WASTE MANAGEMENT AT THE COUNTRY LEVEL: RESPONSES TO THE NOVEMBER 2018 LabCOP WASTE MANAGEMENT QUESTIONNAIRE

LABORATORY AND HEALTHCARE WASTE MANAGEMENT
TRAINING SESSION 1 : A COLLABORATIVE SHORT TERM TRAINING EFFORT CONDUCTED BY CDC INTERNATIONAL LABORATORY BRANCH (ILB), THE AFRICAN SOCIETY FOR LABORATORY MEDICINE (ASLM) LABCOP PROGRAM, AND THE GLOBAL FUND

Presented by: David Bressler, MS, CBSP, (SM)NRM
International Laboratory Branch
CDC, Division of Global HIV and TB
Email: dpb8@cdc.gov

PURPOSE

- Bring together LabCOP country teams and experts in identifying strategies and methods for building and sustaining waste management systems
- Speak specifically to the growing waste management issues of HIV Viral Load (VL) testing solid and liquid waste

Overview of Short Term Training Program

Objective

- Collaboration with the African Society for Laboratory Medicine (ASLM) and the LabCOP community, to offer awareness training on laboratory Waste Management (WM)
- Short term, distance learning (ECHO/Zoom) program covering critical issues of laboratory/healthcare WM w/focus on VL liquid chemical waste
- Key concerns that we all face when dealing with healthcare waste – the sources, the hazards, and potential strategies for mitigating
- Country leadership engagement, and encourage “outside the box” thinking
- Monthly, 1 hour learning sessions over a six month period, with resources collected

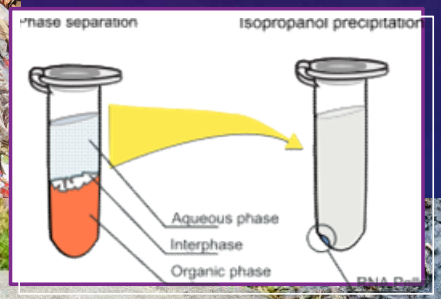
Overview of this Session

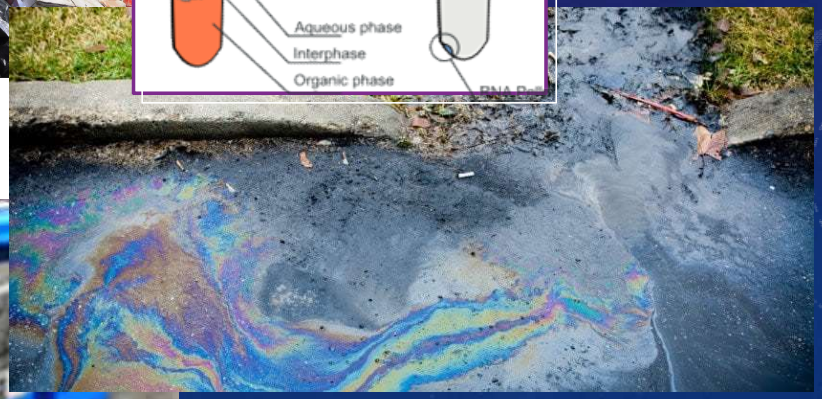
Objective

- Present an overview of the WM situation, focus on VL WM
- A review of countries’ current WM practices based on 28Nov 2018 questionnaire responses received by ASLM
- General WM assumptions going forward
- A preview of the *WHO Safe Management of Wastes from Health-Care Activities* Bluebook

Hazardous waste is a global problem

- Represents a significant current and future public health concern
- Healthcare and Laboratory Waste that is not managed correctly poses a significant threat to the environment and its inhabitants.





HEALTHCARE RELATED WASTE OVERVIEW

Key facts from WHO regarding Medical waste

- The term health-care waste includes all the waste generated within health-care facilities, research centres and laboratories related to medical procedures.

- Of the total amount of waste generated by health-care activities, about 85% is general, non-hazardous waste.
- The remaining 15% is considered hazardous material that may be infectious, toxic or radioactive.

- Every year an estimated 16 billion injections are administered worldwide, but not all of the needles and syringes are properly disposed of afterwards.

- Open burning and incineration of health care wastes can, under some circumstances, result in the emission of dioxins, furans, and particulate matter.

- Measures to ensure the safe and environmentally sound management of health care wastes can prevent adverse health and environmental impacts from such waste including the unintended release of chemical or biological hazards, including drug-resistant microorganisms, into the environment thus protecting the health of patients, health workers, and the general public.

