WALS Origin and Operational Use in South East Asia 1988 -

SELEENA BENJAMIN

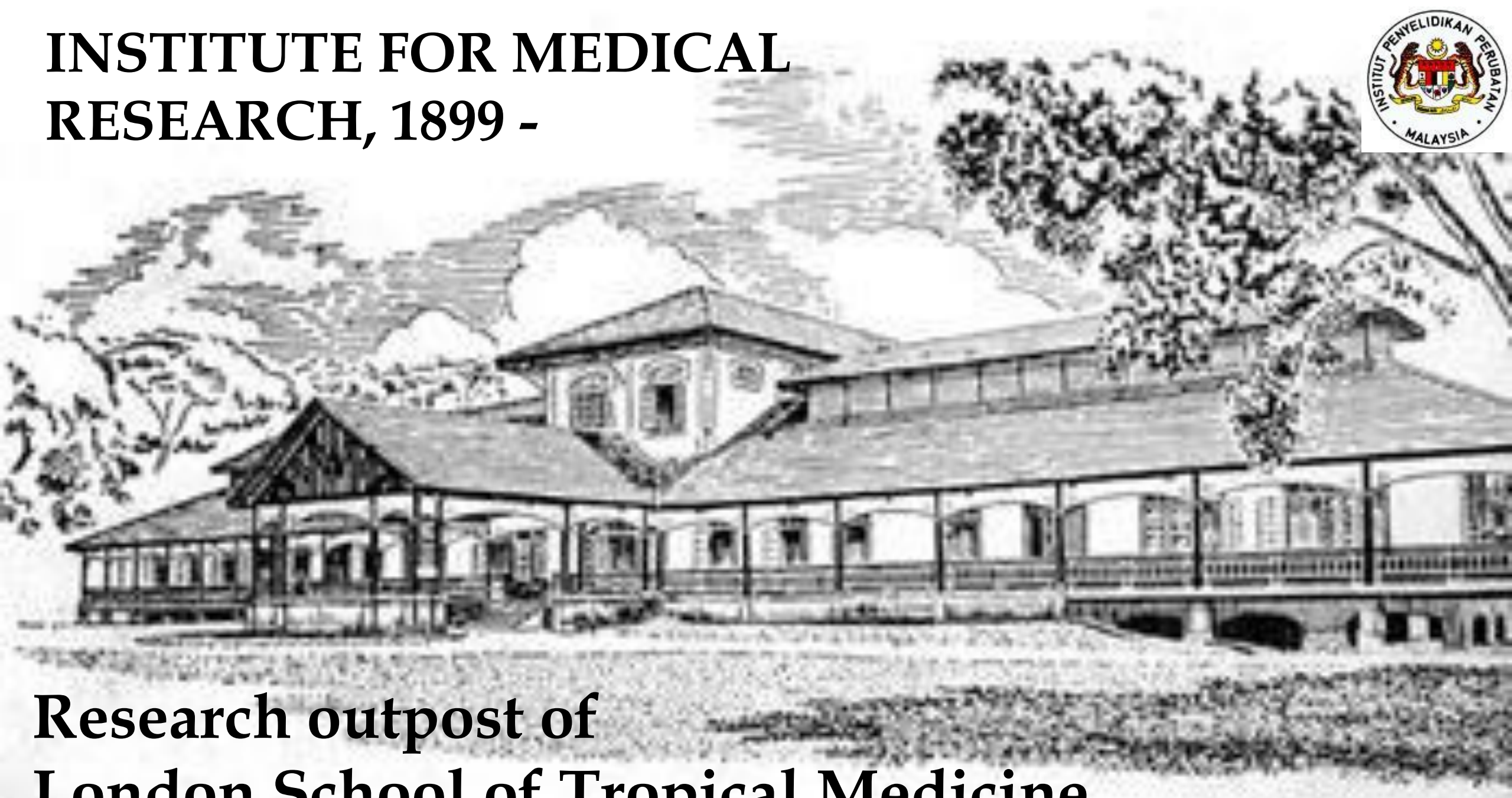
MANAGER
PUBLIC HEALTH BUSINESS
ASIA/INDIA REGION

VALENT BIOSCIENCES

WEST MALAYSIA

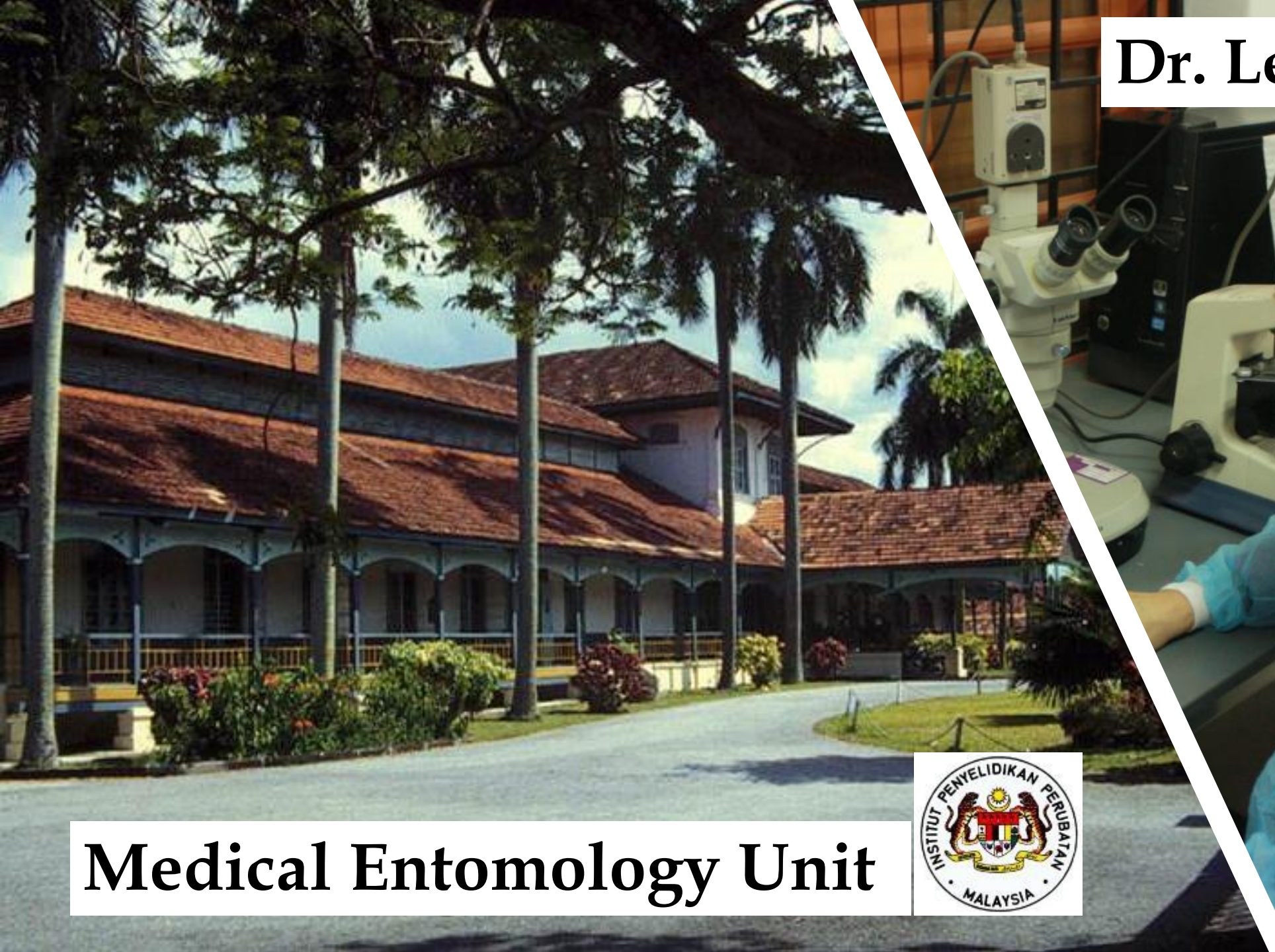
EAST MALAYSIA

INSTITUTE FOR MEDICAL RESEARCH, 1899 -



