PacMOSSI

Pacific Mosquito Surveillance Strengthening for Impact

RESIDUAL SPRAYING

AGAINST *AEDES* VECTORS IN THE PACIFIC

Workshop Presentation Slides

Table of Contents

Opening session

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Opening session

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Explain the focus of the workshop
- Express your expectations for the workshop

2

Rationale for workshop

Residual spraying is an important intervention against *Aedes* mosquitoes

- It can prevent *Aedes* mosquitoes from transmitting dengue, Chikungunya and Zika
- Spray operations must ensure high coverage of households, structures and harbourages, with high quality and safe application of insecticides
- Low-quality spraying can jeopardise the residual spray program

3

Training of spray operators is therefore important to ensure quality vector control that is safe and effective.

It is essential that every spray operator demonstrates competency before moving to the field and performing residual spraying without supervision.

4

This workshop is designed for spray operations to support training for quality, safe and effective residual spraying against *Aedes* vectors in the Pacific.

5

Objectives for the workshop

By the end of this workshop, you will be able to:

Recount key requirements for quality, safe and effective residual spraying indoors and in harbourage sites of *Aedes* vectors

Explain:

- How to sensitise households and prepare houses for spraying
- How to target spraying to specific locations and areas within locations
- Correct spraying techniques for hand compression sprayers (and motorised mist blowers)
- Correct handling, use, maintenance and disposal of residual spraying equipment and supplies
- Correct completion of spray activities, including tracking/reporting

6

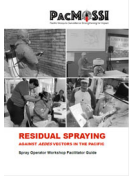
Overview of workshop

	Day 1	Day 2	Day 3	Day 4	Day 5
8:30-9:15	**Opening** Pre-workshop test	Review of Day 1	Review of Day 2	Review of Day 3	Review of Day 4
9:15-10:15	**S1: Introduction** • Residual spraying principles	**S6: Daily preparations and tasks** • Daily spray tasks	**S12: Indoor spray technique** • Re-pressurising the sprayer	**S19: Sprayer maintenance and storage**	**S24: Spraying in difficult situations**
10:15-10:30	*BREAK*	*BREAK*	*BREAK*	*BREAK*	*BREAK*
10:30-12:30	**S2: Overview of residual spraying against *Aedes*** • Mosquitoes • Spray priorities • Do not spray	**S7: Preparing spray units** **S8: Practice communicating with community** • Preparing housing units	**S13: Practice indoor spray technique**	**S20: Practice checking discharge rate**	**S25: Practice troubleshooting**
12:30-13:30	*LUNCH*	*LUNCH*	*LUNCH*	*LUNCH*	*LUNCH*
13:30-15:30	**S3: Health and safety** • Incidents • First Aid	**S9: Spray equipment and insecticides**	**S14: Outdoor harbourage treatment** **S15: Practice treatment of outdoor harbourages**	**S21: Supervision and data management** **S22: Practice using forms**	**S26: Review session** • Code of conduct
15:30-15:45	*BREAK*	*BREAK*	*BREAK*	*BREAK*	*BREAK*
15:45-17:00	**S4: Personal protective equipment (PPE)** **S5: Practice with PPE** • Don/doff	**S10: Mixing insecticide and pressurising** **S11: Practice mixing and pressurising**	**S16: Outdoor residual spraying beyond the yard** **S17: Practice spraying beyond the yard** **S18: End of day clean up** • Progressive rinse	**S23: Spray skills observation** • Skills test	**Closing** • Post-workshop test

Key: *Classroom learning* | *Practical demonstrations* | *Hands-on participation*

7

Resources



***PacMOSSI Spray Operator Workshop Facilitator Guide**:* Maps out workshop information, preparations, requirements and sessions. Module format, so it can be adapted to the needs of the participants. Includes Annexes with workshop and data resources.

***PacMOSSI Spray Operator Field Guide**:* Principal technical resource. Simple overview of key technical content covered in sessions.

***PacMOSSI Spray Operator Workshop Presentations**:* Detailed technical content for classroom sessions.

Videos: Mainly for Goizper hand compression sprayers but can replace these with other videos in country trainings if needed.

SPC/WHO Manual for *Aedes* Vector Surveillance and Control in the Pacific: reference manual for technical details.

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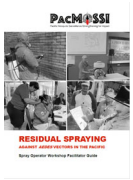
Participant assessments



- ***Attendance sheets:*** to be completed daily (Annex 1)
- ***Pre-workshop written test:*** knowledge self-assessment and multiple-choice test. Helps the facilitator better understand the level of knowledge and experience participants have when they enter the course, indicating areas where additional emphasis may be needed (Annex 2)
- ***Post-workshop written test:*** knowledge self-assessment and multiple-choice test**.** Affirms that participants have gained the required knowledge and reached the required level of competency (Annex 3)
- ***Skills observation test:*** measures ability of participants to perform 10 core skills. Allows facilitators to observe the participants and provide any corrective directions to improve their spray technique (Annex 4)
- ***Workshop assessment:*** end of workshop feedback. Provides feedback to facilitators to inform any adjustment of workshop content or delivery so that future workshops adequately meet the needs of participants (Annex 5)

9

Logistical arrangements

- Safety
- Transport
- Start and break times
- Bathrooms
- Water
- In case of an emergency
- If other help is needed

10

Expectations

For participants

- Be present: on time and focussed
- Be respectful
- Ask if you do not understand
- Support other participants
- **Actively participate**

For facilitators

- Be present: on time and focussed
- Be respectful
- Help all participants build the skills they need
- Answer all questions or find answers

11

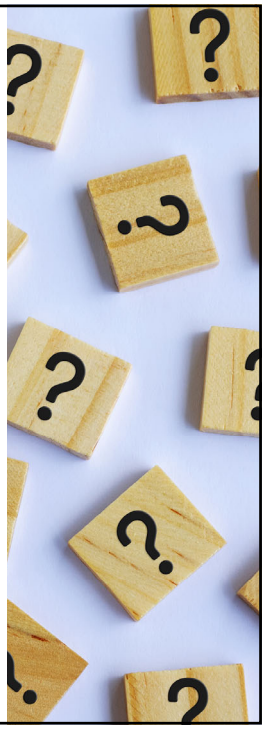
Actively participate

Volunteers please

- Herders (2)
- Meeting timekeepers (2)
- Energisers (4)
- Reporters (4)
- Grievance officers (2)

12

Ask questions!



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Pre-workshop test

- Complete individually
- 20 minutes assigned
- Do your best – you are not expected to know all the answers!
- Do not look up online or ask anyone for help
- Raise hand if any questions
- Raise hand when completed

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Session 01:

Introduction to residual spraying

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 01:

Introduction to residual spraying

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Explain how residual spraying is conducted
- Discuss goals for vector-borne disease prevention
- Explain when residual spraying is appropriate
- Explain the benefits of residual spraying

2

What do you know about residual spraying?

3

What is residual spraying?

The process by which a long-lasting insecticide is applied to the common resting sites of mosquitoes inside houses and other buildings and outside in harbourage areas.

4

How does residual spraying differ from other types of spraying?

- Applied to areas where mosquitoes rest
- Relies on residual efficacy of insecticides
- Has extended impact, generally for at least 3-4 months

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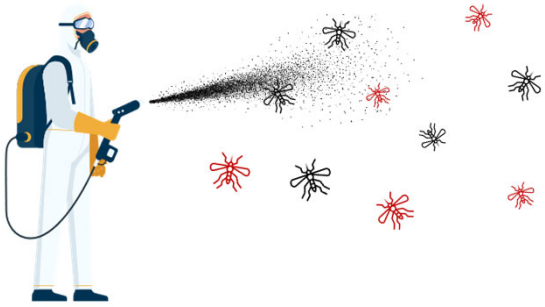

- Residual spraying exposes mosquitoes to the insecticide
- This kills them, preventing them from transmitting the pathogen

Residual spraying can drastically reduce the transmission of vector-borne diseases in participating communities.

6

What concerns do community members typically have about residual spraying?

7

Activity: fact or fiction?

Consider each statement. Is it a fact or a myth?

Walk to the side of the room that reflects your opinion.

8

Activity debrief

Why do you think we conducted it this way?

What is the advantage of:

- Having participants decide if a statement is fact or myth?
- Letting participants see how others vote?
- The facilitator's seeing how the group voted?
- Having participants move around the room?

9

Where is residual spraying appropriate?

1-2X

10

What makes residual spraying successful?

- Precise planning, preparation, and logistics
- Dedicated and disciplined spray operators
- Well-organised and diligent supervisors
- Enough staff for payroll, procurement, environmental compliance, and other tasks
- Good data recording, communication, and community relations

11

What are the benefits of residual spraying?

- Mosquitoes that cause disease are killed
- Fewer children and adults suffer from sickness
- Fewer days are missed from school and work
- Families are healthier and happier
- Communities are more productive
- Less money is spent on clinic visits and medication for vector-related illness

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Key messages

- Residual spraying can effectively prevent diseases – if done under appropriate conditions and to high quality.
- There are numerous benefits of residual spraying.
- An important part of the role of those working on residual spraying is to dispel myths and misconceptions about residual spraying.

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Session 02:

Overview of residual spraying against *Aedes*

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 02:

Overview of residual spraying against *Aedes*

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Explain key considerations for residual spraying against *Aedes*
- Describe the targets for residual spraying

2

Know your enemy

Successful vector control depends on understanding the habitats and behaviours of the vectors in an area and then selecting interventions to which the mosquito's behaviours make it most susceptible.

Aedes aegypti

Aedes albopictus

Aedes polynesiensis

Left image: CDC/James Gathany
Middle image: CDC/James Gathany
Right image: CINHP/G.McCormack

3

***Aedes* mosquitoes can transmit diseases to humans** such as dengue, chikungunya and Zika.

Residual spraying against *Aedes* involves **applying a long-lasting insecticide** to surfaces on which these mosquitoes commonly rest.

Derivative of Spraying to prevent malaria by DFAT, CC BY 2.0

4

Types of residual spraying

Depending on the resting sites of local *Aedes* vectors, residual spraying can be conducted:

Indoor residual spraying

Outdoor residual spraying of harbourages
(including larval habitats)

Images: Prof Scott Ritchie

5

Indoor residual spraying (IRS) is the application of residual insecticides to the resting sites of *Aedes* mosquitoes inside houses.

Image: Ranjith de Alwis, World Health Organization, Vanuatu

6

IRS *Aedes*

- Very effective at controlling *Aedes* mosquitoes
- Vector absorbs a lethal dose when it comes into contact with a sprayed surface
- Residual activity lasts for at least 3-4 months
- Best method to quickly reduce *Aedes* density during an outbreak
- Supported by the WHO Vector Control Advisory Group

7

Outdoor residual spraying (ORS) is the application of residual insecticides to outdoor resting sites.

Image: Dr Mutizwa Odwell Muzari, Queensland Health

8

ORS *Aedes*

- Resting sites on vegetation are called **peri-domestic** areas
- Residual spraying of peri-domestic areas is called **barrier spraying** or **harbourage spraying**
- May be effective against vectors such as as *Ae. albopictus*, *Ae. polynesiensis* and *Ae. hensilli*
- Uses a residual insecticide so less frequent re-application is needed
- Persists for ~6 weeks, is rain-resistant when dry and degrades minimally when exposed to UV

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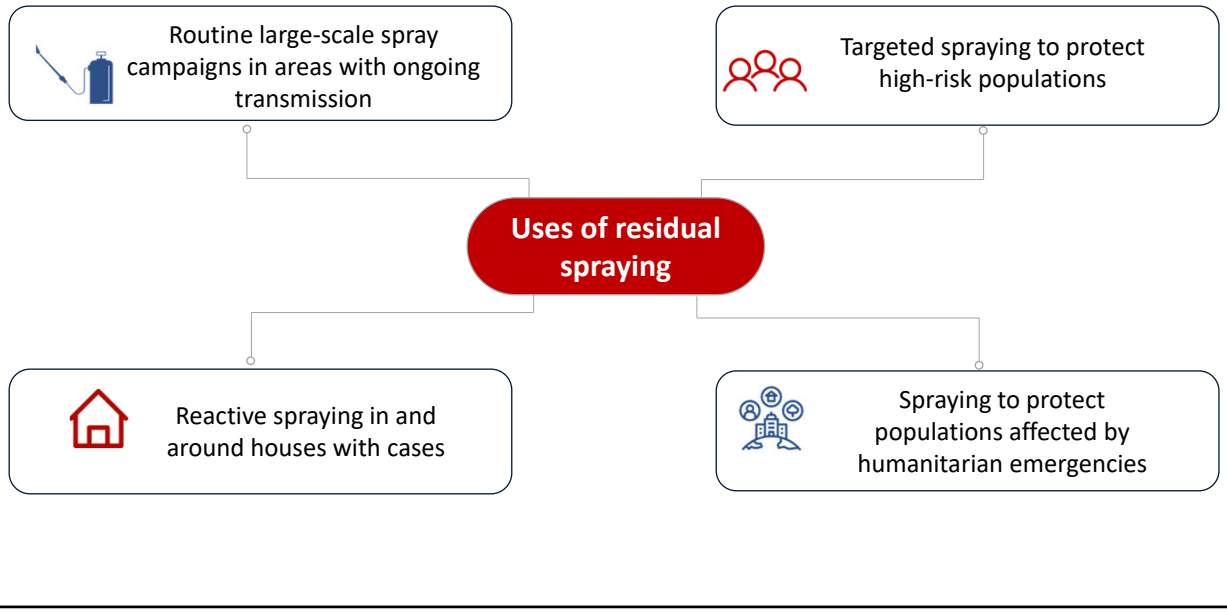

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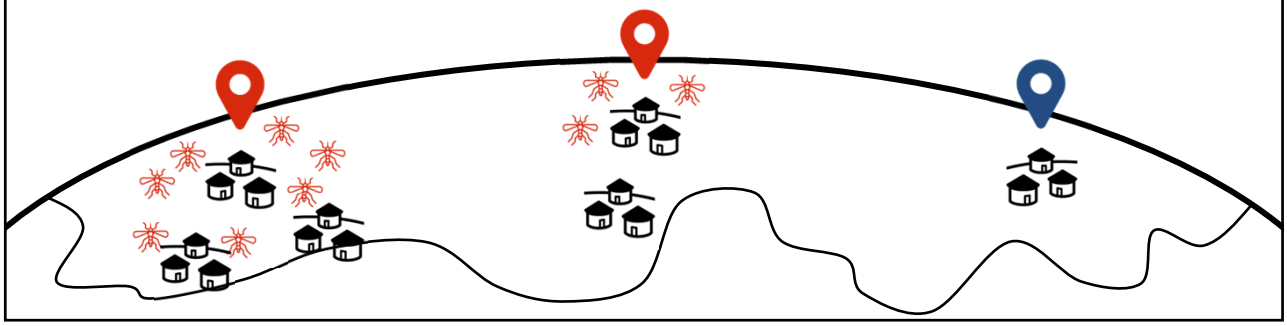
Targets for residual spraying

1. **Response areas:** spray at locations with a disease outbreak or elevated risk.