Sources of Healthcare waste from within a medical facility

Table 2.3 Examples of health-care waste from different sources

Major sources (hospitals and medical centres)	Sharps	Infectious and pathological waste	Chemical, pharmaceutical and cytotoxic waste	Non-hazardous or general waste
Medical ward	Hypodermic needles, intravenous set needles, broken vials and ampoules	Dressings, bandages, gauze and cotton contaminated with blood or body fluids; gloves and masks contaminated with blood or body fluids	Broken thermometers and blood-pressure gauges, spilt medicines, spent disinfectants	Packaging, food scraps, paper, flowers, empty saline bottles, non-bloody diapers, non-bloody intravenous tubing and bags
Operating theatre	Needles, intravenous sets, scalpels, blades, saws	Blood and other body fluids; suction canisters; gowns, gloves, masks, gauze and other waste contaminated with blood and body fluids; tissues, organs, fetuses, body parts	Spent disinfectants Waste anaesthetic gases	Packaging; uncontaminated gowns, gloves, masks, hats and shoe covers
Laboratory	Needles, broken glass, Petri dishes, slides and cover slips, broken pipettes	Blood and body fluids, microbiological cultures and stocks, tissue, infected animal carcasses, tubes and containers contaminated with blood or body fluids	Fixatives; formalin; xylene, toluene, methanol, methylene chloride and other solvents; broken lab thermometers	Packaging, paper, plastic containers
Pharmacy store			Expired drugs, spilt drugs	Packaging, paper, empty containers
Radiology			Silver, fixing and developing solutions; acetic acid; glutaraldehyde	Packaging, paper
Chemotherapy	Needles and syringes		Bulk chemotherapeutic waste; vials, gloves and other material contaminated with cytotoxic agents; contaminated excreta and urine	Packaging, paper
Vaccination campaigns	Needles and syringes		Bulk vaccine waste, vials, gloves	Packaging
Environmental services	Broken glass		Disinfectants (glutaraldehyde, phenols, etc.), cleaners, spilt mercury, pesticides	Packaging, flowers, newspapers, magazines, cardboard, plastic and glass containers, yard and plant waste
Engineering			Cleaning solvents, oils, lubricants, thinners, asbestos, broken mercury devices, batteries	Packaging, construction or demolition waste, wood, metal
Food services				Food scraps; plastic, metal and glass containers; packaging

Table 2.3 WHO Safe management of wastes from health-care activities / edited by Y. Chartier et al. – 2nd ed.

MAJOR SOURCES OF HEALTHCARE WASTE

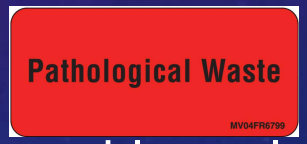
- Hospitals and other health facilities
- Laboratories and research centres
- Mortuary and autopsy centres
- Animal research and testing laboratories
- Blood banks and collection services
- Nursing homes for the elderly

Note: Health-care waste is often not separated into hazardous or non-hazardous wastes in low-income countries making the real quantity of hazardous waste much higher.

TYPES OF HEALTH-CARE RELATED WASTE

Infectious waste: waste contaminated with blood and other bodily fluids (diagnostic samples), cultures and stocks of infectious agents (includes autopsy material and infected laboratory animals), or waste from patients with infections (e.g. swabs, bandages and disposable medical devices);

Pathological waste: human tissues, organs or fluids, body parts and contaminated animal carcasses;



Sharps waste: syringes, needles, disposable scalpels and blades, etc.;

Chemical waste: solvents and reagents used in laboratories, disinfectants, sterilants and heavy metals contained in medical devices (e.g. mercury in broken thermometers) and batteries;

TYPES OF HEALTH-CARE RELATED WASTE cont'd

Pharmaceutical waste: expired, unused and contaminated drugs and vaccines;

