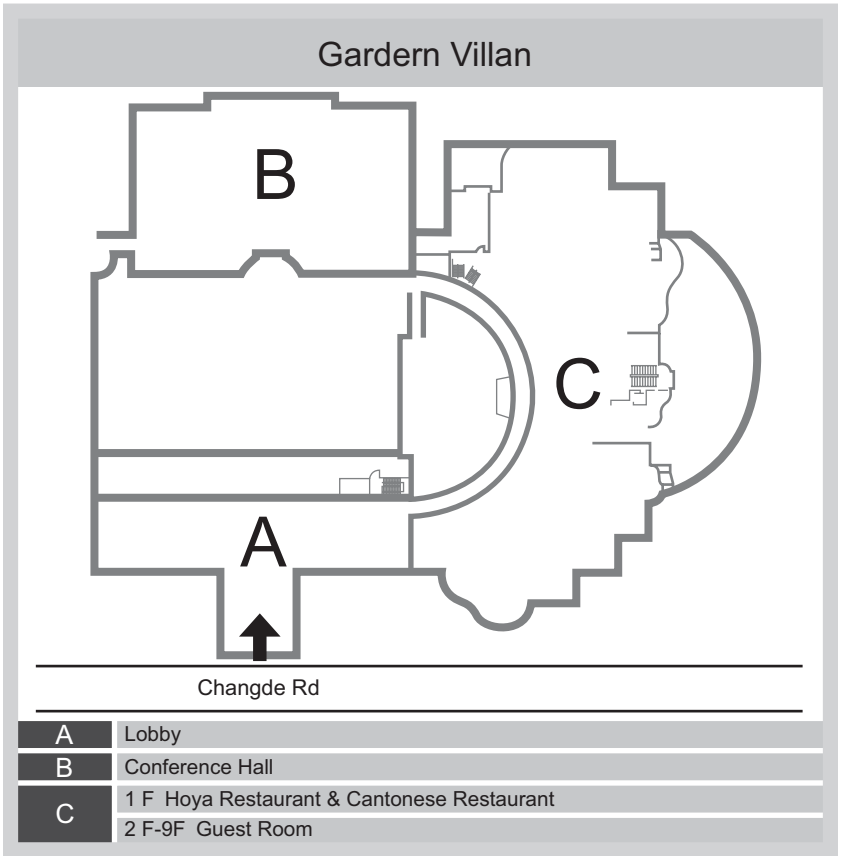
Centers for Disease Control, Chinese Taipei

Official Language

English

Floor Plan of Garden Villa





Daily Program

Thursday, 5 June 2008		
Time	**Session**	**Speaker**
09:15-09:45	Registration	
09:45-10:10	Opening Ceremony	Dr. Steve Hsu-Sung Kuo Director Centers for Disease Control, Chinese Taipei
Keynote Speech		
10:00-10:40	Model of Dengue Fever Control in Kaohsiung Area	Dr. Ming-Rong Harn Former Director Health Bureau of Kaohsiung City, Chinese Taipei
10:40-11:00	Coffee Break	
Special Lecture		
11:00-11:30	Approaches to Controlling Mosquitoes and Mosquito-Borne Infections in Canada	Dr. Robbin Lindsay Research Scientist Public Health Agency, Canada
11:30-12:00	Group Photo	
12:00-13:30	Lunch Break	
I. Coordination & Cooperation		
13:30-14:20	Inter-Sectoral Coordination and Regional Cooperation for Dengue Fever Control	Dr. Yuh-Wern Wu Director KKP Inter-University Resource Center for Teaching and Learning I-Shou University, Chinese Taipei
14:20-16:00	Practice I: Vector Survey and Breeding Sites Management.	Ms. Yu-Hsin Chen Professional Nurse Mr. Yen-Chang Tuan Assistant Technical Specialist Ms. Chu-Tzu Chen Associate Researcher Centers for Disease Control, Chinese Taipei
16:00-21:30	City Tour & Dinner	

Friday, 6 June 2008

Time	Session	Speaker
II. Community Mobilization and Communication		
08:30-09:20	Community Mobilization and Communication for Dengue Fever Prevention and Control	Dr. Hung-Yi Chuang Associate Professor Kaohsiung Medical University, Chinese Taipei
09:20-10:10	Community Mobilization for Dengue Fever Control in Kaohsiung County	Dr. Joh-Jong Huang Director Health Bureau of Kaohsiung County, Chinese Taipei
10:10-10:30	Coffee Break	
III. Vector Control		
10:30-11:20	Emergency Control on Dengue Fever Vectors	Dr. Hwa-Jen Teng Associate Researcher Centers for Disease Control, Chinese Taipei
11:20-12:10	Dengue Fever Vector-Breeding Sites--Introduction and Management	Ms. Chu-Tzu Chen Associate Researcher Centers for Disease Control, Chinese Taipei
12:10-13:00	Lunch Break	
IV. Applying New Techonology		
13:00-13:20	Dengue Fever Vector-Breeding Sites--Management System and GIS Application	Dr. Jen-Hsiang Chuang Director Health Command Center Centers for Disease Control, Chinese Taipei
13:20-14:20	Practice II: Dengue Fever Vector-Breeding Sites--Management System and GIS	Dr. Jen-Hsiang Chuang Director Dr. Yu-Lun Liu Medical Officer Mr. Ching-Hui Jiang Research Assistant Health Command Center Centers for Disease Control, Chinese Taipei
V. Dengue Fever Emergency Control Practice		
14:20-16:40	Practice III: Dengue Fever Emergency Control Fongshan City, Kaohsiung County	Ms. Ming-Fang Hsieh Assistant Technical Specialist Dr. Jhy-Wen Wu Technical Specialist Mr. Jen-Hsin Wang Assistant Technical Specialist Centers for Disease Control, Chinese Taipei
16:40-17:00	General Discussion & Closing Remarks	Dr. Steve Hsu-Sung Kuo Director Centers for Disease Control, Chinese Taipei

Speakers' CVs, Abstracts and Handouts

Dr. Ming-Rong Harn

- **Current Position:** Adjunct Associate Professor
- **Department:** Institute of Occupational Safety and Health (IOSH)
- **Organization:** Kaohsiung Medical University
- **Economy:** Chinese Taipei
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Educational Background

1969-1976: Medicine, Kaohsiung Medical University
1992-1994: Master of Science, Medicine Institute of Kaohsiung Medical University

Professional Career

Aug. 2007-Present: Adjunct Associate Professor, Institute of Occupational Safety and Health (IOSH), Kaohsiung Medical University
Oct. 2007-Present: Attending Doctor, Internal Medicine, Harn's clinic, Kaohsiung
May 2008-Present: Superintendent, Tsu-Yuen Hospital, Peikang

Publications

- Masaru Nawa, Tomohiko Takasaki, ***Ming-Rong Harn***, Ichiro Kurane, et al. Evaluation of Immunoglobulin A-capture Enzyme-linked Immunosorbent Assay for Serodiagnosis of Dengue Virus Infection. 2006, WHO Dengue Bulletin, Vol. 30, 157-161.
- ***Harn Ming-Rong***, et al. "登革熱防治與城市美學" Center for Disease Control, Department of Health Kaohsiung City, Dec. 2006
- ***Harn Ming-Rong***, et al. "3Q 3H 集錦, 2003-2004. 第1集" Department of Health, Kaohsiung Coty, Mar. 2005
- ***Harn Ming-Rong***, et al. "3Q 3H 集錦, 2005-2006. 第2集" Department of Health, Kaohsiung Coty, Dec. 2006
- ***Ming-Rong Harn***, "高雄市登革熱防治工作報告" Center for Disease Control, Department of Health Kaohsiung City, 2003, 2004, 2005

Model of Dengue Fever Control in Kaohsiung Area

Ming-Rong Harn
Adjunct Associate Professor
Kaohsiung Medical University

Introduction: In the era of global village, the threat and disease burden of Dengue Fever is growing. Since 1987, there have been small or sometime large Dengue Fever outbreaks in Grand Kaohsiung area each year. Through years and years of hard Dengue Fever control campaign, we have accumulated some valuable experiences, which we would like to share with you.

Strategy: Our control strategies are: 1) Do the preventive control measures in advance, before the disease outbreak; 2) Be vigilant to the imported dengue cases; 3) Integrate public and private resources 4) Clearing up the vector breeding sites is the mainstay for Dengue Fever control; 5) Turn lemon into lemonade, i.e. through Dengue Fever control, we transform our city to be cleaner and greener; 6) Be humble; no complacence, to face the Dengue challenge.

Action Plan: Kaohsiung city has launched a 4-year plan of Dengue Fever control from 2007 to 2010. In the ordinary period, integrated comprehensive method is the guideline for colleagues and people to follow. While in the epidemic period, SOP of emergency control method will be performed. The control method is called "6 in 1" method, which includes disease surveillance, vector surveillance, clean-up vector breeding sites, insecticide fogging, health education, and ovitraps disposal.
On the vector control, we classify the vector breeding sites into large, small and cryptic mosquito breeding sites. Each of them has specific significance and needs specific attention.

Fire Fight Model: Once there is Dengue outbreak found, every effort and resource must be implemented immediately in the hot spot to control the spread of disease, the sooner the better. Meanwhile, a firewall should be set up in the sub-hot spot.

Successful factors: We have learned some successful factors, such as environmental clean-up and source reduction in all year round are very important; integrate public and private resources together; enough manpower; community people participation; supervision and follow-up mechanism is also necessary for a success.

Difficulties: We also have encountered some difficulties during the control campaigns, such as the increased number of imported cases; shortage of well trained manpower; delayed case reporting from doctors; cryptic vector breeding sites; resistance of fogging from residents; difficulty of isolating infected dengue cases; as well as the rising trend of global warming.

Conclusions: The threat of dengue fever is growing. We should be humble to face it. Before the advent of effective dengue vaccine, vector control is the mainstay at present time. Concerted effort among administrations and people is the key to success. Finally, it's better to turn lemon into lemonade, transforming the city to be cleaner and greener.

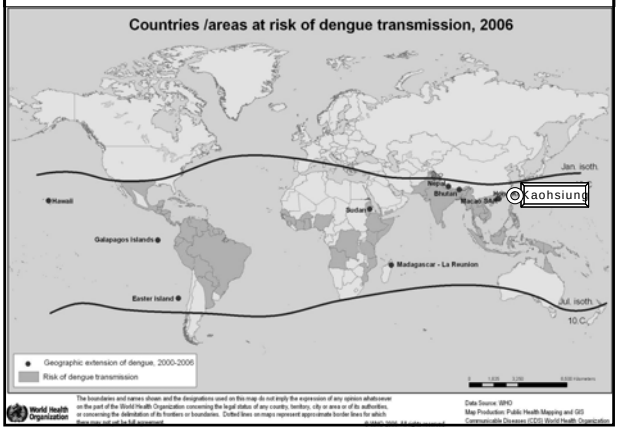
Model of Dengue Fever Control in Kaohsiung Area

Ming-Rong Harn, MD;MS
Kaohsiung Medical University
Chaur-Dong Chen, Win-Chai Chen, Chi-Kung Ho
Department of Health, Kaohsiung City

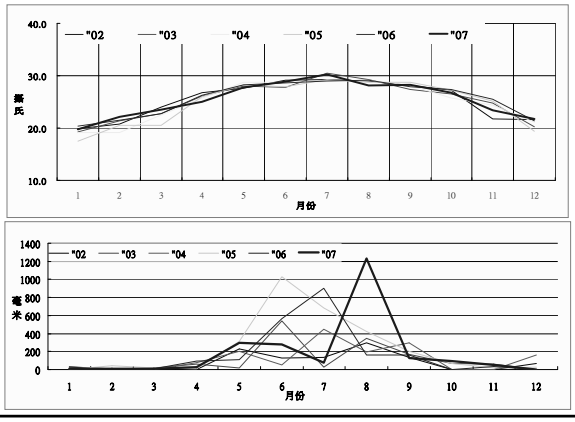
Outline

- **Introduction**
- **Model of DF Control**
  - **Goal**
  - **Strategy**
  - **Action plan**
- **Discussion**
  - **Successful Factors of Dengue Fever Control**
  - **Difficulties of Dengue Fever Control**
  - **SWOT**
- **Conclusions**

Introduction



Average Temperature & Rain Fall, 2002-2007



Transmission Model

Imported Dengue Cases

↓

Mosquito bites

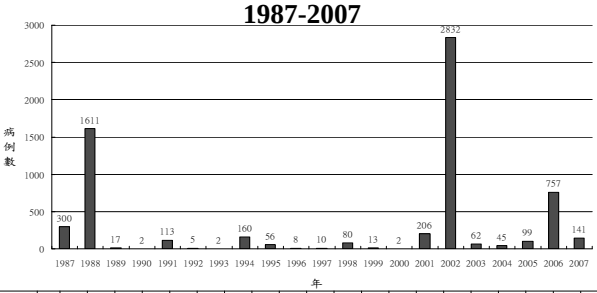
↓

Local Cases

↓

Spread out

Epidemiology of Dengue Fever, Kaohsiung City 1987-2007



西元年	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	01	02	03	04	05	06	07
DF	300	1611	17	2	113	5	2	160	56	8	10	80	13	2	206	2832	62	45	99	757	141
DHF	ND										0	2	1	0	7	137	1	1	1	16	0
Mortaty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	9	0	0	0	4	0

Goal of Dengue Fever Control

1. **Control Initial Dengue Fever Outbreak Within 6 Weeks.**
2. **No Mortality Case.**

Strategy

- **One ounce of prevention is better than one pond of treatment**
- **Beware of the imported cases**
- **Integrate public and private resources**
- **Clean up the vector breeding sites**
- **Prompt control**
- **Turn lemon into lemonade**
- **Be humble, no complacence**