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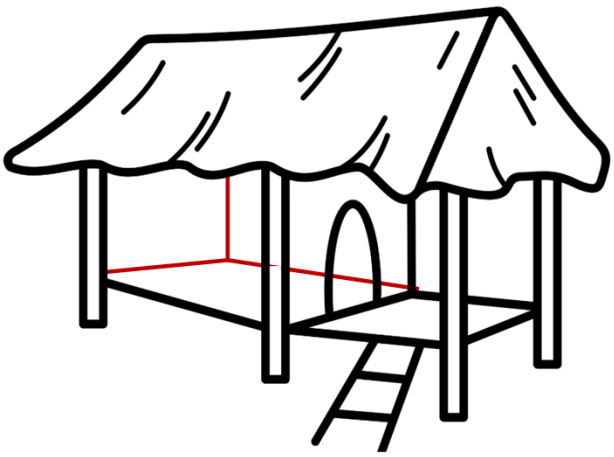
Targets for residual spraying

2. **Housing unit:** houses and associated structures that are common resting sites of vectors



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Where to residual spray

3 **Community spaces:** include structures or common areas where people sleep or gather during the day e.g., markets, community centres, schools

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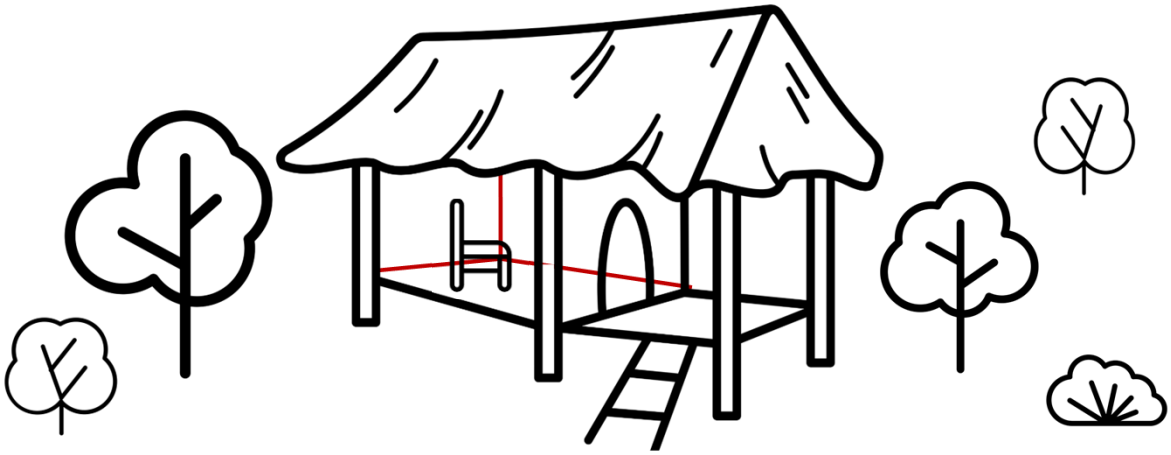
Where to residual spray

4 **Sprayable surfaces:** the specific areas within and around structures that adult *Aedes* use as resting sites and that can retain residual insecticide



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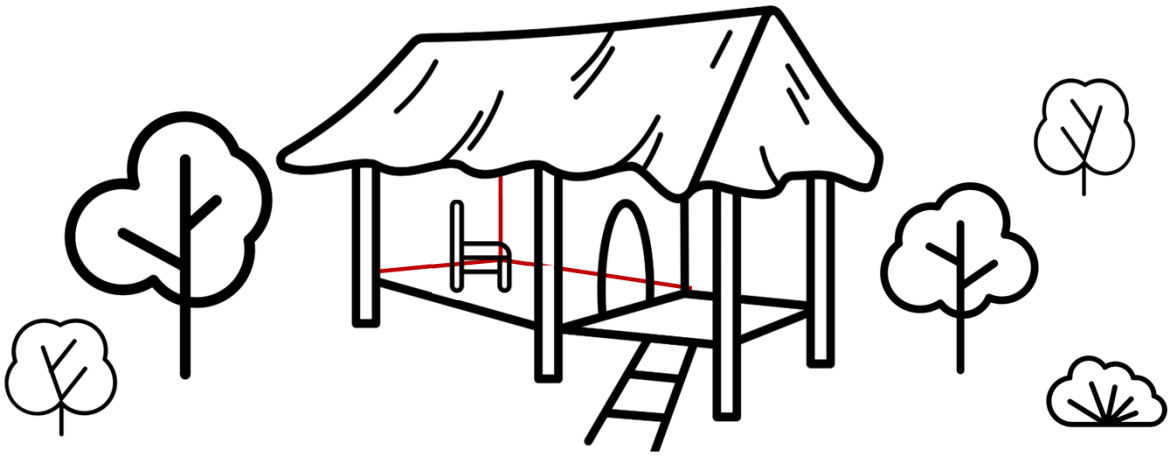
Where to residual spray

5 **Harbourage areas:** potential adult resting sites and larval habitats outdoors



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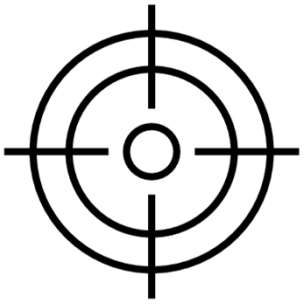

The aim is to treat sprayable surfaces of all appropriate structures for every housing unit and community space plus all harbourages within a response area.

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Key messages

- Knowledge of key vector habitats and behaviours is critical for residual spraying
- It can be applied for different purposes
- It can be applied in different areas, locations (indoors, outdoors, harbourages), structures, surfaces
- Residual spray programs must be adapted to the situation

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Session 03:
Health and safety

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 03:

Health and safety

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Identify hazards to be aware of when spraying houses and yards
- Identify best practices for minimising exposure to insecticides
- Explain the symptoms and treatment of insecticide exposure

2

Health and safety

All insecticides are poisonous and can be harmful if improperly used.

When handling insecticides:

- Read labels
- Wear full PPE
- Don't eat, drink or smoke
- De-pressurise sprayer when not in use

Spray operators must:

- Hydrate before work
- Hydrate during the day
- Wash hands before eating or drinking

3

All spray operators should understand how to respond to critical incidents related to residual spraying.

Insecticide exposure

Insecticide spills

4

Symptoms usually begin within 12 hours after exposure. Team leaders are trained to screen for visible signs.

Mild

- Fatigue
- Headache
- Dizziness
- Blurred or dark vision
- Excess sweat and saliva
- Nausea and vomiting
- Stomach cramps & diarrhea

Moderate

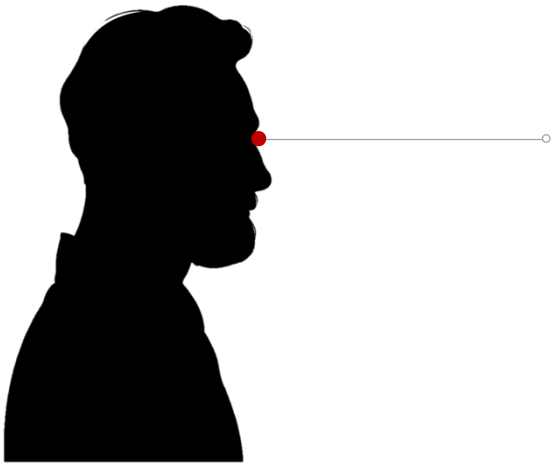
- Difficulty walking
- Weakness
- Chest discomfort
- Muscle twitches
- Pinpoint pupils
- Increased severity of earlier symptoms

Severe

- Unconsciousness
- Severely pinpointed pupils
- Muscle twitches
- Secretions from mouth and nose
- Breathing difficulty
- **If not treated, death can result.**

5

If exposure is suspected, immediate action must be taken

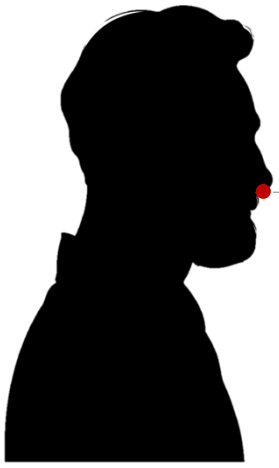


Eye contact

- ✓ Rinse immediately and thoroughly with clean, cool water for at least 15 minutes
- ✓ Life the eyelids and rinse underneath
- ✓ Inform Team Leader
- ✓ If stinging or vision problems persist, take the person to a clinic

6

If exposure is suspected, immediate action must be taken

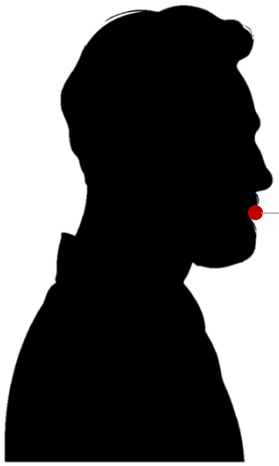


Spray is inhaled

- ✓ Exit the house immediately
- ✓ Sit down in the shade
- ✓ Inform Team Leader
- ✓ If burning sensation in the lungs for more than 10 minutes in fresh air, take the person to a clinic

7

If exposure is suspected, immediate action must be taken

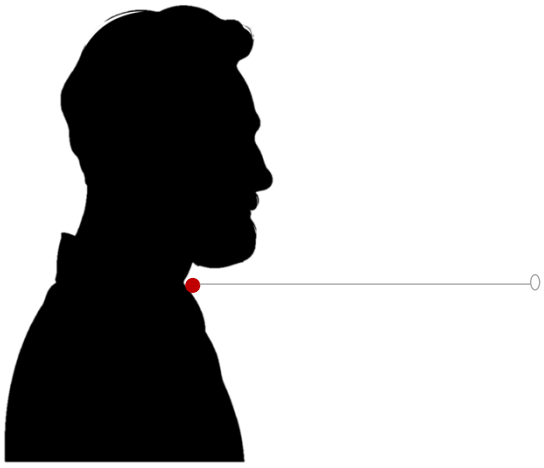


Insecticide is swallowed

- ✓ Immediately take the person to the nearest health clinic
- ✓ Do not force the person to vomit or eat any food

8

If exposure is suspected, immediate action must be taken



Skin contact

- ✓ Take off all contaminated clothing immediately
- ✓ Wash exposed skin immediately with soap and plenty of water
- ✓ Flush the area with large quantities of water
- ✓ Move the person to a cool, shady location
- ✓ Inform Team Leader if skin irritation persists after washing
- ✓ If any skin irritation is seen, transfer to a clinic quickly

9

How to prepare for emergencies

First aid kit

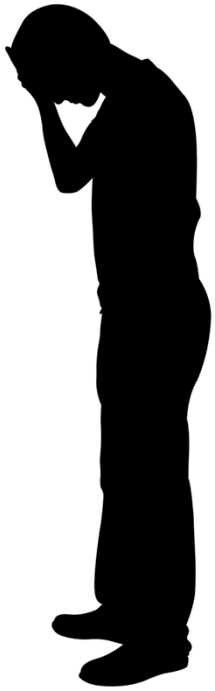
- Adhesive bandages or plasters
- Gauze, tape, cloth bandages
- Eye wash
- Antibiotic cream
- Hydrocortisone cream/calamine
- Pain killers, e.g., aspirin.

Spill response kit

- Absorbent sand or sawdust
- Long-handled brush with stiff bristles
- Short-handled brush and pan

10

Remember - spray operators must stop working and inform the Team Leader immediately if experiencing any breathing difficulties, headache, fatigue, eye irritation, skin irritation, or any other form of ill-health or discomfort.



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Key messages

- There are numerous ways to reduce the risk of exposure to insecticides
- It is important that Team Leaders and Spray Operators remain alert for any symptoms of insecticide exposure
- All those involved in spraying must be aware of the appropriate responses
- First Aid Kits and Spill Response Kits must be made available

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Session 06:

Daily spray preparation

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 06:

Daily spray preparation and tasks

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

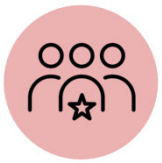
By the end of this session, you will be able to:

- Compare daily tasks of spray operators and team leaders
- Explain procedures for commencing the spray day

2

Daily spray tasks

Before leaving for the spray site



Team lead

- Provides a morning brief on the plan for the day
- Provides insecticide and all reporting forms to spray operators

Spray operator

- Checks PPE for condition
- Prepares the sprayer and checks for any issues (leaks, pressure)
- Reports any issues to the team lead

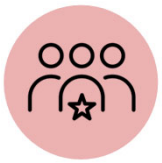
Both

Travel to site with sprayers depressurised and secured upright

3

Daily spray tasks

At the spray site



Team lead

- Engages with community leaders
- Allocates houses to each spray operator
- Observes spray operator procedures and provides corrective action

Spray operator

- Provides reassurance that chemicals are safe
- Gives instructions for before and during spraying
- Confirms approval to spray
- Ensures preparations for spraying are complete
- Sprays inside and outside as directed
- Reviews post-spray instructions with householder
- Fills in house spray cards and daily reporting forms
- Reports any issues to team lead

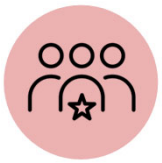
Both

Travel back to wash point once day is complete

4

Daily spray tasks

After returning the wash point



Team lead

- Confirms clean up
- Collects all forms from spray operators
- Reviews insecticide use
- De-briefs spray operators

Spray operator

- Disposes remaining insecticide
- Cleans equipment using progressive rinse
- Removes, cleans and stores PPE
- Cleans self with soap and water
- Provides forms to the team lead

5

Morning procedures

Confirm the following:

- Location to meet each morning
- Expected arrival time
- All equipment is in good condition
- Any illness or concerns have been reported to the team leader
- Transporting personnel, equipment and supplies to the field has been arranged
- Check-in time established

6

Key messages

- Spray Operators and Team Leaders must be familiar with their daily tasks
- Procedures should be clear to all
- Any deviations should be corrected

7

Session 07:
Preparing spray units

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 07:

Preparing spray units

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Articulate what is required to prepare housing units for spraying
- Describe the priorities for spraying

2

Entering a property

- Make yourself known – to the homeowner and any dogs on the property
- Call out, “Hello, anyone home?” and verbally identify yourself
- Rattle the gate if there is one
- Look around
- Be alert
- Go straight to the front door and knock
- Do not wander around the yard

3

Greeting residents

> Hi my name is [insert name].
>
> I work for [insert department] and am part of the Dengue mosquito control team.
>
> We are currently going to everyone's house in the neighbourhood to treat against mosquitoes. This includes spraying safe insecticides on surfaces where mosquitoes commonly rest and checking for containers that can hold water that harbour mosquitoes.
>
> We will treat containers where mosquitoes are found or likely to inhabit.
>
> These approaches will kill any potentially dangerous mosquitoes that could transmit diseases to you, your family or your neighbours.

