DISINFECTION & DISINSECTION/ TRANSPORT OF HUMAN REMAINS ZAMBIA

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Disease-causing bacteria can linger on surfaces in commercial airplane cabins for up to a week, according to an Auburn University study presented this week at the annual meeting of the American Society for Microbiology.

Kiril Vaglenov, a graduate student in Auburn’s Department of Biological Sciences, conducted a two-year study—funded through the Federal Aviation Administration’s Airliner Cabin Environmental Research Center—to determine how long E. coli O157:H7 and methicillin-resistant Staphylococcus aureus, or MRSA, would survive on commonly touched surfaces under typical airplane conditions. A major airline carrier supplied researchers with material from armrests, plastic tray tables, seat-pocket cloth, window shades and metal toilet buttons.

“Our data show that both of these bacteria can survive for days on these surfaces, particularly the porous material such as armrests and seat-pockets,” said Vaglenov. “Air travelers should be aware of the risk of catching or spreading a disease to other passengers and practice good personal hygiene.”
DISINFECTION

IHR DEFINITION

- Disinfection: The procedure whereby measures are taken to control or kill infectious agents on a human or animal body, on a surface or in or on baggage, cargo, containers, conveyances, goods and postal parcels by direct exposure to chemical or physical agents;

- “decontamination” means a procedure whereby health measures are taken to eliminate an infectious or toxic agent /biological or matter on a human or animal body surface, in or on a product prepared for consumption or on other inanimate objects, including conveyances, that may constitute a public health risk;

- deratting” means the procedure whereby health measures are taken to control or kill rodent vectors
The competent authority needs to exercise oversight over cleaning and disinfection programmes (Ports Entries).

Competent Authorities are responsible for supervising service providers on:

- Relating to travellers (ill)
- Baggage, cargo
- Containers and conveyances and goods at points of entry
- Including with inspections and medical examinations, as necessary.
DISINFECTION

- Possible routes of infection transmission that might occur on board aircraft fall into three categories:

- Directly inhaled respiratory droplets, suspended airborne particles, or both;

- Direct contact with faecal matter, blood or other body fluids

- Cause-Bacteria/Virus

- Impact Intervention-PPE/Solution
General Guidelines for Maintenance Crew

High Efficiency Particulate Air (HEPA) filters

- About 50% of the air in most modern aircraft is re-circulated.
- However, air is only reused after having gone through HEPA filters.

![HEPA Filter Diagram](image-url)
Use soap: Using water alone does not remove soil and grease which can trap unseen germs and viruses.

Wash your hands for at least 15-20 seconds using the following steps.

Total duration of the entire procedure is 40-60 seconds.

Remove all jewelry and wet hands with warm water.
Apply soap to hands.
Rub hands together.
Cover all surfaces of the hands and fingers.
Clean knuckles, back of hands and fingers.
Clean the space between the thumb and the index finger.
Cover the fingernails by working the fingertips into the palm.
Rinse well under warm running water.
Dry with a disposable paper towel, then use the towel to turn off the tap.
What kind of Disinfection should be conducted

- Routine Cleaning and Disinfection (Service Providers should receive training)
- Enhanced Cleaning and Disinfection (PHEIC) has been declared
- Cabin Crew during an event (IATA Guidelines)
- Is the Disinfection conducted by a Service Provider / Airline – Role of Ports Health
- Pre-Agreement/Procedures
- Release of the Aircraft-Type of Disinfectant Used-Considered prior to event
- PPE – Who will provide/Priority Staff
DISINFECTED: ISSUES OF CONSIDERATION

- Cloth, leather or other materials?
- Detrimental effect on aircraft or on aircraft equipment/Materials compatibility
- Which germs - Broad Spectrum
Other Areas of Consideration (IATA Procedures)
RECOMMENDED ATTRIBUTES FOR AIRCRAFT DISINFECTANT

- Safety of active ingredients for human
- Environmental safety
- Spectrum of micro biocidal activity
- Transport, storage and inventory control
- Directions for use
- Speed of activity (Affect Release of the Aircraft)
  - Disinfectant approved in States to which an airline operates
  - WHO Approved
  - Health and Aviation :need to consider aircraft disinfection requirements prior to an event
CHEMICAL DISINFECTANT

- Unaffected by environmental factors
- Stable when concentrated or diluted
- Odourless
- Cheap, readily-available and easy to use (Bleach – Airport but not aircraft)
- Able to penetrate and develop a detergent action
SAFETY

- The chemicals used are often corrosive and toxic and have to be handled with care.