Research outpost of London School of Tropical Medicine

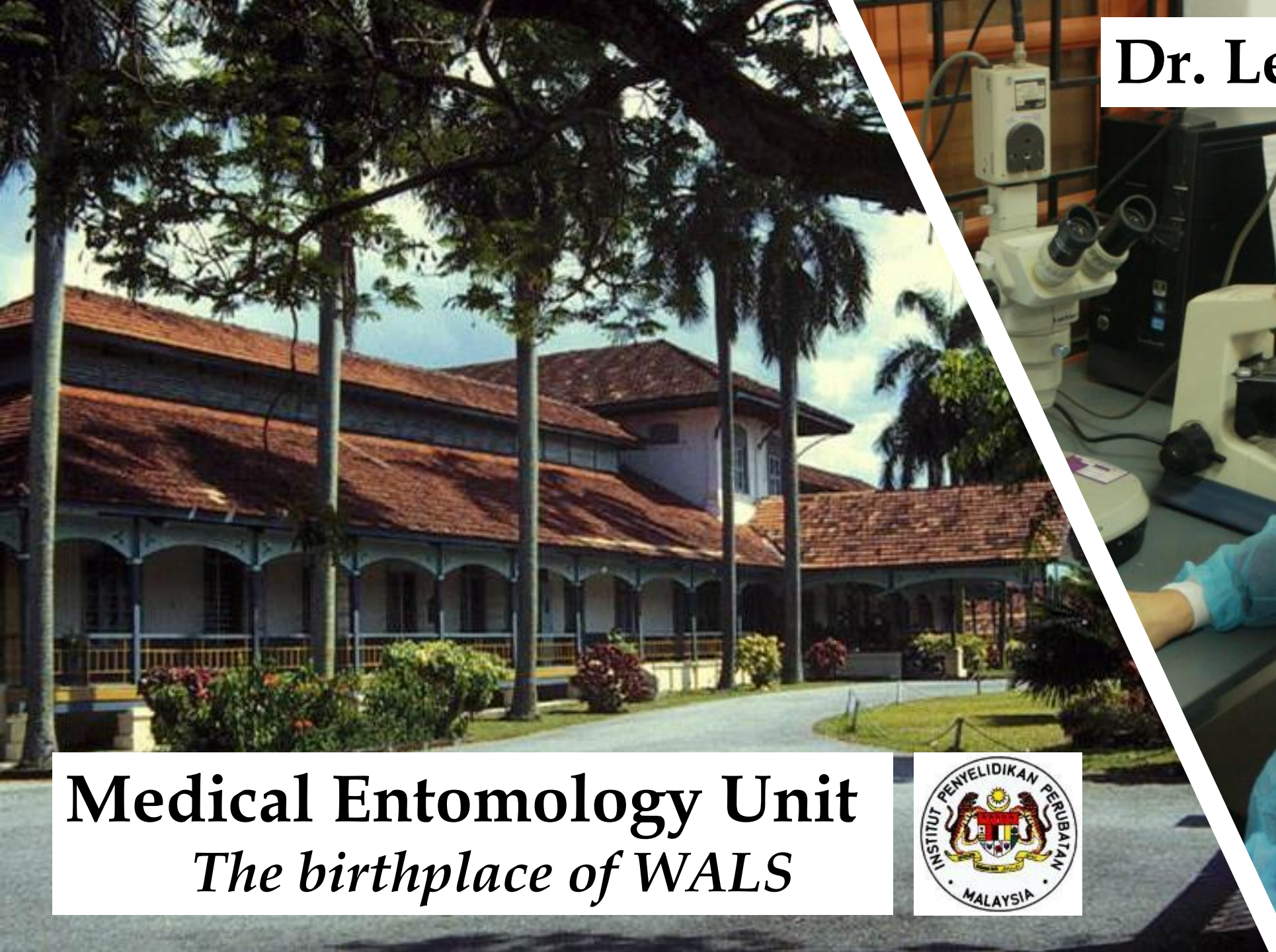
Dr. Lee Han Lim



Medical Entomology Unit

INSTITUT PENYELIDIKAN PERUBATAN • MALAYSIA •

Dr. Lee Han Lim



Medical Entomology Unit

The birthplace of WALS

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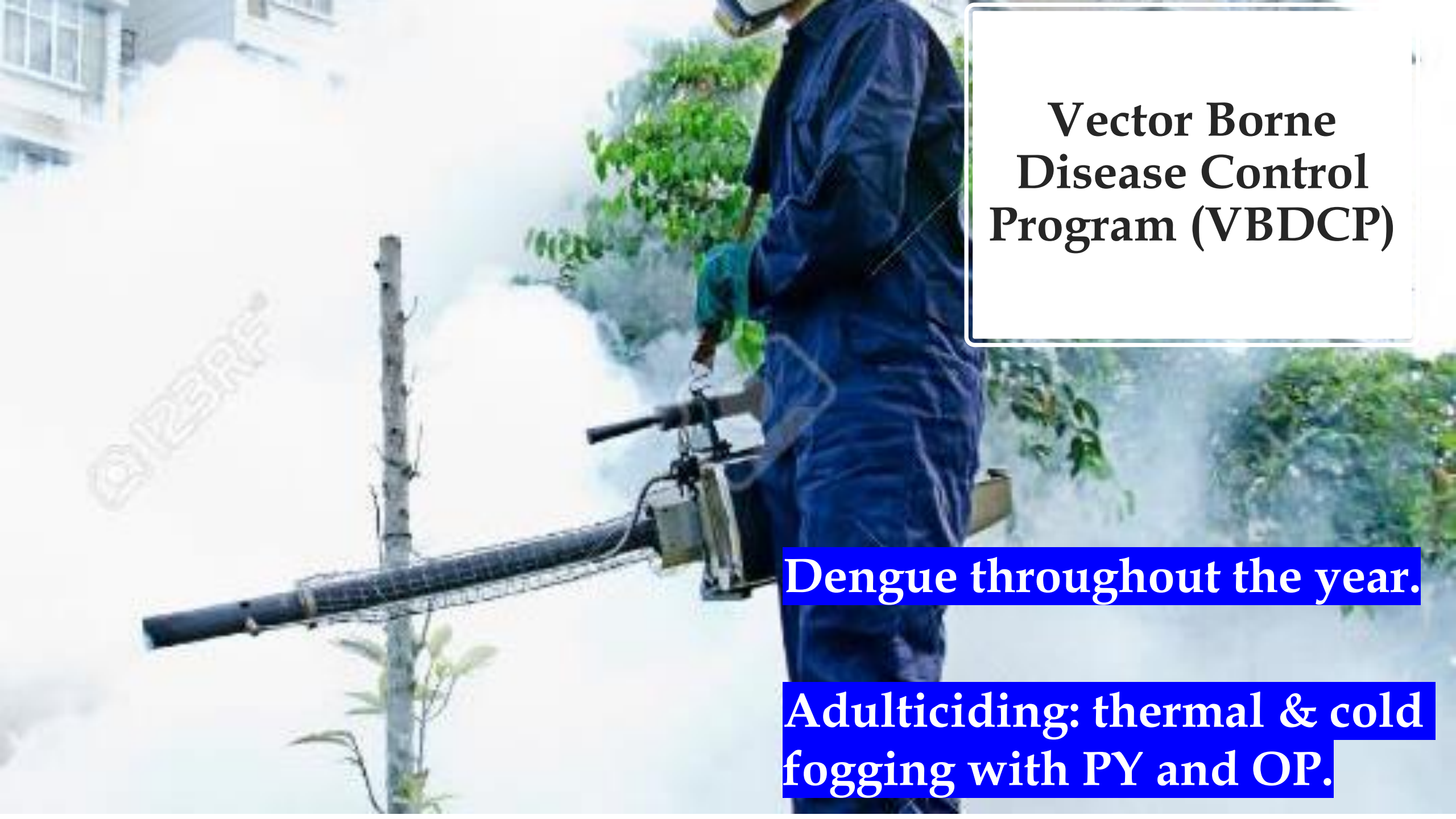