4

If children are home alone - do not enter the dwelling. Leave and come back another time if needed.

5

If someone comes home while you are in their yard - stop what you are doing and greet the occupant. Make it clear that you are not an intruder.

If a resident is not happy that you are on their property – leave.

6

Preparing housing units for spraying

Spray Operators should confirm with the residents that the following preparations are complete:

- Informed consent has been given to spray
- Clean water (~15 litres) is available for the team to use for mixing insecticide
- All objects of value have been put away e.g., mobile phones, money, documents
- All occupants and animals are away from the structures to be sprayed

7

Preparing housing units for spraying

Spray Operators should confirm with the residents that the following preparations are complete:

- **These have been covered or removed:**
  - water
  - food
  - water containers
  - food containers
  - cooking utensils
  - children's toys
  - bedding
  - clothing

8

Ask:

Does anyone who is currently home have any breathing difficulties such as asthma?

Are there birds, fish or reptiles present?

Stress the importance of staying away from the area being sprayed

Remove animals from area, cover cage /tank or turn off water filters for 30 mins

9

Where and what *not* to spray

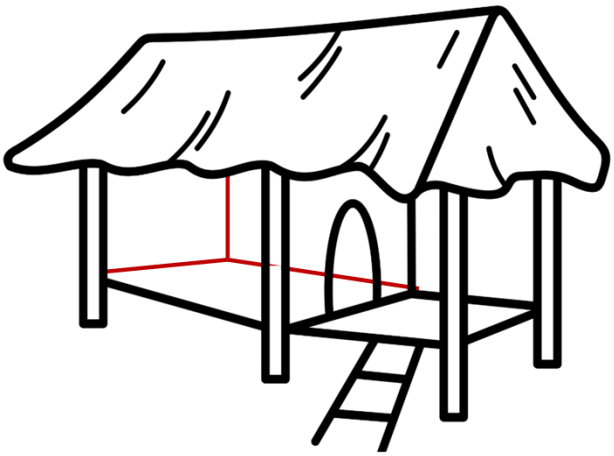
Spray Operators should make sure to avoid spraying the following:

- People or animals
- Animal food or water bowls
- Kitchens & containers or utensils used for food storage or preparation
- Children's toys
- Clothing or bedding
- Rooms with people or animals that can't be moved
- Running or storm water
- Water tanks, ponds or waterways with fish
- Housing units, yards or community spaces:
  - where permission to spray has not been granted
  - that pose a risk to Spray Operators

10

At each housing unit or community space

1 **Start with the main structure**



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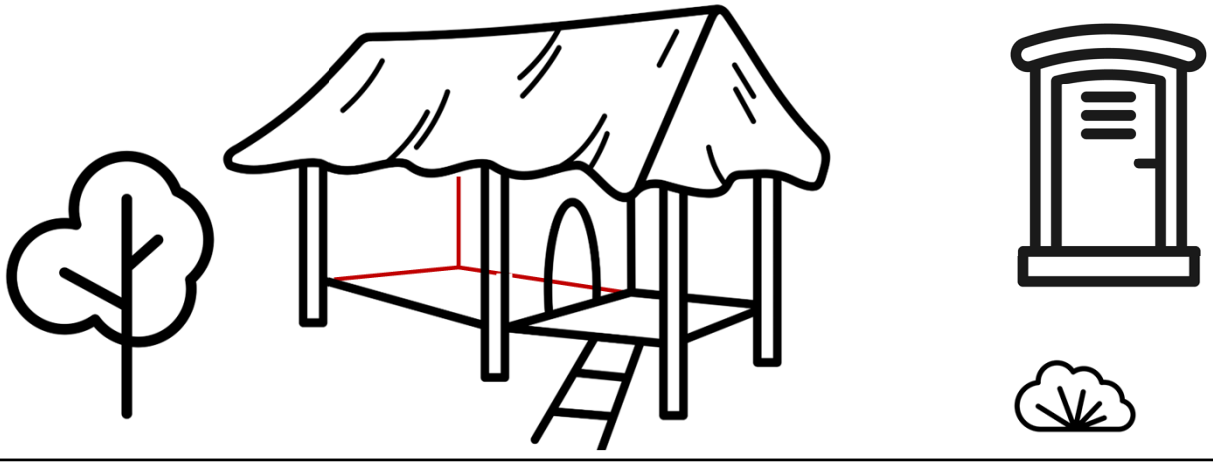
At each housing unit or community space

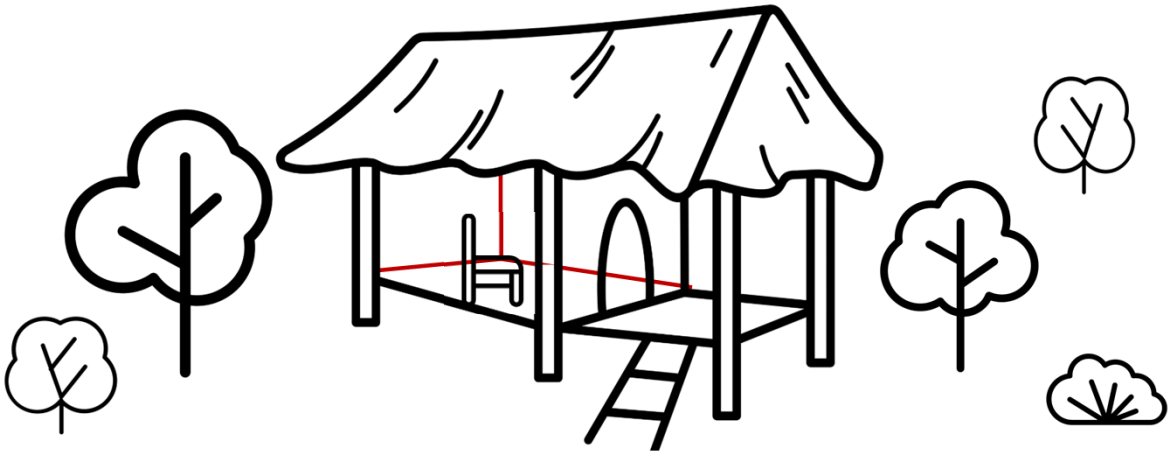
2 **Then spray structures close to the main structure**



12

At each housing unit or community space

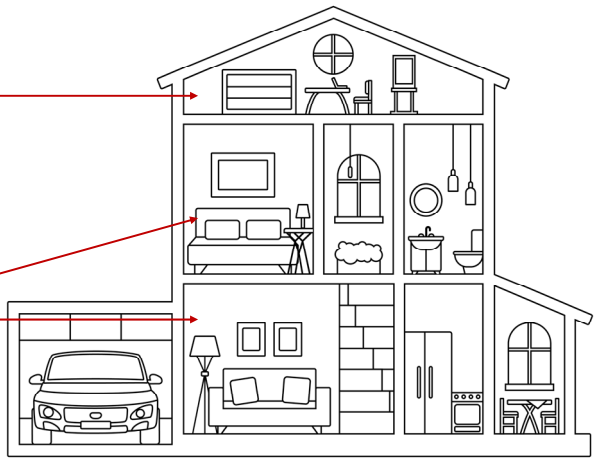
3 **Then inspect and spray potential outdoor harbourages (adult resting sites and larval habitats) including furniture, other objects and vegetation**



13

Inside each structure

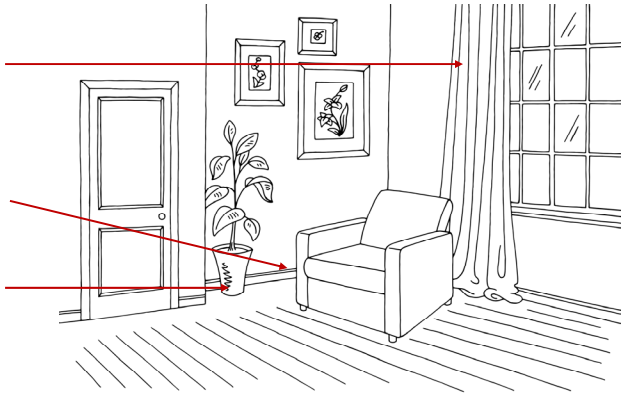
- If multiple floors, start with the upper and move towards the lower floors
- Move clockwise through the structure, starting from the main (front) entrance
- Target mosquito resting areas, such as bedrooms, bathrooms, storage and living rooms



14

Within each room

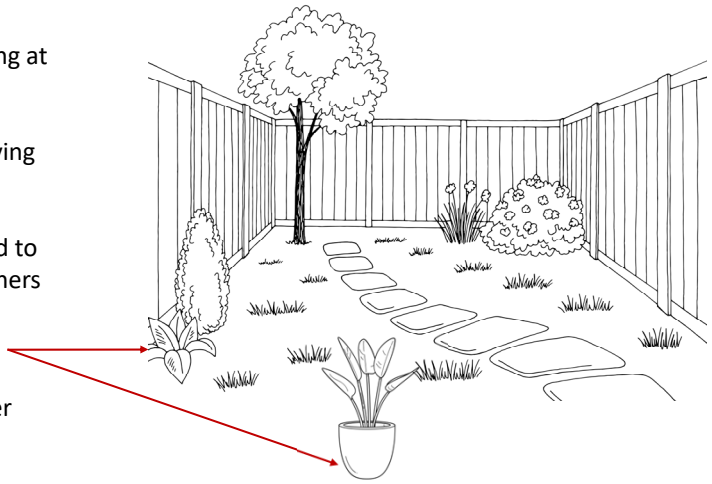
- Start at the doorframe and spray exposed wall surfaces and curtains first, moving clockwise around the room
- Spray dark areas under and behind large furniture
- Spray under smaller furniture and other surfaces



15

In each yard

- Conduct yard inspection and spraying at the same time
- Start at the gate/yard entrance moving clockwise around the yard
- Look up, look down and look around to identify natural and artificial containers that can hold water or harbour mosquitoes
- Treatment depends on the container type



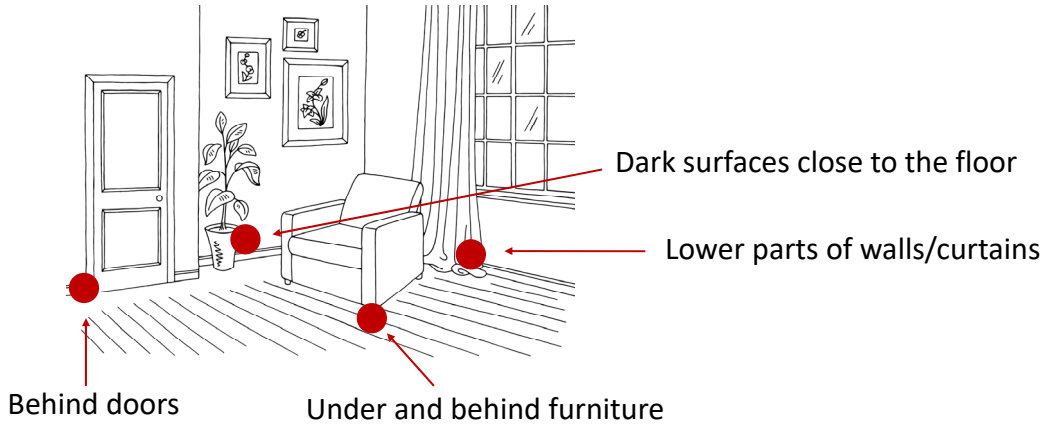
16

Rapid response is essential during outbreaks.

Priorities are defined to improve efficiency.
These must be based on known resting sites of local *Aedes* vectors in local structures and habitats.

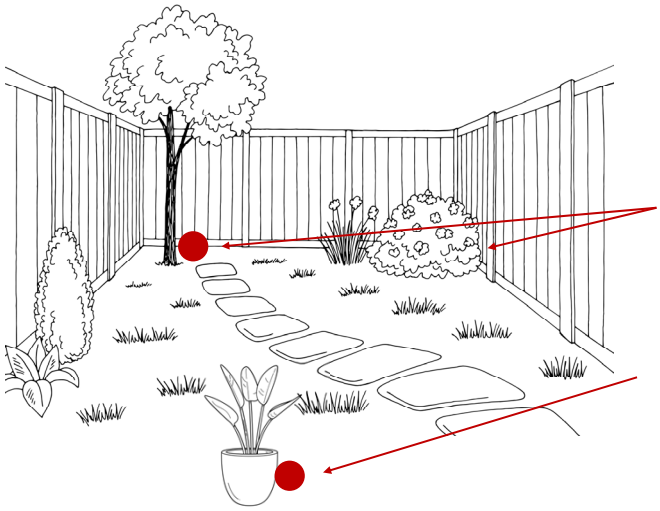
17

Spray priorities: indoors



18

Spray priorities: outdoors



Under outdoor furniture, shaded areas, vegetation, sheds, storage areas, machinery/equipment

Any container that can hold water and is a habitat for *Aedes* mosquito larvae

19

Stop spraying if anyone enters the house or if people or animals come within 10 metres while you are spraying outside areas or yards.

20

Key messages

- Preparations are required in advance of spraying – these should be clearly communicated to householders and Spray Operators should confirm adherence
- Spray priorities should be defined for each program to ensure that spray operations are efficient and effective for the given situation
- Spray priorities will depend largely on the habitats and behaviour of the target vector(s)

21

Session 09a:

Spray equipment

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 09a:

Spray equipment

Hand-compression sprayer: Goizper iK Vector Control Super

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Understand the features of one type of hand-compression sprayer
- Identify parts of a sprayer and their basic functions

2

Traditional compression sprayers

- Traditional Metallic Compression sprayers have been used for a long time for IRS (1950).
- They are very heavy, carried on just one shoulder, and have complex maintenance.

