WEEKLY EPIDEMIOLOGICAL REPORT

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Fogging in Dengue Control (Part I)

This is the first in a series of two articles on Fogging in Dengue Control. The first article is on advantages and limitations of fogging and the technique of fogging. The second article will describe the favourable conditions for fogging, fogging cycles and safe use of insecticides.

Introduction

Dengue/Dengue Hemorrhagic Fever is an acute viral infection transmitted by mosquitoes, primarily by *Aedes aegypti*. Dengue vector mosquitoes breed in clean water in man made containers such as used tyres, flower vases, solid wastes and any other containers in which the water stagnates for a week or more. Adult mosquitoes rest mostly indoors under furniture, inside closets etc, but also frequent peridomestic habitats.

Vector control is an important strategy for interrupting transmission especially in areas where the disease burden is high. Reduction in the densities of mosquito vector can be achieved through several methods such as environmental methods, biological methods and chemical methods.

Integrated Vector Management

Integrated Vector Management is the basic approach adopted for management of vectors of diseases of public health importance. The essential requirement of this approach is the availability of more than one method of control, which can be utilized in a cost effective manner.

Environmental methods reduce vectors by improving sanitation through health education. Other control measures serve as supplementary control measures. Several types of environmental management such as drainage of mosquito breeding sites, filling of pits, prevention of water stagnation or promoting personal protection through use of screened windows are some of the examples.

Biological control of vectors, through use of predators and pathogens, particularly larvivorous fish [e.g. Poecelia reticulate (Guppy)] has been a useful eco-friendly vector control method. Larvivorous fish can be used in ponds, unused wells etc.

Chemical methods are used judiciously and selectively in carefully identified areas which depend on the epidemiological and entomological parameters. Chemical control methods are essentially supplementary to basic sanitation and environmental management even when they are employed as principal means to achieve rapid and maximum control of vector. The available chemical control options include:

- Selective indoor residual insecticide spraying in high risk areas
- Promotion of use of Insecticide Treated Nets (ITN) .
- Selective chemical control of vector larvae/pupae
- Space spraying (aerosol application/fogging)

Space sprays can be applied either as thermal fogs at 10–50 l/hectare or as ultra-low volume applications of undiluted or slightly diluted technical-grade insecticide in the form of a cold aerosol of droplets of controlled size (15–25 µm) at a rate of 0.5–2.0 l/hectare . Portable or vehicle-mounted thermal or cold-fog generators can be used for ground application. Aerial cold fog application is sometimes used if the target area exceeds 1000 hectares or cannot be covered by ground equipment within 10 days.

Use of thermal fogging as a vector control method

Thermal Fogging has been found a useful vector control method in specific situations such as Dengue outbreak situations, as a temporary contingent supplement to the other epidemic prevention and containment measures. It must be used only for a limited period in clearly identified areas. Fogging has been listed as the **last option in chemical control methods due to some of its limitations.** In view of the limitations, fogging is not a preferred option for vector control and needs to be discouraged as a routine method.

Fog is an aerosol spray having a distribution of droplets with a Volume Median Diameter (VMD) below 50 microns (mostly 5-15 microns). The technique is based on the principle that insecticide which is vaporized inside the machine condenses to form a fine cloud of droplets on contact with cooler air when it comes out of the machine. The insecticide is vapor-

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ized at a very high temperature inside the machine. Once the fog comes out of the machine, it tends to spread in different directions by mixing with the wind. Insecticides -mainly Organophosphates and Pyrethroids- such as Malathion, Fenitrothion, Deltamethrin, Etofenprox, λ-Cyhalothrin, Permethrin, Cyphenothrin etc are widely used in fogging. Thermal fogging is psychologically more acceptable as it generates a highly visible fog. The most common and preferred types of equipment include portable thermal foggers and mist blowers. Vehicle mounted machines have limitation of their use as their use is restricted to areas with communicable roads only.

Advantages of thermal fogging

- The spray formulation contains lesser active ingredient of insecticide in a large volume of diluents thereby reducing the operator's exposure to insecticide
- Easily visible fog

Limitations of thermal fogging

- Temporary stay of fog in the environment with no residual effect
- Effect is primarily on adult mosquitoes that come in contact with the fog
- Repeated applications needed
- High cost
- Effect on vectors is highly dependent on climatic factors like wind velocity and its direction, humidity, temperature etc.
- Thermal fog reduces visibility to a great extent and may create traffic hazards
- Burning of large volumes of diluents may not be environment friendly
- Undesirable effect on other insects such as bees
- Very high temperatures of machines and use of organic solvents (highly inflammable) poses serious risk of fire hazards
- Fogging equipment needs regular maintenance and accurate calibration

Dengue outbreak containment using thermal Fogging

Target area

Since total coverage can rarely be achieved during ground applications, space spraying should focus on areas where people congregate (e.g. high-density housing, schools, hospitals) and where dengue cases have been reported or vectors are abundant. Selective fogging up to 400 metres from houses in which dengue cases have been reported is commonly practised (perifocal fogging). However, by the time a case is detected and a response is mounted, the infection is likely to have spread to a wider area.

