Kansas Department of Health and Environment
Division of Health

Poliovirus Investigation Guideline

Contents

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Revision History:

Date	Replaced	Comments
05/2018	02/2012	Updated Laboratory Analysis section, Epidemiology, and Communicable period. Further guidance provided on Investigator's Responsibilities, Case and Contact Investigation, and Contact Management. Updated K.A.R. 28-1-6.
02/2012	03/2009	Revised format. Replaced BSE with BEPHI. Removed references to KS-EDSS. Replaced Supplemental Form with Suspected Case Worksheet. Added notification section. Replaced case definition with CDC 2010 version.

Poliovirus Infection
Disease Management and Investigation Guidelines

CASE DEFINITION – Poliomyelitis, Paralytic (CDC 2010)

Clinical Description for Public Health Surveillance:

- **Confirmed:** Acute onset of a flaccid paralysis of one or more limbs with decreased or absent tendon reflexes in the affected limbs, without other apparent cause, and without sensory or cognitive loss; AND in which the patient:
  - has a neurologic deficit 60 days after onset of initial symptoms; or
  - has died; or
  - has unknown follow-up status.
- **Probable:** Acute onset of a flaccid paralysis of one or more limbs with decreased or absent tendon reflexes in the affected limbs, without other apparent cause, and without sensory or cognitive loss

Comment: *All suspected cases of paralytic poliomyelitis are reviewed by a panel of expert consultants before final classification occurs. Confirmed cases are then further classified based on epidemiologic and laboratory criteria.*[1]

CASE DEFINITION – Poliovirus Infection, Nonparalytic (CDC 2010)

Confirmed: Any person without symptoms of paralytic poliomyelitis in whom a poliovirus isolate was identified in an appropriate clinical specimen, with confirmatory typing and sequencing performed by the CDC Poliovirus Laboratory, as needed.

LABORATORY ANALYSIS:

1) Cell culture is as sensitive, or more sensitive, than most molecular assays; negative pan-enterovirus polymerase chain reaction (PCR) result cannot rule out poliovirus infection, and the use of cerebrospinal fluid (CSF) as a specimen for polio diagnostics is also an insensitive tool.
2) Specimens for culture that may yield poliovirus:
   - Stool: highest likelihood, especially when a*t least 2 stool specimens are obtained 24 hours apart as early in the course of disease as possible (ideally within 14 days after onset).*
   - Pharyngeal swabs: intermediate probability of isolation
   - Blood or spinal fluid: very low probability of isolation but is diagnostic
3) To increase the probability of poliovirus isolation, collect at least 2 stool specimens and 2 throat swabs: 1) 24 hours apart as early in the course of the disease as possible, and 2) ideally within the first 14 days after onset of paralytic disease.

[1] Sutter RW, Brink EW, Cochi SL, et al. A new epidemiologic and laboratory classification system for paralytic poliomyelitis cases. Am J Public Health 1989; 79:495-8.

- Send specimens to a reference laboratories for isolation on appropriate cell lines (cell culture).
- **Isolation of wild poliovirus will constitute a public health EMERGENCY**.
- Poliovirus isolates are forwarded to CDC for intratypic differentiation and possible sequencing to differentiate between wild or vaccine-related.
- Kansas Health and Environment Laboratory (KHEL) can assist with forwarding isolates or specimens (stool and throat swabs) to CDC for primary isolation on appropriate cell lines.

4) To send isolates or specimens to KHEL for forwarding to CDC, contact the KDHE-BEPHI (1-877-427-7317).

5) Information on serological testing (Complement Fixation (CF) or Neutralization (N)):
   - Helpful in supporting or ruling out the diagnosis of paralytic polio
   - May be falsely negative in immunocompromised persons.
   - Neutralizing antibodies appear early and may be at high levels by the time of hospitalization – so a fourfold titer cannot be demonstrated.
   - Vaccinated persons would also have measurable titers
   - Serology cannot differentiate between wild and vaccine-related virus.