3

Hand-compression sprayer: The iK Vector Control Super

Technical features to improve IRS and larviciding interventions:


Robust


Efficient


Safe


Light and comfortable


Easy to maintain

4

iK Vector Control Super
Training materials

- Goizper trainers and local staff
- Training documents
- Training videos

5

iK Vector Control Super: Design

- Corrosion and UV resistant (special material selection)
- Pressure resistant (special design)
- Impact resistant (special design)
- No leakages (no welding parts)

Imperial College London

IPARC

INTERNATIONAL PESTICIDE APPLICATION RESEARCH CENTRE
Imperial College, Silwood Park
Buckhurst Road, Sunninghill,
Ascot, Berkshire, SL5 7PY, UK

Safe and efficient application for chemical and biological pest management

a World Health Organisation (WHO) collaborating centre

Fax direct to IPARC 0207 5942 450
http://www.iparc.org.uk

CERTIFICATE OF COMPLIANCE

This is to certify that the:

Plastic Mod IK VECTOR CONTROL SUPER Compression Sprayer

Supplied by Goizper s.coop
ANTIGA, 4
20577 ANTZUOLA
Apartado 211-20570 Begara
GUIPUZCOA
SPAIN goizper@goizper.com

were evaluated on site and at the International Pesticide Application Research Centre (IPARC), Imperial College London, Silwood Park, UK.

The samples were **FULLY COMPLIANT** with the requirements of the

WHO Equipment for Vector Control Specification Guidelines
(WHO/CDS/NTD/WHOPES/GCDPP/2010.9)

REVISED EDITION 2010 for:-

Hand Operated Compression Sprayers

Tested at IPARC by:

E.W. Thornhill
Consultant

Countersigned by:

Prof.G.A.Matthews

January 2016

WHOPES Certification (by IPARC)

6

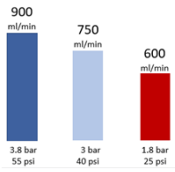
Comparing sprayers: Efficiency

The iK Vector Control Super **reduces insecticide deposit variation on the wall**.

Traditional metallic equipment

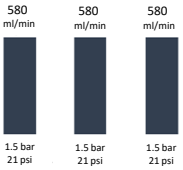
Pressure gauge

- Operator decides when to stop
- Tank pressure, nozzle flow rate and insecticide dosage vary considerably
- High risk of sub-dosing -> mosquito resistance



iK Vector Control Super

Low pressure control flow valve



- Automatic stop
- Nozzle flow rate is constant
- Uniform liquid volume emitted during all of the application

7

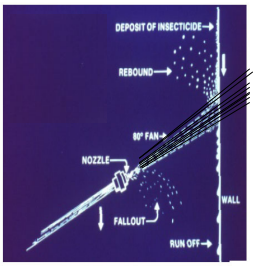
Comparing sprayers: Efficiency

The iK Vector Control Super **reduces insecticide loss**.

Traditional metallic equipment

High spraying pressure (average 3bar/40psi)

- Insecticide loss of 16% due to rebound and atomisation
- Fine droplets fail to reach the wall (atomisation)
- Big droplets rebound or run off



iK Vector Control Super

Control flow valve (low pressure 1.5 bar/21 psi)

- 50 % reduction of insecticide loss
- Due to rebound and atomisation effect being significantly reduced when spraying at low pressure (1.5bar/ 21psi)

8

Comparing sprayers: Efficiency

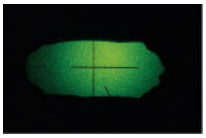
The iK Vector Control Super **has a longer nozzle lifespan**.

Traditional metallic equipment

Tip erodes over time

- Hardened stainless steel nozzles

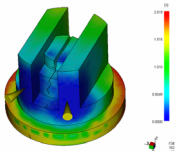
- Worn spray tips have higher output with more spray concentrated under each tip



iK Vector Control Super

Much more durable and better performance

- Low erosion materials and manufacturing processes



- Nozzle internal design using CFD software

9

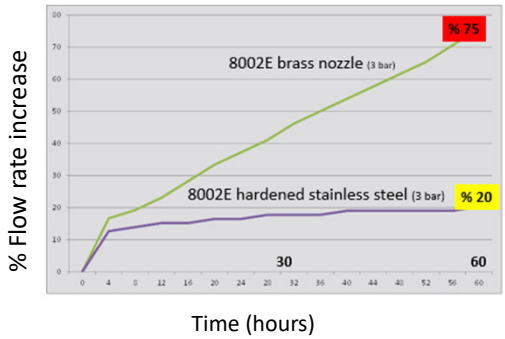
Comparing sprayers: Efficiency

The iK Vector Control Super **has a longer nozzle lifespan**.

*Tests made following the conditions described in ASAE standards for agricultural nozzle erosion (1991) with 6% of KAOLIN.

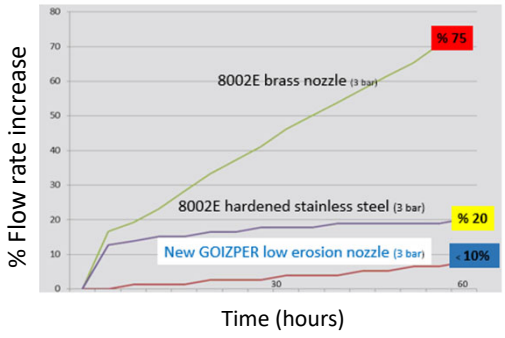
Traditional metallic equipment

Erosion of nozzle (20%) provokes waste of chemical



iK Vector Control Super

Lower erosion (10%), lifespan x 2, saves money



10

Comparing sprayers: Efficiency

The iK Vector Control Super **has lower risk of nozzle blockages**.

Traditional metallic equipment

Unprotected nozzle

- Risk of nozzle blockages due to dirtiness

iK Vector Control Super

Nozzle protection

- Open fixed position

- Closed fixed position

11

Comparing sprayers: Efficiency

The iK Vector Control Super **mixes chemical correctly**.

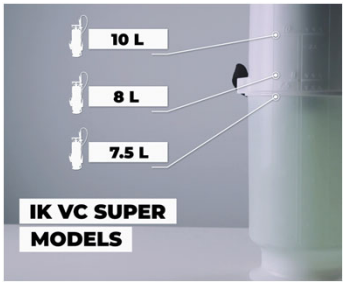
Traditional metallic equipment

Opaque tanks

- Very difficult to read the tank volume correctly
- Not easy to prepare the chemical mixing correctly

iK Vector Control Super

Semi-translucent tank



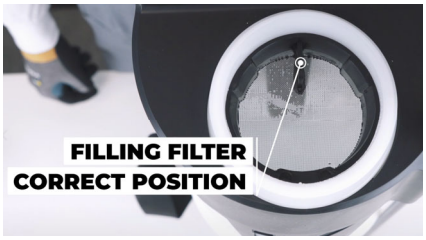
- Easy to read the tank volume correctly
- Easy to prepare the chemical mixing correctly

12

iK Vector Control Super: Unique features

Safety valve

Prevents the tank from over pressurising by releasing air automatically



Filling filter

A wide stainless steel filling filter is provided with the equipment

Special lid design

To store extra nozzles (2 even fan nozzles, 2 larviciding nozzles, 1 nozzle filter)

13

Comparing sprayers: Comfort

The iK Vector Control Super **reduces spray operator fatigue**.

Traditional metallic equipment

Heavy and uncomfortable to carry

- Very tiring and uncomfortable to carry over one shoulder
- Risk of losing precision in spraying technique

iK Vector Control Super

New design and materials with improved comfort

- Very light tank (3 kg)
- More comfortable with two easily adjustable straps to carry the pump on the back

14

Comparing sprayers: Health and environment

The iK Vector Control Super **reduces spray operator risk of contamination**.

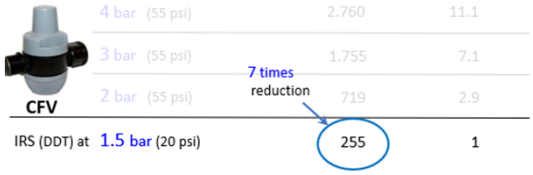
Traditional metallic equipment

High contamination risk

	Operator contamination	
	Dermal (mg/man/hour)	Respiratory (mg/man/hour)
IRS (DDT) at 4 bar (55 psi)	2.760	11.1
IRS (DDT) at 3 bar (40 psi)	1.755	7.1
IRS (DDT) at 2 bar (30 psi)	719	2.9
IRS (DDT) at 1.5 bar (20 psi)	255	1

iK Vector Control Super

New design and materials with improved comfort



15

iK Vector Control Super: Cleaning and maintenance

- No need for expertise or expensive spares parts and tools
- Since spray is made of 50% fewer parts than traditional sprayers, it has fewer problems (less parts, less problems)
- Very **easy** to manipulate
- Almost 100% tool free

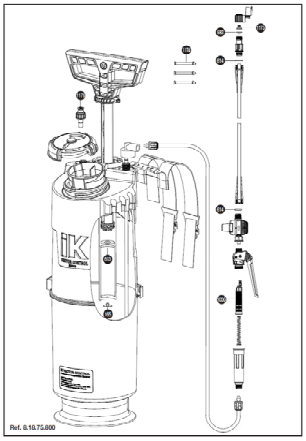
16

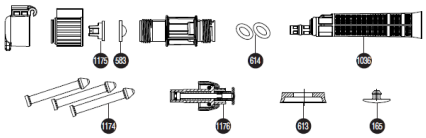
iK Vector Control Super: Components

Service kit available with the most frequently used spare parts

Images source: Goizper Group

Angled nozzle tip (120° elbow) for spraying under furniture





17

Key message

Residual spraying can be improved by using the most suitable tools, such as new tools that are already available

18

Session 09b:

Mist-blower

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 9b:

Spray equipment: motorised backpack mist-blower

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Name the different parts of spray equipment
- Explain the steps involved in properly maintaining spray equipment
- Know the steps necessary to ensure sprayers function and to identify potential challenges and troubleshoot

2

Mist-blower components

3

Spray unit components

4

Preparing the mist-blower

Pre-start checks

- Check fuel system for damage or leaks e.g. fuel cap/ tank, hose connections and primer bulb
- Check spark plug boot is secure
- Check all levers move freely and trigger springs back to idle position
- Check chemical tank & hoses for damage or leaks

5

Preparing the mist-blower

Fueling up

- Before fueling, clean the filler cap and the area around it to ensure that no dirt falls into the tank
- Position the machine so that the filler cap faces up
- Turn the cap counter-clockwise until it can be removed from the tank opening
- Fill with unleaded petrol and 2-stroke oil mixed at 50:1
- Turn the cap clockwise and tighten it down as firmly as possible by hand

6

Preparing the mist-blower

Filling the container

- Make sure chemical release switch on handle is closed (downward position)
- Open container cap and check seal for damage or dirt (a poorly sealed container can result in chemical spilling onto user)
- Add water to container and test machine if it has not been used recently
- Fill container with chemical mix do not fill past the 14-litre mark
- Replace cap making sure it has a good seal

7

Preparing the mist-blower

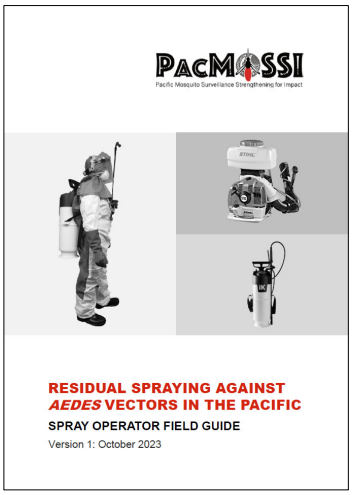
Filling the container

- Make sure chemical release switch on handle is closed (downward position)
- Open container cap and check seal for damage or dirt (a poorly sealed container can result in chemical spilling onto user)
- Add water to container and test machine if it has not been used recently
- Fill container with chemical mix do not fill past the 14-litre mark
- Replace cap making sure it has a good seal

Petrol (litres)	2-stroke oil (ml)
1	20
5	100
10	200

8

Operating the mist blower



See PACMOSSI Spray Operator Field Guide

Pages 38 - 39

9

Cleaning the mist-blower

- Drain and clean the fuel tank in a well-ventilated area
- Run the engine until it runs out of fuel
- Thoroughly clean the machine
- Also clean the air filter (located behind the plastic cover on the left of the machine - remove 2 screws to access)
- Do not expose the container to direct sunlight for unnecessarily long periods as UV rays can make the container material brittle, which could result in leaks or breakage

It is important to clean the blower if storing for 3 months or longer

10

Session 10:

Starting up

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 10:

Starting up – assembly, mixing, pressurising, calibrating & carrying

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

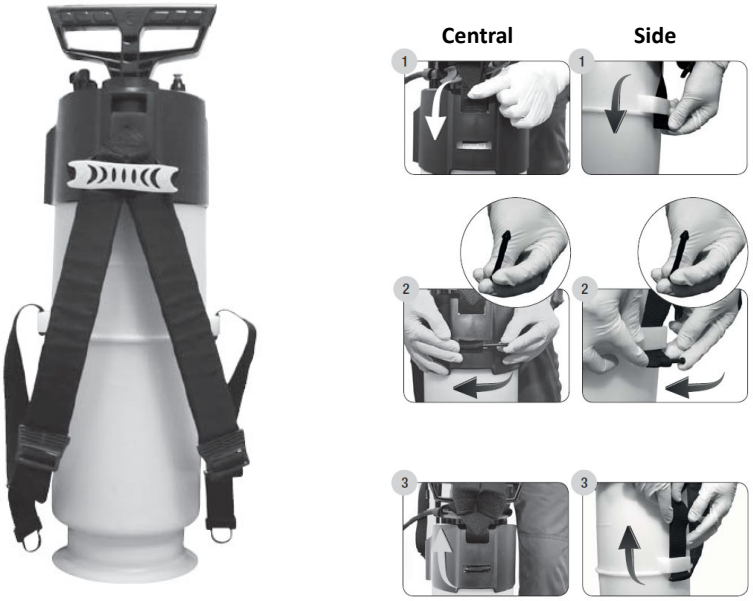
- Articulate how to correctly assemble the sprayer
- Articulate how to mix the insecticide
- Articulate how to pressurise and depressurise the pump during spray procedures
- Articulate how to calibrate and carry the sprayer