The street maps of the area to be sprayed must be studied carefully before the spraying operation begins. Ensure proper traffic control when conducting outdoor thermal fogging since it can pose a traffic hazard to motorists and pedestrians. The most essential information about the operation area is the wind direction. Spraying should always be done from downwind to upwind, i.e. going against the direction of the wind. Doors and windows of houses and buildings in the area to be sprayed should be kept open.

Vehicle-mounted fogging

The vehicle is driven at a steady speed of 6-8 km/hr along the streets. Fog production should be turned off when the vehicle is stationary. Fogging should commence on the downwind side of the target area and progressively move upwind.

When possible, spraying should be carried out along streets that are at right angles to the wind direction. In areas where streets run parallel as well as perpendicular to the wind direction, spraying is only done when the vehicle travels upwind on the road parallel to the wind direction.

In areas where the roads are narrow and houses are close to the roadside, the spray head should be pointed directly towards the back of the vehicle. In areas with wide streets with houses and buildings far from the roadside, the spray head should point at an angle to the left side of the vehicle. The vehicle should be driven close to the edge of the road. In dead-end roads, the spraying is done only when the vehicle is coming out of the dead-end, not while going in. The spray head should be tilted up at a 45° angle to the horizontal to achieve maximum throw of droplets.

Portable thermal fogging

Thermal fogging with portable thermal foggers is done from house to house, always fogging from downwind to upwind. When fogging outdoors, it is important to direct the fog at all possible mosquito resting sites, including hedges, covered drains, bushes and tree-shaded areas. The most effective type of thermal fog for mosquito control is a medium/dry fog, i.e. it should just moisten the hand when the hand is passed quickly through the fog at a distance of about 2.5-3.0 metres in front of the fog tube. Adjust the fog setting so that oily deposits on the floor and furniture are reduced.

House fogging technique

In single-storey houses, fogging can be done from the front door or through an open window without having to enter every room of the house. All bedroom doors should be left open to allow dispersal of the fog throughout the house (but it may be necessary to enter the house if it is a large one).

House fogging means spraying in the vicinity of the house. Stand 3-5 metres in front of the house and fog for 10 to 15 seconds, directing the nozzle towards all open doors, windows and eaves. If appropriate, turn away from the house and standing in the same place, fog the surrounding vegetation for 10 to 15 seconds. If it is not possible to stand three metres from the house due to the closeness of houses and lack of space, the spray nozzle should be directed towards house openings, narrow spaces and upwards. Fog particles drift through the area and into houses to kill mosquitoes which become irritated and fly into the particles. The settled deposits can be residual for several days to kill mosquitoes resting inside houses and on vegetation not exposed to the fog. In multi-storey buildings, fogging is carried out from upper floors to the ground floor and from the back of the building to the front. This ensures that the operator has good visibility along his spraying path.

All doors and windows should be closed before fogging and kept clo sed for at least 30 minutes for maximum efficacy if fogging is carried out inside the building.

While walking from house to house, hold the nozzle upwards so that particles can drift through the area. Nozzle should not be directed towards the ground.

Sources

Dengue : guidelines for diagnosis, treatment, prevention and control, available from

whqlibdoc.who.int/publications/2009/9789241547871_eng.pdf

Guidelines for insecticide fogging for outbreak control, available from

stg2.kar.nic.in/healthnew/PDF/Guideline_Fogging.pdf

Compiled by Dr. Madhava Gunasekera of the Epidemiology Unit

Table 1: Vaccine-preventable Diseases & AFP

07th – 13th January 2012 (02nd Week)

Disease	No. of Cases by Province									Number of cases during current week in 2012	Number of cases during same week in 2011	Total number of cases to date in 2012	Total number of cases to date in 2011	Difference between the number of cases to date in 2012 & 2011
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	02	01	02	00	00	00	00	01	00	06	00	06	01	+ 500.0 %
Diphtheria	00	00	00	00	00	00	00	00	00	-	-	-	-	-
Measles	00	00	00	00	00	00	00	00	00	00	01	00	02	-100.0 %
Tetanus	00	00	00	00	00	00	00	00	00	00	01	00	02	-100.0 %
Whooping Cough	01	00	00	00	00	00	00	01	01	03	01	00	02	-100.0 %
Tuberculosis	108	22	03	05	26	23	00	09	09	205	100	569	240	+ 137.8 %

Table 2: Newly Introduced Notifiable Disease

07th – 13th January 2012 (02nd Week)