Vector Borne Disease Control Program (VBDCP)

Dengue throughout the year.

Adulticiding: thermal & cold fogging with PY and OP.

Vector Borne Disease Control Program (VBDCP)

Before Bti was integrated into the operational control program in the 2000s….

Larviciding: temephos SG, anti mosquito oil, etc.

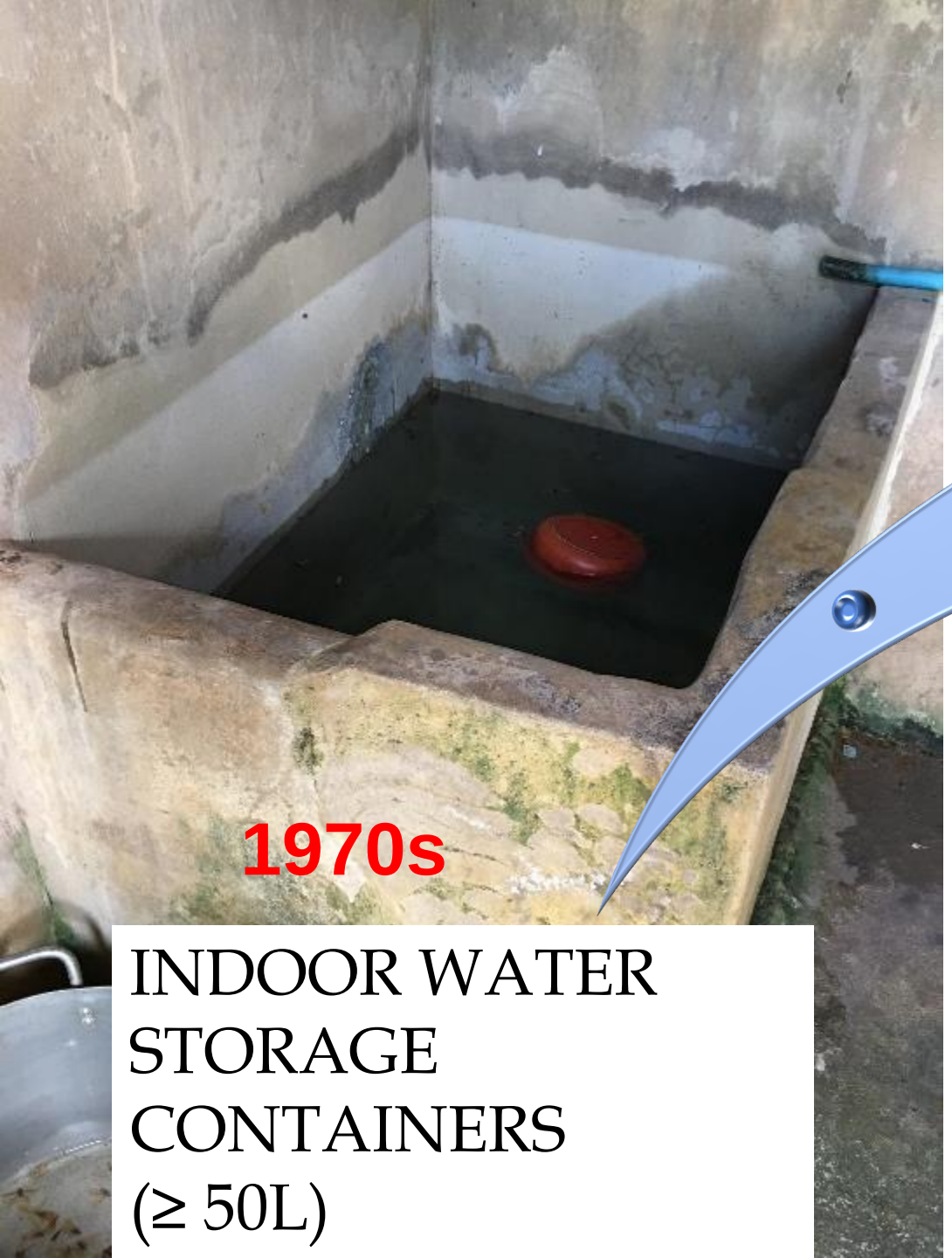
"Obvious larval habitats were treated with granular larvicides or compression sprayers"

Hand held sprayers to spray larvicides.

Challenges faced by VBDCP:

- Dengue was persistent and the cases were increasing.
- Cases happened even when preventive vector control activities were in place.
- Transmission continued in spite of active vector control measures.
- Chemical insecticide resistance.
- Larvicides were impractical to apply in hard-to-reach sites.

Transition of larval habitats over the years



1970s

INDOOR WATER STORAGE CONTAINERS (≥ 50L)