2

How to assemble

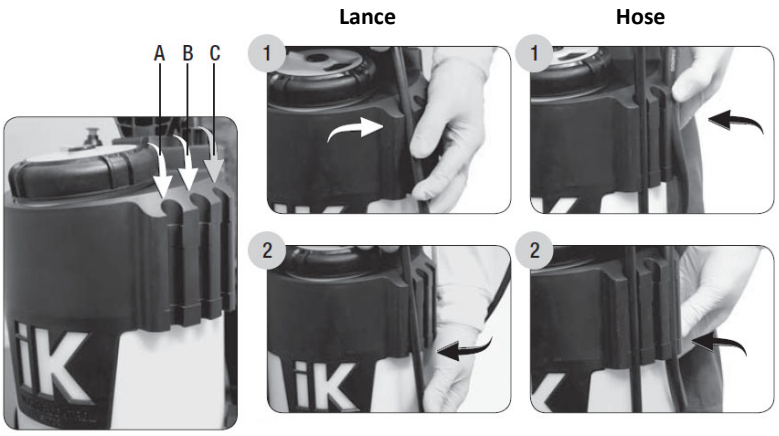
3

How to assemble



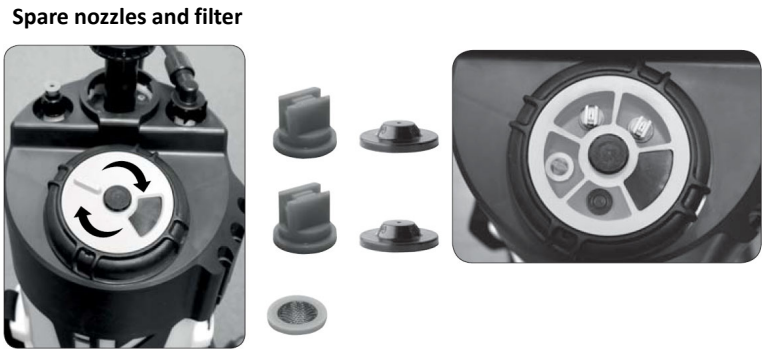
4

How to assemble



5

How to assemble

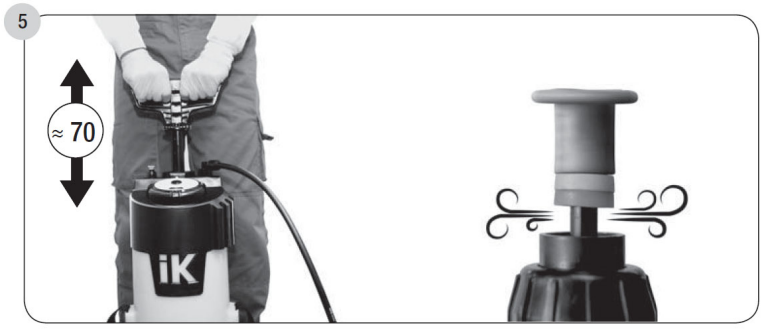


6

How to mix

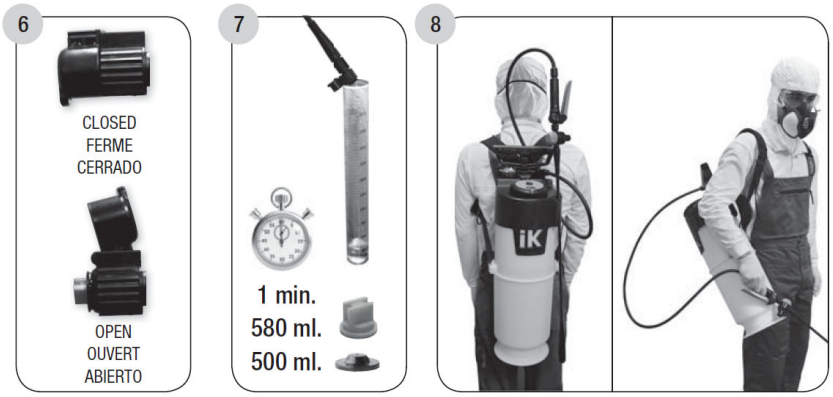
7

How to pressurise



8

How to calibrate and carry



This will be covered in more detail in later sessions

9

Key messages

- Procedures for starting up should be made clear to Spray Operators
- Trainings should focus on ensuring these procedures are correctly followed
- Any deviations should be corrected during training and supervision

10

Session 12:

Indoor spray technique

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 12:

Indoor spray technique

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

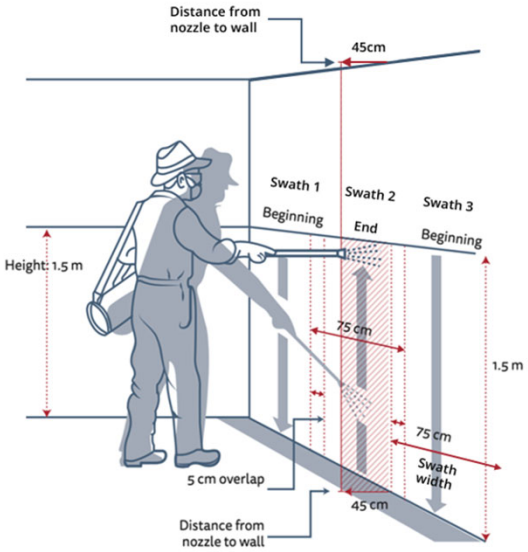
By the end of this session, you will be able to:

- Explain the differences in spraying walls, curtains and furniture (distance from surfaces, application speed, etc.)
- Describe the importance of repressurising and when spraying should stop

2

Spraying interior walls

- Stand 1 m from surface to be sprayed
- Leave 45 cm between surface & spray nozzle (for swath width of 75 cm)
- Start spraying at the top (a height of 1.5 m) and move spray down
- Step to the right to get to the middle of the next swath, then spray from the bottom up to 1.5 m
- Use a uniform spraying speed of ~3.5 seconds for a 1.5 m-long swath
- Ensure 5 cm overlap between spray swaths

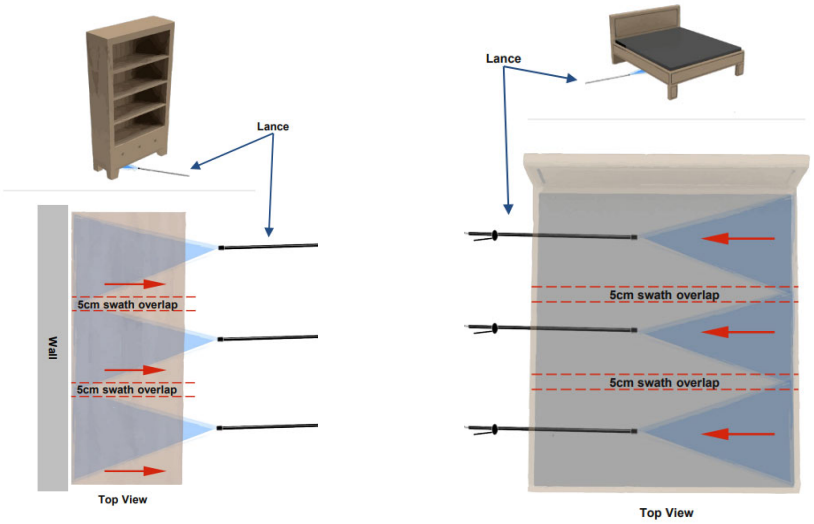


3

Overlap between spray swaths

4

Spraying under or behind large furniture



5

Spraying curtains

It may be sufficient to spray only the outer surface of curtains:

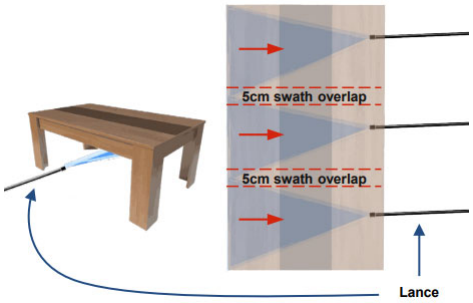
- Carefully flick the curtain sideways and spray the lower wall behind the curtain
- Close the curtain and spray the lower outer surface of the curtain. Take care to avoid damage as curtain fittings may be delicate.

If there is evidence of *Aedes* often resting on the interior side:

- Step between the wall and curtain
- Extend the curtains away from the wall with your hand
- Spray from the upper side to the lower side of the curtain at 2.5 seconds per meter
- Pay attention to folds to ensure a uniform spray pattern

6

Spraying tables and light furniture



7

Re-pressurising the sprayer

It is important that the tank remains sufficiently pressurised.

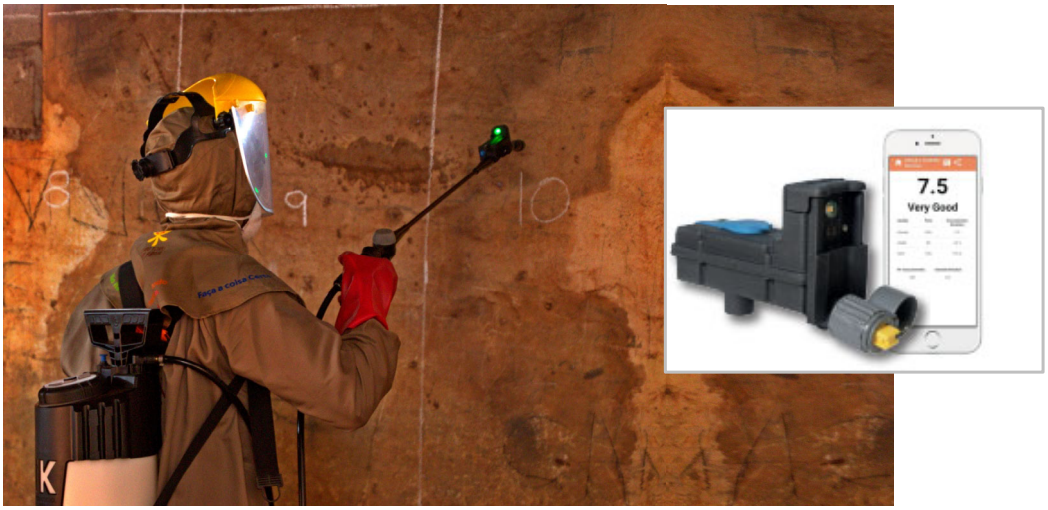
It should be re-pressurised when the flow of pesticide is shut off automatically (for pumps with a CFV like the Goizper sprayer) or when the pressure gauge falls below 25 PSI.

Sprayer with 1.5 bar CFV	Sprayer without CFV
Spray without checking pressure gauge	Spray while periodically checking pressure gauge to ensure pressure is above 25 psi
Stop spraying when insecticide flow automatically shuts off as pressure is below minimum required	Stop spraying when pressure is 25 psi or lower
Repressurise by placing sprayer on ground and pumping until safety valve releases pressure and green mark shows	Repressurise by placing sprayer on ground and pumping to 55 psi

8

iK Smart Light

A new tool to enable more efficient delivery of IRS

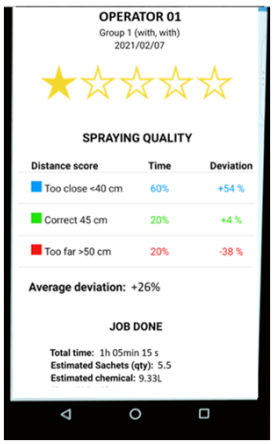


9

iK Smart Light

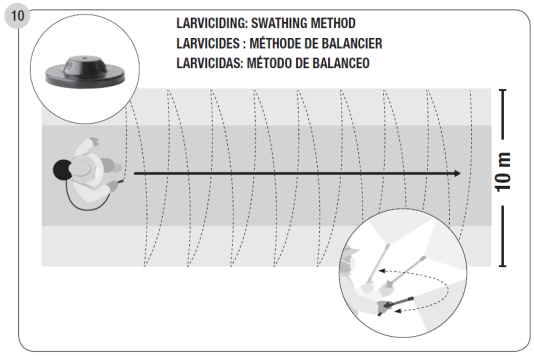
An **electronic device** that guides Spray Operators in spraying at the correct distance and speed during their training and IRS operations.

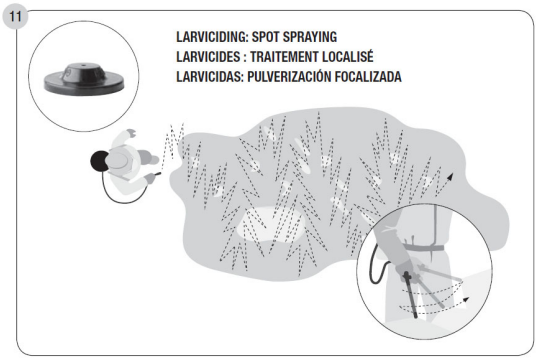
Comes with a **smartphone app** to collect spraying data and improve use of the sprayer.