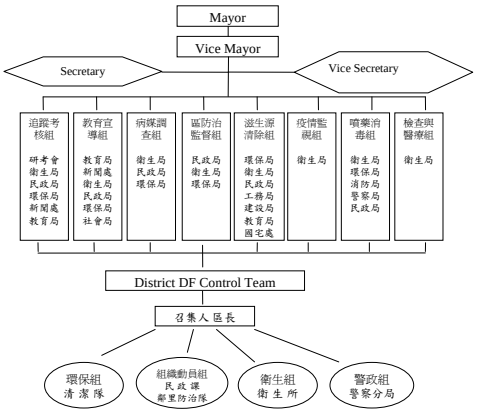
Action Plan

- **4 years plan of dengue fever control in Kaohsiung City, 2007-2010**

Dengue Fever Control
-Integrated comprehensive method

1. **Meeting of Organization Committee**
2. **Imported Cases Surveillance**
3. **Vector Surveillance**
4. **Breeding Source Reduction**
5. **Ovitraps Monitoring**
6. **Community Participation**
7. **Clean-Up Campaign**
8. **Disease Surveillance**
9. **Healthy Education**
10. **Media**
11. **Fever Alert (School, Nursing Home, Church)**

Organization Committee, Kaohsiung City



Inter-Department Collaboration

1. Medical Diagnosis:DOH
2. Fogging: DOH
3. Disease Surveillance: DOH
4. Clean Breeding sites:EPA
5. Vector Surveillance:DOH
6. Health Education: DOE
7. District Supervision:DOC
8. Evaluation: COR&E
9. District DF control Team: District Leader

Vigilant to Imported Dengue Cases

1.Fever Alert and Screening at the Airport and Seaport
2.Health Education to Travelers, Sailors, Foreign Workers and Spouses。

Dengue Fever Vector Control

- Large Mosquito Breeding Sites
- Small Mosquito Breeding Sites
- Cryptic Mosquito Breeding Sites
- Special public places for vector control
- Turn Lemon into Lemonade

Large Vector Breeding Sites

- Basement
- Vacant premise
- Vacant land
- Construction site
- Flower shop
- Tire

Small Vector Breeding Sites

- Cans, bottles, boxes,cups, bowels,
- Plates, trays, buckles,
- Canvas fold
- Plant axils

Cryptic Vector Breeding Sites

- **Drainage**
- **Roof gutter**
- **Roof tank**
- **Basement**
- **Tree hole**

Special Public Places for DF Vector Control

- **School**
- **Park**
- **Market Place**
- **Bank**
- **Flower shop**
- **Church, Temple**
- **Etc.**

Check the Major Breeding Sites by Assigned Department

- Schools：Department of Education
- Market Places：Economic Affairs Bureau
- Parks：Maintenance Office Bureau
- Construction sites ：Public Works Bureau
- Flower shops：Dapartment of health
- Banks：Department of Finance
- Church、Temple：Civil Affairs Bureau
- Nursing Home Services ：Department of Health
- Public places：District Office

Mar~May | June~Aug | Sep~Nov

Check and Follow-Up Every 3 Months

社區參與 Community Participation

- 社區登革熱防治 **Community-based dengue fever control**
- 社區組織登革熱防治隊 **District organization committee**
- 組織公共資源和人力 **Organize community resources and manpower.**
- 志工 **Volunteers**
- 由下而上的管理 **Bottom-up**
- 城市美學 **Clean and green city**

民眾 People

- 登革熱防治人人有責 (Dengue control is everybody's job)
- 政府的能力有限 (Limited public resource)
- 政府規劃策略與行動方案 (Administration set up strategy and action plan)
- 需要民眾參與 (Community people join in)
- 『巡、倒、清』 (Patrol, tip, and clear-up)
- 請告訴鄰居 (Tell your neighbors)
- 大家一起來 (Work together)

Source Reduction & Community Clean-up

◎ Source Reduction: EPA and DOH

◎ Community Clean-up: Buteux index >4

◎ Volunteers in community

◎ Check,clear-up and follow up mechanism

Clean up and make city clean and green

Emergency DF Control in Epidemic Period

- 6 in 1 method
  - Disease surveillance
  - Vector surveillance
  - Clean-up breeding sites and source reduction
  - Emergency insecticide fogging
  - Health education
  - Ovitraps disposal

1 -Disease Surveillance

訪問衛教個案，疫調發現潛在病例！

2-Vector Surveillance and Control

高雄市每年都有捕獲帶病毒之病媒蚊

3-Clean breeding sites and source reduction

清除積水容器，防止另一波疫情發生！

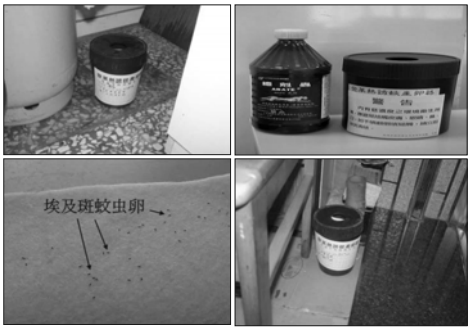
4-Emergency Fogging

即時消滅帶病毒蚊子，創立病媒實驗室，進行藥效測試！

5-Public Health Education

呼籲市民配合防疫措施，醫師座談鼓勵通報！

6 –Ovitraps disposal



提供噴藥成果評估及藥效測試！

Fire Fight Model

◎ **Early Detection and Prompt Control**

◎ **Integrate all resources to fight the outbreak immediately**

◎ **Put the initial dengue outbreak under control within 6 weeks**

◎ **Hot Spot：Follow emergency control SOP**

◎ **Sub-hot spot：Set up fire wall**

◎ **Manpower: Inter-district cooperation**

Regional Cooperation

- **Kaohsiung city, Kaohsiung county, Ping-Tong county, Tainan city, and Tainan county, etc.**
- **Regular meeting and sharing experiences**
- **Coordinated dengue fever control campaign**
- **Support each other**

Role of Central Administration

- **Central CDC / DOH**
  - **Fever Screening at the airport**
  - **Technical , administrative and Financial support**
- **EPA**
- **Legislative Department**
  - **Budget Approval**
- **Labor Affairs Committee**
  - **Manpower support**
  - **Foreign workers management**
- **Ministry of Communication**
  - **Traveler affairs management**
- **Ministry of Internal Affairs**
  - **Foreign spouse affairs management**

Summary of Control Method -1

	Control Method	1987~'02	2003	2004	2005	2006	2007
Virus	Case Report from physicians	*	*	*	*	*	*
	Patient Isolation	*	*	*	*	*	*
	Prevention of infected abroad		*	*	*	*	*
	Fever alert and screening			*	*	*	*
	Vector surveillance			*	*	*	*
Eggs	Ovitraps		*	*	*	*	*
Larvae	Clean breeding sites	*	*	*	*	*	*
	Abate		*	*	*	*	*
	Bti				*	*	*
	Source reduction					*	*
Adult Mosquito	Fogging		*				
	Net capture			*	*	*	*
	Sticky ovitraps				*	*	*

Summary of Control Method -2

	Control method	1987~'02	2003	2004	2005	2006	2007
Public	Health Education	*	*	*	*	*	*
	Media	*	*	*	*	*	*
	Health management		*	*	*	*	*
	Community participation					*	*
	Volunteers						*
Environment Management	Patrol, tip, and clean up		*	*	*	*	*
	Clean vacant premises			*	*	*	*
	Clean large breeding sites			*	*	*	*
	Clean-up campaign					*	*
	City beauty						*
Emergency Control	Organization committee		*	*	*	*	*
	6 in 1 control method			*	*	*	*
	Regional cooperation			*	*	*	*

Successful Factors for DF control

- **Environmental clean up and source reduction**
- **Integrated control method**
  - **Regional Cooperation**
  - **Central and local administration**
  - **Inter-departmental cooperation**
- **Early detection and prompt control**
- **Enough manpower**
- **Community participation**
- **Oversee and follow-up mechanism**
- **Humble, no complacence**

Difficulties on Dengue Fever Control

More imported cases
Lack of well trained manpower
Late reporting from doctors
Cryptic vector breeding sites
Resistance of fogging from residents
Difficult to isolate dengue patients
People indifference
Media
Political factor
Global warming

DF Control SWOT

Strength	**Weakness**
Well expirierenced **Political commitment** **Good regional cooperation** **Ocean barrier**	**Lack of well trained manpower** **Late reporting from doctors** **Potential large breeding sites** **Cryptic vector breeding sites** **People indifference** **Political factor**
Opportunity	**Threat**
Clean and green city **Biotech development** **Academic study** **Health diplomacy**	**More imported cases** **Global warming** **Ageing people, more mortality**

結論Conclusions

- **登革熱威脅與日聚增(The threat of dengue fever is growing)**
- **謙卑以對(Humble)**
- **病媒防治乃是工作重點(Vector control is the main stay at present.)**
- **整合政府和民間的力量是成功的關鍵 (Concerted effort among government and people is the key to success.)**
- **轉禍為福 (Turn lemon into lemonade)**

Collaboration and Acknowledgement

- **Department of Health, Kaohsiung city**
- **Centers for Disease Control**
- **Kaohsiung Medical University**
- **Other colleagues in dengue fever control campaign**

Dr. Robbin Lindsay

- **Current Position:** Research Scientist
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- **Organization:** National Microbiology Laboratory, Public Health Agency of Canada
- **Economy:** Canada
- **Tel:** 1-204-7896060
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Educational Background

BSc., Dept. of Biology, University of Winnipeg, 1985
MSc., Dept. of Entomology, University of Manitoba, 1989
PhD, Dept. of Environmental Biology, University of Guelph, 1995

Professional Career

Currently R. Lindsay is a Research Scientist at the National Microbiology Laboratory where he conducted field- and laboratory-based research on the occurrence, prevalence and distribution of arthropod-borne zoonotic disease agents in Canada. These investigations are intended to provided relevant information for pathogen detection and control of these agents.

Publications

- Safronetz, D., Drebot, M. A., Artsob, H., Cote, T., Makowski, K., & ***Lindsay, L. R.*** 2008. Sin Nombre virus shedding patterns in naturally infected deer mice (Peromyscus maniculatus) in relation to duration of infection. Vector-borne and Zoonotic Diseases 8: 97-100.
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Approaches to Controlling Mosquitoes and Mosquito-Borne Infections in Canada

Robbin Lindsay
Research Scientist
Zoonotic Diseases and Special Pathogens, National Microbiology Laboratory, Public Health Agency of Canada, Winnipeg, Manitoba

Nineteen species of arboviruses have been isolated from arthropods in Canada. This total includes 11 viruses which are transmitted by mosquitoes. Historically, western equine encephalitis and St. Louis encephalitis viruses have been the most medically important mosquito-borne infections in Canada. However, with the incursion of West Nile virus into Canada in 2001, this exotic virus has far surpassed the burden of illness imposed by the latter two viruses. In order to track and control WNV in Canada, comprehensive surveillance programs that utilize dead birds, mosquitoes, horses and humans, to track the geographic spread and impact of WNV, were established in most Canadian provinces. The objectives of this presentation will be to provide an overview of the various surveillance components employed to monitor WNV activity in Canada with an emphasis on the continued evolution and refinement of mosquito control and disease prevention strategies across the country. The role of Public Health Agency of Canada in the overall surveillance program will be discussed along with major outcomes from implementation of the WNV surveillance program and future challenges to maintaining quality mosquito control and disease prevention programs.

Approaches to Controlling Mosquitoes and Mosquito-borne Infections in Canada

APEC Health Working Group

APEC Workshop for The Control practice of Dengue Fever

Chinese Taipei, 5-6 June 2008

L. Robbin Lindsay

Zoonotic Diseases and Special Pathogens, National Microbiology Laboratory, Public Health Agency of Canada, Winnipeg, Manitoba



Presentation outline

- ✓ History of arbovirus activity in Canada
- ✓ Summary of 8 years of WNV surveillance in Canada
- ✓ Major outcomes of surveillance and control programs
- ✓ Challenges for mosquito control

Arboviruses isolated in Canada

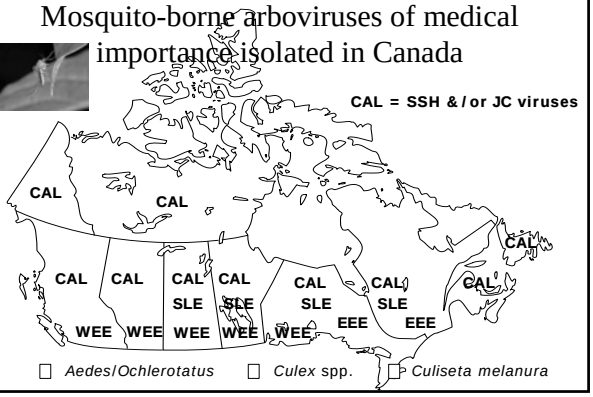
Of over 500 known arboviruses, 19 have been isolated in Canada including:

- 2 midge-borne (*Culicoides*) viruses
  - Blue tongue, epizootic hemorrhagic disease
- 6 tick-borne viruses
  - Powassan encephalitis virus, Colorado tick fever virus
- 11 mosquito-borne viruses

Mosquito-borne arboviruses isolated in Canada

Virus	Antigenic group	Disease in humans/animals
Eastern equine encephalitis	Alphavirus	+ humans, + animals
Western equine encephalitis	Alphavirus	+ humans, + animals
St. Louis encephalitis	Flavivirus	+ humans, - animals
Snowshoe hare	California	+ humans, + animals
Jamestown Canyon	California	+ humans, - animals
California encephalitis	California	? humans, - animals
Trivittatus	California	- humans, - animals
Cache Valley	Bunyamwera	? humans, + animals
Northway	Bunyamwera	- humans, - animals
Turlock	Turlock	- humans, - animals
Flanders	Rhabdovirus	- humans, -animals

Mosquito-borne arboviruses of medical importance isolated in Canada



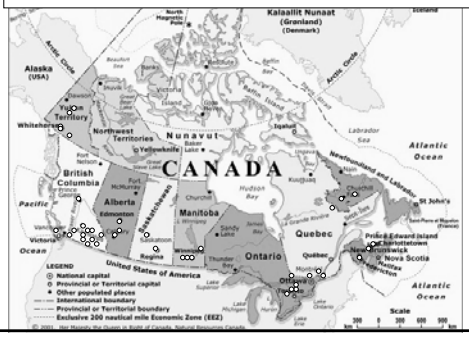
Human cases of mosquito-borne arboviruses in Canada

