

Aircraft disinsection:
*WHO recommended products, methods
and procedures*

Dr Rajpal Yadav

Vector Ecology & Management Unit

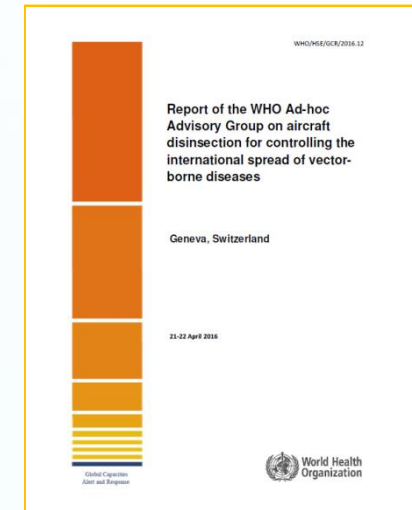
Department of Control of Neglected Tropical Diseases

World Health Organization, Geneva, Switzerland



Findings of a WHO expert group (2016)

- Infected human travellers may introduce pathogens
- Mosquito vectors travel on aircraft & other conveyances
 - A small proportion may carry pathogens
 - Pathogen importation in mosquito vectors has a low probability
- Some documented cases of “airport malaria” and dengue caused by mosquitoes carried on an international flight
- No documented cases of yellow fever & Zika virus to date
- Effectiveness of disinsection was considered low for preventing pathogen importation



Source:
http://apps.who.int/iris/bitstream/10665/44836/1/9789241503235_eng.pdf

58th World Health Assembly, 16-25 May 2005

- The revised edition of IHR includes an updated definition of disinsection:
 - “... is the procedure whereby health measures are taken to *control or* kill the insect vectors of human disease present in baggage, cargo, containers, conveyances, goods and postal parcels” (Part I, Article 1).
- Modified: “disinsecting...shall be carried out so as not to cause undue discomfort to any person, or injury to his health...” **to** “disinsecting...shall be carried out so as to avoid injury and, as far as possible, discomfort to persons...” (Part IV, Article 22).

Currently WHO recommended disinsection methods

- **Pre-flight aerosol application**
- **Blocks away aerosol application**
- **Top-of-descent aerosol application**
- **Residual treatment**

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INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY

REPORT OF THE INFORMAL CONSULTATION ON
AIRCRAFT DISINSECTION

WHO/HQ, GENEVA, 6-10 NOVEMBER 1995



UNEP
United Nations Environment Programme
Programme des Nations Unies
pour l'Environnement



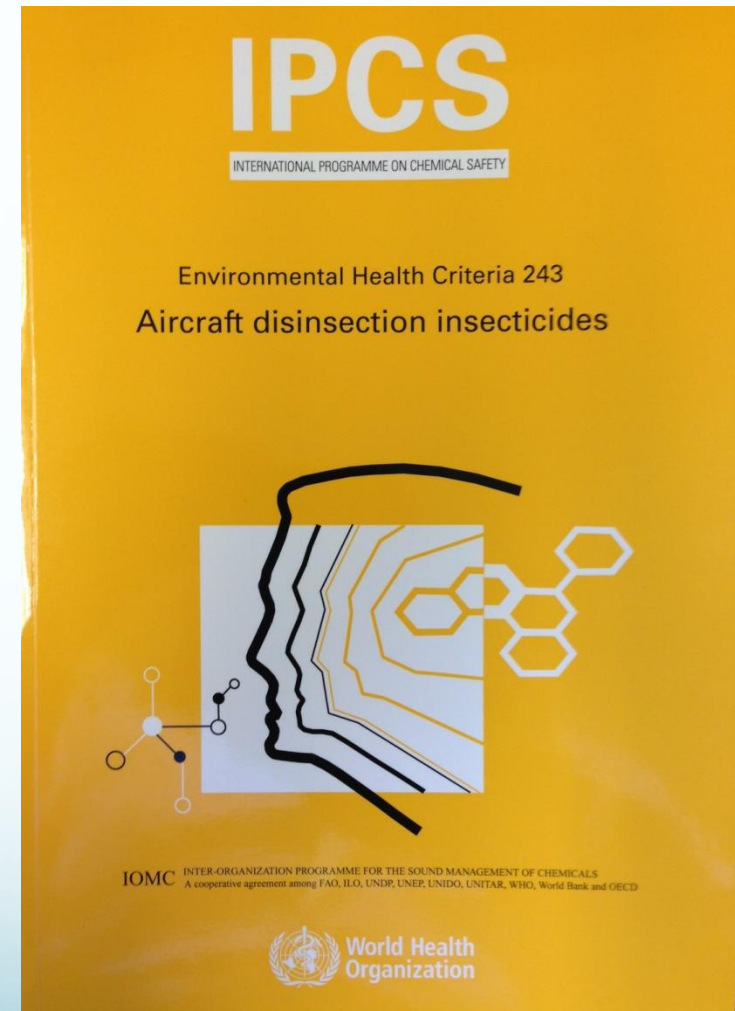
International Labour Office
Bureau International du Travail