10

Sprayer use for larvicide application





11

Key messages

- There is a specific technique for spraying of walls, curtains, large and small furniture inside houses
- It is essential to maintain sufficient pressure throughout spraying, though this is made easy with the use of the control flow valve
- New tools are available to ensure correct spray technique
- Hand-compression sprayers can also be used for the application of larvicides

12

Session 19:

Sprayer cleaning and maintenance

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 19:

Sprayer cleaning and maintenance

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Name the different parts of spray equipment
- Explain the steps involved in properly maintaining spray equipment
- Describe the appropriate storage conditions of spray equipment
- Know the steps necessary to ensure sprayers function and to identify potential challenges and troubleshooting

2

Review: Compression sprayer

Flexible lance and/or angled nozzle tip (120° elbow) for spraying under furniture

Components include:

- Lance to deliver insecticide to surfaces
- Safety valve to protect against over-pressurising
- Lid with spare nozzle and filter storage
- Tank translucent to see insecticide volume
- Straps adjustable for use on 1 or both shoulders
- Footrest integrated for securing sprayer
- Filler filter carried inside tank
- Control Flow Value (CFV) for constant pressure in nozzle and auto cut-off
- Parking lance and hose for easy carrying
- Fan nozzle and filter for 580 ml/min with CFV
- Nozzle protector to prevent clogs or damage

3

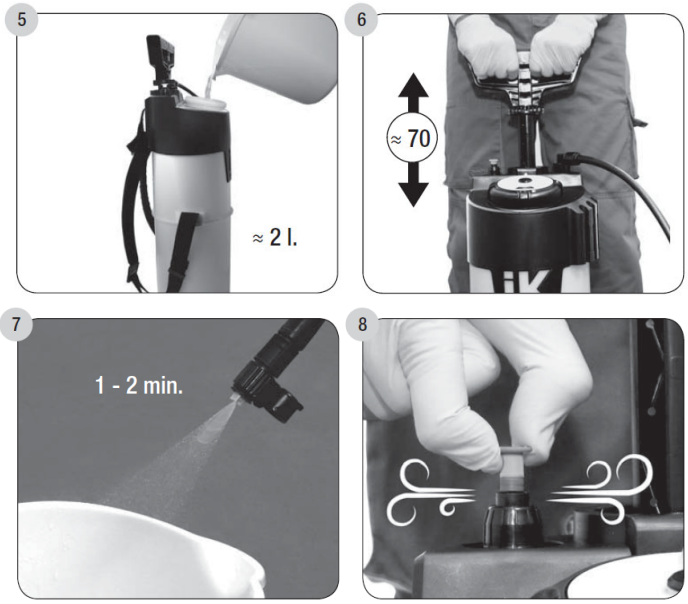
Cleaning

1 Tank: Triple rinsing

4

Cleaning

2 Discharge system



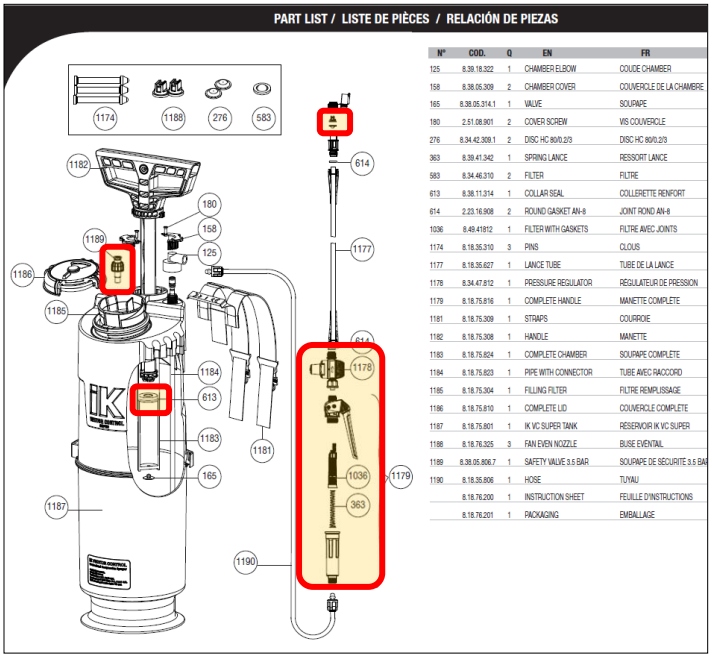
5

Cleaning

3 Nozzle and filters

6

Maintenance

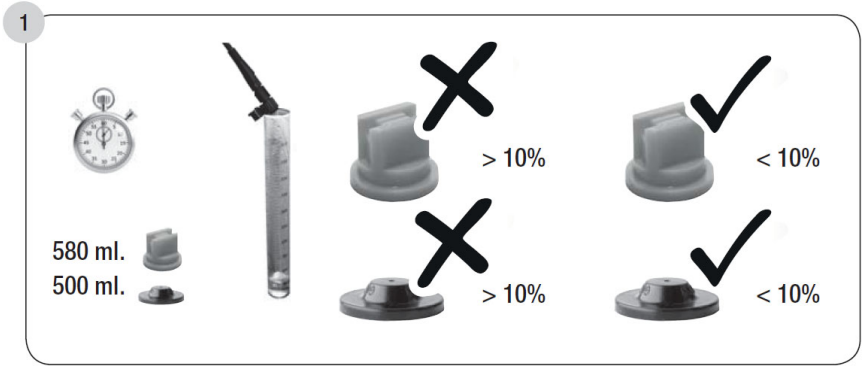


PART LIST / LISTE DE PIÈCES / RELACIÓN DE PIEZAS

N°	COD.	Q	EN	FR
125	8.39.18.322	1	CHAMBER ELBOW	COUDE CHAMBER
158	8.38.05.309	2	CHAMBER COVER	COUVERCLE DE LA CHAMBRE
165	8.38.05.314.1	1	VALVE	SOUPAPE
180	2.51.08.901	2	COVER SCREW	VIS COUVERCLE
276	8.34.42.309.1	2	DISC HC 80/0.2/3	DISC HC 80/0.2/3
363	8.39.41.342	1	SPRING LANCE	RESSORT LANCE
583	8.34.46.310	2	FILTER	FILTRE
613	8.38.11.314	1	COLLAR SEAL	COLLERETTE RENFORT
614	2.23.16.908	2	ROUND GASKET AN-8	JOINT ROND AN-8
1036	8.49.41812	1	FILTER WITH GASKETS	FILTRE AVEC JOINTS
1174	8.18.35.310	3	PINS	CLOUS
1177	8.18.35.627	1	LANCE TUBE	TUBE DE LA LANCE
1178	8.34.47.812	1	PRESSURE REGULATOR	REGULATEUR DE PRESSION
1179	8.18.75.816	1	COMPLETE HANDLE	MANETTE COMPLETE
1181	8.18.75.309	1	STRAPS	COURROIE
1182	8.18.75.308	1	HANDLE	MANETTE
1183	8.18.75.824	1	COMPLETE CHAMBER	SOUPAPE COMPLETE
1184	8.18.75.823	1	PIPE WITH CONNECTOR	TUBE AVEC RACCORD
1185	8.18.75.304	1	FILLING FILTER	FILTRE REMPLISSAGE
1186	8.18.75.810	1	COMPLETE LID	COUVERCLE COMPLETE
1187	8.18.75.801	1	IK VC SUPER TANK	RESERVOIR IK VC SUPER
1188	8.18.76.325	3	FAN EVEN NOZZLE	BUSE EVENTAIL
1189	8.38.05.806.7	1	SAFETY VALVE 3.5 BAR	SOUPAPE DE SECURITE 3.5 BAR
1190	8.18.35.806	1	HOSE	TUYAU
	8.18.76.200	1	INSTRUCTION SHEET	FEUILLE D'INSTRUCTIONS
	8.18.76.201	1	PACKAGING	EMBALLAGE

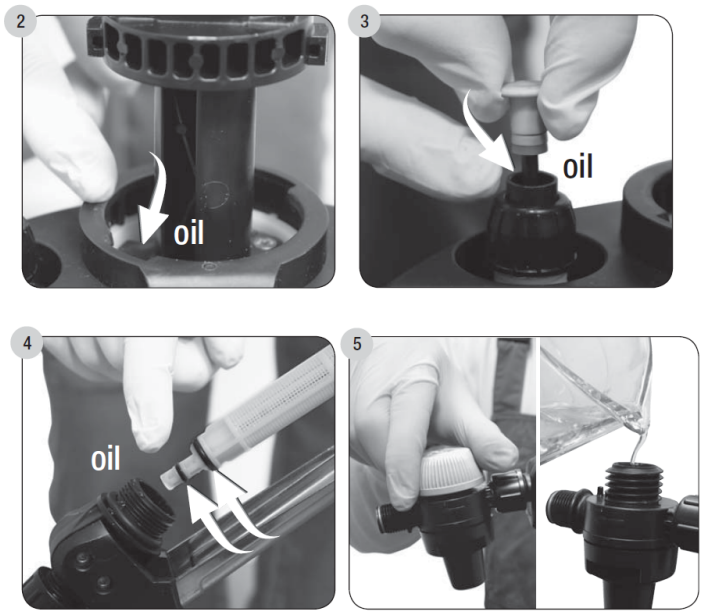
7

Maintenance



8

Maintenance



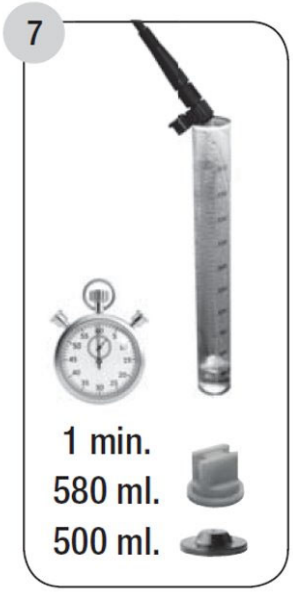
9

Checking sprayer discharge rate

Calibrate sprayers regularly (at least monthly during heavy use) to ensure correct discharge rate and detect any problems.

While wearing PPE:

- Pour water into tank to max 3/4 full
- Cap and pressurise above minimum required to spray (e.g. 4 bar -58 psi)
- Check tank is holding pressure (listen for hiss)
- Check no leaks along lance and hose especially at any joins
- Confirm on/off valve works
- Spray for 1 minute, collecting discharge and measure in jug
- Repeat 3x and calculate the average ml released per minute



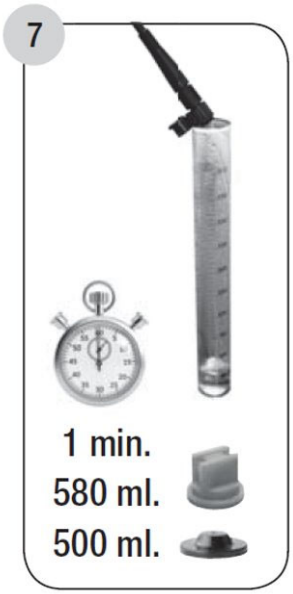
10

Checking sprayer discharge rate

For sprayers with 1.5 bar CFV, the correct discharge for 80° flat fan nozzle (8002) should be 580 ml per minute

Must be within ±10% of this = 520-640 ml per minute

- If higher by >10%, nozzle tip likely worn
- If no spray or the discharge rate is incorrect or low, may be clogged
- If spray deposition pattern inconsistent, may be clogged



11

What are some common challenges?

- Doesn't build pressure
- Handle goes up
- Liquid comes out
- Doesn't spray
- Doesn't shut off
- Leakage at the lance
- Safety valve failure

12

Troubleshooting

Common issues	Potential solutions
Control valve does not shut off	• Clean O-ring and seating surface on control valve • Replace O-ring if worn
Unit leaks where wand joins control valve	• Clean O-ring in lance and sealing surfaces • Replace O-ring if worn

13

Troubleshooting

Common issues	Potential solutions
Tank does not pressurise when handle is pumped	• Lubricate plunger cup with petroleum jelly (not oil) • Replace plunger cup
Unit leaks where cap joins wand	• Clean O-ring on wand and sealing surfaces • Replace O-ring if worn

14

Troubleshooting

Common issues	Potential solutions
Leaks where pump seals at tank	Clean gasket sealing surfaces or replace gasket.
Liquid or air enters pump cylinder	Clean check valve sealing surface or replace check valve

15

Troubleshooting

Common issues	Potential solutions
Air leaks at hose connection	Ensure gasket is tight If O-rings are used, clean sealing surfaces or replace O-rings; re-attach hose Do not use plastic as a replacement for O-rings or gaskets on the trigger handle as this will affect its structural integrity and may damage it

16

iK Vector Control Super

All spare parts are available in bulk upon request

Training resources available:

- Goizper trainers and local staff
- Training documents
- Training videos

17

Watch: Goizper video on cleaning (3 min)

18

Key messages

- Correct cleaning and maintenance are essential to ensure spray equipment remains functional
- Common issues with spray equipment can often be resolved in the field if there is a good understanding of how it works and what to do for each issue
- This will support optimal efficiency and effectiveness of spray operations

19

Session 21:

Supervision and data management

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 21:

Supervision and data management

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Understand the importance of good record keeping for spray data
- Understand how and why to complete Property Spray Cards
- Understand how and why to complete Daily Spraying Records
- Identify common mistakes in completion of the spray data and how to avoid them

2

Importance of good recordkeeping for spray data

- Data are used to make decisions about future spray operations and other strategic plans
- Collecting accurate data has impacts beyond the daily count of properties sprayed
- Inaccurate data can have a national impact on future spray operations

3

Performance monitoring

Good record keeping helps to ensure that spraying is done correctly and consistently at each property.

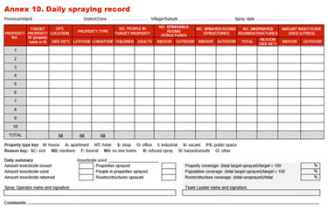
Spray Operators are responsible for collecting information during spraying, including:

Property spray cards


Annex 9. Property spray card

To be retained by residents for their records, and updated on future spray rounds

Daily spray records


Annex 10. Daily spraying record

To be retained by spray operators and provided to the Spray Team Leader at the end of each day

4

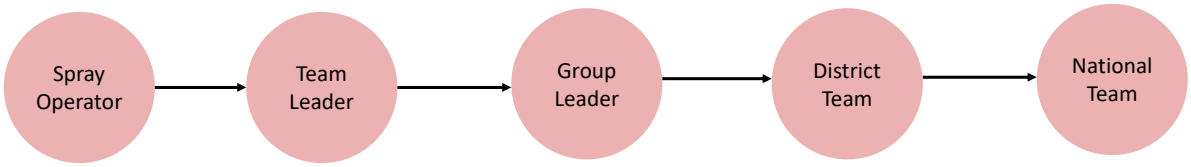
End of day procedures

Spray Operator passes on Daily Spray Records to **Team Leader**

Team Leader provides totals to the **Group Leader**

Group Leader provides tallies for each operating site to the **District Team**

District Team sends compiled data from other operating sites to **National Team**



National Team tallies information to create national statistics

5

Property spray cards

Annex 9. Property spray card

Province/Island ..... District/Zone ..... Village/Suburb .....

Property ID ..... Longitude ..... Latitude .....

Date card issued .....

Property type (tick those that apply): ☐ house ☐ apartment ☐ hotel ☐ shop ☐ office ☐ industrial ☐ vacant ☐ public space

TREATMENT NO.	DATE SPRAYED	SPRAY OPERATOR	NO. PEOPLE IN TARGET PROPERTY		TOTAL NO. SPRAYABLE ROOMS/STRUCTURES ON PROPERTY		NO. UNSPRAYED ROOMS/ STRUCTURES ON PROPERTY		INSECTICIDE USED	AMOUNT OF INSECTICIDE USED
			CHILDREN	ADULTS	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)		
1										
2										
3										
4										
5										

Reason key / totals: **SC:** sick **NB**: newborn **F**: funeral **NH:** no one home **R:** refused spray **H:** hazard/unsafe **O:** Other

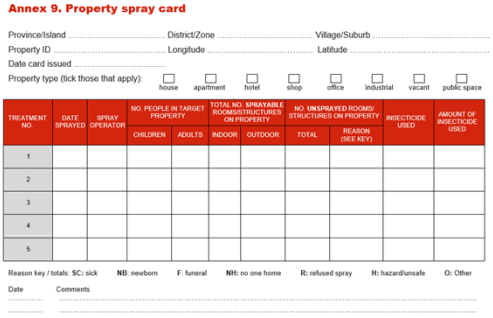
Date Comments

.....