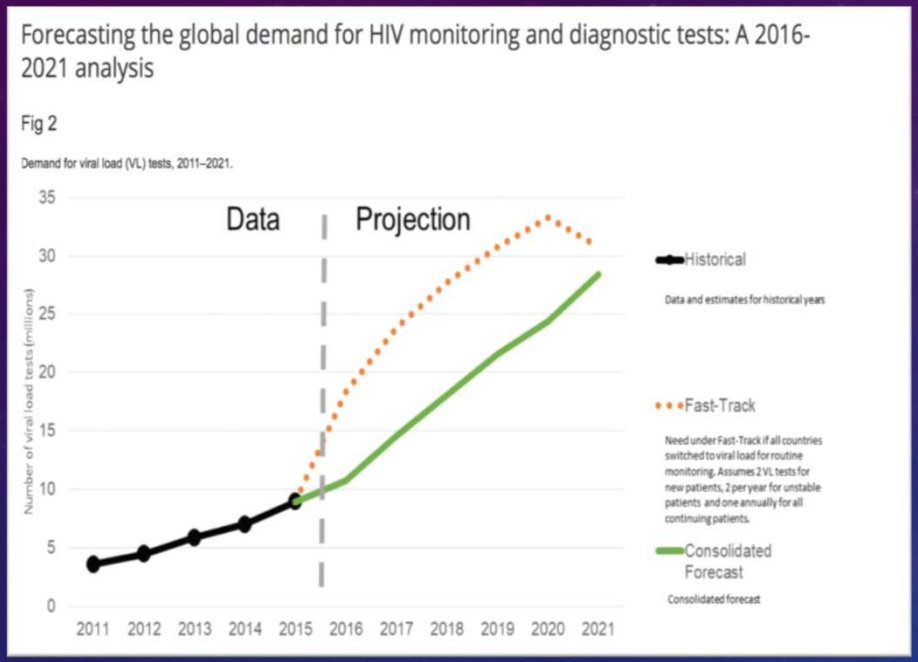
Cytotoxic waste: waste containing substances with genotoxic properties (i.e. highly hazardous mutagenic, teratogenic or carcinogenic components), such as cytotoxic drugs used in cancer treatment and their metabolites;

Radioactive waste: such as radioactive diagnostic material or radiotherapeutic materials;

Non-hazardous or general waste: waste that does not pose any particular biological, chemical, radioactive or physical hazard

VIRAL LOAD TESTING WASTE MANAGEMENT OVERVIEW

VL WASTE BACKGROUND



- The President's Emergency Plan for AIDS Relief (PEPFAR) supports viral load (VL) scale-up in over 40 countries
- By 2020, more than 30 million HIV VL tests will be performed globally[1]
- Estimated 924,000 L of effluent chemical waste and 2,102,100 kg of solid waste will be produced annually
- Facilities conducting majority of VL testing are often located in low-to middle income countries (LMIC) with limited infrastructure and little to no existing waste management policies and practices
- Improper management of this waste poses a significant threat to the public health and environment.

1 Habiyambere V, Dongmo Nguimfack B, Vojnov L, Ford N, Stover J, Hasek L, et al. (2018) Forecasting the global demand for HIV monitoring and diagnostic tests: A 2016-2021 analysis. PLoS ONE 13(9): e0201341. https://doi.org/10.1371/ journal.pone.0201341

BACKGROUND cont'd

- HIV VL molecular diagnostic testing produces potentially hazardous chemical waste, containing Guanidinium Thiocyanate (GTC)
- Thiocyanate is toxic to humans and animals and if untreated and poured down the drain can pollute waters and harm aquatic life
- GTC can produce hydrogen cyanide gas when it comes in contact with an acid or oxidizer, such as bleach

COUNTRY CHALLENGES AND BARRIERS

- Lack of country specific WM regulations and guidelines
- Limited financial and human resources
- Lack of technological and infrastructural advancement
- Shortage of local WM technical expertise

ADDRESSING THE SITUATION

- Awareness of, and identification of effective, sustainable medical waste management options is necessary to reduce this increasing public health threat
- Countries require assistance on waste management (WM) methods for the disposal of waste generated during HIV VL testing

REVIEW OF COUNTRY RESPONSES TO 28NOV18 WM SURVEY

- Country Specific Waste Management Survey
- Presented to attendees at the 28Nov18 LabCOP introductory session on Laboratory Waste Management
- Six multiple choice questions on WM status in the country
- Each question contained an open text field for more detailed answers
- Responses collected by ASLM LabCOP

LIST OF QUESTIONS

1. **What types of waste are collected, transported, and disposed at PEPFAR- supported testing facilities? Circle all that apply.**

   Chemical waste: (e.g., waste that includes laboratory solvents and reagents, disinfectants, acids, bases, flammable liquids, used for nucleic acids extraction or preservation (e.g., formalin, formaldehyde, paraformaldehyde, alcohol, etc.), etc.)

   Cytotoxic waste: (i.e. highly hazardous substances that are, mutagenic, teratogenic or carcinogenic, such as cytotoxic drugs used in cancer treatment and their metabolites)

   Infectious waste: (e.g., waste contaminated with blood and other bodily fluids, cultures or stocks of infectious agents, disposable medical devices, testing cartridges and kits contaminated with infectious material, etc.)