6) Additional guidance from the following resources:
   - KHEL Virology and Serology section: www.kdheks.gov/virosero/index.html
   - Submitting Specimens to CDC: www.cdc.gov/laboratory/specimen-submission/index.html

EPIDEMIOLOGY

In the Americas, the last case of wild poliovirus-virus (WPV) disease was detected in Peru in 1991, and the hemisphere was certified as free of indigenous WPV in 1994. Among the three WPV types, type 2 was declared eradicated worldwide in September 2015. In 2017, WPV remains endemic in just 3 countries: Afghanistan and Pakistan in Asia, and Nigeria in Africa. The potential for importation of WPV into the United States remains until worldwide poliomyelitis eradication is achieved. Universal vaccination of infants and children is the only means of establishing and maintaining population immunity against poliovirus. Members of certain religious groups and the clustering of other subpopulations that object to vaccination represents the highest risk for epidemic poliomyelitis. The emergence of circulating vaccine-derived polioviruses (cVDPVs) causing outbreaks of poliomyelitis have been reported in regions where OPV is being used and overall routine polio vaccination rates are low. There have been 2 reported cases of vaccine associated paralytic polio (VAPP) in the United States after 2000, the year that the U.S. use of OPV was discontinued. To remove the risk for infection with cVDPVs type 2, all OPV-using countries simultaneously switched in April 2016 from trivalent OPV (tOPV) to bivalent OPV (bOPV), which contains only types 1 and 3 polioviruses.

DISEASE OVERVIEW

A. Agent:
Polio is caused by poliovirus, with antigenic types 1, 2, and 3. Type 1 is most often the agent in paralytic illnesses. Type 2 was most often associated with vaccine-associated cases

B. Clinical Description:
Poliomyelitis is an acute illness ranging in severity from inapparent infection to paralytic disease. The fatality rate ranges between 2-10%. Symptoms include fever, headache, nausea and vomiting, stiffness in neck and back, with or without paralysis. Paralysis is typically flaccid, asymmetric and most commonly affects the lower extremities. Any recovery from paralysis usually begins within 1 month. Between 25 - 40% of persons who contracted paralytic poliomyelitis in childhood may develop "post-polio syndrome" 30 - 40 years later. This syndrome is characterized by muscle pain, exacerbation of existing weakness, and/or development of new paralysis or weakness. In children, 90% of all infections are asymptomatic.

Vaccine-associated poliomyelitis (VAPP) can occur in a recipient 7 to 21 days after oral polio vaccine administration or in susceptible contacts of the vaccine recipient 20 to 29 days after vaccine administration. Adults have a slightly increased risk of vaccine-associated paralytic poliomyelitis.

C. Reservoirs: Humans.

D. Mode(s) of Transmission:
Transmission is primarily through the fecal-oral route. However, the virus can be transmitted by indirect contact with infectious saliva or feces, or by contaminated sewage or water.

E. Incubation Period:

Range 3-35 days; usually 7-14 days for paralytic poliomyelitis

F. Period of Communicability:
Not defined, but as long as virus is excreted. In symptomatic and asymptomatic cases, poliovirus can be found in pharyngeal secretions 36 hours, and in the feces 72 hours, after exposure to infection. Poliovirus can remain present in the throat for approximately 1 week and in the stool from 3 to 6 weeks.

G. Susceptibility and Resistance:
Persons who are immunodeficient are at increased risk for acquiring polio. Lifelong, type specific immunity follows natural infection.

H. Treatment: Supportive only.

I. Vaccines:

- IPV, an inactivated (killed) polio vaccine, is administered via injection and is used as part of the routine all-IPV immunization schedule in the U.S.
- OPV, a live oral polio vaccine, is used in many parts of the world. When the risk of wild-type polio transmission is greater than the risk of possible VAPP, it is the vaccine of choice for polio outbreak control.

NOTIFICATION TO PUBLIC HEALTH AUTHORITIES

All confirmed or ***suspected*** polio cases shall be reported within **4 hours by phone**:

1. Health care providers and hospitals: report to the local public health jurisdiction or KDHE-BEPHI (see below)
2. Local public health jurisdiction: report to KDHE-BEPHI (see below)
3. Laboratories: report to KDHE-BEPHI (see below)
4. KDHE-BEPHI will contact the local public health jurisdiction by phone within one hour of receiving any suspected anthrax report.

