Poliovirus Containment in the US

Bryan Shelby, PhD

U.S. NAC Auditor

NAC
U.S. National Authority
for Containment of Poliovirus

Disclaimer: The findings and conclusions in this presentation are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Overview

1. Eradication and Global Context
2. Global Containment
3. About the US NAC
4. Poliovirus Infectious Material
5. Poliovirus Potentially Infectious Material (PIM)
6. National Survey/Inventory
7. Containment Implementation in the US

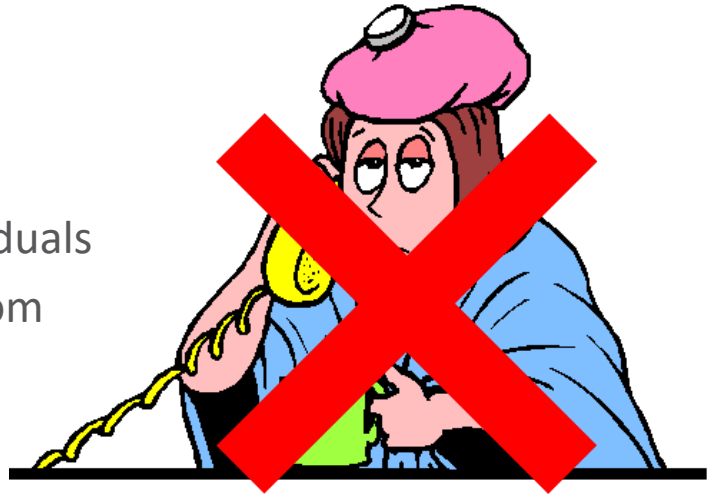
Eradication and Global Context

Global Containment of Poliovirus

Risk from Continued Work with Poliovirus or Materials Potentially Contaminated with Poliovirus:

Asymptomatic Laboratory Acquired Infections (LAI) and Shedding

- Both vaccines (IPV and OPV) protect against disease but not infection
- Vaccinated worker = no symptoms
- If worker is infected in the laboratory
  - Poliovirus may be shed in stool
  - Potential silent transmission in community
  - Possible polio disease in unvaccinated individuals
- Documented cases of secondary transmission from unidentified LAIs in literature
- If worker becomes infected, you won't know.



Polio Eradication – the end game

WHO Global Action Plan (GAPIII)

……to minimize poliovirus facility-associated risk after type-specific eradication of wild polioviruses and sequential cessation of oral polio vaccine use

Endorsed by the World Health Assembly 2015

Global Action Plan III

- “Some countries will host a limited number of PV facilities that serve critical international functions (vaccine production/QC, crucial research)”
- Based on a biorisk management system
  - Similar to QMS but for biosafety and security
  - Management and lab share responsibility
  - Demonstrate that all risks have been identified and effective controls are in place for all 16 Elements
- Not based on more familiar Risk Group (RG) and Biosafety Level (BSL)

Technical (GAPIII) Requirements for Containment

1. Biorisk management system
2. Risk assessment
3. Poliovirus inventory and information
4. General safety
5. Personnel and competency
6. Good microbiological technique
7. Clothing and personal protective equipment
8. Human factors
9. Healthcare
10. Emergency response and contingency planning
11. Accident/incident investigation
12. Facility physical requirements
13. Equipment and maintenance
14. Decontamination, disinfection, and sterilization
15. Transport procedures
16. Security

What Does “Containment” Mean?

- **Destroy (and document):** Autoclave, incinerate
- **Contain:** Become a Poliovirus-Essential Facility (PEF)
  - Work with materials in certified containment space
- **Transfer:** To a designated PEF

Currently, poliovirus type 2 (PV2) may only be handled in certified PEFs

WHO Containment Certification Scheme

Describes the implementation, audit, and certification processes under GAPIII

Certificate Type	Time period
Certificate of Participation (CP)	**1 year**
First step in certification	
Interim Certificate of Containment (ICC)	**≤ 3 years**
Requires audit against all 16 GAPIII elements, the PEF to develop a time-bound action plan for all non-conformities, regular progress assessments	
Certificate of Containment (CC)	**3 years**
Requires audit with no resulting major non-conformities and annual review	

About the U.S. NAC

NAC Establishment

- Poliovirus Containment Activity stood up Jan 2017
- Designated as U.S. NAC Jan 2018
- Located at the Centers for Disease Control and Prevention (CDC) due to expertise in poliovirus, eradication, and laboratory containment
- No regulation in the US compelling facilities to adopt WHO GAP III containment measures