WEE - greater than 1,500 human symptomatic cases (1930's-1980's)

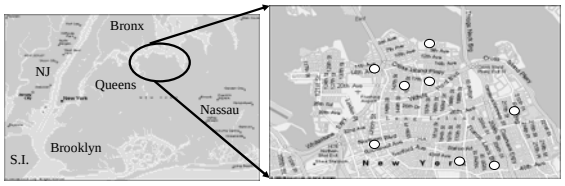
SLE - epidemic in 1975 with 66 cases in southern Ontario and one each in Quebec & Manitoba. Four cases in southern Ontario in 1976

CAL (snowshoe hare & Jamestown Canyon viruses) – originally recognized in 1978, case number ?, under-diagnosed in Canada

Mosquito control operations in Canada Prior to WNV arrival



When WNV arrived in North America



The response in Canada was to plan
Convened meeting January 2000 (federal, provincial & NGO)
Developed WNV surveillance and response plans

Basic components of surveillance for WNV

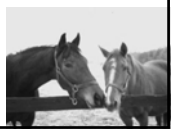
Bird surveillance
- -Enhanced passive surveillance for dead birds
- -Active surveillance: sentinel chickens

Mosquito surveillance

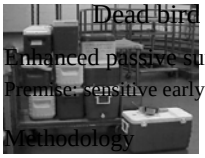
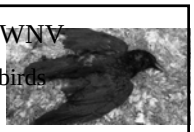
Veterinary (horses) surveillance

Human surveillance





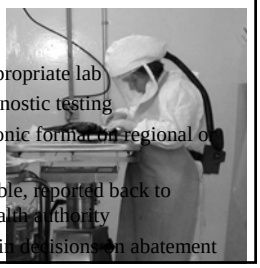
Dead bird surveillance for WNV

Enhanced passive surveillance in dead birds

Premise: sensitive early warning system

Methodology



- Stimulate reporting of dead birds
- Dead bird pick up & delivery to appropriate lab
- Triage, sample collection &/or diagnostic testing
- Data (including sightings) to electronic format on regional or national data base (mapping)
- Testing results entered when available, reported back to affected health district & regional health authority
- Public informed of activity & used in decisions on abatement

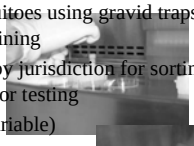
Mosquito surveillance for WNV

Mosquito surveillance


Premise: Will help define epidemiology of WN virus & provide data central to mosquito control efforts

Methodology

- Weekly collection of adult mosquitoes using gravid traps &/or CDC light traps following training
- Collected mosquitoes submitted by jurisdiction for sorting, species determinations & pooling for testing



- Diagnostic testing undertaken (variable)
- Info on mosquito population dynamics & species infected reported to local jurisdictions

- Data used as part of decision-making regarding need for mosquito control

Horse surveillance for WNV

Enhanced passive veterinary surveillance

Little value to predict human cases but part of epidemiology, high morbidity/mortality & large mammal equivalents

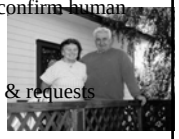
Methodology

- Sick animals reported by owners to veterinarians
- Diagnosis based on clinical signs & diagnostic tests
- Testing in some jurisdictions problematic (capacity), typically by private, state (provincial) or federal labs
- Cases reported to owner then to regional public health &/or national authorities (USDA or CFIA)
- Reporting & tracking may improve once made notifiable on national level (Canada)

Surveillance for WNV in people

Enhanced passive or active human surveillance

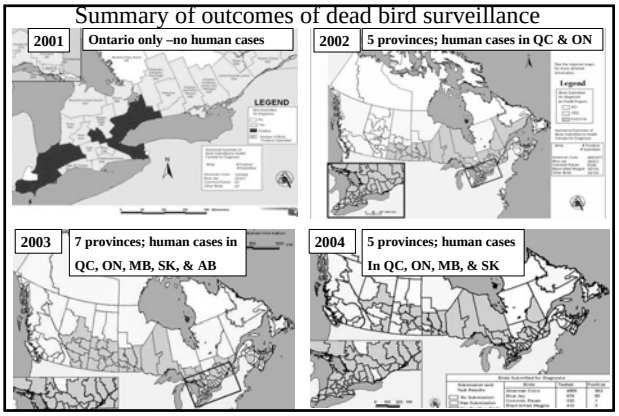
Clear need for diagnostic capacity to detect & confirm human infections (physician awareness)



Methodology

- Physicians suspect cases on clinical symptoms & requests diagnostic tests (serology, other)
- Local hospital/provincial or federal/labs undertake molecular (RT-PCR) or serological testing (HI, ELISA), confirmation (PRNT) at CL 3 laboratories (limited national capacity)
- Results of testing to physician & provincial PH authorities, national databases (Health Canada)
- Data used to inform public of risk & decisions on need for mosquito control measures

Summary of outcomes of dead bird surveillance



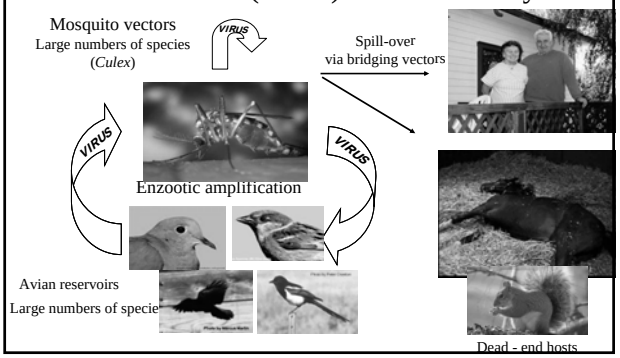
2005

Dead birds in 7 provinces

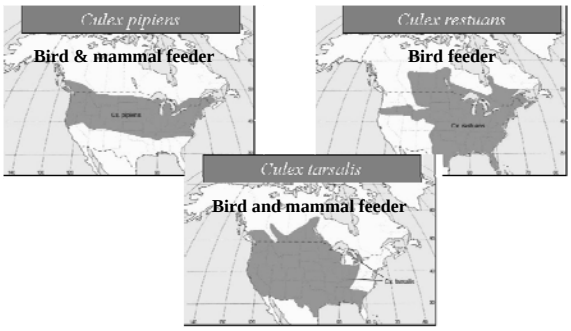
2006

Dead birds in 5 provinces

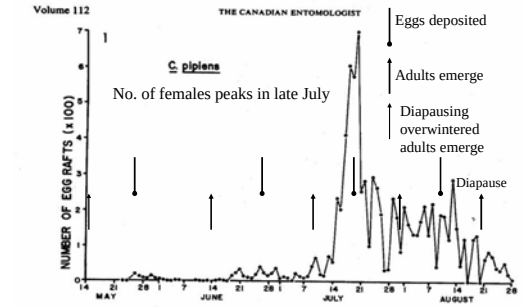
West Nile Virus (WNV) transmission cycle



Distribution of primary enzootic vectors of WNV

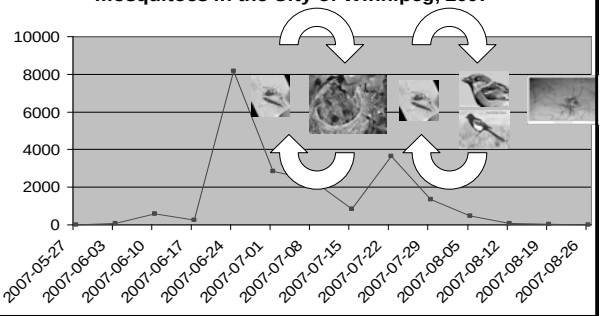


Timing of egg laying & seasonality of *Culex* species cohorts



After Madder et al. 1983, Can. Entomol. 112: 877-883; J. Med. Entomol. 20: 275-287

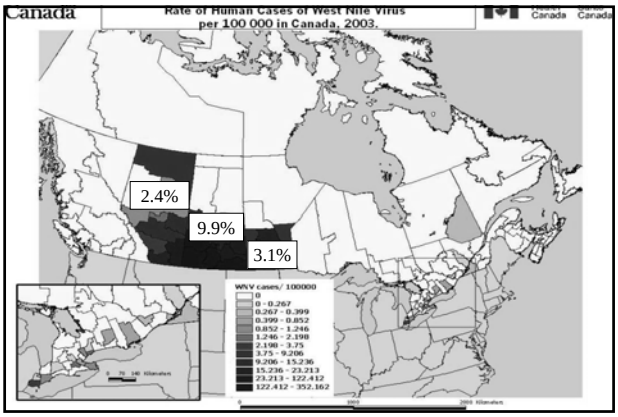
Patterns of abundance of *Culex tarsalis* mosquitoes in the City of Winnipeg, 2007



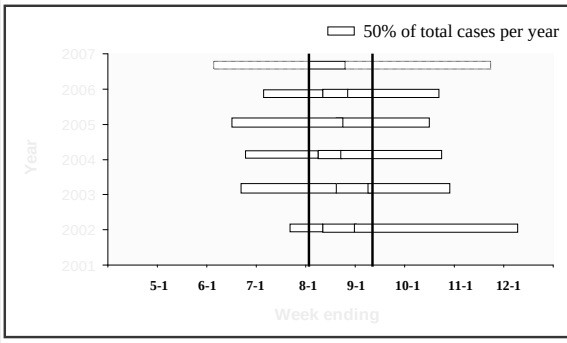
WNV human infections, USA vs Canada

Year	No. of cases (deaths) USA	Canada	No. areas reporting cases States	Provinces
1999	62 (7)	0	1	0
2000	21 (2)	0	3	0
2001	66 (9)	0	10	0
2002	4,156 (263)	419 (19)	39**	2
2003	9,862 (264)	1,235 (10)	45**	5
2004	2,470 (90)	25 (2)	40**	4
2005	2,819 (105)	224 (12)	42	5
2006	4,269 (177)	151 (2)	43**	4
2007	3,510 (109)	2,353 (8)	42	4

**Includes Washington D.C.



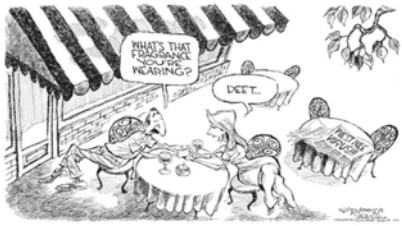
Human WNV Case Timeline by Onset Week Canada: 2002-2007



Prevention of WNV: Response plan

Two main avenues of intervention:

- Public education (personal protection & source reduction)
- Implementation of mosquito control activities



Public education

All possible media sources used to push messages about:

- use of repellents & appropriate clothing
- avoidance of mosquito infested areas & peak times of activity
- local source reduction

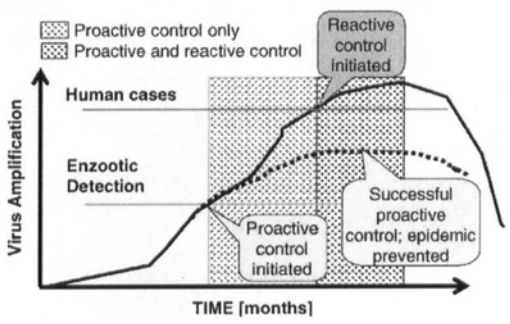
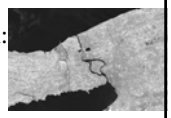


Figure 1. Importance of proactive versus reactive mosquito control in controlling WNV transmission to humans.

What mosquito control measures have been undertaken

Larval surveys & mapping in:
BC to NS



Larviciding undertaken in some jurisdictions in:
BC, Alberta, Saskatchewan
Manitoba (Winnipeg & 48 rural municipalities)
Ontario, Quebec

Products used:
Methoprene (Altosid), BTI (Vectobac, Aquabac)
Chlorpyrifos (Dursban)

Adult mosquito control programs

Adulticiding specifically for WNV control:
Conducted at different intensities in Manitoba (2003-7), Saskatchewan (2006-7)

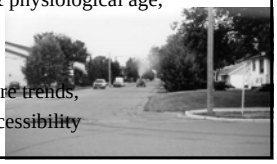
Product used:
Malathion (ULV ground-based applications)

Action points for adulticiding

Manitoba probably most advanced model for risk assessment and action points

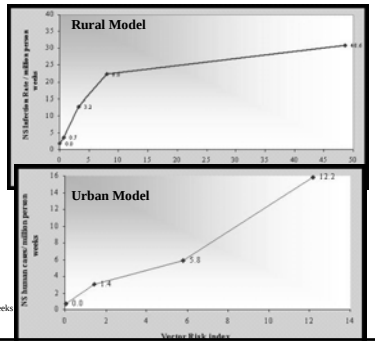
Consider the following parameters:

- No. of infected mosquitoes,
- Vector risk index,
- *Culex tarsalis* generation & physiological age,
- Human population at risk,
- Time of year,
- Past & predicted temperature trends,
- Community lay-out and accessibility



Manitoba

Model used for risk assessment in Rural & Urban centers in Manitoba



*per million person weeks

Manitoba

Example: Threshold for Consideration

Community	Pop.	# + Pool	Pools tested	Prop.. +.. pools	MIR	MLE-IR	Av. Culex tarsalis per Trap	Prop. Cx. tarsalis	EIROAM	VRI	Human Rate PMPWAR*	Human Rate PMPWAR* with VRI ♦ 2	Human Rate Reduction	No. of Human Cases/Week Prevented in Community	No. of Weeks to Spray to Prevent 2.. Infl Case
Ste Anne	2,402	2	7	0.3	6.6	7.7	314	0.2	1.5	2.4	38	8	30	0.07	8
Stone-wall	5,093	2	10	0.2	4.0	4.5	1440	0.5	2.3	6.5	137	58	79	0.4	2
Morden	7,035	3	8	0.4	7.5	9.4	2916	0.8	7.5	27.4	645	311	334	2.3	1
Winkler	11,362	1	8	0.1	2.5	2.7	1642	0.8	2.2	4.4	88	34	54	0.6	1

* PMPWAR – per million person weeks at risk


What is a reasonable approach for WNV disease prevention?