World Health Organization
Organisation mondiale de la Santé

Source:
http://who.int/iris/bitstream/10665/100023/1/9789241572439_eng.pdf

WHO Guidelines: Efficacy testing and risk assessment of aircraft disinsection products



Disinsection products

- Permethrin (25:75) TC, 2% AE (aerosol), EC
- d-Phenothrin TC; 2% AE
- 1-*R*-trans-phenothrin TC

Insecticides and spray operations should comply with:

- WHO specifications and procedures, and
- regulations in the country of arrival

TC, technical concentrate; AE, aerosol; EC, emulsifiable concentrate

Disinsection methods

- **Pre-flight* aerosol application**
 - Done by ground staff before passengers board
 - Within 1h before closing doors
 - Flight deck, passenger cabin, toilet areas, open overhead and side wall lockers, and crew areas are treated
 - Insecticide: 2% permethrin (25:75)
 - Target dose: 0.7 g AI/100 m³ (= 35 mL)
 - Droplet size: 10–15 µm
 - Further in-flight spray done (top-of descent)

* = Pre-embarkation disinsection

Disinsection methods

- **Blocks away aerosol application**
 - Applied by cabin crew members
 - Flight deck is sprayed first (no pilots/passengers are onboard)
 - Cabin sprayed next before flight takes off
 - Passengers onboard, cabin doors are closed, lockers/toilet areas remain open
 - Airconditioning system is turned off
 - Cargo hold sprayed (by ground staff)
 - Insecticide: 2% d-phenothrin (= 1-R-trans-phenothrin)
 - Target dose: 0.7 g AI/100 m³ (= 35 mL)
 - Droplet size: 10–15 μm

Routine space spray on aircraft leaving countries with malaria



Challenge: Luggage lockers are closed
Best practice: they should be open



Disinsection methods

- **Top-of-descent aerosol spraying**
 - When aircraft starts descending to arrival airport
 - Air recirculation system set to normal
 - 2% d-phenothrin (= 1-R-trans-phenothrin)
 - Target dose: 0.7 g AI/100 m³ (= 35 mL)
 - Application rate: 1 g (mL) per second

Disinsection methods

- **Residual treatment**
 - Applied by a professional PCO
 - Cabin and cargo internal/floor surfaces treated
 - food preparation areas & electrically sensitive areas excluded
 - Hand compression sprayer (with CFV & Flat fan nozzle)
 - Insecticide: permethrin (25:75) 2% EC
 - Dose: 0.2 g AI/m² (10 mL/m²) every ≤ 2 months
 - After treatment, turn on airconditioning for at least 1h before crew/passengers board aircraft
 - Re-treatment of areas depend on frequent cleaning

Methods and operating procedures for aircraft disinsection

Report of a WHO consultation
Geneva, 3-4 July 2018



Key challenges

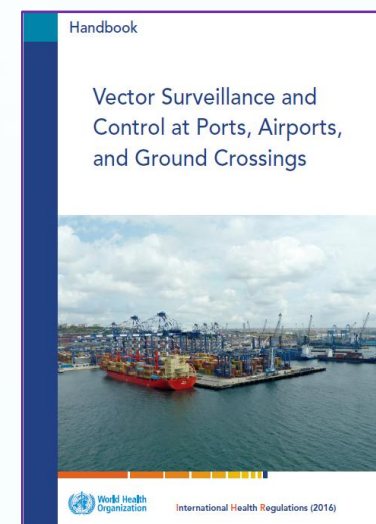
- Few disinsection products
- Limited market – limits investment
- Complex registration process
- New (non-chem) methods lacking
- Efficacy testing guidelines to be more practical
- Lack of updated guidance and training documents
- Lack of information on countries requiring disinsection
- Disinsection operations staff inadequately trained

Challenges

- Pyrethroid resistance in mosquitoes
- Regulatory restrictions in some countries banning use of certain pyrethroids
- Lack of vector surveillance data

Next steps by WHO

- Update of WHO aircraft disinsection methods and procedures
- Guidance on vector surveillance & control at PoE (2016):
 - Training manuals planned
- A new online vector identification platform