NAC
U.S. National Authority
for Containment of Poliovirus

U.S. National Center for Containment of Polioviruses
Center for Preparedness and Response

Director and
National Poliovirus
Containment Coordinator
Lia Haynes Smith, PhD

Executive Assistant

Senior Advisor for Management
& Communications
Christye Brown, PhD, MPH

Lead Auditor
Christy Myrick, PhD

Public Health Analyst
Cecelia Sanders, MPA

Database Support

Auditor
Christy Ottendorfer, PhD

Auditor
Bryan Shelby, PhD

LINK TBD

As of October 12, 2018

Responsibilities

- National Survey/Inventory of PV material implementation
- Implement the Containment Certification Scheme for GAP III = application and audit process to become a Poliovirus Essential Facility (PEF)
  - Assist US facilities working with PV materials in understanding containment needs
  - Where needed, develop policies that interpret WHO GAP III elements for national circumstances
  - Seek WHO endorsement for PEF applications
  - Conduct audits to assess implementation of GAP III containment elements

Containment Implementation in the US

Collaborative Approach

- Engage affected facilities
  - PV2 dPEFs decreased from **20** in 2017 to **11** in 2019
  - Seek input on NAC documents and policies
- Encourage a community of practice
  - NAC-PEF Webinars
  - Voluntary sharing of contact information

Step-Wise Implementation of Poliovirus Containment in the U.S.

Step-Wise Implementation of PV Containment in the U.S.

- GAPIII stipulates that 16 containment elements must be met once WHO declares final eradication (All 3 poliovirus types)
- Facilities retaining PV2 infectious materials are aware of the need for additional containment measures
  - None are currently operating under full GAPIII containment
  - Some are transitioning into laboratories designed for higher containment, while others will complete necessary work with PV2 infectious materials in the near future

Rationale for Step-Wise Approach

- Effective 2^0 and 3^0 safeguards in the form of robust population immunity and sanitation systems are in place
- The distance between common current practices and WHO GAPIII containment is too great to bridge in a single step, making a step-wise approach necessary
- Not all facilities will need to achieve WHO GAPIII containment (*i.e.,* those that will cease work under a CP)
- There is no regulation in place in the U.S. compelling facilities to adopt WHO GAPIII containment measures

Step-Wise Implementation of Poliovirus Containment

Step 1

- Now & during Certificate of Participation (CP) period
- Facilities should focus on biosafety measures
- Facilities implement *Risk Mitigation Strategies for Work with PV2 Infectious Material During the Transition Period*
- CP awarded for 1 year

Step 2

- During Interim Certificate of Containment (ICC) and/or Certificate of Containment (CC)
- Facilities work to implement all WHO GAPIII elements and U.S. policies for both biosafety and security
- Effective until WHO declares eradication of all poliovirus types
- ICC awarded for up to 3 years

Step 3

- WHO declaration of eradication
- All PV types (1, 2, and 3) are subject to containment
- GAPIII specifies additional physical facility requirements that must be in place at facilities working with WPV or VDPV
- U.S. NAC policies will be revisited and, where appropriate, updated to reflect more stringent biosafety and security measures
- CC awarded for 3 years and renewed every 3 years

Risk Mitigation Strategies for Work with PV2 Infectious Materials During the Transition Period

- Starting point for enhanced practices now (eradicated agent)
- Incorporates some BSL3 practices in BSL2 laboratory setting, including
  - Work in primary containment (*e.g.,* Biosafety Cabinet)
  - PPE to protect worker (*e.g.,* face mask, eye protection)
- Minimum mitigation measures for work with PV2 infectious materials in the transition period
- Not a substitute for WHO GAPIII, Annex 2 or Annex 3

Poliovirus-Essential Facilities as of March 2019

- **11 facilities plan to retain PV2 IM:**
  - **Final certification goal**
    - 5 intend to proceed to full certification
    - 6 will apply for a Certificate of Participation only and cease work
  - **Type of facility**
    - 4 are academic institutions
    - 4 are private industry companies
    - 3 are government laboratories
- **3 Certificates endorsed by Global Certification Commission**

PV Infectious Materials (IM)

Poliovirus Infectious Materials Include:

- Clinical samples from confirmed PV infections
- Fecal or respiratory secretion samples from recent OPV recipients
- Samples (human or environmental) that have tested positive for PV
- Infected animals or samples
- Derivatives that contain PV capsid sequence