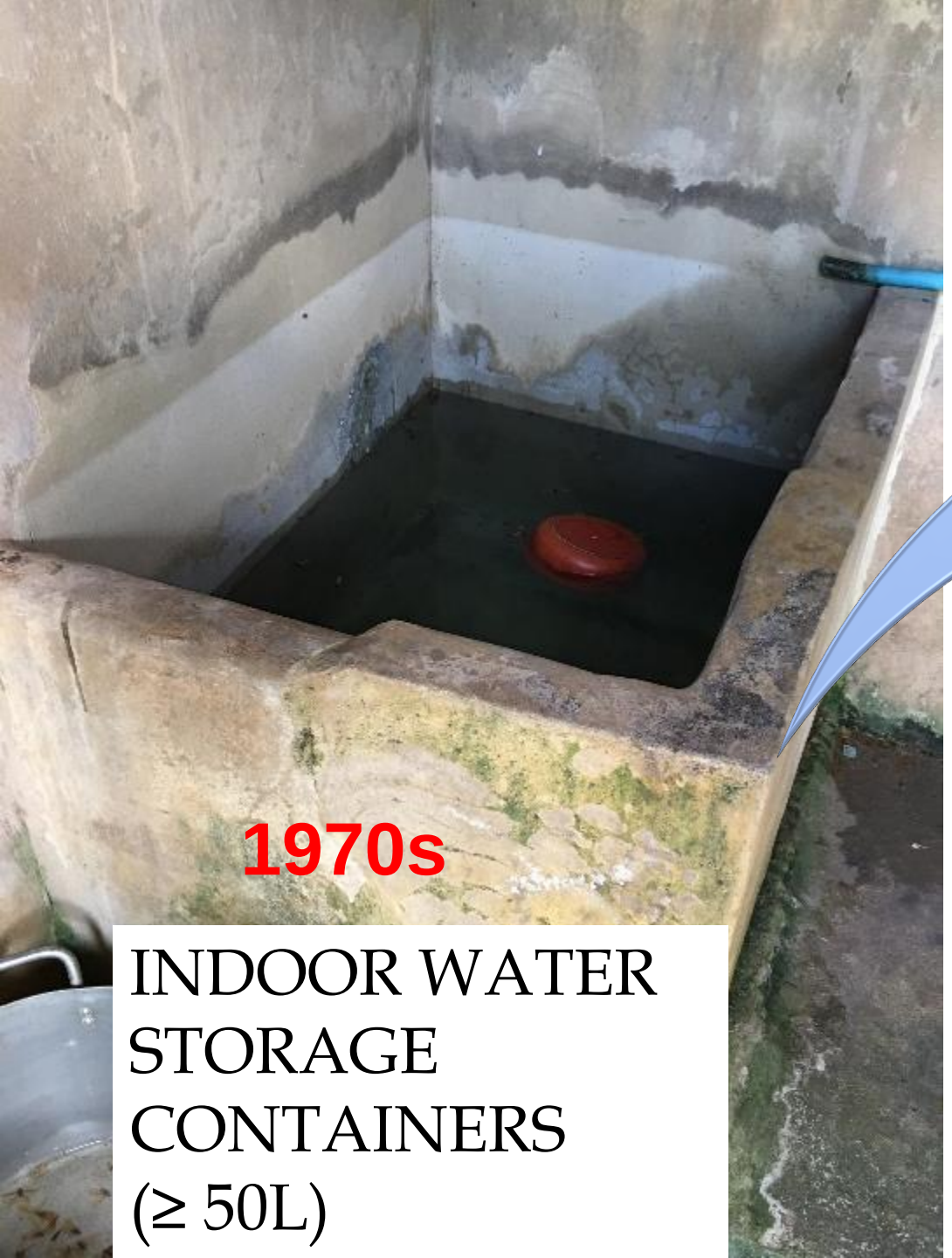
1980s

1990s

OUTDOOR WATER RECEPTACLES

- artificial
- natural
- ≤ 20 L
- 3.5 fold more

Transition of larval habitats over the years



1970s

INDOOR WATER STORAGE CONTAINERS (≥ 50L)

1980s

1990s

OUTDOOR WATER RECEPTACLES

- widespread
- numerous
- cryptic

1988 – early 1990s:
Evaluated Bti formulations & sprayers

- Bti granules, dunks, TP, WP, etc
- Compression sprayer.

1988 – early 1990s: Evaluated formulations & sprayers

X Bti granules, dunks, TP, WP, etc.
X Compression sprayer.

- Bti requires frequent applications.
- Bti clogs the nozzle
- Difficulty in application.
- Bti tends to settle to the bottom of water receptacle soon after application.
- Bti is not effective in polluted waters.

Formulation issue
&
Application equipment issue

1990s -

CHANGE IN THE LARVICIDING APPLICATION STRATEGY TO REACH THE WIDESPREAD, NUMEROUS & CRYPTIC CONTAINERS

Bti spray formulation(s) that can be dispersed as microdroplets, uniformly into the feeding zone of the target larval habitats.

Dengue Vector Control 1994 –

- Outdoor spray application
  - Open fields; Residential estates; Closed car parks
- Truck mounted ULV generators
  - Scorpion
  - Igeba U15
  - Dynafog MaxiPro 4
- Back pack mist blowers
  - Maruyama MD 300/301
  - Stihl SR 380/420
- Thermal fogger
  - AF 35

To disperse Bti micro droplets to reach a wide area

To use the available sprayers

To spray Bti + adulticide together

- Cups with Ae, Cx, An larvae – residual for 14 days
- Cages with adults
- MgO slides

VALENT BIOSCIENCES

#21

Microdroplet Application of Mosquitocidal *Bacillus thuringiensis* Using Ultra Low Volume Generator for the Control of Mosquitoes

P. Seleena and H. L. Lee
Div. of Med. Entomology, Inst. for Med. Research, Malaysia

Ultra low volume (ULV) fogging trials of mosquitocidal *Bacillus thuringiensis* subsp. *israelensis* (B.t.i.) together with malathion against mosquito larvae and adults were conducted in an open air field, housing estates and in a construction site. Commercial aqueous B.t.i. formulation, VECTOBAC 12AS (Abbott Laboratories) containing 1200 ITU/mg against *Aedes aegypti,* and malathion 96% technical grade were used. ULV generators viz. IGEBA and Dynafog Maxipro4 were used to disperse these formulations at discharge rates ranging between 0.25 to 0.50 L/min. The effectiveness of the ULV fogging at various distances from the ULV generator was evaluated by measuring 4 different parameters: larval mortality, adult mortality, B.t.i. count from the test samples and ULV droplet analysis. These trials have indicated that ULV fogging is effective in dispersing the B.t.i. (9v) together with malathion (1v) to affect complete larval and adult mortality. However the mortality varied in relation to the distances from the ULV generator depending on the structure and surrroundings of the building and other environmental factors. Larval mortality remained the same in the test samples even 14 days after the fogging, indicating the persistency of the fogged B.t.i. particles at 28-32°C. These trials have shown that ULV fogging is effective in dispersing bacteria and malathion but to ensure a successful fogging operation the flow rates have to be adjusted in accordance to the ULV generator used and the environment.

INSTITUT PENYELIDIKAN PERUBATAN MALAYSIA

FIELD TRIALS TO DETERMINE THE EFFECTIVENESS OF *BACILLUS THURINGIENSIS* SUBSP. *ISRAELENSIS* APPLICATION USING AN ULTRA LOW VOLUME GENERATOR FOR THE CONTROL OF *AEDES* MOSQUITOES

P. SELEENA AND H.L. LEE
Division of Medical Entomology, Institute for Medical Research, Jalan Pahang, 50588 Kuala Lumpur, Malaysia

ABSTRACT

Ultra low volume (ULV) fogging trials of mosquitocidal *Bacillus thuringiensis* subsp. *israelensis* (*Bti*) together with malathion against *Aedes* mosquito larvae and adults were conducted in an open-air field, in housing estates and at a construction site. A commercial aqueous *Bti* formulation, VECTOBAC 12AS® (Abbott Laboratories) containing 1,200 ITU/mg against *Aedes aegypti*, and malathion 96% technical grade were used. ULV generators, viz. IGEBA® and Dynafog Maxi Pro 4® were used to disperse these formulations at discharge rates ranging between 0.25 to 0.50 L/min. The effectiveness of the ULV fogging was evaluated by measuring 4 different parameters at various distances from the ULV generator: larval mortality, adult mortality, *Bti* count from the test samples and ULV droplet analysis. These trials have indicated that ULV fogging is effective in dispersing a mixture of malathion and *Bti*, to affect complete larval and adult mortality simultaneously. However, the mortality varied in relation to the distances from the ULV generator, depending on the structure and surroundings of the house. The fogged *Bti* particles were able to affect larval mortality for a duration of 14 d post ULV, indicating the persistency of the fogged *Bti* particles in the environment. These trials have shown that ULV fogging is effective in dispersing bacteria and malathion simultaneously; however, to ensure a successful fogging operation the flow rates have to be adjusted in accordance with the ULV generator used and the environment.