- The electricity supply must be switched off /maintained when the washing process is performed.

- After fumigation, adequate ventilation is necessary before the re-entry of personnel.

- PPE Worn: Dust and aerosols may be dangerous; all staff should wear protective masks, boots, coats, trousers and gloves.
Recommended Products

- WHO does not recommend commercial products
- Accelerated” hydrogen peroxide (AHP)
- Produced by Virox technologies (Canada)
- Aero-Sense Disinfectant Cleaner
- [Alcohol 70-75%: difficult to handle/store]
Sodium hypochlorite (bleach)

- Strong oxidizing agent
- Good disinfectant
- Inexpensive

BUT

- Dissolves aluminium
- Reduces fire retardant properties
- Not suitable for use on aircraft
- Free from off-gassing and Volatile Organic Chemicals (VOS)
  Must be avoided
Other Methods


- Carbon Dioxide & Nitrogen are considered but not registered.

- Environmental Consideration

- Thermal Disinfestation-Hot Air carefully applied to the aircraft cabin

- Inquire what is happening in our States.
Procedure: WHO Guide to Hygiene and Sanitation

http://www.who.int/water_sanitation_health/publications

- 2nd edition published 1977
- 3rd edition published 2009 - Chapter 3: Cleaning and Disinfection
DISINSECTION
DISINSECTION
AIRCRAFTS/AIRPORTS

DEFINITION:

- The procedure whereby measures are taken to control or kill the insect vectors of human diseases present in or baggage, cargo, containers, conveyances, goods and postal parcels.
DISEASES OF CONCERN

- Malaria
- Dengue
- Yellow Fever
- Chikungunya fever (similar to dengue) - transmitted by Aedes mosquito
- Zika
Disinsection

Aircrafts

Airports (Passenger terminals and the area within 400 m)
Disinsection is a public health measure that is mandated by the International Health Regulations (Annex2).

Every conveyance leaving an area where vector control is recommended by WHO should be disinsected and kept free of vectors.

Passenger terminals and the area within 400 m of airports should be kept free of vectors.

Surveillance Required of Mosquito Vector at Airports/Airline=Required WHO(2005)-?? Are countries complying
Disinsection

WHO Advisory Group 2016

- Effectiveness of Disinsection
- Avoidance/reduction of importation of new mosquito vectors to a country or region
- Especially Islands
- Zealand/Australia Despite Disinsection- Increased numbers of imported vectors recorded previously not there
Risk Assessment Team

**EXPERTS**
- Entomology
- Virology
- Vector Control, infectious diseases surveillance
- Chemical safety
- Mathematical modelling
- Travel medicine
- Border security
- Aviation operations.

**WHOPES-2016**
- d-Phenothrin technical grade material
- 1R-trans-phenothrin technical grade material
- Permethrin technical grade material
WHO Advisory Group 2016-Limitations

- Mosquito vectors is not just limited to aircraft cabins
- Hide overhead lockers, baggage and cargo holds –
- The current practice of applying aerosols in aircraft cabins after overhead lockers have been closed is not a good practice
- Limited Pyrethroids recommended by WHO
- Regulatory Restrictions of Pyrethroids by certain States
- Limited products approved by airline manufactures (Boeing/Air Bus)
- Increasing resistance of mosquito vectors to many insecticides.
- Limited availability of disinfectants in certain Regions
- Others Issues
Disinsection-WHO Advisory Group 2016-Recommendations

- Member States-prioritize compliance to IHR
- Member States should undertake a risk assessment relating to the probability of the importation of mosquito vectors
- The probability of infected persons entering the country

- Member States must use this to inform their Disinsection policies
- Improve consistency in Disinsection/may require exceeding the 400 meter at the airports
- WHO=Risk Assessment of pathogens
- Chemical and Non-Chemical Disinfectants Methods
- Research (Resistance and Others)
Yellow Fever Angola 2015
Approved Methods

- Pre-flight
- Blocks away
- Top of Descent
- Residual (2 months)
Approved Methods-Pre-flight

- The spray is applied before the passengers board the aircraft but not more than 1 hr before the doors are closed.