.....

6

Property spray cards



Annex 9. Property spray card

Province/Island ..... District/Zone ..... Village/Suburb .....
Property ID ..... Longitude ..... Latitude .....
Date card issued .....
Property type (tick those that apply): ☐ house ☐ apartment ☐ hotel ☐ shop ☐ office ☐ industrial ☐ vacant ☐ public space

TREATMENT NO.	DATE SPRAYED	SPRAY OPERATOR	NO. PEOPLE IN TARGET PROPERTY		TOTAL NO. SPRAYABLE ROOMS/STRUCTURES ON PROPERTY		NO. UNSPRAYED ROOMS/ STRUCTURES ON PROPERTY		INSECTICIDE USED	AMOUNT OF INSECTICIDE USED
			CHILDREN	ADULTS	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)		
1										
2										
3										
4										
5										

Reason key / totals: **SC:** sick **NB:** newborn **F:** funeral **NH:** no one home **R:** refused spray **H:** hazard/unsafe **O:** Other

Date Comments

.....

.....

Used to track for each spray round:

- Date of spraying
- Coverage of structures within the building or property
- Any issues with accessing structures for spraying
- Type and amount of insecticide used

7

Daily spraying record

Annex 10. Daily spraying record

Province/Island ..... District/Zone ..... Village/Suburb ..... Spray date .....

PROPERTY NO.	TARGET PROPERTY ID (property name or #)	PROPERTY TYPE	GPS LOCATION		NO. PEOPLE IN TARGET PROPERTY		NO. SPRAYABLE ROOMS /STRUCTURES		NO. SPRAYED ROOMS /STRUCTURES		NO. UNSPRAYED ROOMS/STRUCTURES		AMOUNT INSECTICIDE USED (LITRES)	
		(SEE KEY)	LATITUDE	LONGITUDE	CHILDREN	ADULTS	INDOOR	OUTDOOR	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)	INDOOR	OUTDOOR
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
TOTAL		na	na	na										

Property type key: **H:** house **A:** apartment **HT:** hotel **S:** shop **O:** office **I:** industrial **V:** vacant **PS:** public space
Reason key: SC: sick **NB:** newborn **F:** funeral **NH:** no one home. **R:** refused spray **H:** hazard/unsafe **O:** other

Daily summary
Amount insecticide issued
Amount insecticide used
Amount insecticide returned

Insecticide used: _____
Properties sprayed
People in properties sprayed
Rooms/structures sprayed

Property coverage: (total target-sprayed)/target x 100 %
Population coverage: (total target-sprayed)/target x 100 %
Room/structure coverage: (total-unsprayed)/total %

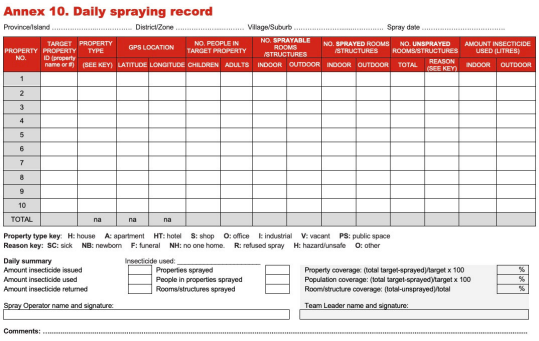
Spray Operator name and signature:

Team Leader name and signature:

Comments: .....

8

Daily spraying record



Annex 10. Daily spraying record

Province/Island ..... District/Zone ..... Village/Suburb ..... Spray date .....

PROPERTY NO.	TARGET PROPERTY ID (property name or #)	PROPERTY TYPE	GPS LOCATION		NO. PEOPLE IN TARGET PROPERTY		NO. SPRAYABLE ROOMS /STRUCTURES		NO. SPRAYED ROOMS /STRUCTURES		NO. UNSPRAYED ROOMS/STRUCTURES		AMOUNT INSECTICIDE USED (LITRES)	
		(SEE KEY)	LATITUDE	LONGITUDE	CHILDREN	ADULTS	INDOOR	OUTDOOR	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)	INDOOR	OUTDOOR
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
TOTAL			na	na	na									

Property type key: H: house A: apartment HT: hotel S: shop O: office I: industrial V: vacant PS: public space
Reason key: SC: sick NB: newborn F: funeral NH: no one home. R: refused spray H: hazard/unsafe O: other

Daily summary
Amount insecticide issued
Amount insecticide used
Amount insecticide returned

Insecticide used: _____
Properties sprayed
People in properties sprayed
Rooms/structures sprayed

Property coverage: (total target-sprayed)/target x 100 %
Population coverage: (total target-sprayed)/target x 100 %
Room/structure coverage: (total-unsprayed)/total %

Spray Operator name and signature:

Team Leader name and signature:

Comments: .....

Used to track for each spray round:

- Track locations and structures sprayed each day
- Details of people who live or work in sprayed and unsprayed properties
- Any issues with accessing houses or structures for spraying
- Type and amount of insecticide used

Note: Insecticides should be counted as soon as they are received, and this information should be added to the form

9

Daily spraying record: example

Annex 10. Daily spraying record

Province/Island SHEFA, Efate District/Zone Port Vila Village/Suburb Nambatri Spray date 1 November 2023

PROPERTY NO.	TARGET PROPERTY ID (property name or #)	PROPERTY TYPE	GPS LOCATION		NO. PEOPLE IN TARGET PROPERTY		NO. SPRAYABLE ROOMS /STRUCTURES		NO. SPRAYED ROOMS /STRUCTURES		NO. UNSPRAYED ROOMS/STRUCTURES		AMOUNT INSECTICIDE USED (LITRES)	
		(SEE KEY)	LATITUDE	LONGITUDE	CHILDREN	ADULTS	INDOOR	OUTDOOR	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)	INDOOR	OUTDOOR
1	NT-032	H			3	3	4	0	3	0	1	SC	1	0
2	NT-033	H			4	2	3	2	3	2	0		1	0.5
3	NT-034	S			2	1	2	1	0	0	3	R	0	0
4	NOTE: HEAVY RAIN AND WAS UNABLE TO SPRAY													
5														
6														
7														
8														
9														
10														
TOTAL	NT-034	na	na	na	9	6	9	3	6	1	4	na	2	0.5

Property type key: H: house A: apartment HT: hotel S: shop O: office I: industrial V: vacant PS: public space
Reason key: SC: sick NB: newborn F: funeral NH: no one home. R: refused spray H: hazard/unsafe O: other

Daily summary
Amount insecticide issued 5
Amount insecticide used 2.5
Amount insecticide returned 2.5

Insecticide used: _____
Properties sprayed 2
People in properties sprayed 7
Rooms/structures sprayed 7

Property coverage: (total target-sprayed)/target x 100 67 %
Population coverage: (total target-sprayed)/target x 100 80 %
Room/structure coverage: (total-unsprayed)/total 58 %

Spray Operator name and signature:

Team Leader name and signature:

Comments: .....

The *spray operator* James Bond, working at a location in Port Vila (Nambatri), received 5 insecticide units at the start of the day.

James sprayed 2 residential properties but was refused entry to a shop.

He used 2.5 L of the assigned insecticide. His work finished early and could not be resumed due to a downpour of rain.

10

Daily spraying record: example

Annex 10. Daily spraying record

Province/Island SHEFA, Efate District/Zone Port Vila Village/Suburb Nambatri Spray date 1 November 2023

PROPERTY NO.	TARGET PROPERTY ID (property name or #)	PROPERTY TYPE	GPS LOCATION		NO. PEOPLE IN TARGET PROPERTY		NO. SPRAYABLE ROOMS /STRUCTURES		NO. SPRAYED ROOMS /STRUCTURES		NO. UNSPRAYED ROOMS/STRUCTURES		AMOUNT INSECTICIDE USED (LITRES)	
		(SEE KEY)	LATITUDE	LONGITUDE	CHILDREN	ADULTS	INDOOR	OUTDOOR	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)	INDOOR	OUTDOOR
1	NT-032	H			3	3	4	0	3	0	1	SC	1	0
2	NT-033	H			4	2	3	2	3	2	0		1	0.5
3	NT-034	S			2	1	2	1	0	0	3	R	0	0
4		NOTE: HEAVY RAIN AND WAS UNABLE TO SPRAY												
5														
6														
7														
8														
9														
10														
TOTAL	NT-034	na	na	na	9	6	9	3	6	1	4	na	2	0.5

Property type key: **H:** house **A:** apartment **HT:** hotel **S:** shop **O:** office **I:** industrial **V:** vacant **PS:** public space
Reason key: **SC:** sick **NB:** newborn **F:** funeral **NH:** no one home. **R:** refused spray **H:** hazard/unsafe **O:** other

Daily summary

Insecticide used:

Amount insecticide issued	5	Properties sprayed	2
Amount insecticide used	2.5	People in properties sprayed	7
Amount insecticide returned	2.5	Rooms/structures sprayed	7

Property coverage: (total target-sprayed)/target x 100	67 %
Population coverage: (total target-sprayed)/target x 100	80 %
Room/structure coverage: (total-unsprayed)/total	58 %

Spray Operator name and signature:

Team Leader name and signature:

Comments: .....

Target spray unit ID: Be sure to use the household name or number and not the name of the person you meet the day of spraying.

This should be a unique ID that allows the household to be located again at a later stage.

Property type: Record the property type in reference to the key.

11

Daily spraying record: example

Annex 10. Daily spraying record

Province/Island SHEFA, Efate District/Zone Port Vila Village/Suburb Nambatri Spray date 1 November 2023

PROPERTY NO.	TARGET PROPERTY ID (property name or #)	PROPERTY TYPE	GPS LOCATION		NO. PEOPLE IN TARGET PROPERTY		NO. SPRAYABLE ROOMS /STRUCTURES		NO. SPRAYED ROOMS /STRUCTURES		NO. UNSPRAYED ROOMS/STRUCTURES		AMOUNT INSECTICIDE USED (LITRES)	
		(SEE KEY)	LATITUDE	LONGITUDE	CHILDREN	ADULTS	INDOOR	OUTDOOR	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)	INDOOR	OUTDOOR
1	NT-032	H			3	3	4	0	3	0	1	SC	1	0
2	NT-033	H			4	2	3	2	3	2	0		1	0.5
3	NT-034	S			2	1	2	1	0	0	3	R	0	0
4		NOTE: HEAVY RAIN AND WAS UNABLE TO SPRAY												
5														
6														
7														
8														
9														
10														
TOTAL	NT-034	na	na	na	9	6	9	3	6	1	4	na	2	0.5

Property type key: **H:** house **A:** apartment **HT:** hotel **S:** shop **O:** office **I:** industrial **V:** vacant **PS:** public space
Reason key: **SC:** sick **NB:** newborn **F:** funeral **NH:** no one home. **R:** refused spray **H:** hazard/unsafe **O:** other

Daily summary

Insecticide used:

Amount insecticide issued	5	Properties sprayed	2
Amount insecticide used	2.5	People in properties sprayed	7
Amount insecticide returned	2.5	Rooms/structures sprayed	7

Property coverage: (total target-sprayed)/target x 100	67 %
Population coverage: (total target-sprayed)/target x 100	80 %
Room/structure coverage: (total-unsprayed)/total	58 %

Spray Operator name and signature:

Team Leader name and signature:

Comments: .....

Target spray unit GPS: can be found when at the site using a smart phone

No. of people in spray unit: the number of people who regularly sleep in the sprayed structures

- ***Children:*** ≤ 18 years
- ***Adults:*** ≥ 18 years

12

Daily spraying record: example

Annex 10. Daily spraying record

Province/Island SHEFA, Efate District/Zone Port Vila Village/Suburb Nambatri Spray date 1 November 2023

PROPERTY NO.	TARGET PROPERTY ID (property name or #)	PROPERTY TYPE	GPS LOCATION		NO. PEOPLE IN TARGET PROPERTY		NO. SPRAYABLE ROOMS /STRUCTURES		NO. SPRAYED ROOMS /STRUCTURES		NO. UNSPRAYED ROOMS/STRUCTURES		AMOUNT INSECTICIDE USED (LITRES)	
		(SEE KEY)	LATITUDE	LONGITUDE	CHILDREN	ADULTS	INDOOR	OUTDOOR	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)	INDOOR	OUTDOOR
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2	NT-033	H			4	2	3	2	3	2	0		1	0.5
3	NT-034	S			2	1	2	1	0	0	3	R	0	0
4		NOTE: HEAVY RAIN AND WAS UNABLE TO SPRAY												
5														
6														
7														
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10														
TOTAL	NT-034	na	na	na	9	6	9	3	6	1	4	na	2	0.5

Property type key: H: house A: apartment HT: hotel S: shop O: office I: industrial V: vacant PS: public space
Reason key: SC: sick NB: newborn F: funeral NH: no one home. R: refused spray H: hazard/unsafe O: other

Daily summary

Insecticide used:

Amount insecticide issued	5	Properties sprayed	2	Property coverage: (total target-sprayed)/target x 100	67 %
Amount insecticide used	2.5	People in properties sprayed	7	Population coverage: (total target-sprayed)/target x 100	80 %
Amount insecticide returned	2.5	Rooms/structures sprayed	7	Room/structure coverage: (total-unsprayed)/total	58 %

Spray Operator name and signature:

Team Leader name and signature:

Comments: .....

Sprayable structures: Reflects the total number of sprayable structures in the household.

Reasons key: a code that indicates the reason why structures were not sprayed.

13

Daily spraying record: example

Annex 10. Daily spraying record

Province/Island SHEFA, Efate District/Zone Port Vila Village/Suburb Nambatri Spray date 1 November 2023

PROPERTY NO.	TARGET PROPERTY ID (property name or #)	PROPERTY TYPE	GPS LOCATION		NO. PEOPLE IN TARGET PROPERTY		NO. SPRAYABLE ROOMS /STRUCTURES		NO. SPRAYED ROOMS /STRUCTURES		NO. UNSPRAYED ROOMS/STRUCTURES		AMOUNT INSECTICIDE USED (LITRES)	
		(SEE KEY)	LATITUDE	LONGITUDE	CHILDREN	ADULTS	INDOOR	OUTDOOR	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)	INDOOR	OUTDOOR
1	NT-032	H			3	3	4	0	3	0	1	SC	1	0
2	NT-033	H			4	2	3	2	3	2	0		1	0.5
3	NT-034	S			2	1	2	1	0	0	3	R	0	0
4		NOTE: HEAVY RAIN AND WAS UNABLE TO SPRAY												
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6														
7														
8														
9														
10														
TOTAL	NT-034	na	na	na	9	6	9	3	6	1	4	na	2	0.5

Property type key: H: house A: apartment HT: hotel S: shop O: office I: industrial V: vacant PS: public space
Reason key: SC: sick NB: newborn F: funeral NH: no one home. R: refused spray H: hazard/unsafe O: other

Daily summary

Insecticide used:

Amount insecticide issued	5	Properties sprayed	2	Property coverage: (total target-sprayed)/target x 100	67 %
Amount insecticide used	2.5	People in properties sprayed	7	Population coverage: (total target-sprayed)/target x 100	80 %
Amount insecticide returned	2.5	Rooms/structures sprayed	7	Room/structure coverage: (total-unsprayed)/total	58 %

Spray Operator name and signature:

Team Leader name and signature:

Comments: .....