#21

Microdroplet Applicatio
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P. Sele
Div. of Med. Entomology

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FIELD TRIALS TO DETERMINE THE EFFECTIVENESS OF *BACILLUS*
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Will the sprayed Bti microdroplets impact the wild population ?

Will the sprayed Bti microdroplets impact the disease ?

Malaria Control 1998-2001

Malaria Control 1998-2001

- *An balabacensis*
- Shallow muddy pools – footprints
- VectoLex WDG
- Backpack mister, sprayed the entire village
- Adult mosquito surveillance

Space spraying of bacterial insecticides against *Anopheles balabacensis* for the control of malaria in East Malaysia. SEAJTMPH 2004: 68-78

VectoBac® WDG WALS and its impact on mosquito vector control and disease transmission, 2004 - 2019

- **Outdoor spray application**
  - Residential estates
  - Dengue endemic sites
  - *Ae aegypti* and *Ae albopictus*
  - Ovitrap surveillance (Target < 10%)
  - Dengue cases/incidence rate

- **Outdoor spray application**
  - Dense vegetation with swamps
  - Malaria vector and *Ae albopictus*
  - Ovitrap surveillance
  - Adult mosquito surveillance.
  - Malaria cases

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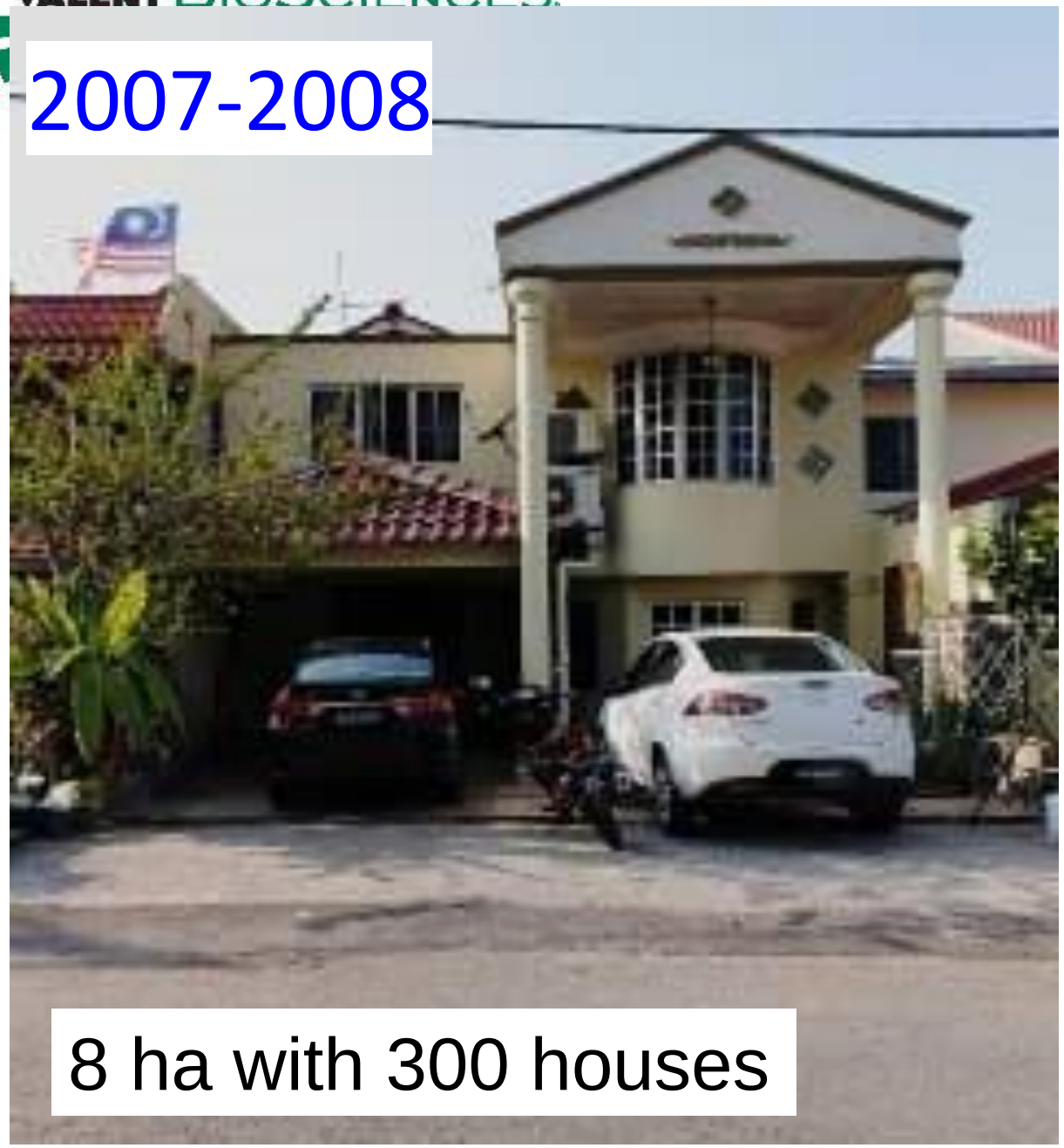
  - Adult mosquito surveillance.
  - Malaria cases

- ≤ 12 ha with back pack misters.
- ≥ 12 ha + tracks with truck mounted ULV generators.

VALENT BIOSCIENCES

2007-2008

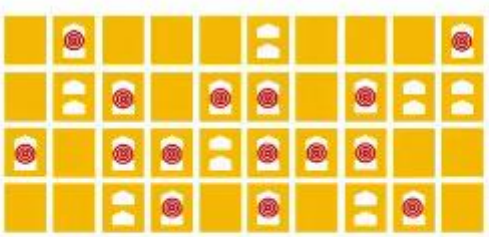


8 ha with 300 houses

One year study, 2007-2008
60 ovitraps per site

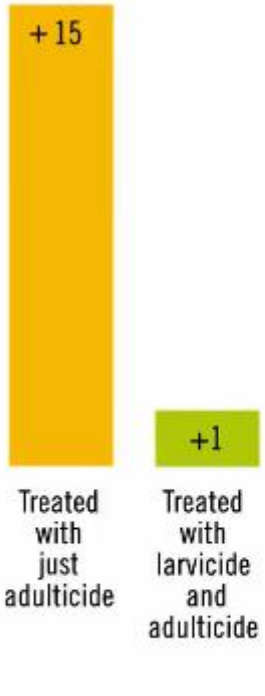
MALAYSIA

CONTAINER MOSQUITO CASE STUDY | 2007-2008



10 Hectares — 400 Houses

8 Hectares — 300 Houses



≥ 40% OI & 15 dengue cases in non Bti WALS treated area

≤ 10% OI & 1 dengue case in Bti WALS treated area

Tan AW et al (2012), SEAJTMPH, 296 – 310

1st publication to show that vector control impacted dengue transmission.