Source:

https://apps.who.int/iris/bitstream/handle/10665/204660/9789241549592_eng.pdf

Some comprehensive methods recommended by the meeting

a. Flights with multi-stops where disinsection is required

Treatment options	Passengers/ crew on board	Cabin	Insecticide and formulation	Final dose by area/ space	Applied by	Application equipment	Frequency of application	Hold/Cargo	Considerations
Residual	None	All cabin except excluded areas ^a	For cabin and hold: Permethrin (25:75) 50% EC to be diluted to 2% permethrin for use ^b	0.2 g/m ² for internal surfaces; 0.5 g/m ² for floors; ^c flow rate 10 mL/m ²	Professional PCO	Compression or cold fogger calibrated for droplet size, flow rate, target dose	At least every 8 weeks	Yes	1. Areas deep cleaned or refurbished within the treatment interval must be retreated; 2. Airconditioning run for at least 1 h before passengers and crew embark.
Pre-embarkation ^d	Crew only	All cabin (incl. toilets, crew rest, lower galleys, lift access and flight deck)	Permethrin (25:75) 2% AE	35 g formulation/ 100 m ³ with droplet size of 10-15 µm	Flight crew or ground staff	Aerosol cans	All departures where required	Residual treatment with permethrin EC, or use an aerosol containing 2% permethrin and 2% d-phenothrin	1. Airconditioning switched off; 2. To be applied within 1h before doors are closed.
Pre-departure (formerly "blocks away")	Passengers and crew	All cabin (incl. toilets, crew rest, lower galleys, lift access and flight deck)	2% d-phenothrin (or 1R-trans-phenothrin)	35 g formulation/ 100 m ³ (= 0.7 g a.i. per 100 m ³)	Flight crew for cabin; ground staff for holds and flight deck	Aerosol cans	All departures where required	Residual treatment with permethrin EC, or use an aerosol containing 2% permethrin and 2% d-phenothrin	1. Airconditioning switched off; 2. Overhead lockers closed after spraying is complete.
During flight (formerly "top of descent")	Passengers and crew	All cabin except excluded areas ^a	2% d-phenothrin AE (or 2% 1R-trans-phenothrin AE)	35 g formulation/ 100 m ³ (= 0.7 g a.i. per 100 m ³)	Flight crew	Aerosol cans	All flights where required	Residual treatment with permethrin EC, or use an aerosol containing 2% permethrin and 2% d-phenothrin	1. Air re-circulation set at normal flow; 2. Does not disinsect all areas of the cabin; 3. Potential exposure to vector-borne diseases from infective mosquito bites during flight.

^a Excluded areas can include flight deck, direct spraying of seats, food preparation areas and crew rest areas. Electrically sensitive areas can be sprayed with 2% permethrin AE.

^b Can also be supplied in a ready-to-use form as a 2% solution.

^c The aim is to spray the floor surfaces with 0.2 g/m² (i.e. a total of 0.4 g/m²); however as spray aimed at other surfaces may also be deposited from fall-out of larger droplets on the floor, especially along aisles, the maximum dose at floor level is estimated to be 0.5 g/m².

^d Method used in Australia/New Zealand; replaces the WHO Pre-flight method.

b. Nonstop flights or flights that stopover in locations where disinsection is not required

Disinsection Options	Passengers/ Crew on board	Cabin treated	Insecticide and formulation	Final dose area/ space	Applied by	Application equipment	Frequency of application	Hold/Cargo treated	Considerations
Residual	None	All cabin except excluded areas ^a	For cabin and hold: Permethrin (25:75) 50% EC to be diluted to 2% permethrin for use ^b	0.2 g/m ² for internal surfaces; 0.5 g/m ² for floors; ^c flow rate 10 mL/m ²	Professional PCO	Compression or cold fogger calibrated for droplet size, flow rate, target dose	At least every 8 weeks	Yes	1. Areas deep cleaned or refurbished within the treatment interval must be retreated; 2. Airconditioning run for at least 1 h before passengers and crew embark.
Pre-embarkation (formerly "pre-flight")	Crew only	All cabin (incl. toilets, crew rest, lower galleys, lift access and flight deck)	Permethrin (25:75) 2% AE	35 g formulation/ 100 m ³ (= 0.7 g a.i. per 100 m ³)	Flight crew or ground staff	Aerosol cans	All departures where required	Residual treatment with permethrin EC, or use an aerosol containing 2% permethrin and 2% d-phenothrin	1. Airconditioning switched off; 2. To be applied within 1h before doors are closed.
Pre-departure (formerly "blocks away")	Passengers / crew	All cabin (incl. toilets, crew rest, lower galleys, lift access and flight deck)	2% d-phenothrin AE (or 2% 1R-trans-phenothrin AE)	35 g formulation/ 100 m ³ (= 0.7 g a.i. per 100 m ³)	Flight crew for cabin; ground staff for holds and flight deck	Aerosol cans	All departures where required	Residual treatment with permethrin EC, or use an aerosol containing 2% permethrin and 2% d-phenothrin	1. Airconditioning switched off; 2. Overhead lockers closed after spraying is complete.

^a Excluded areas can include flight deck, direct spraying of seats, food preparation areas and crew rest areas. Electrically sensitive areas can be sprayed with 2% permethrin AE.

^b Can also be supplied in a ready-to-use form as a 2% solution.

^c The aim is to spray the floor surfaces with 0.2 g/m² (i.e. a total of 0.4 g/m²); however as spray aimed at other surfaces may also be deposited from fall-out of larger droplets on the floor, especially along aisles, the maximum dose at floor level is estimated to be 0.5 g/m².

Thank you