- Surveillance
- Public education
- Integrated mosquito management in high risk areas
- Adulticiding when risk to public health warrants


Major outcomes: WNV surveillance

Dead bird surveillance

- Effective early warning system
- Dramatic improvements in turnaround times aided by diagnostic platforms & decentralization of testing
- New approaches being attempted
  - ‘sentinel cities’: sampling of nestling birds
  - enhanced dead bird surveillance in urban centers
  - utility of feather pulp as diagnostic target

Horse surveillance

- Ineffective & abandoned in most jurisdictions

Human surveillance

- Major improvements in diagnostic capacity
- Gains in understanding of clinical spectrum of disease, at risk-groups, etc.
- Screening of blood supply (CBS & Hema Quebec)
- Tools to differentiate timeline of infection (recent vs. older)

Major outcomes from mosquito surveillance

Capacity building: surveillance, identification, virus detection

Expanded data on population dynamics & distribution patterns

Identification of field-collected WNV-positive species

Data on spatial & temporal patterns of infection in vectors

Development & 'field-testing' of vector indices

New mosquito species detected

Ochlerotatus japonicus & Stegomyia (Aedes) albopictus

Range expansions of some species

Minor range expansions-*Cx. tarsalis* in QC, ON, NT & BC

Major range expansions-*Oc. japonicus* in QC & ON, 2001-2004

Data to support effects of specific environmental parameters (e.g., temperature) on virus amplification

Detection and search for other pathogens (WEE, EEE)

Major outcomes in mosquito control

Tremendous increase in overall capacity to control larval and adult mosquitoes

Annual renewal of programs in many affected jurisdictions in Canada

Some 'new' products and formulations becoming available in Canada (e.g., *Bacillus sphaericus* & Methoprene 90 day ingot)

Continued dedication to evaluate, refine & improve mosquito control operations

Challenges for mosquito control

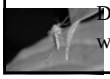
Sustained funding for mosquito control programs

Refining action points for intervention (ramping up & ratcheting down)

Using all of the tools in the toolbox including adulticides

Maintaining and increasing the number of mosquito control products in the Canadian marketplace

Dealing with mosquitoes or public health messages when activity occur when mosquito numbers low



Acknowledgments

- Members of WNV National Steering Committee
- Staff of Canadian Cooperative Wildlife Health Centre (Dr. I. Barker)
- Members of Mosquito surveillance & Control subcommittee (C. Back, P. Belton, A. Furnell, R. Anderson, P. Curry)
- Manitoba Mosquito surveillance & Control committee (Dr. Susan Roberecki, Fran Schellenburg)
- Zoonotic Diseases and Special Pathogens, National Microbiology Laboratory, Public Health Agency of Canada

Dr. Yuh-Wern Wu

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Educational Background

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Master of Chemistry, National Taiwan University

Professional Career

Deputy Magistrate of Kaohsiung County
Professor of I-Shou University
Chair of Chemical Engineering Dept, I-Shou University

Publications

- ***Yuh-Wern Wu***, "The Investigation of Free Radical Intermolecular Addition Cyclization Reactions by Free Radical SH2' Reaction," 中國化學學會年會, 2007.11
  Yuh-Wern Wu 辛純浩， "高雄縣政府五合一跨機關服務的推動經驗與檢討," 研考雙月刊, vol.31, no.4, pp.33-49, 2007.08
- ***Yuh-Wern Wu***, Hsu-Ting Huang, Yi-Jing Chen, Jyh-Ferng Yang, "Free radical SH2´ reaction mechanism study by comparing free radical SH2´ reaction with free radical addition reaction," Tetrahedron, vol.62, no.25, pp.6061-6064, 2006.06
- ***Yuh-Wern Wu***, "南方綠巨人南區環保科技園區, " 中華環安衛科技協會會刊, vol.23, pp.3-8, 2006.06
- ***Yuh-Wern Wu***, Hsu-Ting Huang, Zhau-Jie Huang, Huang-Ming Huang, Jyh-Ferng Yang, "The solvent effect on the reaction constants of tert-butyl radical addition to 2-substituted allyl chlorides, " Tetrahedron, vol.61, pp.4461-4466, 2005.05

Inter-Sectoral Coordination and Regional Cooperation for Dengue Fever Control

Yuh-Wern Wu
Professor & Chief
Department of Chemical Engineering & KKP Inter-University Resource Center for Teaching and Learning

The inter-sectoral coordination and regional cooperation for Dengue Fever control is introduced in this presentation. The main focus is on how the Local administration integrates the work of Dengue Fever control with the Chinese Taipei Authority and Township administration. It seems work well that the integration between the administrations if there is the subordinate relationships among them (the vertical integration). However, it is difficult that the integration between the administrations if the subordinate relationships do not exist among them (the horizontal integration). Both the vertical and the horizontal integrations are discussed. Who is in charge of the work of integration between the administrations? How does the work of integration between the administrations be done? These will be discussed in the mechanism of the integration between the administrations. The mechanism of the integration between the administrations is illustrated by the process was executed in Dengue Fever control. The work of integration is the important role in Dengue Fever control

Inter-Sectoral Coordination and Regional Cooperation for Dengue Fever Control

Dr. Yuh-Wern Wu (吳裕文)
I-Shou University
Chinese Taipei

Outline

- An intro: Dengue fever
- The institutional framework of Chinese Taipei official bureaus
- Integrating resources across institutions
- The importance of integration: From an executive perspective

An Intro: Dengue Fever

An intro: Dengue fever 1/2

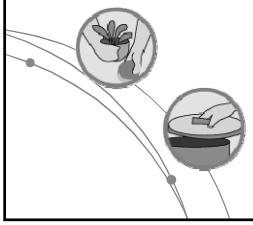
- What is Dengue fever?
  - A disease transmitted via Aedes mosquitoes.
- Causes of Dengue fever?
  - Weather
    - Hot and humid weather such as summer.
  - Environment
    - mosquitoes breed on residual water in artificial containers.
- The key to prevention…
  - Eliminate the causes of dengue fever!!!

- The question is….

HOW?

An intro: Dengue fever 2/2

- We cannot control the weather, but we can strive to keep the environment clear!!
- The next puzzle to solve is…



How are we going to <u>work efficiently together</u> to keep the environment free from disease transmitting mosquitoes?

Institutional Framework of Chinese Taipei Official Bureaus

The institutional framework of Chinese Taipei official bureaus

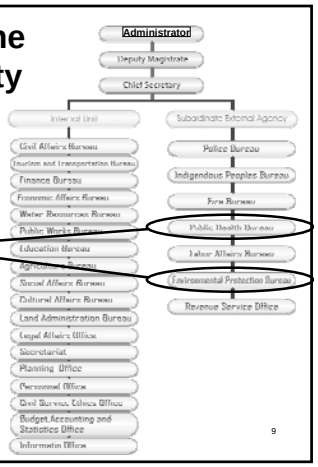
- Before discussing how to work together, we need to take hold of who we are working with.
- The 3 levels of dominion:
  - Chinese Taipei Authority:
    - Responsible for Chinese Taipei policies and affairs.
  - County Administration :
    - Responsible for policies and affairs pertaining to the county.
  - Local township:
    - Official units that implements the policies from the higher level bureaus.

Our position in the institutional framework

- The 3 levels of dominion :
  - Chinese Taipei Authority
    - Responsible for Chinese Tai…
  - County Administration
    - Responsible for policies and affairs pertaining to the county.
  - Local township:
    - Official units that implements the policies from the higher level bureaus.

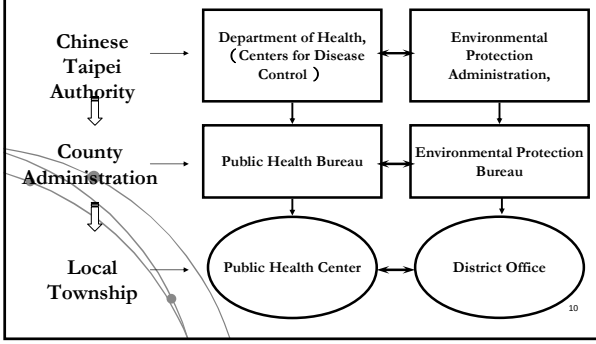
Our position in the implementing of policies

Organization of the Kaohsiung County Administration



The 2 bureaus in Kaohsiung County responsible for dengue prevention and control

Bureaus from different administrational levels responsible for dengue control

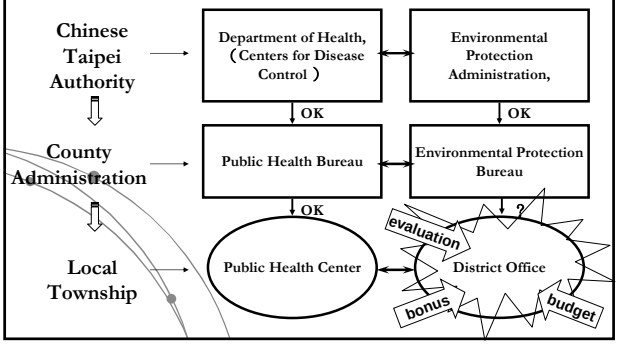


Integrating Resources Across Institutions

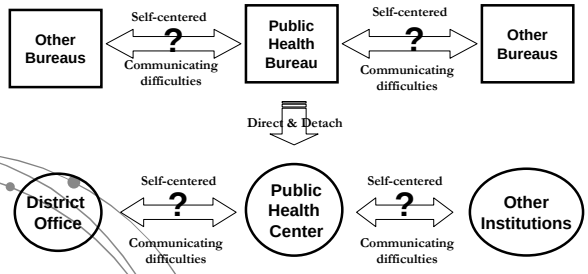
Integrating resources across institutions

- Present State
  - The subordinate relationship between the Chinese Taipei authority and the county administrations makes it easier for the two to cooperate.
  - On the other hand, as no subordinate relationship exist between bureau to bureau, cooperation is impeded.

The cooperation between the Chinese Taipei Authority, and local Administrations



The cooperation between bureaus that are parallel in power

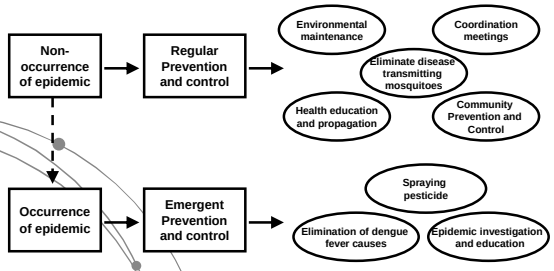


The integration of resource across institutions parallel in power

- Hard because...
  - Bureaus other than the Public Health bureau believe that they have nothing to do with dengue fever prevention and any issue related to it.

Importance of Integration: From an Executive Perspective

The prevention and control of dengue fever is not only the responsibilities of PHB and EPB, but also the responsibilities of other bureaus in the County Administration. Therefore, the coordination meetings must be held regularly to integrate the work of prevention and control.

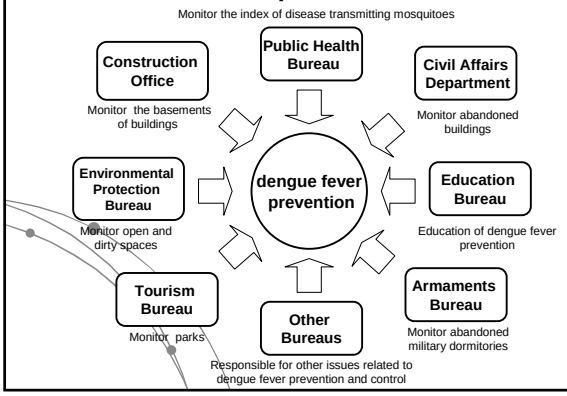


The three most important missions in dengue fever prevention

1. **Elimination of dengue fever causes**
2. **Spraying pesticide**
3. **Epidemic investigation and education**

How do we integrate these missions together to efficiently implement the missions and prevent dengue fever from happening?

Division of labor among bureaus in dengue fever prevention

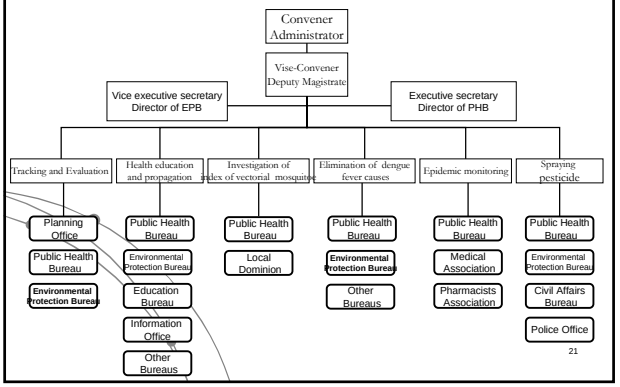


The key to integration

- How are we going to integrate the bureaus under the county administration ?

The county administration should establish a dengue fever prevention center to integrate the bureaus.

Kaohsiung County's dengue fever prevention center



When cases of dengue fever occurs…

Elimination of dengue fever causes

Spraying pesticide

Epidemic prevention education

Elimination of dengue fever causes

County Administration
(Responsible for integration and division of labors)

Environmental Protection Bureau	Construction Office	Public Health Bureau	Tourism Bureau	Armaments Bureau
Eliminate dengue fever causes from open and dirty spaces	Eliminate dengue fever causes from the basements of buildings	Eliminate dengue fever causes from the inside of buildings	Eliminate dengue fever causes from parks	Eliminate dengue fever causes from abandoned military dormitories

Spraying pesticide

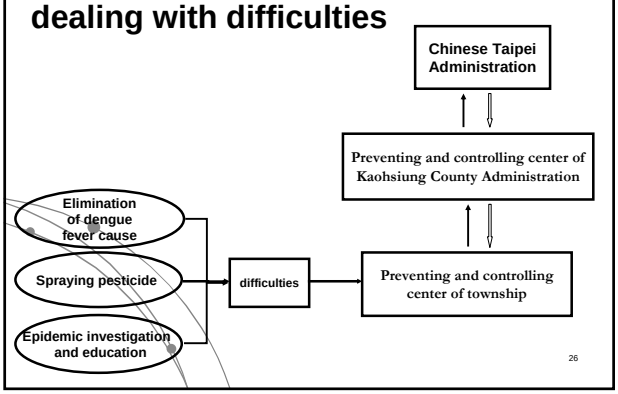
County Administration
(Responsible for integration and division of labors)

Environmental Protection Bureau	District Office	Public Health Bureau	Public Health Center	Police office
Spraying pesticide outdoors	Spraying pesticide outdoors	Spraying pesticide indoors	Spraying pesticide indoors	Help out with the work

Epidemic Investigation and Education

Educating citizens what dengue fever is and how to prevent it is an important part of dengue fever prevention. By having knowledge of it, people will be more readily to cooperate with the administration.