VALENT BIOSCIENCES

PLOS ONE

2015-2016

https://doi.org/10.1371/journal.pone.0230910

Editor: Richard Paul, Institut Pasteur, FRANCE

Received: October 21, 2019

Accepted: March 11, 2020

Published: April 1, 2020

RESEARCH ARTICLE

Wide area spray of bacterial larvicide, *Bacillus thuringiensis israelensis* strain AM65-52, integrated in the national vector control program impacts dengue transmission in an urban township in Sibu district, Sarawak, Malaysia

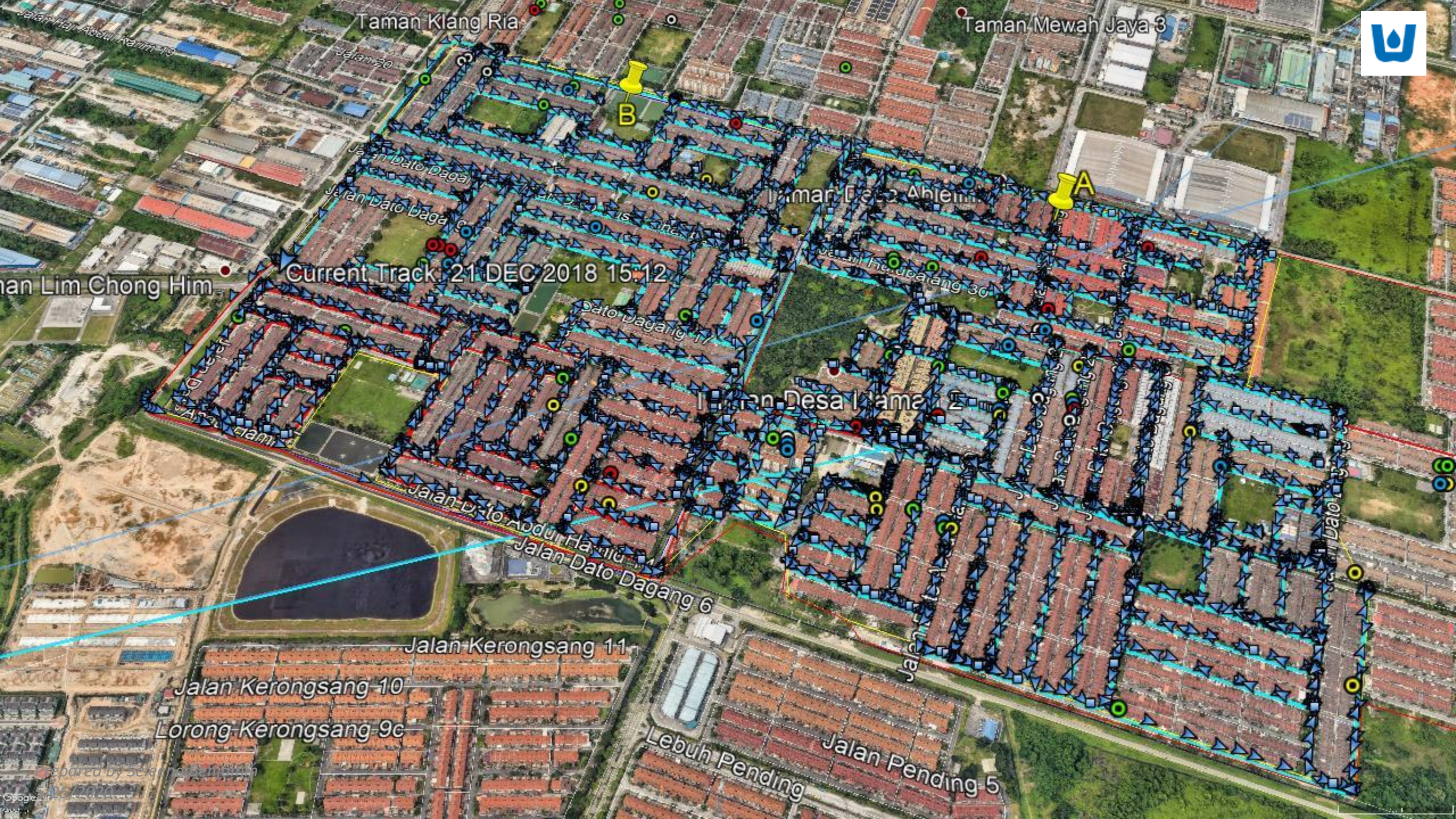
Selangor State, Malaysia, 2018 – 2019.

- 174 ha residential estate.
- Transmission from EW47/ 2018.
- WALS from truck mounted ULV.

TIFA ULV HD PLUS

Prepared by Seleena Benjamin 5/25/2020

Prepared by Seleena Benjamin
5/25/2020


Taman Klang Ria
Taman Mewah Jaya 3
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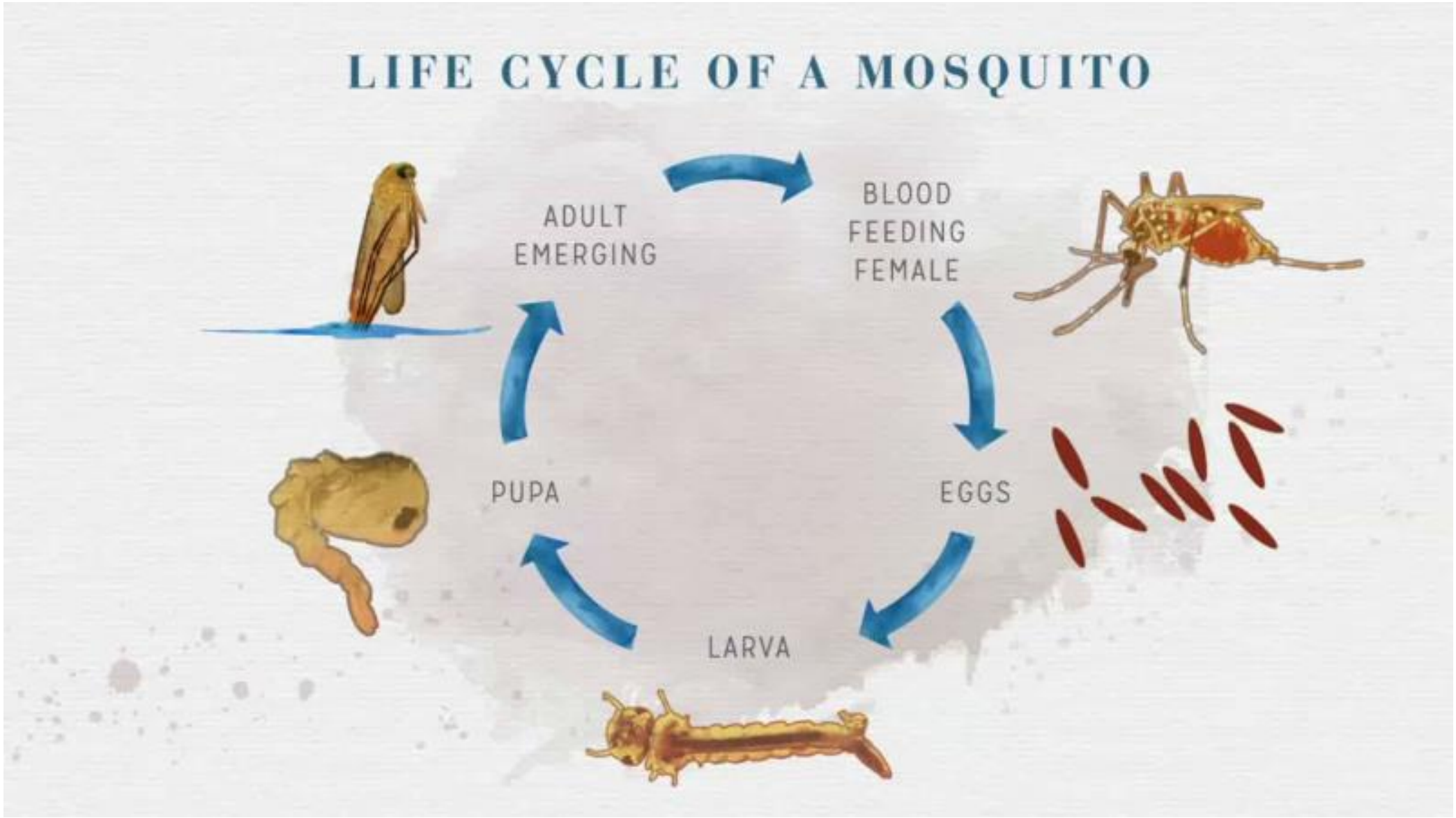
Current Track 21 DEC 2018 15.12
Jalan Dato Dagang 6
Jalan Kerongsang 11
Jalan Kerongsang 10
Lorong Kerongsang 9c
Lebuh Pending
Jalan Pending 5
Prepared by Selenoid Technology
Sdn Bhd 2020