Disease	No. of Cases by Province									Number of cases during current week in 2012	Number of cases during same week in 2011	Total number of cases to date in 2012	Total number of cases to date in 2011	Difference between the number of cases to date in 2012 & 2011
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	22	08	13	05	06	03	02	01	18	78	60	139	142	- 02.1 %
Meningitis	05 KL=3 GM=2	04 KD=1 ML=3	00	01 JF=1	01 TR=1	03 KR=3	00	01 MO=1	04 RP=1 KG=3	19	15	34	30	+ 13.3 %
Mumps	19	04	08	02	15	03	20	06	10	84	37	167	79	+ 111.4 %
Leishmaniasis	00	01 ML=1	03 HB=1 MT=2	00	00	01 KN=1	03 AP=2 Po=1	00	02 RP=2	10	13	17	17	+ 100.0 %

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

DPDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna, **KN**: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam, **AP**: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps.

Special Surveillance: Acute Flaccid Paralysis.

Leishmaniasis is notifiable only after the General Circular No: 02/102/2008 issued on 23 September 2008. .

Dengue Prevention and Control Health Messages

Check the roof gutters regularly for water collection where dengue mosquitoes could breed.

Table 4: Selected notifiable diseases reported by Medical Officers of Health

07th – 13th January 2012 (02nd Week)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Returns Received
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	242	461	3	6	0	0	3	12	0	0	2	4	0	0	0	0	0	0	**92**
Gampaha	256	412	4	7	0	0	2	3	0	0	4	8	0	1	8	14	0	0	**80**
Kalutara	55	97	2	9	0	0	2	5	0	0	3	8	0	0	2	3	0	0	**92**
Kandy	40	104	4	9	0	0	2	2	0	0	0	5	3	7	1	1	0	0	**78**
Matale	8	17	7	10	0	1	2	2	0	0	2	4	1	1	1	1	0	0	**75**
Nuwara	4	13	4	5	0	0	0	0	0	0	1	3	2	4	0	1	0	0	**62**
Galle	20	48	1	6	0	0	1	2	0	1	1	3	0	0	0	0	0	0	**84**
Hambantota	12	28	2	4	0	0	0	0	1	1	2	5	4	7	1	1	0	0	**92**
Matara	58	88	4	6	0	0	1	4	0	0	4	7	3	6	6	10	0	0	**100**
Jaffna	18	34	7	14	0	1	17	37	3	5	0	2	23	63	0	1	0	0	**100**
Kilinochchi	2	8	1	2	0	0	1	2	0	0	0	0	3	7	0	0	0	1	**75**
Mannar	10	25	2	3	1	1	1	2	0	0	0	1	1	2	0	0	0	0	**40**
Vavuniya	3	7	0	0	2	4	1	1	0	2	1	3	0	0	0	0	0	0	**100**
Mullaitivu	0	2	2	2	1	1	1	1	0	0	1	2	0	0	0	0	0	0	**100**
Batticaloa	38	78	1	5	0	0	2	3	0	0	2	2	0	0	0	0	0	0	**64**
Ampara	1	2	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	**29**
Trincomalee	4	15	9	13	0	0	0	2	0	0	1	1	0	0	0	0	0	0	**92**
Kurunegala	26	68	2	5	0	1	1	3	0	0	4	7	6	7	1	4	0	0	**83**
Puttalam	13	41	9	11	0	0	0	1	0	0	0	2	0	1	0	0	0	0	**50**
Anuradhapu	14	21	1	5	0	0	1	1	0	1	7	15	0	1	1	2	0	0	**84**
Polonnaruw	1	4	1	1	0	0	0	0	0	0	3	4	0	0	0	1	0	0	**57**
Badulla	16	22	2	4	0	0	2	3	0	0	0	0	1	1	1	2	0	0	**88**
Monaragala	3	9	2	5	0	1	0	3	0	0	1	7	0	1	1	2	0	1	**82**
Ratnapura	10	39	5	10	0	3	1	1	0	2	5	13	0	0	0	0	0	0	**72**
Kegalle	41	63	1	1	0	0	1	3	1	5	3	4	1	1	7	19	0	0	**82**
Kalmune	11	15	5	14	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**62**
SRI LANKA	**906**	**1721**	**82**	**158**	**04**	**13**	**42**	**94**	**05**	**17**	**48**	**111**	**48**	**110**	**30**	**62**	**00**	**02**	**79**

Source: Weekly Returns of Communicable Diseases WRCD).
***Dengue Fever / DHF** refers to Dengue Fever / Dengue Haemorrhagic Fever.
****Timely** refers to returns received on or before 13th January, 2012 Total number of reporting units 329. Number of reporting units data provided for the current week: 275
A = Cases reported during the current week. **B** = Cumulative cases for the year.

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Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to **chepid@sltnet.lk.**

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