The procedures of dealing with difficulties



The interaction between the Chinese Taipei Authority and county administrations

- The Chinese Taipei Authority should provide support including finance, equipment, and human resources when cases of dengue fever take place.
- The difficulties ,which could not be solved at the county administration level, would be submitted to the coordination meeting held by the Chinese Taipei Authority to seek for solutions.

Thank You!

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Professional Career

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Publications

- ***HY Chuang***, JJ Huang, YC Huang, PL Liu, MC Wang. The use of fine nets to prevent the breeding of mosquitoes on dry farmland in southern Chinese Taipei. (Submitted manuscript)
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Community Mobilization and Communication for Dengue Fever Prevention and Control

Hung-Yi Chuang
Director
Kaohsiung Medical University

Currently, prevention of epidemic dengue fever still depends upon effective, long-term mosquito control. To be cost-effective and sustainable, such control must be achieved through integrated community-based action. International recognition of the importance of social mobilization and communication for prevention and control of dengue fever has gathered pace in recent years. Community mobilization and communication for dengue fever prevention and control put in place for many years in the local administration. Traditionally, there are good examples of IEC (Information, Education, Communication) programs that have improved knowledge and attitudes, however, there are few good examples of communications programs with measurable changes in behaviors. It is critical to measure actual changes in behaviors, not just assume it has occurred. A Step-by-Step Guide developed by WHO has ready (Planning Social Mobilization and Communication for Dengue Prevention and Control: A Step-by-Step Guide, Ed. Will Parks and Linda S Lloyd, WHO/CDS/WMC/2004.2). This guide offers a comprehensive and innovative managerial insight to planning social mobilization and communication for behavioral impact (COMBI). The talk provides a brief overview of the guide's purpose and content firstly. Then, some experiences of dengue fever control programs in the local are presented, including use of fine-nets for water buckets in dry farmland, and covering sewer outlets. In conclusion, we found"SMART" Objectives selected is the most important in our experience. Each objective should be hopefully more specific, as well as measurable in that progress can be assessed in terms of behavioral and/or entomological impact. In addition, the objective must be locally and culturally acceptable and reasonably realistic. And each clearly states a time period for achievement. Thus, dengue-COMBI could have been adopted as the national approach to social mobilization and communication for dengue fever prevention and control.

Community Mobilization and Communication for Dengue Fever Prevention and Control

Hung-Yi Chuang, MD, MPH, ScD
Kaohsiung Medical University

June 6, 2008. APEC Workshop for the Control Practice of Dengue Fever

Introduction

- Currently, prevention of epidemic dengue still depends upon effective, long-term mosquito control.
- To be cost-effective and sustainable, such control must be achieved through integrated community-based action.
- Community mobilization and communication for dengue prevention and control put in place for many years.

What is COMBI?

Communication-for-Behavioral-Impact

A dynamic approach to behaviour change that utilizes:

Strategic Social Mobilization + **Social Communication** =

Measurable changes in behaviour!

Material from Linda S. Lloyd, Dr.P.H.
Consultant, WHO/WMC

Why do we need a new approach?

- Although there are good examples of IEC (Information, Education, Communication) programs that have improved knowledge and attitudes, there are few good examples of communications programs with measurable changes in behaviour
- It is critical to measure actual changes in behaviour, not just assume it has occurred

Material from Linda S. Lloyd, Dr.P.H.
Consultant, WHO/WMC

COMBI: based on theory and practice

- **Behaviour change theories**
- **Communication theory**
- **Marketing practice**

Material from Linda S. Lloyd, Dr.P.H.
Consultant, WHO/WMC

Points in common among behaviour change theories

The person or community should have:

- **a positive intention toward the new behaviour**
- **a minimum of barriers to achieve the behaviour**
- **sufficient ability to carry out the behaviour**
- **encounter messages that serve as reminders**

Believe that the actions will have positive results and benefits

Elder, J. et al. 1998. Strategies for Health Education:Theoretical Models. In *Handbook of Immigrant Health*, Sana Loue (Ed). New York: Plenum Press

COMBI is different because

it is a methodology for planning sustained actions **in communication and social mobilization.**

Material from Linda S. Lloyd, Dr.P.H.
Consultant, WHO/WMC

Also,

COMBI focuses on measurable **changes in behaviour,**

NOT JUST

changes in knowledge or attitude.

Material from Linda S. Lloyd, Dr.P.H.
Consultant, WHO/WMC

COMBI's Three Programmatic Phases

- planning
- implementation and monitoring
- evaluation

Will Parks & Linda Lloyd (2004), Planning Social Mobilization and Communication for Dengue Fever Prevention and Control: A Step-by-Step Guide. WHO/CDS/WMC/2004.2, TDR/STR/SEB/DEN/04.1

HICDARM

Achieving behavioural results

IEC programs focus on HIC

First, we	**H** ear about the new behaviour
then, we become	**I** nformed about it
and later	**C** onvinced that it is worthwhile.
In time,	
we make the	**D** ecision to do something about our conviction
and later we take	**A** ction on the new behaviour.
We next await	**R** e-confirmation that our action was a good one
and if all is well, we	**M** aintain the behaviour!

COMBI focuses on DARM

Behavior adoption

Step-by-step guide, p.5

Fifteen Steps of COMBI Planning

1. Assemble a multidisciplinary planning team
2. State preliminary behavioural objectives
3. Plan and conduct formative research
4. Invite feedback on formative research
5. Analyse, prioritize, and finalize behavioural objectives
6. Segment target groups
7. Develop your strategy
8. Pre-test behaviours, messages, and materials
9. Establish a monitoring system
10. Strengthen staff skills
11. Set up a system to manage and share information
12. Structure your programme
13. Write a Strategic Implementation Plan
14. Determine your budget
15. Conduct a pilot test and revise your Strategic Implementation Plan

Step-by-step guide, p.7

COMBI's Five Integrated Actions

- **Public relations / advocacy / administrative mobilization**
- **Community mobilization**
- **Sustained appropriate advertising**
- **Personal selling / interpersonal communication / counseling**
- **Point-of-service promotion**

Step-by-step guide, p.8

Three approaches of the COMBI

- Establishment of precise behavioral (not just knowledge change) objectives on the basis of thorough research.
- Integration of a judicious blend of communication actions appropriate to the various groups targeted and to the behavioral outcomes desired, all carefully coordinated and timed.
- Constant monitoring of progress towards the achievement of these behavioral objectives.

Step-by-step guide, p.10

Dengue-COMBI in action

- **Use of fine-nets for water buckets in dry farmland – an experience in Alian and Tianliao**
- **Use of fine-nets covering sewer outlets**

"SMART" Objectives

Specific: based on priority behaviours

Measurable: you can measure the adoption, or not, of the behaviour

Appropriate: your target audience understands what the behaviour is, the behaviour is culturally acceptable

Reasonable: the objective can be achieved given existing resources

Time: within a specified time period

Water-buckets in Dry-farmland

- **In Alian and Tianliao, farmers traditionally store rainwater in big buckets to irrigate their dry-farmland.**
- **Traditional IEC progressing for years, but in vain.**

WHO/TDR/Crump

Not suitable in Kaohsiung County dry-farmland

The Fine-net that Health Bureau of Kaohsiung County Distributed

Monitoring & Evaluation

The means and standard deviations of Container Indices in Alian and Tianliao Townships before fine net used (2004) and after (2005).

	Villages	2004	2005	*p*-value of pairedt	*p*-value*
Alian	8	5.88±2.23	1.63±0.91	0.001	0.012
Tianliao	10	2.30±0.48	1.20±0.42	<0.001	0.007

*Wilcoxon Signed Rank Test

Reasonable & Acceptable

- Culturally acceptable
- Convenient to use
- Inexpensive (<NT$ 50)
- But the nets were easily lost. (??)

-COMBI in action

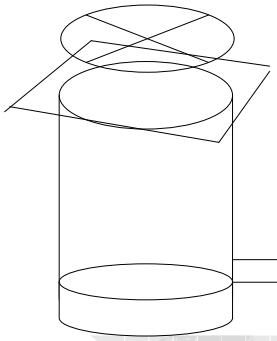
Use of fine-nets covering sewer outlets

- Urban area
- Sewer system – rainwater
- Out-door or park
- Residents did not care

→ IEC in vain

Sewer outlet

Nets covering on Sewer outlet



Community Mobilization

Pictured by cello-phone

-COMBI in action

Electric power company

-COMBI in action

Conclusion

- **International recognition of the importance of social mobilization and communication for prevention and control of dengue fever has gathered pace in recent years.**
- **A Step-by-Step Guide developed by WHO has ready.**
- **"SMART" Objectives selected is the most important in our experience.**

Conclusion

"SMART" Objectives

Specific: based on priority behaviours

Measurable: you can measure the adoption, or not, of the behaviour

Appropriate: your target audience understands what the behaviour is, the behaviour is culturally acceptable

Reasonable: the objective can be achieved given existing resources

Time: within a specified time period

Acknowledgement

- **Community & Leaders**
- **Volunteers**
- **Assistants**
- **Colleagues**
- **Family**

Thank you！Q&A

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1993-1996: Attending Physician of Family Medicine Department, Kaohsiung Medical University Hospital, Kaohsiung, Chinese Taipei
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1996-1998: Member and Vice Chairperson of Union of Women Aegis Report Committee of Kaohsiung City
1997-1998: Member of Women's Right Promotion Committee of Kaohsiung City
1998-2000: Member and Chairperson of Union of Women's Aegis Report Committee of Kaohsiung City
1998, 1999-2001, 2006: Part-time lecturer of Nursing Department, Kaohsiung Medical University, Kaohsiung, Chinese Taipei

Publications

- ***Joh-Jong Huang*** (2007) The help-seeking experience of battered women in danger. 2007 The Conference of current issues of domestic violence prevention in Chinese.
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Community Mobilization for Dengue Fever Control in Kaohsiung County

Joh-Jong Huang
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The Health Bureau of Kaohsiung County

Southern Chinese Taipei is located in the subtropical area, with the climate quite suitable for Dengue fever epidemic, esp in the era of global warming. The first recent significant endemic prevalence of Dengue fever in Kaohsiung County took place in 1992, with 1956 cases identified. In the modern life, people who live in Kaohsiung County frequently work and study in adjacent area, but with less interaction with their neighbors in the community. Besides, immigrant Dengue fever cases were frequently diagnosed as the results of international traveling between Chinese Taipei and Southeast Asia. These habitants' behaviors decisively worsen the negative influence of the climate factors.

During 1992 Dengue fever endemic, community organization became well recognized as the key strategy to extinguish Dengue fever. Since then, community empowering via community identification, democratic participation and total behavior of the residents created a strong atmosphere in the community to motivate the habitants and mobilize all the resources in the community as effective approaches for the public issues, and most important is the Dengue fever control. Special designed lectures are launched by the Health Bureau workers, and close mutual interaction cause the habitants organized and mobilized to construct the strong community identification. The main issues of Dengue fever control in the community mobilization are infection sources eradication, mosquito monitoring and environmental hygiene. After the peak endemic year, the identified Dengue fever case numbers dropped from 1956 in 2002 to 40 in 2007. And there are totally 227 communities empowered and mobilized.

The roles of the Health Bureau of Kaohsiung County are initiators, promoters, coordinators in the process of community mobilization. In addition, update information and re-engineering are also provide by the Health Bureau to keep the community at high level of motivation and mobilization.

Community Mobilization for Dengue Fever control

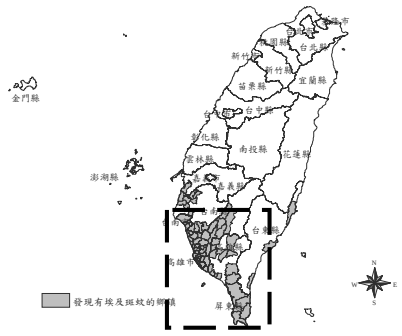
Kaohsiung County as an Example

Health Bureau of Kaohsiung County

Dr. Joh-Jong Huang

Geographic character of Kaohsiung County

Distribution of Aedes aegypti



Cases of Dengue fever identified in Kaohsiung County

	2002	2003	2004	2005	2006	2007
Kao-hsiung County	1956	15	14	45	185	40

Community empowering in Kaohsiung County

Introduction to Community Empowering

- Civilization through learning and education to build a community identification on the base of empowered network。
- Rethinking and reengineering the community。

Eradication of Infectious sources

- Environments monitoring
- Detecting the infectious sources
- Cleaning
- Container removal from the environment

Organization in the Community Mobilization

- Dengue fever is constructed as a disease of Environmental or community characters。
- The Plan as "Community of Disease Prevention" began in 2004. And till 2008, There are 227 communities organized and mobilized。

Year	2004	2005	2006	2007	2008	total
No.	6	31	45	60	85	227

Activities of Schools in the community

Results of community empowering for disease control

Results of community mobilization

- Mobilized to organize the present community sources
- Mobilized the people in the community to achieve the main goal as "no infectious source, no Dengue fever"
- Learn from the childhood

An Example of Community Mobilization

高雄縣鳳山市生明社區發展協會

name	Ming-Shern Community of Kaohsiung County
No. of persons	2,068
volunteer	60
Introduc-tion of the community	This community was once very prosperous due to its neighborhood of the Military School. Due to the decaying of the school, the activity went declined in the precious years.