   Non-hazardous or general waste: (e.g., waste that does not pose any particular biological, chemical, radioactive or physical hazard)

   Pathological waste: (e.g., waste that includes human tissues, organs or fluids, body parts and contaminated animal carcasses)

   Pharmaceutical waste: (e.g., expired, unused and contaminated drugs and vaccines)

   Radioactive waste: (e.g., products contaminated by radioisotopes including radioactive diagnostic material or radiotherapeutic materials)

   Sharps waste: (e.g., syringes, needles, disposable scalpels and blades, etc.)

   Other: _____

LIST OF QUESTIONS CONT.

2. **What treatment technologies for hazardous waste are currently available at the PEPFAR- supported testing facilities? (Circle all that apply)**

   Burn pits
   Chemical Treatment (e.g. use of chemical disinfection)
   Dry-heat treatment (e.g., use of hot-air ovens)
   Encapsulation (the process of filling containers with waste, adding an immobilizing material, and sealing)
   Microwave treatment (a steam-based process where treatment occurs through the action of moist heat and steam generated by microwave energy)
   Steam Treatment (e.g., use of autoclaves)
   Thermal treatment (the use of high temperatures in the treatment of waste such incinerator, pyrolysis, rotary kiln, etc.)
   Other: _____

3. **How many viral load testing facilities are PEPFAR-supported?**

   None
   1 to 5
   6 to 10
   11 to 20
   21 to 50
   More than 50

4. **How is liquid chemical waste from the VL testing platforms currently being disposed at these PEPFAR-supported testing facilities?**

   Encapsulation (i.e., filling containers with liquid waste, adding an immobilizing material, and sealing)
   Poured down the sink
   Thermal treatment (e.g. Incineration)
   Don't Know
   Not applicable
   Other Method: _____

LIST OF QUESTIONS CONT.

5. **Are there national regulations and policies that regulate the treatment, storage, and disposal of hazardous waste?**
   - Yes
   - No
   - Don’t know
6. **Are there regulatory bodies that enforce these national regulations and policies for the treatment, storage and disposal of hazardous waste?**
   - Yes
   - No
   - Don’t know

COUNTRY RESPONSES

WM Country Survey Results from LabCOP session 28Nov2019

	Malawi	Tanzania	South Africa	Uganda	Zambia	Ethiopia
1. What types of waste are collected, transported, and disposed at PEPFAR- supported testing facilities?						
Chemical waste	☑	☑	☑	☑	☑	☑
Cytotoxic waste	☑	☑		☑		
Infectious waste	☑	☑	☑	☑	☑	☑
Non-hazardous or general waste	☑	☑	☑	☑	☑	☑
Pathological waste	☑	☑			☑	
Pharmaceutical waste	☑	☑		☑		
Radioactive waste	☑	☑				
Sharps waste	☑	☑	☑	☑	☑	☑
2. What treatment technologies for hazardous waste are currently available at the PEPFAR-supported testing facilities?						
Burn pits	☑					
Chemical Treatment (e.g., use of chemical	☑					☑
Dry-heat treatment (e.g., use of hot-air ovens)						
Encapsulation (i.e., the process of filling containers with waste, adding an immobilizing material, and sealing)				☑		
Microwave treatment						
Steam Treatment	☑	☑		☑	☑	
Thermal treatment	☑	☑		☑	☑	☑
Other			* No treatment method on site -- subcontracted to WM company			

- **Received responses from 6 countries of 10, with general consensus on types of waste produced**
- **Thermal and steam treatment appears most often used as treatment technologies**

COUNTRY RESPONSES CONT

3. How many viral load testing facilities are PEPFAR-supported?					
None					
1 to 5					
6 to 10					
11 to 20	☑	☑	☑	☑	☑
21 to 50					
More than 50					
4. How is liquid chemical waste from the VL testing platforms currently being disposed at these PEPFAR-supported testing facilities?					
Encapsulation (i.e., filling containers with liquid waste, adding an immobilizing material, and sealing)			☑		
Poured down the sink	☑	☑		☑	☑
Thermal treatment (e.g., Incineration)					
Don't Know					
Not applicable					

- **Responses were generally consistent regarding numbers of testing facilities**
- **There was consistency regarding the disposal of liquid chemical waste from VL testing**