WALS Treatment Schedule, 2004 - 2020

Once a week for 4 weeks	Once in 2 weeks for 2 months	Once in 2 weeks for ?
○ Outbreak ○ OI ≥ 20 %	○ Reduction in cases ○ OI ≤ 10 %	

VALENT BIOSCIENCES



WALS Treatment Schedule, 2004 - 2020

Once a week for 4 weeks	Once in 2 weeks for 2 months	Once in 2 weeks for ?
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WALS Treatment Schedule, 2004 - 2020

Impact on transmission observed

- *Surviving adult mosquitoes.*
- *Virus incubation in mosquitoes and human.*

- Distance between the WALS treated and non WALS treated site is at a minimum 11 m apart.
- Flight range of 150 m.

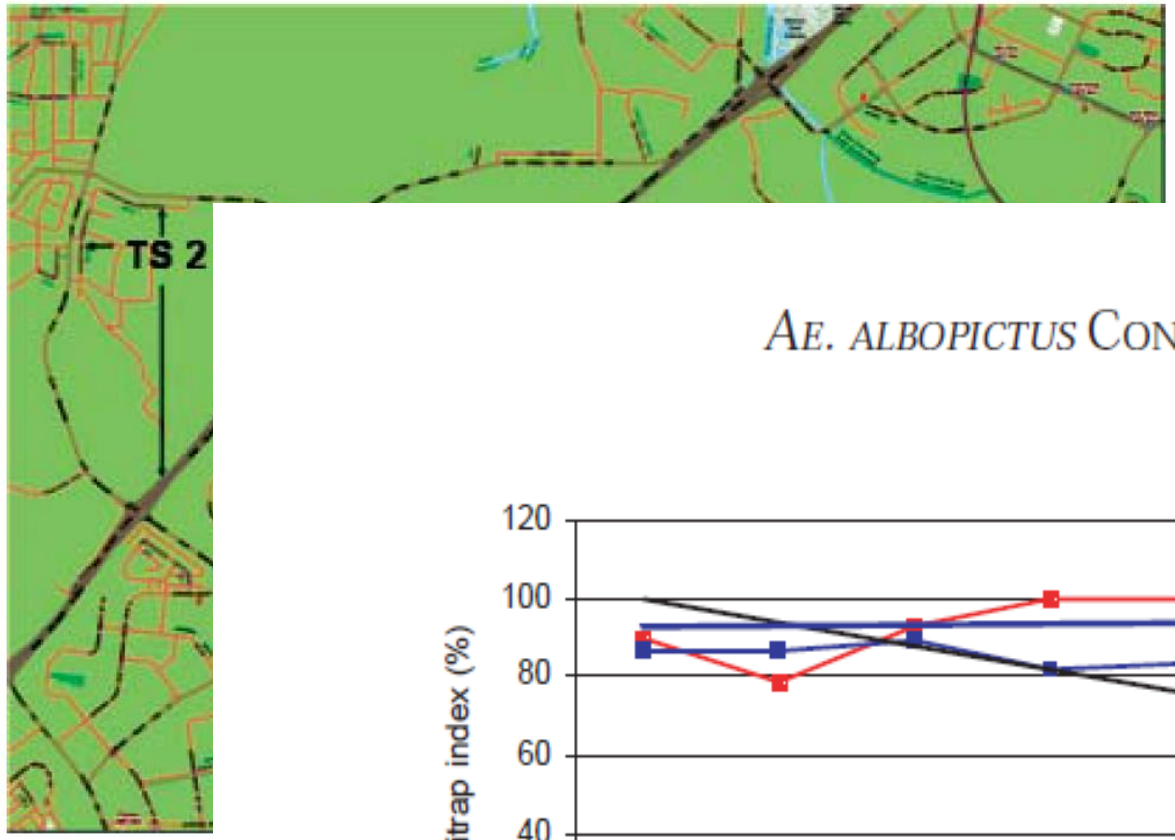
- VectoBac® WDG WALS spray from truck mounted ULV generator significantly aided in interrupting the dengue transmission.

- This application strategy is a key tool to suppress the vector population in wide areas with numerous larval habitats which are difficult to be treated by compression sprayers or direct application.

SINGAPORE ARMY 2001 -

- 130 ha
- Dense vegetated site
- *Ae albopictus*
- Igeba U40 and Stihl SR420
- Ovitrap surveillance