- A 2% permethrin cis:trans (25:75) formation is currently recommend for this application.
Approved Methods-Block Away

Blocks Away

- Spraying is carried out by crew members when the passengers are on board,

- After closure of the cabin door and before the flight takes off

- An aerosol containing an insecticide for rapid action is used

- A/C off – during cabin spraying

- The flight deck is sprayed before the pilot boards, when no passengers are on board
WHO Approved Methods Top-of-Descent

- Carried out as the aircraft starts its descent to the arrival airport

- Applied with the air recirculation system set at from high to normal flow

- The doors of overhead luggage racks should be closed only after spraying has been completed

- 2% D-phenothrin = WHO recommendation

- To be applied at a rate of 35g of formulation per 100 m3

- Cargo holds should also be disinsected
WHO Approved Methods-Residual

- The internal surfaces of the passenger cabin and cargo hold, excluding food preparation areas, are sprayed with a compression sprayer that has a constant flow valve and flat fan nozzle according to WHO specifications.

- Permethrin 25:75 (cis:trans) emulsifiable concentrate = WHO Recommendation

- Target dose of 0.2g/m² applied at intervals not exceeding 2 months.
WHO Approved Methods

- The emulsion is applied at 10ml/m3 to avoid run off

- Residual sprays are applied by professional pest control operators and are intended for long term residual activity on aircraft interior surfaces.

- In electrically sensitive areas, it may be necessary to use an aerosol instead of a compression sprayer

- After treatment is completed, air-conditioning packs should be run for at least 1 hr before the crew and passengers embark.

- Pesticides formulations including spray cans should comply with national regulations & international standards as well as with WHO specifications for pesticides
PROCEDURES

Rapid Method-Block Away

- Treatment of the interior of the aircraft using a quick acting insecticide spray
- Immediately before take-off, with the passengers on board
PROCEDURES

Rapid action + limited Residual method

- Treatment of the interior for the aircraft on the ground before passengers come on board, using a residual-insecticide aerosol

- Plus additional in-flight treatment with a quick-acting spray shortly before landing
IATA Airline Survey

Of 17 airlines that disinsected

- 12% used residual method
- 24% residual + cabin spraying
- 68% cabin spraying alone

- Anecdotal reports of passengers feeling unwell after spraying: metallic taste; eye/throat/skin irritation; headache; allergic reaction; dyspnoea; cough; asthma attack
Current (WHO) approved chemicals

- Pyrethroids – synthetic chemicals based on natural extract of chrysanthemums
- Permethrin 2% (residual)
- D-phenothrin 2% (short-lived: space spraying)
- Both rapidly broken down and human effects are minimal
- Anecdotal reports of passengers feeling unwell after spraying: metallic taste; eye/throat/skin irritation; headache; allergic reaction; dyspnoea; cough; asthma attack
SAFETY OF PYRETHROIDS FOR PUBLIC HEALTH USE

World Health Organization
Communicable Disease Control, Prevention and Eradication
WHO Pesticide Production Scheme (WHO-PPS)
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<td>- IHR not fully implemented at Airports</td>
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<td>- Airline Operators or Service Providers - Lack of Guidance from DOH</td>
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<td>- Airport Operators - Disinsection</td>
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<td>- Industry confused Oversight (DOH/CAA)</td>
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<td>- ICAO Security Audit/USOAP - Annex 9 - Address Public Health Issues</td>
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<td>- Role of the CAA (Legislation-Operators establish a relationship with DOH)</td>
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<td>- Risk assessment conducted - Expert</td>
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<td>- Provide Updated list WHO Countries</td>
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<td>- No Guidance from DOH - Airlines Disinsection</td>
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<td>- Cost - Disinsection of Aircrafts not requiring the procedure</td>
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<tr>
<td>- WHO - Take to long to amended the List of Countries requiring</td>
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<tr>
<td>- Ports Health - Not Trained &amp; WHO-Guidance Material - Not Implemented at State Level</td>
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ICAO-State Letter- Non-Chemical Disinsectants

- An air door or air curtain is a device used to prevent air or contaminants from moving from one open space to another.
Air curtain: non-chemical disinsection
AIR CURTAIN
Repatriation Bodies
Respect for the dead is a value deeply ingrained in all societies, cultures and religions.

This respect should not be compromised when a person dies from an infectious disease.

It can be difficult to balance respect for the deceased person.

With the health and safety of those who come into contact with them.
WHO REPRATRIATION OF BODIES

- WHO – Several References on the safe handling of dead bodies following a Disaster

- WHO – Position is that the risk of transmission from a person dying from infectious disease is considered to be unlikely

- It is important that any movement of bodies should be coherent with International Health Regulations (IHR)

- State Parties – Regulations on the transport of a person who has died on infectious disease before carrying the remains

- Information should be sought on whether the destination country has specific requirements
WHO REPRATRIATION OF BODIES

- If the State does not have such regulation, guidelines from IATA on Airport Handling Manual should be followed.