Community mobilization

Emergent pesticide use in the community

Greening of the Community

Community Empowering

Useless houses monitoring

Vectors control in the community

Other Examples

Greening of the community environment (Wan-Kaon Community)

before after

Show-ponds as Environmental control

THANKS

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Section Chief, Division of Vector-borne Infectious Diseases, Centers for Disease Control, Chinese Taipei, Jul. 1999-Jun. 2004
Research Associate, Section of Medical Entomology, Institute of Preventive Medicine, Aug. 1993-Jun. 1999

Publications

- ***HJ Teng***, LC Lu, SW Jian, DD Ji, C. A Lin survey of sand flies in FuXing Township, Taoyuan County and a PCR diagnostic method of sand fly infection. Chinese Taipei Epidemiol. Bull. 25, 2008. (In acceptance)
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Emergency Control on Dengue Fever Vectors

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Dengue is an important travel disease and is transmitted by Aedes (Stegomyia) mosquitoes. Up to date, no vaccine is available for this disease. Therefore, fighting this disease through mosquito vectors is the only method to stop the spread of dengue viruses. An emergency control strategy based on the biology of Aedes (Stegomyia) species and transmission cycle of dengue viruses is proposed to combat these dengue mosquito vectors. The infrastructure of emergency control and the components of available control measures are discussed. These control measures include law enforcement, insecticide spray, and source reduction. Finally, dengue emergency control in Chinese Taipei is given as an example.

APEC Workshop for the Control Practice of Dengue Fever, Kaohsiung , Chinese Taipei
2008/6/5-6

Emergency Control on Dengue Fever Vector

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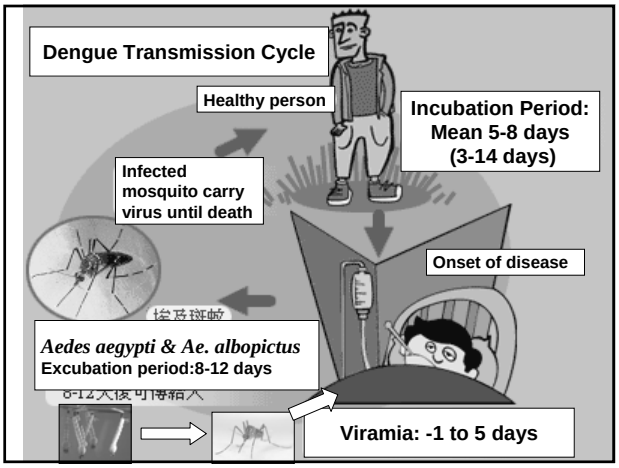


Dengue Mosquito Vector Species (Stegomyia)

- ▶ *Aedes aegypti*
- ▶ *Aedes albopictus*
- ▶ *Aedes polynesiensis*
- ▶ *Aedes rotumae*
- ▶ *Aedes gardnerii imitator*
- ▶ *Aedes malikuli*
- ▶ *Aedes patriciae*
- ▶ *Aedes pseudalbopictus*
- ▶ *Aedes cooki*
- ▶ *Aedes scutellaris*
- ▶ *Aedes upolensis*
- ▶ *Aedes africanus*
- ▶ *Aedes bromeliae*
- ▶ *Aedes luteocephalus*
- ▶ *Aedes alcasidi*
- ▶ *Aedes annandalei*
- ▶ *Aedes desmotes*

Aedes Species (16) in Chinese Taipei

Subgenus	Species no.	Species
Stegomyia	9	*Ae. aegypti, Ae. albopictus, Ae. alcasidi, Ae. annadalei, Ae. desmotes, Ae. gardnerii imitator, Ae. malikuli, Ae. patriciae, Ae, pseudalbopictus*

Subgenus	Species no.	Subgenus	Species no.
Aedimorphus	2	Neomelaniconin	1
Cancraedes	1	*Paraedes*	1
Lorrainea	1	*Scutomyia*	1

*Ochlerotatus: Ochlerotatus 3 species & Finlaya 18 species

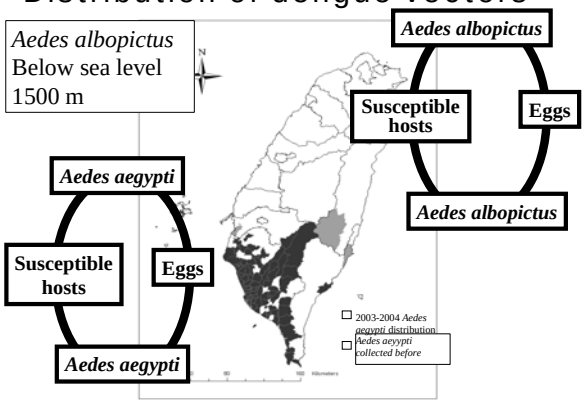
Major Dengue Vectors in Chinese Taipei

Aedes aegypti

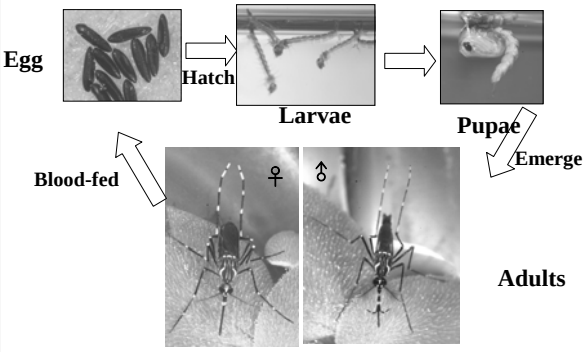
Aedes albopictus

Distribution of dengue vectors

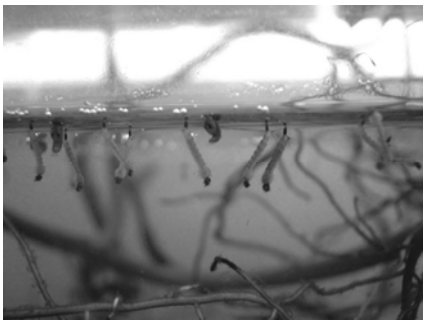
Aedes albopictus
Below sea level
1500 m



Life Cycles of *Aedes aegypti*

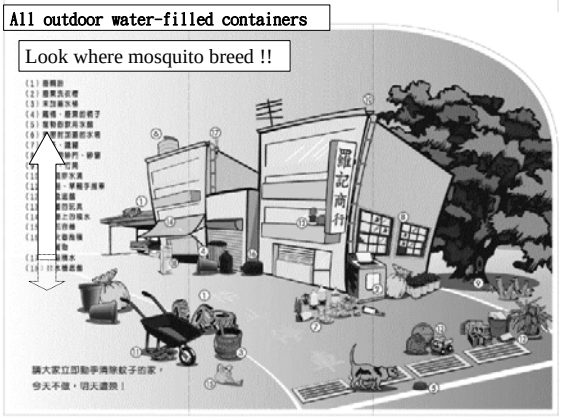


Where Mosquito Vector Breed ?

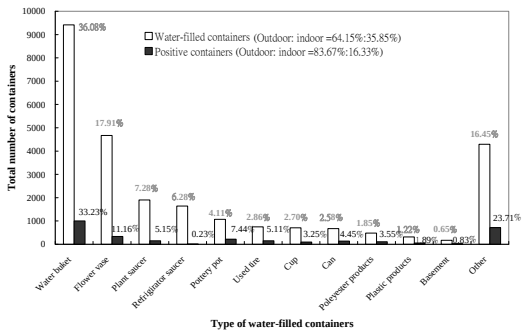


All outdoor water-filled containers

Look where mosquito breed !!



Types of Water-filled Containers



Resting Site of Dengue Vectors in 2003

Resting site	*Aedes aegypti*				*Aedes albopictus*			
	♀	♂	Total		♀	♂	Total	
	%	%	%	No.	%	%	%	No.
Indoor	27.8	49.9	77.7	3739	1.4	0.4	1.8	32
Outdoor	7.2	15.1	22.3	1074	60.7	37.5	98.2	1711
Total	35.0	65.0	100	4813	62.1	37.9	100	1743

*Kaohsiung City, Kaohsiung County, and Pingtung County

Resting Places inside the houses

(Dr. Hwang, 1993)

Resting places	*Aedes aegypti*		*Aedes albopictus*	
	No.	%	No.	%
Living room	12	34.3	2	40
Bed room	6	17.1	0	0
Bath room	1	2.9	0	0
Kitchen	2	5.7	0	0
Basement	10	28.6	1	20
Others	4	11.4	2	40
Total	35	100	5	100

Resting Places（6 hrs after release）

（Dr. Hwang, 1993）

Places	*Aedes aegypti* females	*Aedes albopictus* females
Wall	24	19
Furniture	43	3
Clothes	42	27
Ceiling	22	0
Others	0	0
Total	131	49
Release no.	400	400

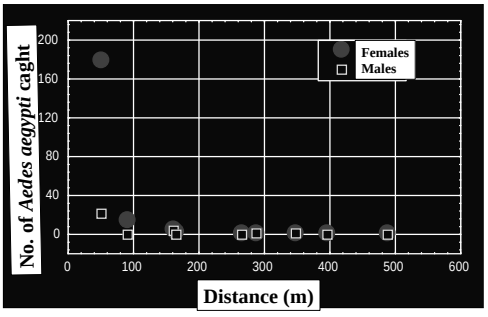
Resting Hight

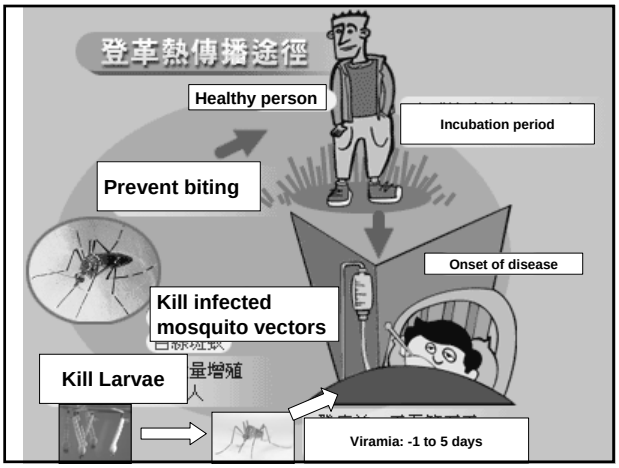
(Dr. Hwang, 1993)

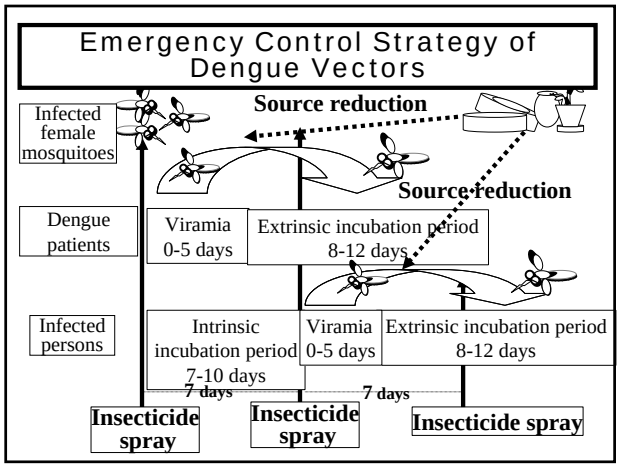
Hight	*Aedes aegypti*		*Aedes albopictus*	
	No.	%	No.	%
> 2 m	23	18	2	4
0.5-2 m	96	76	43	81
<0.5 m	8	6	8	15
Total	127	100	53	100

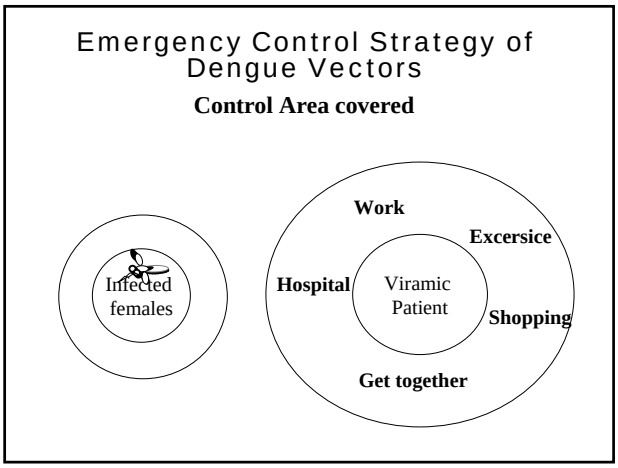
Fly Distancesof *Aedes aegypti*

(Dr. Hwang, 1993)









Laboratory Diagnosis

Vector-borne Viral and Richettsial Disease Laboratory
Dr. J. H. Hwang & Dr. P. Y. Shu

Diagnostic method	Specimen	Time to complete
RT-PCR	Acute blood	1.5 days
ELISA	Acute blood R blood	8 hrs
Virus isolation	Acute blood	7 days

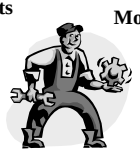
Virus Detection in Mosquitoes

Year	*Aedes aegypti*			*Aedes albopictus*			Month of Positive pools
	Test pool	Mosquito no	Positive pools	Test pool	Mosquito no	Positive pools	
1987	32	394	1	22	126	0	11
1988	196	3535	8	85	248	0	7-10
1995	59	1022	0	189	4234	2	9
1996	55	514	0	237	3700	1	9
1998	72	809	1	100	1504	0	12
2002	272	545	3	35	62	0	6,10
2004	741	13139	1	816	15741	0	9
2005	6128	39765	2	6041	39696	0	8,10
2006	4323	32777	8	3503	23108	0	7,8,10-12
合計	11878	92500	24	11028	88419	3	6-12

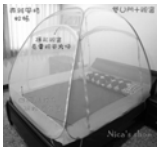
Preventing mosquito bites

Wear long sleeves and pants

Mosquito repellents



Mosquito coils, liquids to excel mosquitoes



Use bed nets when sleep Screens on door & windows

Insecticide sprays to kill adults

- Space spray

  A insecticide application that insecticide is applied as tiny droplets to float in the space to kill flying mosquitoes