- Type 2 materials are subject to containment now as specified in GAP III
- Type 1 and 3 materials will be subject to GAP III once declared eradicated by WHO

PV Potentially Infectious Material (PIM)

Poliovirus Potentially Infectious Materials (PIM) Include:

- Fecal, environmental/sewage, or respiratory secretion samples collected for any purpose in a time and place where wild PV was circulating or OPV was used
- Products of these materials from PV permissive cells or animals
- Uncharacterized enterovirus-like cell culture isolates from countries known or suspected to have circulating wild PV at the time of collection
- Respiratory and enteric virus stocks handled under conditions where PV contamination is possible
- http://polioeradication.org/wp-content/uploads/2016/07/PIM-guidance-20190122-EN.pdf

Evaluating Sample Collections for Potential Poliovirus

- Historical domestic or international samples may be potentially infectious for poliovirus
- Factors in identifying potentially infectious materials (PIM)
  - Sample type (human stool or respiratory, environmental/sewage)
  - Storage (-20^{o}C or colder)
  - Country where collected
  - Date of collection
- Tables with dates when poliovirus was last present in each country
  - http://polioeradication.org/wp-content/uploads/2018/11/PIM-Annex-2-16-Nov-18.pdf

What’s in your freezer?

- Materials in US April 2000 to present
  - NO = Not PIM
- Materials collected in the US prior to April 2000
  - YES = PIM
- Materials collected internationally
  - MAYBE = Compare sample origin information with country tables

Samples potentially contaminated with wild poliovirus WPV PIM

- Subject to GAP III containment
- Current US recommendations for these materials
  - Storage: secure samples in locked freezer or laboratory, limit access
  - Work: contact the US NAC

Samples potentially contaminated w/ oral polio vaccine OPV PIM

- Not subject to GAP III containment
- Subject to WHO *Guidance to minimize risk for facilities collecting, handling or storing materials potentially infectious for poliovirus* (PIM Guidance)
  - Risk classification based on material type (stool/sewage, respiratory, nucleic acid) and work (use with PV permissive cells)
  - Storage: secure samples in locked freezer or laboratory, limit access
  - Work: mitigations include risk assessment, good laboratory practices, validation of methods, and immunization of staff

National Survey/Inventory

2002-2003 Survey

- All WPV infectious and potentially infectious
- 32,429 institutions surveyed (>100,000 laboratories)
  - CLIA-registered laboratories
  - All U.S. doctoral/research universities
  - All biotechnology and pharmaceutical institutions
  - All federal agencies with biomedical laboratories
  - All state and territorial public health laboratories
- 180 laboratories identified

2015 Survey

- All 3 types
- Asked about IM and PIM
- Targeted PV and enterovirus labs:
  - 2002 identified laboratories, known PV2 laboratories, US State and Territorial Public Health laboratories, commercial diagnostic testing laboratories, laboratories identified by targeted literature review
  - 398 surveys received/401 sent – response rate 99.3%
  - 20 potential PEFs
- National inventory not complete
  - outreach needed to labs that may have PIM

2018 Survey

- Launched in December 2018
- Will target laboratories with PIM, especially respiratory laboratories
- Is available on NAC website and direct email
- Advertise
  - NAC website
  - Distribution through professional societies
  - Conference talks and expos
  - Social media

U.S. NAC Website- Survey Webpage

https://www.cdc.gov/cpr/polioviruscontainment/surveys_laboratories.htm

Actions Needed by Laboratories

- ALL
  - Assess historical domestic and all international sample collections for PIM
  - Destroy all non-essential PV materials, those known to contain poliovirus (IM) *and* those potentially contaminated with poliovirus (PIM)
  - Ensure all retained poliovirus materials are declared in the national survey
- THOSE WITH POLIOVIRUS MATERIALS
  - Contact the U.S. NAC
  - Complete the national survey to declare these materials

Key Messages

Summary

- Share information with your colleagues
- Identify PV materials at your institution
- Encourage destruction of non-essential PV materials
- Contact U.S. NAC to declare PV materials
- Follow U.S. NAC recommendations for retaining PIM

Resources

- US NAC website
  - www.cdc.gov/cpr/polioviruscontainment

- Global Poliovirus Eradication Initiative website
  - polioeradication.org/polio-today/preparing-for-a-polio-free-world/containment/containment-resources/
    - Global Action Plan III (GAP III)
    - *Guidance to minimize risk for facilities collecting, handling or storing materials potentially infectious for poliovirus* (PIM Guidance)
    - Country table for identifying PIM

Thank you