- In order to transport human remains a death certificate, identity and the use of coffin, cause of death is required, and the body must not be an infection risk.

- If Chemical & Radiological exposure is suspected, Ports Health should be consulted.
Technical Instructions

- If the deceased has had a communicable disease.

- Their remains will be classified under IATA /Annex 18 regulations as an “infectious substance”.


- Issued every two years to reflect UN cycle

- “Each Contracting State shall take the necessary measures to achieve compliance with the detailed provisions contained in the Technical Instructions.” (*Annex 18, 2.2.1*)
Category A

- An infectious substance which if transported and exposure occurs
- Is capable of causing permanent disability, life-threatening or fatal disease in otherwise healthy humans or animals.

- *Infectious substances meeting these criteria which cause disease in humans or both in humans and animals shall be assigned to United Nations number UN 2814*

- Indicative examples of substances that meet these criteria are given in the table in Annex 2.
REPRATRIATION OF BODIES

- There are two categories of infectious substance, A and B.
- Category A includes highly infectious agents (e.g., Lassa, Ebola, Marburg, and others) and Category B includes such infections as HIV.
- Strict packaging rules apply to the transport of specimens considered to be Category A or B infectious substances.
- Coffins does not meet these requirements.
- Therefore, a special permit needs to be issued (example in Ireland)
Regulation 92.00.16 Dangerous Goods

- Packaging
- Handling
- Marking Infectious Material
- Report if there is damage to the package to either Public Health
REPRATRIATION OF BODIES

- There is no International Legislation regarding Repartition of Bodies (Infectious Risk)

- And probably also (depending on the countries involved) from the countries of transit and destination.

- As it is very unlikely that such a permit would be issued for the sole purpose of repatriating human remains

- It is considered that cremation is the only viable option for such cases.

- This may not be acceptable to families for a variety of reasons (culture/religious reasons)
REPRATRIATION OF BODIES

- There is no regulation or requirement that human remains must be embalmed.
- Some issues remain around the transportation of those who die from, or with, Category B (HIV) infections.
- It is considered that the risk of infection from such a body, which is enclosed in a body bag and placed in a lined coffin, is negligible.
REPRATRIATION OF BODIES EBOLA IATA

- Information from WHO regarding Ebola

- IATA-Guidelines for CC to manage death on board and its handling, upon landing – Advice is sought from Health Authorities

- "There is no scientific data on the survival of the Ebola virus in the dead bodies."

- Assumptions: Indirect evidence on the survival of the virus in the environment in general suggests that the virus may be able to survive in corpses for days

- And probably, weeks, but that is just an assumption
Human Remains Procedure-IATA Procedure

- Human Remains (HUM), except cremated, must be packed in a hermetically sealed (air sealed, water resistant, on porous) inner containment

- Which may be constructed of a flexible material or may be a rigid coffin of lead or zinc.

- The inner containment must then be packed inside a wooden or metal coffin.

- The wooden or metal coffin must be protected from damage by an outer packing

- Covered by canvas (cloth used to make tents/sail oil painting) or tarpaulin so that the nature of its contents is not apparent.
Human Remains Procedure-IATA Procedure

- Cremated remains must be shipped in Funeral Urns which are efficiently cushioned by suitable packing, against breakage.

- These flexible materials are now widely available and are recognised by many States as being suitable to achieve the requirements for a hermetically sealed inner containment.

- In addition this flexible material avoids the problems with the use of lead or zinc.

- Both of which are heavy, expensive and present difficulties as they must meet the requirements for environmental waste applicable in most States.
REPRATRIATION OF BODIES

Carriage of human remains in coffins on passenger and cargo aircraft are subject to the following conditions:

- Non-cremated HUM shall not be loaded in close proximity to foodstuffs (EAT)
- The pilot-in-command should be informed
- Stowage position on individual aircraft type shall be subject to company’s policy.
However, should a body fluid leakage occur while transporting dead bodies, the usual accepted guidelines endorsed by WHO for dealing with spilled body fluids should be followed, as stated below:

- Wear disposable gloves and, if available, a plastic apron.
- If the spillage has occurred on an aircraft, only use cleaning materials suitable for aircraft use.
- Do not try to clean the body fluids by hosing with water or air.
- Use material that will adsorb the body fluids and scrape the material into a biohazard bag.
Wash the area with water/disinfectant after removal of the adsorbent material.