COUNTRY RESPONSES CONT

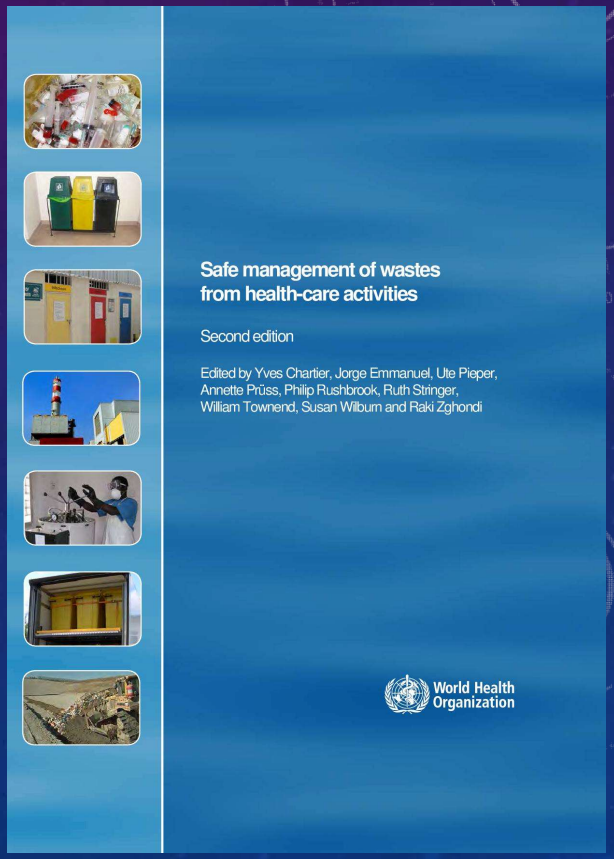
5. Are there current national regulations and policies in place that regulate the treatment, storage, and disposal of hazardous waste?					
Yes		☑	☑	☑	☑
No	☑				
Don't know					
6. Are there regulatory bodies that enforce these national regulations and policies for the treatment, storage and disposal of hazardous waste?					
Yes	☑	☑	☑	☑	
No					☑
Don't know					

- **While most countries agreed that there were national policies and regulations in place**
- **One country not aware of enforcement of regulations**

WHO Publication: Safe Management of Wastes from Health-Care Activities, 2nd Ed, 2014

WHO official guidance document on all types of Health Care related waste and best practices

- Chapter 1-3 covers introduction, definitions, sources and characterizations of types of waste along with risks/hazards associated
- Chapters 4 and 5 cover regulatory and policy issues, as well as management planning strategies for waste
- Chapter 6 reviews Health-care waste minimization, reuse and recycling
- Chapter 7 covers waste storage, handling and transport of waste, while Chapter 8 covers treatment and disposal considerations
- Chapter 9 covers waste water and sewage treatment
- Chapter 10 economic considerations of healthcare waste management
- Chapter 11 Health and safety practices for health-care personnel and waste workers
- Chapter 12 looks at Hospital Hygiene and Infection Control
- Chapter 13 covers training and education issues
- Chapter 14 Health-care waste management in emergencies
- Chapter 15 Future considerations for healthcare waste management



WASTE MANAGEMENT STRATEGY FOR IMPROVEMENT

TO DO for next month…

- Review the WHO Blue Book on Healthcare Waste Management: https://www.who.int/water_sanitation_health/publications/wastemanag/en/
- Specifically look at:
  - Chapter 1-3
  - Chapter 7
  - Chapter 8
- Focus on VL waste management

WASTE MANAGEMENT STRATEGY FOR IMPROVEMENT

NEXT MONTH and beyond…

- Current best practices and guidance from WHO on waste management
- Country presentations from countries beginning training efforts to deal with VL waste expectations
- Special speaker regarding one country's experiences on dealing with VL waste
- Country presentations on their own experiences in WM best practices
- Brainstorming on developing country WM awareness and engaging stakeholders
- Review project progress and follow-up country VL WM checklist results

WASTE MANAGEMENT STRATEGY FOR IMPROVEMENT Cont.

- Review Chapter 1-3 of the WHO WM Bluebook: https://www.who.int/water_sanitation_health/publications/wastemanag/en/

- Chapters 4 and 5 cover regulatory and policy issues, as well as management planning strategies for waste
- Chapter 7 covers waste storage, handling and transport of waste
- Chapter 8 covers treatment and disposal considerations
- Chapter 11 Health and safety practices for health-care personnel and waste workers
- Chapter 13 covers training and education issues

REFERENCES AND RESOURCES

Habiyambere V, Dongmo Nguimfack B, Vojnov L, Ford N, Hasek L, et al. (2018). Forecasting the global demand for HIV monitoring and diagnostic tests: A 2016-2021 analysis. PLoS One 13(9): e0201341. https://doi.org/10.1371/journal.pone.0201341

WHO publication: Safe management of wastes from health-care activities, 2014. http://www.who.int/water_sanitation_health/publications/safe-management-of-waste-summary/en/

Resources for LMIC waste issues:
https://www.healthcare-waste.org/resources/introduction/
https://www.healthcare-waste.org/resources/documents/

THANK YOU!

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the African Society for Laboratory Medicine.