SINGAPORE ARMY 2001 -



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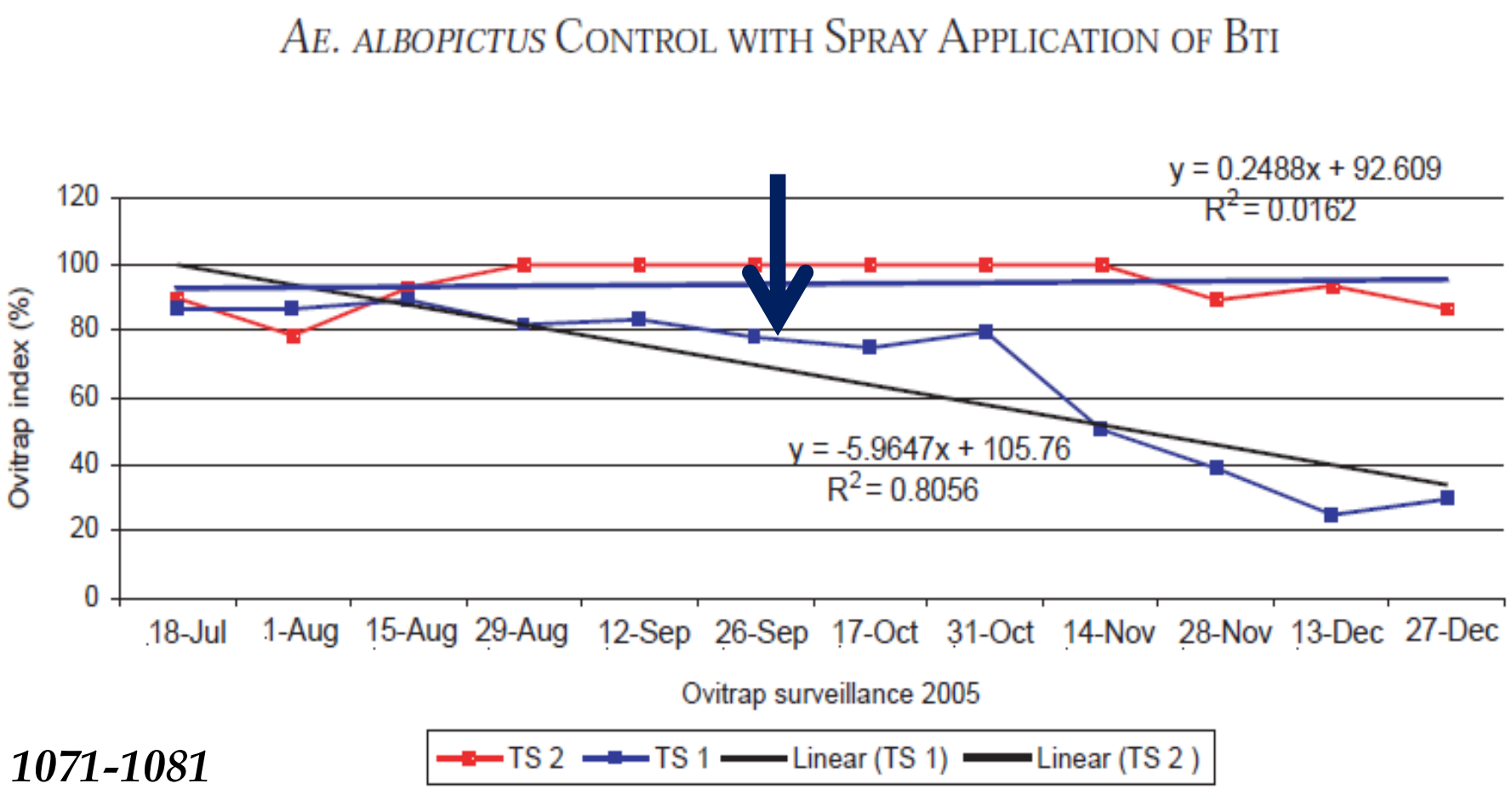
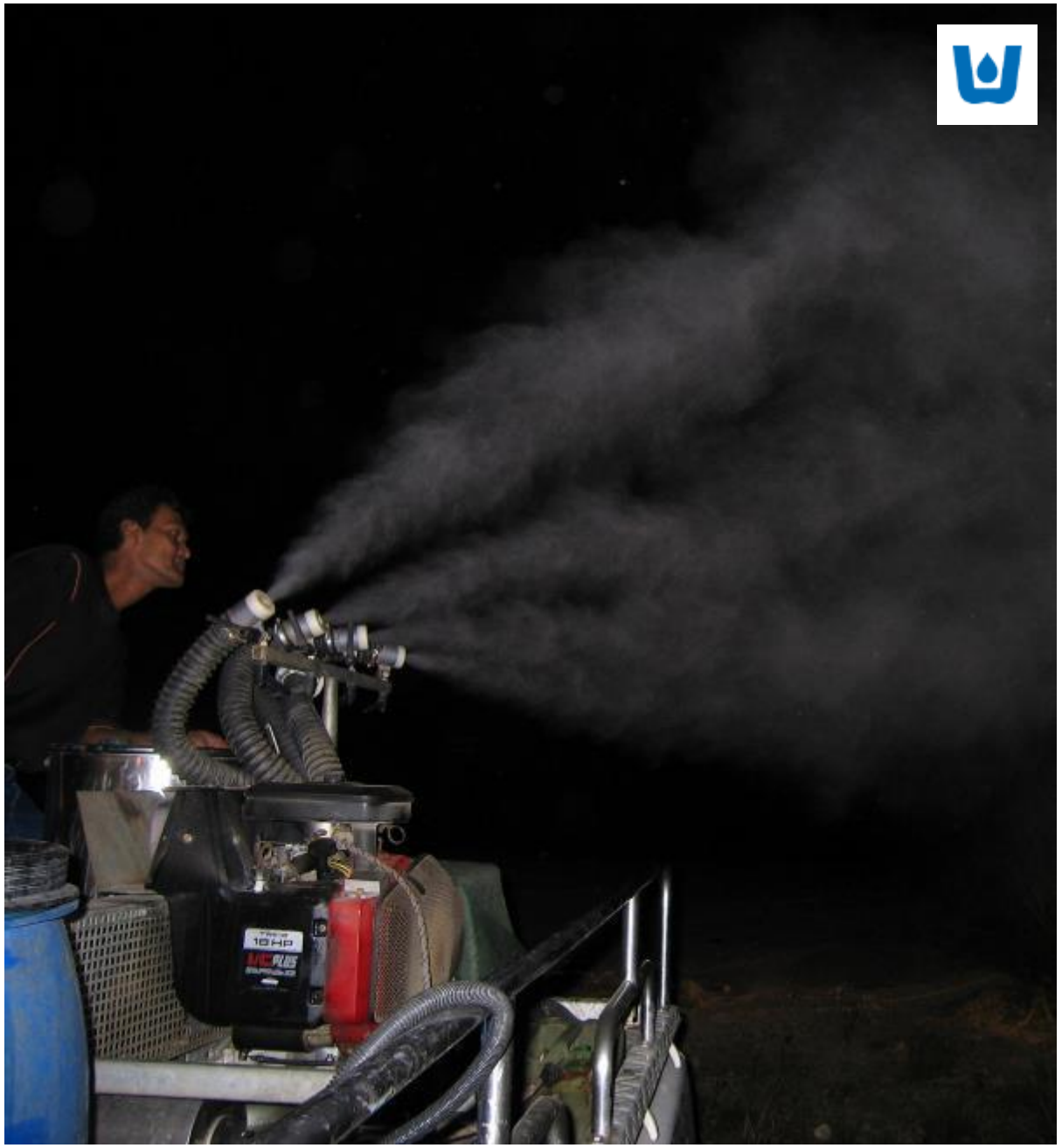


SEAJTMH 2010: 1071-1081

SINGAPORE ARMY 2007 -

- Routine malaria vector control and other mosquitoes
- Dense vegetated site
- Igeba U40 and Stihl SR420

VALENT BIOSCIENCES



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Am. J. Trop. Med. Hyg., 82(6), 2010, pp. 1024–1029
doi:10.4269/ajtmh.2010.09-0562

Elimination of Malaria Risk through Integrated Combination Strategies in a Tropical Military Training Island

✓ No malaria cases.
✓ Terminated chemoprophylaxis program

AMJTMH 2010: 1024-1029

Wide Area Spray Of VectoBac WDG Microdroplets Impacts The Mosquito Population and the Disease.

5/12/2020

Bti is not effective in polluted waters ?

But, VectoBac WDG WALS shows otherwise…

4 hours after VectoBac WDG WALS, all *Culex* larvae were dead

IMR studies have shown that Bti microdroplets kill *Culex* larvae faster than the *Aedes* larvae.

Dengue Control Program – *Culex* is killed !

VectoBac WDG WALS, from truck mounted ULV generator or a back pack mistblower, is acknowledged as a key tool in disease control programs.

CHALLENGE:

- Efficient & sufficient sprayers.

THANK YOU