Dispose of gloves and apron in a biohazard bag.

Wash hands thoroughly with soap and water afterwards.

If you have any further questions, contact your airline Medical Department or your national public health agency.
REPRATRIATION OF BODIES

- A Contracting State shall facilitate the prompt release of human remains being imported by air.

- Provided that applicable laws and regulations governing the importation of human remains are complied with.

- The advance notification, either in paper form or electronically, of the transport of human remains would likely facilitate the entry of human remains at the State of destination.

- Human remains shall be accompanied by a laissez passer for a human remains, reproduced in Appendix 14 issued by the appropriate public authority of the State of origin.
The laissez passer shall be issued by the appropriate public health authority referred to in, after it has ascertained that:

a) All the medical, health, administrative and legal requirements of the regulations in force in the State of origin relating to the transfer of human remains

b) Where appropriate, burial and exhumation have been complied with.
REPRATRIATION OF BODIES

b) the remains have been placed in a coffin which complies with the requirements laid down

c) the coffin only contains the remains of the person named in the laissez passer and such personal effects as are to be buried or cremated with the human remains
REPRATRIATION OF BODIES

Handling Urns

- Handling and loading as normal cargo

- *Note: there appears to be no scientific or technical reasons why HUM and live animals (AVI) should be segregated in aircraft cargo compartments.*

- *However, it may be ethical for cultural reasons to segregate them*
Case Study Mass Repatriation

- Ebola Incident-20th July 2014
- 12 Sept 2014-Guest House In Nigeria Collapsed
- Long Distance Mass Re-repatriation from an Ebola –Risk Area-2014
- Total=116 South Africans
- Bodies treated as possibly contaminated with Ebola
- The bodies were said to have been in close proximity with other bodies at mortuaries
- The risk was that decomposing bodies were contaminated body fluids from Ebola Disease Patients
Case Study Mass Repatriation
Case Study Mass Repatriation

- Baggage in a transparent body bag which was sealed, decontaminated with chlorine solution, wiped around.

- Bag placed in a 2\textsuperscript{nd} bag and 15 ml Formaldehyde squirted between the bags, sealed.

- Vaporising Formaldehyde created Formaldehyde gas layer between the bags.

- 2\textsuperscript{nd} layer decontaminated with chlorine solution.

- Placed in an Opaque Metal Lined Body Bag.

- Formaldehyde squirted between the bags, sealed-decontaminated with chlorine solution.

- Stoke Baskets Stretcher Used-Precooled mass truc repatriation.
SA National Dept. Health - Transport of Human Remains - Potentially Infections

- H. Remains must be placed in a Polythene Bag, sealed airtight.
- Placed in a Sturdy Non-Transparent Sealed Coffin.
- Embalmed /or the total body surface being covered with a 5cm layer of wood sawdust which is treated with a disinfectant.
- Medical Practitioner actioner must declare that the human remains does not constitute a hazard.
- Human Remains – Cause of death is Small Pox, Viral Haemorrhagic Fever, Anthrax.
- The body shall be embalmed and strict guidelines from the Health must be followed.
- May not use public transport, container must be free of leakages, secretions & offensive odours must be eliminated.
SA National Dept. Health-Transport of Human Remain-Potentially Infections

- They must comply with the requirements above: sealed bag, transparent sealed coffin

- The above shall not be damaged, open, come into direct contact and remove the remains once the container has been sealed without prior approval from the Medical Practitioner

- The law makes provision on cremated bodies

- Import and export of human remains requires a special permit

- The importation of Human Remains requires a special permit from the Director General

- Law on management of Human Remains (Radioactive Material), silence on the Procedure to be followed during transportation
REPRATIATION

- Mass Disaster-SA Expert Team working with the State Experts
- Body Identification (Finger Prints, DNA Dental Records)
- PPE
- Managed by Military & not civilian
- Single Body - Repratiation in the Civil Aviation Sectors
- General Guidelines from IATA-Transport of Human Remains
- Not Unique to Ebola
- If needed, lots of lessons can be learned from local Military
EXPERIENCE – Kenya & Nigeria
REPRATRIATION OF BODIES

- Airport Handling Manual (AHM 333)
- IATA Guidelines
- Handling of human remains
- Human remains procedure
- Handling of coffins
- Handling urns
Thank You