- Residual spray

  A insecticide application that insecticide is applied to the surface of the wall, furniture... to kill resting mosquitoes

Space Spray Machine

- **ULV machine**

- **Fogging machine**

Residual Spray Machine

Quality of Insecticide Sprays

- **Insecticide efficacy**
- **Machine quality**
- **Operator quality**
- **Spray coverage**

The Evaluation of Insecticide Spay on Aedes aegypti by WHO

Reiter P. & Nathan MB. Guidelines for assessing the efficacy of insecticidal space sprays for control of the dengue vector *Aedes aegypti*. WHO/CDS/CPE/PVC/2001.1

Ovitraps with

25-30 houses

Indoor backpack aspirator

10 houses/team for 2 team

Cage bioassay

Time: 3days before spray and 1 week after

Source Reduction to kill larvae

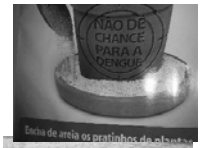
- **Remove all small containers that are not used**
- **Change water plants to plant in soil or dried grass**
- **Large containers**

Use Bti, insecticide growth regulators, temephos etc

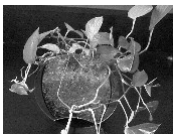
Use mosquito-eating fish

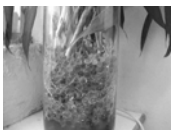
Use Copecodes

Screens

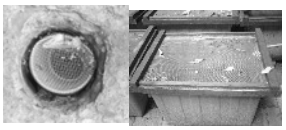



Source Reduction





Source Reduction

Evaluation of Source Reduction Effects

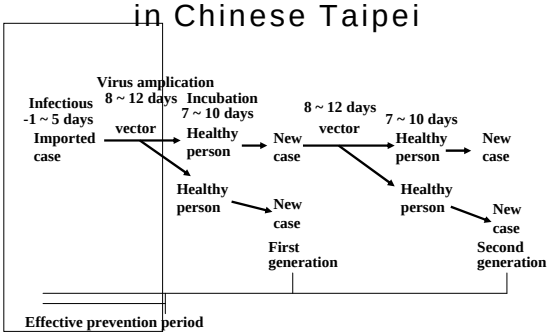
- **Total Water-filled container number**
- **Total Positive Containers**
- **Larval density**
  Larval index, Breteau index,
  pupal indx…

The Possible Source of Dengue Virus in outbreaks of Chinese Taipei areas

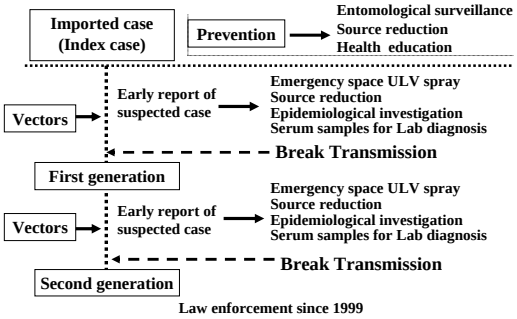
(Dr. P. Y. Shu from CDC)

Year	Case no.	Possible virus sources	Year	Case no.	Possible virus sources
1987-88	> 4500	Thailand	2000	> 100	Thailand
1991	> 100	Thailand	2001-2	> 5,500	Philippines
1994	~ 50	Thailand	2004	> 40	Vietnam
	~ 150	Philippines		~ 300	Philippines
1995	> 180	Vietnam	2005	> 95	Vietnam
	~ 10	Philippines		> 70	Philippines
	> 20	Thailand			
1998	~240	Thailand	2006	>100	Vietnam

Dengue Transmission Theory in Chinese Taipei



Strategy on Dengue Control and prevention



Law enforcement since 1999

Routine Control Measures

For each suspected case

- **Case survey**
- **Insecticide space spray at Patient' house and work place with a radius of 50 meters (another 2 follow up sprays in a 7 day interval, if it is a confirmed case)**
- **Entomological survey**
- **Source reduction**
- **Health education**
- **Law enforcement (if a confirmed case)**

Law Enforcement about Dengue

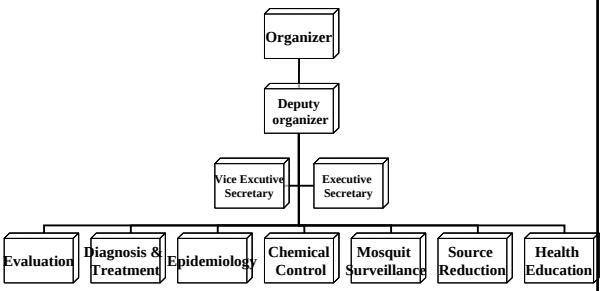
The Control of Communicable Diseases Act (CDC)
Latest re-amended on 2007/7/18

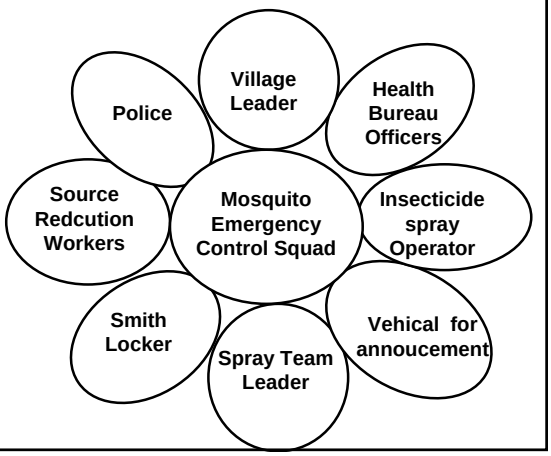
Dengue:
classified as an II notifiable Disease (24 hours reporting)

Article 38 (immediate mandatory prosecution and a fine ranging from NT$ 60,000 to NT$ 300,000)
Enforce the cooperation of residents to ascertain full coverage of control measures.

Article 25 (fine NT$ 3,000 to NT$ 15,000)
Enhance local residents to conduct source reduction by themselves

Infrastructure of Dengue Emergence Control





Pest Control Operators (PCO)

North		Central		South	
Taipei C	249	Maoli C	1	Chiaya	14
Taoyan	58	Taichung	75	Tainan	55
Hsinchu	32	Chunghwa	24	Kaohsiung Co	41
Ilan	5	Nantou	9	Kaohsiung C	42
Keelung	13	Yuanlin	8	Pingtung	11
Total	357		117		163

East		Islands		Total PCO
Hwalien	8	Kingman	2	**657**
Taitung	8	LienChien	2	
Total	16	Total	4	

Density change of immatures reflected in control effects

Index	n	Pre	Post	Reduction	Paired t test
Breteaux index	9	9.67	4.73	51.1.%	P=0.03
Indoor positive container	9	3.06	3.24	-6.0%	P=0.89
Outdoor positive containers	9	6.56	1.49	77.2%	P=0.02
Larval index	9	332.67	67.30	80.0%	P=0.02
Ae. aegypti per premiere	9	2.14	0.62	71.0%	P=0.04
Ae. albopictus per premiere	9	1.19	0.05	96.0%	P=0.047

* 3 rounds insecticide space sprays and 2 rounds source reductions in Pingtung City in 2002

Ms. Chu-Tzu Chen

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Educational Background

MSc (Sep. 1995-June 1997), Graduate Institute in Clinical Nursing Research, National Yang-Ming University, Chinese Taipei

Professional Career

Associate Researcher (Dec. 2006-present), Second Division, Centers for Disease Control, Chinese Taipei

Assistant Technical Specialist (Jun. 2005-Nov. 2006), Third Division, Centers for Disease Control, Chinese Taipei

Professional Nurse (Aug. 2004 - May 2005), Infection Control Division, Centers for Disease Control, Chinese Taipei

Publications (five recent ones)

- Kow-Tong Chen, Shiing-Jer Twu, Hsiao-Ling Chang, Yi-Chun Wu, ***Chu-Tzu Chen***, Ting-Hsiang Lin, Sonja J. Olsen, Scott F. Dowell, Ih-Jen Su, and the Chinese Taipei SARS Response Team (CT: Ming-Liang Lee, Chein-Jen Chen, Ping-Fuai Wu, Tsung-Hsi Wang, Chao A. Hsiung, Mei-Shang Ho, Chuang huan King; CDC-USA: Susan Maloney, Daniel Jernigan, Jim Lando, Tamara L. Fisk, James M. Simmerman; WHO: Babatunde Olowokure, K O ai Kamara, Howard Sobel, Cathy Roth). SARS in Chinese Taipei, Overview and Lessons learned. Int J Infect Dis Mar. 2005; 9(2):77-85.
- ***Chu-Tzu Chen***, Su-Fen Tsai, Hsu-Sung Kuo, Chin-Hui Yang, Sun-Yuan Chou, Ming-Hui Shen, Shih-Yan Yang. Preliminary Results from the First Harm Reduction Program in Chinese Taipei. 2006 International Conference on the Reduction of Drug Related Harm, International Harm Reduction Association.
- Tsung-Hsi Wang, Shan-Chwen Chang, ***Chu-Tzu Chen***, Tsai-Ling Yang, Hsiu Shih, Hwa-Kung Wang, Jih-Haw Chou, and the Working Group for Analysis of Nosocomial Infection Data, Centers for Disease Control, Chinese Taipei. Journal of Infection Control, 2006; 16(1): 1-8.
- Shan-Chwen Chang, ***Chu-Tzu Chen***, An-Li Lin, Yao-Shen Chen, Feng-Yee Chang, Ming-Yuan Chou, Yee-Chun Chen, Wen-Chien Ko, Yin-Ching Chuang, Hsieh-Shong Leu, Yung-Ching Liu, Hsiu Shih, Chan-Hsien Chiu and Bureau of National Health Insurance. Surgical Prophylactic Antibiotic Usage in Medical Centers and Regional Hospitals in Chinese Taipei: 2000 to 2004. Journal of Infection Control, 2006; 16(3): 137-152.

Dengue Fever Vector-Breeding Sites--Introduction and Management

Chu-Tzu Chen
Associate Researcher
Centers for Disease Control, Chinese Taipei

Dengue is an arboviral disease which includes dengue fever (DF) and dengue hemorrhagic fever (DHF). It is caused by four serotypes of dengue viruses which are transmitted to people by infected vectors. Major vectors for DF and DHF are **Aedes aegypti** and **Aedes albopictus. Ae.**

Albopictus is an endemic species and has been associated with the transmission of DF in the Western Pacific Region since the early 19th century. The other important vector of DHF in this area is **Ae aegypti**.

The life cycle of mosquito include four stages of egg, larva, pupa and adult. For identification of the **Aedes** mosquito, there are some features in each stage. The eggs of **Aedes** may be found on moist substrates and on the surface of water. They are laid singly and can survive under dry conditions for some time. The **Aedes** has an expanded breathing tube called siphon at the larval stage. With the aid of the siphon, the larval hangs down some distance from the water surface. The feature for identification of the **Aedes** and **Culex** larval is that the siphon of **Aedes** is shorter. At the pupa stage, the breathing trumpet of the **Aedes** is long and slender with a narrow opening. The adults of **Aedes aegypti** and **Aedes albopictus** can easily be differentiated by the patterns of white scales on dorsal side of the thorax.

The **Aedes** larvae generally breed in clean and unpolluted water. Generally, **Aedes aegypti** prefer to rest indoor in shaded places, whereas **Aedes albopictus** prefer to rest outdoors in shrubs and trees.

In relation to the biology of both **Aedes** species, they breed around house in close association with human habitations. The potential breeding sites are artificial or natural containers. The artificial containers include flower vases and pot plates, pails, water-storage jars, basins, discarded receptacles, unused toilet bowls and cisterns, canvas sheets, choked roof gutters, and discarded tyres. The natural containers are tree holes, bamboo stumps, leaf axils, fallen leaves, and ground depressions.

Destruction or elimination of unwanted natural and artificial containers in and around human living premises definitely contributes to an overall reduction of the **Aedes** population. Container management to reduce the sources of breeding habitats is one of the best approaches for controlling vectors and preventing spread of Dengue.

Dengue Fever Vector-Breeding Sites

Introduction and Management

Chu-Tzu Chen
Centers for Disease Control
Chinese Taipei

Dengue Fever

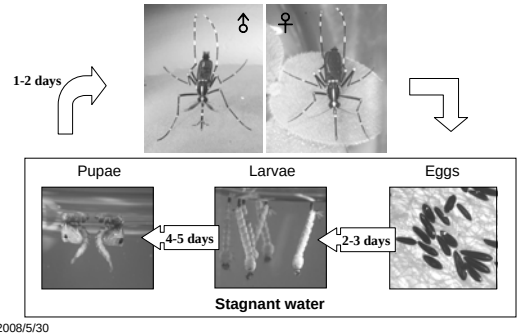
- Dengue Fever is an illness that results from contracting the dengue virus from the bite of an infected ***Aedes*** **mosquito** that is carrying the dengue virus.
- There are four types of dengue viruses.

Vector Identification

Aedes Aegypti

Aedes Albopictus

Life cycle of the *Aedes* mosquito



Dengue Vector Biology

- *Aedes* are day-biters, most active during dawn and dusk.
- The mosquito is attracted by the body odours, carbon dioxide and heat emitted from the animal or humans.
- The female *Aedes* mosquito searches for suitable places to lay their eggs.