Insecticide used: Record the amount used per property.

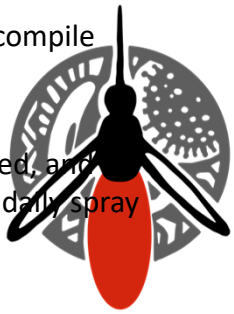
Daily summary: Note insecticide usage and totals for other fields. Calculate the coverage rates for property, population and room/structure.

Spray operator and team leader should sign at end of the day.

14

Key messages

- Good record keeping is important to ensure effective and efficient spray operations, and can be used to report on spray team performance
- Two types of forms need to be completed accurately: the property spray card and daily spray record
- Daily spray record forms are reported to the national level to compile national statistics on spray operations
- It is important that data such as the amount of insecticides used, and reasons for refusal of spraying are recorded accurately on the daily spray record



15

Practice exercise (session 22)

- At the start of the spray day on 12th October 2023, the spray operator James Bond has 5 full packages (or bottles/sachets) of insecticide.
- James Bond sprays 2 out of 10 properties that are present in JCU Village, Cairns, QLD state. JCU village has a population of 250 people.
- At the end of the spray day, the spray operator James Bond has 1 full package (or bottle/sachet) of insecticide, and 4 packages that are empty.

16

Complete the Property Spray Card for these two properties

	Property 1: 5 Lami Street	Property 2: 27 Erakor Lane
✓	A house with 3 structures found to spray, 2 of them sprayed	A shop with 5 structures found to spray, 4 of them sprayed
✓	A total of 7 people live in the 2 structures sprayed, including 3 adults and 4 children.	A total of 15 adults work in the 4 structures sprayed.
✓	3 people sleep in the 1 unsprayed structure. This room could not be sprayed because an elderly man in a bed could not be moved.	The 1 unsprayed structure is a locked storage room that is rarely opened.

17

Property Spray Card: practice exercise

Annex 9. Property spray card

Province/Island ..... District/Zone ..... Village/Suburb .....

Property ID ..... Longitude ..... Latitude .....

Date card issued .....

Property type (tick those that apply): ☐ house ☐ apartment ☐ hotel ☐ shop ☐ office ☐ industrial ☐ vacant ☐ public space

TREATMENT NO.	DATE SPRAYED	SPRAY OPERATOR	NO. PEOPLE IN TARGET PROPERTY		TOTAL NO. SPRAYABLE ROOMS/STRUCTURES ON PROPERTY		NO. UNSPRAYED ROOMS/ STRUCTURES ON PROPERTY		INSECTICIDE USED	AMOUNT OF INSECTICIDE USED
			CHILDREN	ADULTS	INDOOR	OUTDOOR	TOTAL	REASON (SEE KEY)		
1										
2										
3										
4										
5										

Reason key / totals: **SC:** sick **NB**: newborn **F**: funeral **NH:** no one home **R:** refused spray **H:** hazard/unsafe **O:** Other

Date Comments

.....

.....

18

Session 23:

Spray skills observation

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 23:

Spray Skills Observation

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

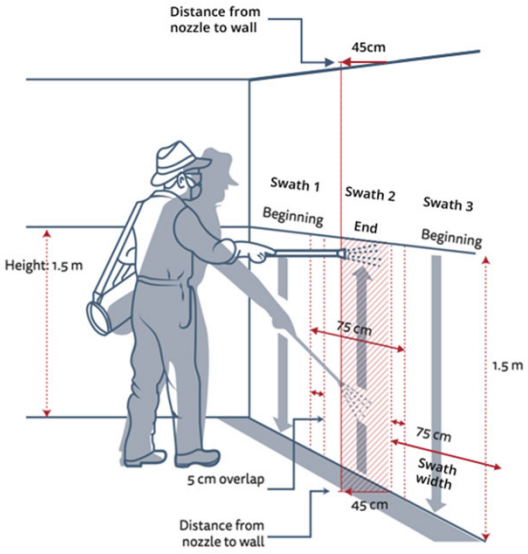
By the end of this session, you will be able to:

- Demonstrate the correct way to pressurise, carry and use the hand-compression sprayer
- Demonstrate the correct way to use the motorised backpack mist-blower
- Explain how to evaluate trainees on their spray skills

2

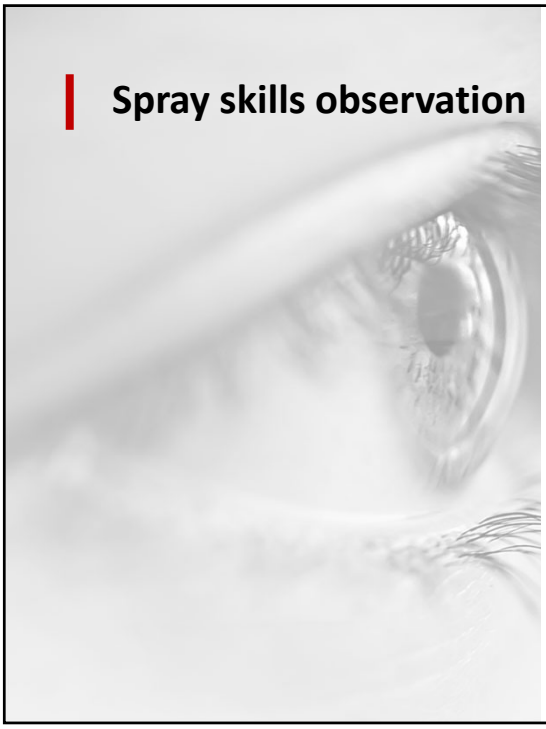
Reflection

- Why is it important to practice the process and technique for residual spraying?
- Do you feel confident that you know the correct process and technique?
- Do you feel confident you could teach it?



3

Spray skills observation



- Divide participants into 3 groups
- Facilitator to demonstrate use of the **spray skills observation test**
- Participants to conduct observation tests for each other

Please help each other (provide guidance or corrective action)

4

Observation 1: Hand-compression spraying of wall

Participants will be asked to:

- Fill their sprayer to 7.5 l and pressurise it
- Perform 3 consecutive sprays of swathes of 1.5 m in height
- Put the sprayer down and de-pressurise it

5

Observation 2: Hand-compression spraying of furniture

Participants will be asked to:

- Fill their sprayer to 7.5 l and pressurise it
- Perform spraying of at least 3 different pieces of furniture
- Put the sprayer down and de-pressurise it

6

Observation 3: Mist-blowing of vegetation

Participants will be asked to:

- Fill their motorised mist-blower with water and insecticide
- Start the blower and lift to carry
- Perform vegetation spraying of at 3 different sections, for at least 10-seconds each and with at least 5 m between sections
- Turn off the mist-blower and put it down

7

Session 24:

Spraying in difficult situations

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 24:

Spraying in difficult situations

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Session objectives

By the end of this session, you will be able to:

- Understand key challenges faced by spray operators
- Understand how to manage/mitigate against them

2

What challenging situations have you faced or could you expect to face while spraying?

3

Spray operators can face numerous challenges

4

Weather conditions

Common issues

Access to houses is restricted by flooding

Extreme heat, wind or other weather event

Potential solutions

- Wait until water subsides to continue spray operations (in the interim prioritise spraying elsewhere)
- Postpone spraying if it is not safe for spray operators and resume when it is safe to do so
- Ensure any allowances or adjustments are made for wind drift whilst spraying

5

Pets and wildlife

Common issues

Animal presents danger to spray team

Pets are not correctly removed or secured away from the house

Birds, fish or reptiles are present at the house

Potential solutions

- Request resident to remove or restrain animal - otherwise, do not enter property
- Request resident to adhere to instructions
- Do not proceed with spraying until this is rectified

6

Common issue

You encounter a dog that is agitated, upset or is behaving in a way that makes you uncomfortable

Your safety and that of your teammates is extremely important. You should feel safe at all times.

Potential solutions

- Rattle the gate when entering a property to alert dogs to your presence
- If the dog still appears agitated - do not enter the property
- Ask the home occupant to restrain the dog
- If you have entered but at any point feel unsafe – leave if it is safe to do so (your teammates may need to distract the dog)

7

Environmental hazards

Common issues

Housing endangers spray team

Environment hazards endanger spray team

Potential solutions

- Do not proceed with spraying until this is rectified

- If identified during initial check, request householder to remove the hazard
- Otherwise, do not proceed with spraying

8

Homeowners

Common issues	Potential solutions
Householders present danger to spray team	**Do not enter** the property
Householders enter house during spraying	Stop spraying immediately and only continue once the occupant has left
Householder comes home while you are in their yard	Stop what you are doing and introduce yourself to the occupant – make it clear you are not an intruder

9

Do not enter a property if the occupants:

- Are under the influence of drugs and/or alcohol
- Exhibit mental health issues
- Are having an argument or domestic dispute
- Do not speak or understand the language(s) being used by the spray team

Never enter a property if you feel unsafe.

10

Other issues

Possible issue

Household items are damaged during spray process

Action required

- Inform householder
- Inform Team Leader

11

The safety and well-being of spray operators is a priority at all times

12

Working in a team creates a safe environment – there is safety in numbers! Teams of two people are a minimum.

Team must work together and know each other's whereabouts. Never leave team members alone in properties.

13

Key messages

- Spray operators face numerous challenges and different types
- These should be identified in advance with mitigating actions
- Spray operator safety and well-being is a priority

14

Session 26:

Review session

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Session 26:

Review session

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Sessions summary

The key topics covered in this workshop included:

- Theory of vector biology and mosquito control
- Demonstration and practice of residual spraying techniques for controlling *Aedes:*
  - Indoor residual spraying (IRS-*Aedes*) using Goizper hand-compression sprayers
  - Outdoor residual spraying of vegetation (ORS-*Aedes*) using Stihl mist-blowers
- Spray challenges, maintenance and troubleshooting
- Health and safety (including PPE use)
- Supervision and data management
- Communicating with the community

2

Theory of vector biology and mosquito control

The key points covered were:

- There is no one perfect method for mosquito control
- The method always depends on the species being targeted (indoors/outdoors) and good understanding of their biology and resting places
- Residual spray can be applied for different purposes in different areas, locations (indoors, outdoors, harbourages), structures, surfaces
- Residual spray programs must be adaptable to the situation
- Mosquito behaviours/distributions are not static

3

Indoor residual spraying (IRS-*Aedes*) using Goizper sprayers

The key points covered were:

- Targets indoor-resting mosquitoes, such as *Aedes aegypti*
- Aims to cover the lower 1.5 m of the walls and under/behind furniture and in dark areas
- Keep nozzle 45 cm from the wall with one swath taking 3.5 seconds - use a faster application speed of the nozzle is closer
- Need to adapt the application speed/technique for use under/around furniture

4

Outdoor residual spraying of vegetation (ORS-*Aedes*) using Stihl mist-blowers

The key points covered were:

- Residual spraying of peri-domestic areas is called **barrier spraying** or **harbourage spraying**
- Targets outdoor-resting vectors such as *Ae. albopictus, Ae. polynesiensis* and *Ae. hensilli*
- Spray technique aims to cover the lower 2 m of vegetation, and to penetrate up to 3 m deep into the vegetation
- Vegetation targeted is very close to buildings or residences where humans reside

5

Spray challenges, maintenance and troubleshooting

The key points covered were:

- Key challenges include personal factors (timing of access), unpredictable weather conditions (or disasters), pets and wildlife, environmental hazards (unsafe or difficult access), political issues
- Householders may not be at home or refuse the spraying
- Parts to repair and maintain the sprayers may be challenging to access locally, spray operators should understand basic cleaning and maintenance (e.g., weekly calibration)

6

Health and safety (including PPE use)

The key points covered were:

- Do not use insecticide near food or food preparation areas (or while eating or smoking), and wash hands and face after spraying
- Teamwork is important (at least 2 people/team). Monitor yourself and your colleagues for symptoms of insecticide exposure or fatigue/overheating
- The best way to protect the spray operator is to wear personal protective equipment (PPE) at all times that there may be contact with insecticide
- Different types of chemicals have different safety/toxicity considerations. It is important to understand the appropriate use of each chemical – both the chemical itself and the technique to apply it

7

Supervision and data management

The key points covered were:

- Good record keeping is important to ensure effective and efficient spray operations, and can be used to report spray team performance (e.g., amount of insecticides used and reasons for refusal of spraying)
- Two types of forms need to be completed accurately: the household spray card and daily spray record (adapted to each country)
- These forms inform accurate planning and reporting at the national level, and are compiled for reporting national statistics

8

Communicating with the community

The key points covered were:

- It is important to communicate different types of information to the community before, during and after spraying
- Common concerns to address with the community include:
  - Queries on why operators wear PPE
  - Health risks to babies, pregnant women or unwell family members
  - Risks of spraying versus not spraying
  - Extreme or unpredictable weather e.g., heat, rain, wind
- Common challenges include vicious dogs, households that cannot be accessed (not friendly, absent, refusal), other hazards

9

Questions and comments?

10

Closing session

PacMOSSI Workshop

Residual spraying against *Aedes* vectors in the Pacific

Closing session:

Overview, test and feedback

PacMOSSI
Pacific Mosquito Surveillance Strengthening for Impact

1

Workshop in a snapshot

- Number of participants
- Number of facilitators/support staff
- Number of countries/provinces included
- Total hours of workshop sessions
- Number of topics covered
- Other key outcomes?

2

Post-workshop test

- Complete individually
- 20 minutes assigned
- Do your best
- Do not look up online or ask anyone for help
- Raise hand if any questions
- Raise hand when completed

3

Workshop evaluation

- Complete individually
- 5 minutes assigned
- All feedback and constructive criticism welcomed by the team

4

Other feedback?

5

Thank you
for your active participation!

6

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Requests for the full set of individual PowerPoint files for presentation, adaptation and/or translation should be sent to: pacmossi@jcu.edu.au

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