Source Reduction

- Remove all potential breeding sites
- Prevent mosquitoes from breeding

Potential Vector Breeding Habitats

- Artificial containers
  - Flower vases and pot plates
  - Pails, water-storage jars, basins
  - Discarded receptacles
  - Unused toilet bowls and cisterns
  - Canvas sheets
  - Choked roof gutters
  - Gully traps
  - Concrete drains
  - Tyres
- Natural containers
  - Tree holes
  - Bamboo stumps
  - Leaf axils
  - Fallen leaves
  - Ground depressions

Flower vases and pot plates

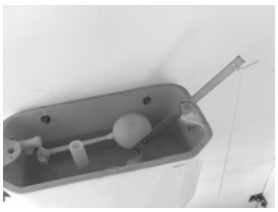
Pails, water-storage jars, basins

2008/5/30

Discarded receptacles

2008/5/30

Unused toilet bowls and cisterns

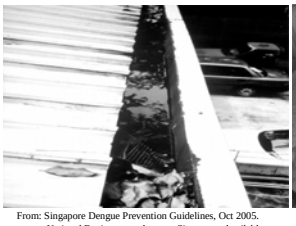


2008/5/30

Canvas sheets

2008/5/30

Choked roof gutters and Tyres

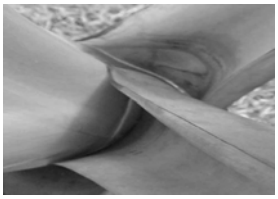
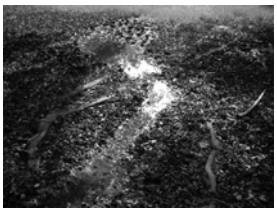



From: Singapore Dengue Prevention Guidelines, Oct 2005. National Environment Agency. Singapore. Available from http://www.geocities.com/prevent_dengue/

Tree holes and bamboo stumps


From: Singapore Dengue Prevention Guidelines, Oct 2005. National Environment Agency. Singapore. Available from http://www.geocities.com/prevent_dengue/

Leaf axils and fallen leaves

From: Singapore Dengue Prevention Guidelines, Oct 2005. National Environment Agency. Singapore. Available from http://www.geocities.com/prevent_dengue/

Ground depressions

Elimination or Alteration of Vector Breeding Sites

Container Management I

- Change the water-pots holding your plants or flowers at least once a week
- Drain flower pots – flowerpots should have holes for drainage
- Use damp soil or sponge instead of water for growing plants
- Keep the saucers of flower pots dry
- Clean the inside of water-pots with brushes

Container Management II

- Throw out the water in your draining pan under your refrigerator at least once a week
- Clean and scrub your dish drainers at least once a week
- Toilet flush tanks should be inspected and cleaned at least once a week and kept covered if going on holiday
- Keep surroundings clean and get rid of containers which may hold even the tiniest amount of water

Other Actions to take

- Punch holes in tins before disposal
- Get rid of derelict vehicles
- Ornamental pools and fountains should be regularly drained and scrubbed, chlorinated, and/or stocked with guppies (fish).
- Swimming pools should be kept clean, filtered, and in good condition.

Community Actions

- Community members can work together —
  - Keep the environment clean
  - Keep gullies/ghuts and drains clean
  - Monitor and destroy any other mosquito breeding places

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Educational Background

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1992-1994: MS in Public Health, National Yang-Ming University (NTMU), Chinese Taipei
1985-1992: MD, School of Medicine, NTMU, Chinese Taipei

Professional Career

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Associate Professor, Institute of Biomedical Informatics, NTMU, Chinese Taipei
Lecturer, Department of Social Medicine, School of Medicine, NTMU, Chinese Taipei

Publications (five recent ones)

- SY Peng, KC Wu, JJ Wang, ***JH Chuang***, SK Peng, YH Lai. Predicting postoperative nausea and vomiting with the application of an artificial neural network. Br J Anaesth. 2007 Jan; 98(1):60-5.
- ***JH Chuang***, SL Yang, CH Chiu, HS Kuo. Web-based Tools Help Fight TB in Chinese Taipei. 11th World Congress on Internet in Medicine. Toronto, ON: JMIR Publications 2006.
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- ML Pan, SF Chiou, ***JH Chuang***. Evaluation of keyword search for classifying chief complaints into syndromes in Chinese Taipei. 2004 Syndromic Surveillance Conference, Boston, Mass, Nov. 2004.
- ***JH Chuang***, Hripcsak G, Heitjan DF. Design and analysis of controlled trials in naturally clustered environments: Implications for medical informatics. J Am Med Inform Assoc. 2002; 9(3):230-8.

Dengue Fever Vector-Breeding Sites -- Management System and GIS Application

Jen-Hsiang Chuang, MD, PhD
Director
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Dengue Fever is one of the most important acute infectious diseases in southern Chinese Taipei. One way for stopping dengue transmission is to eliminate the number of Aedes aegypti through cleaning up the vector-breeding sites. However, it is difficult to automate the information collected from the vector-breeding sites when the data are traditionally stored in free-text documents. It is also difficult to implement different levels of vector control strategies based on the sizes of the dengue clusters (i.e., two or more dengue cases occur within 14 days and their homes are within the distance of 150 meters) without the aids of the geographical information systems (GIS). To improve the efficiency for data management, we integrated the Google Maps technology into an information system for managing the tasks for reducing vector-breeding sites and visualizing dengue clusters for enhancing vector control.

A multi-langue web-based management system has been developed and embedded with an interactive map using the Google Maps API (Application Programming Interface). Google Maps provides street maps overlaid on satellite and high-resolution aerial photographs for everywhere in the world. We use a camera with a GPS (Global Positioning System) receiver to capture the geographic coordinates and photos of the vector-breeding sites simultaneously. After the users upload the photos into the system, their geographic coordinates and uploaded time could be stored into database directly. The locations of the breeding sites with the photos are then marked and displayed on the Google Maps. The system can automatically send an E-mail alert to a designated person if the progress is lagged behind.

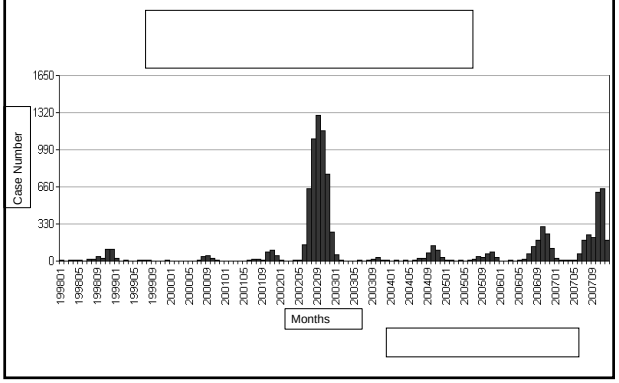
The users can also upload the data of the dengue cases with their geographic coordinates into the system. The locations of the dengue cases with their 50-meter buffers and the dengue clusters, which are automatically identified through the calculation of the system, could be displayed on the Google Maps.

Each interested economic entities will be provided an administrative account for managing their own data and user accounts. A user in a specific economic entity will not be allowed to read the data submitted by the other economic entities. The Centers for Disease Control in Chinese Taipei will continue to maintain and improve this system and to ensure its security. We hope this system could really provide a practical vector control model for controlling dengue in the APEC region.

Dengue Fever Vector-breeding Sites – Management System and GIS Application

Jen-Hsiang Chuang, MD, PhD
Health Command Center
Centers for Disease Control, Chinese Taipei

Dengue in Chinese Taipei (1999-2007)



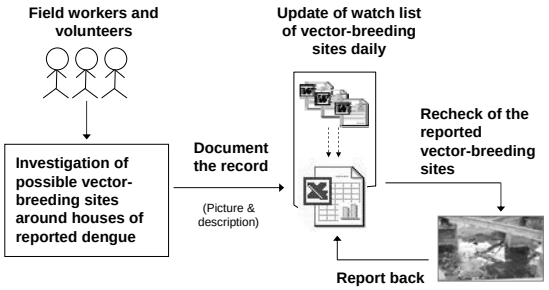
Vector Control Approaches in Dengue

- Chemical Control
  - Mosquitoes may have resistance to commercial aerosol sprays
- Biological control
  - Largely experimental
- Environmental control
  - Elimination of larval habitats
  - Most likely method to be effective in the long term

Intensity of Environmental Control in Chinese Taipei

- Based on severity of epidemic
- Cluster case area: two or more dengue cases occur within 14 days and their homes are within the distance of 150 meters
  - Class A: 2 cases in a cluster
  - Class B: 3-5 cases in a cluster
  - Class C: 6 or more cases in a cluster
- Difficult to implement without the aid of GIS

Procedures for Management of Vector-breeding Sites



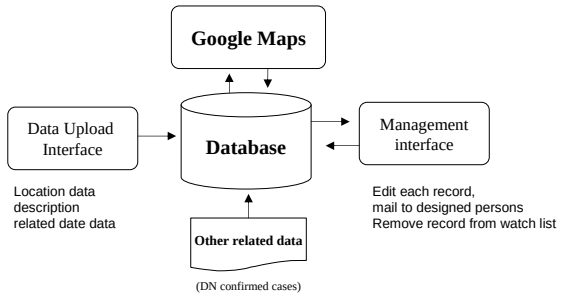
Daily Reports for Monitoring Vector-breeding Sites

Advantages of This System

- To improve the efficiency for data management
  - Integration of Google Maps technology for managing the tasks for reducing vector-breeding sites
- To enhance vector control in each economic entity
  - Visualization of dengue clusters
- Multi-language
- Secure

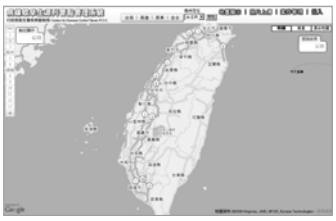
System Screenshot: Cluster Cases

System Overview

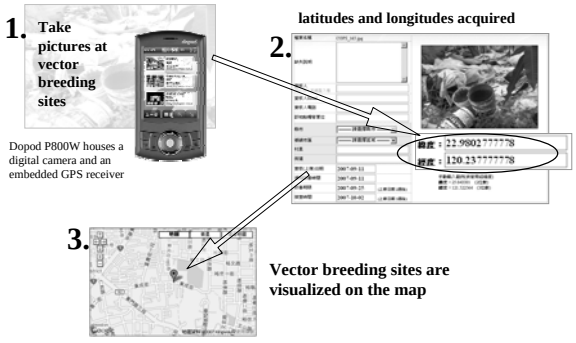


User Interface

- A web-based management system by using ASP.Net and MS-SQL database.
- Embedded with an interactive map using the Google Maps API (Application Programming Interface).



Acquisition of GPS Data



Field Demonstration

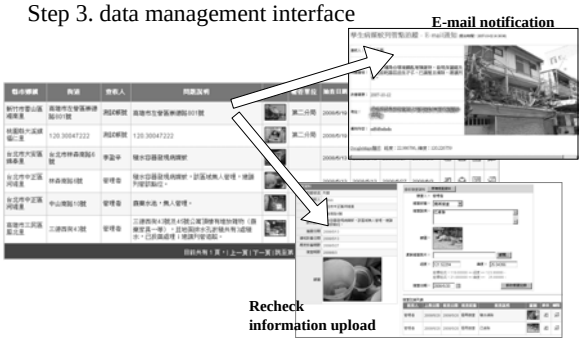
Step 1. Take picture at vector breeding sites

Field Demonstration

Step 2. upload pictures & complete form

Field Demonstration

Step 3. data management interface



Field Demonstration

Step 4. follow-up data report

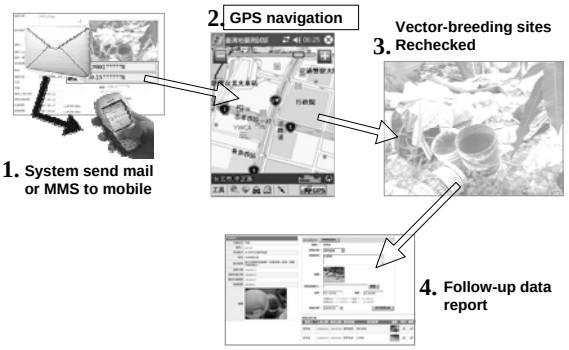
Start watching

2007-09-29

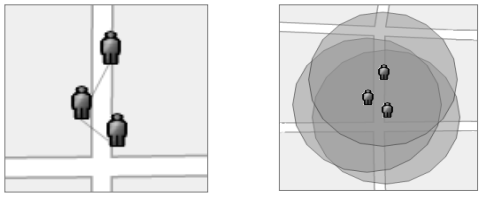
Remove from watch list

2007-10-01

GPS PDA Photo Navigation



Cluster Case Area & 50-meter Buffer for a Case



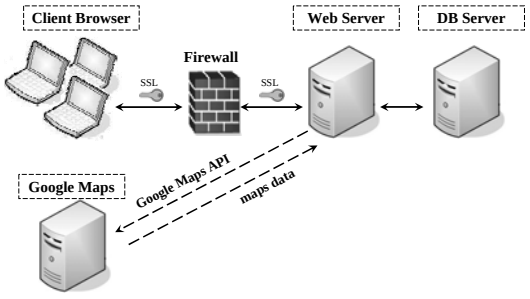
Security Issues on the Web

- Authentication
  - The user is who he or she says he or she is
- Authorization
  - The user is allowed to do what he or she is asking to do
- Confidentiality
  - The requested data are given only to the authenticated, authorized user

Multi-language Design

- Base language: English
- Interface for changing the words in the texts or buttons to other languages
  - Each economic entity is encouraged to localize the interface if it is needed
  - It will facilitate the local workers in each economic entity

Security Infrastructure



Security of the System

- Logon-ID-and-password protection
- No entity can read other entities' data
- SSL secured (128-bit) web site
- Application server and database server are separated
- Vulnerability scanner searches for and maps systems for weaknesses in our website
- Firewall and intrusion detection systems (IDS) are implemented
- Information security management in accordance with ISO 27001 requirements

Google Maps Coverage

region	map tiles	geocoding	localized
Australia	Yes	Yes	Yes
Canada	Yes	Yes	Yes
Chile	Yes	No	No
China	Yes	Yes	Yes
Malaysia	Yes	No	No
Mexico	Yes	Yes	No
Peru	Major roads only	No	No
Thailand	Yes	No	Yes
Vietnam	Major roads only	No	No

•Working on seamless switch between **Google Maps**, **Microsoft Live Search Maps** and **Yahoo! Maps**

Google Maps for Dengue Fever Vector-breeding Sites

URL: http://apecdengue.net/

Contact person: Mr. Ching-Hui Jiang
Email: clay@cdc.gov.tw

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