Kansas Department of Health and Environment (KDHE)
Bureau of Epidemiology and Public Health Informatics (BEPHI)
Phone: 1-877-427-7317

Further responsibilities of state and local health departments to the CDC:

As a nationally notifiable condition, polio cases require an IMMEDIATE, EXTREMELY URGENT or IMMEDIATE, URGENT report to the Center of Disease Control and Prevention (CDC), depending on the case's clinical presentation.

1. PARALYTIC Polio requires **IMMEDIATELY NOTIFIABLE, EXTREMELY URGENT** reporting.
    - KDHE epidemiologist must call the CDC EOC at 770-488-7100 within 4 hours of a being notified of the confirmed case.
    - KDHE-BEPHI will notify the **Local public health jurisdiction** immediately to coordinate on follow-up for the report information needed to complete the electronic form(s) before the next business day.
    - KDHE-BEPHI will file an electronic case report the next business day.

2. NON-PARALYTIC Polio cases requires **IMMEDIATELY NOTIFIABLE, URGENT** reporting.
    - KDHE epidemiologist will call the CDC EOC at 770-488-7100 within 24 hours of a case meeting the confirmed criteria.
    - **Local public health jurisdiction** will report information requested on the disease reporting forms as soon as possible, completing the forms within 3 days of receiving a notification of a polio report.
    - KDHE-BEPHI will file an electronic case report the next regularly scheduled electronic transmission.
        (KDHE-BEPHI files electronic reports weekly with CDC.)

INVESTIGATOR RESPONSIBILITIES

1) Report all poliovirus cases to the KDHE-BEPHI.
2) Initiate the case investigation within1 day of notification of a report.
   - Complete the investigation within 3 days of the notification.
   - Use the CDC *Suspected Polio Case Worksheet* as a guide for data collection, unless AFM is also suspected then refer to the CDC Acute Flaccid Myelitis: Patient Summary Form
3) Contact medical provider to collect information and to confirm diagnosis using current case definition.
   - Collect all information requested in Step 1 of case investigation.
   - Ensure that case/proxy is aware of the diagnosis.
4) Conduct a case investigation to determine the individual's risks of exposure and potential geographical location of exposure.
   - Potential exposure and transmission settings should be evaluated.
   - If there is no known exposure (low suspicion) and no high risk transmission setting (unvaccinated contacts), wait for laboratory results to confirm and a final diagnosis prior to starting the contact investigation.
   - If there is a possible exposure (high suspicion) or a potential high risk transmission setting (unvaccinated contacts), the investigator should immediately start the contact investigation.
5) Situations of high suspicion or potential high risk situations include:
   - Suspected case is reported from a group objecting to vaccination.
   - Suspected case traveled to a location with endemic polio or that is experiencing a polio outbreak within his/her exposure period.
   - Suspected case was exposed to an OPV recipient or to a traveler who visited a location with endemic polio or a polio outbreak.
   - Suspected case attended a daycare or school with unimmunized or under-immunized children during his/her infectious period.
   - Suspected case provided direct patient care to unimmunized or under-immunized individuals during his/her infectious period.
6) Conduct contact investigation to identify additional cases, as needed.
7) Initiate any needed control and prevention measures.
8) Record data, collected during the investigation, in the KS EpiTrax system under the data's associated [tab] in the case morbidity report (CMR).
9) As appropriate, use the disease fact sheet to notify the case, contacts and other individuals or groups.

STANDARD CASE INVESTIGATION AND CONTROL METHODS

Case Investigation

1) Contact the medical provider who reported or ordered testing of the case to obtain the following from the patient's medical records.
   - Is the medical provider considering Acute Flaccid Myelitis along with polio in the differential diagnosis: Refer to the AFM Disease Investigation Guideline for additional guidance.
   - Did the medical provider diagnose polio?
     - No, not diagnosed based on other findings: Record the alternative diagnosis in the [Notes] of EpiTrax. No further investigation required. "Complete" and "Approve" case as directed in Data Management.
     - Unknown or still under investigation; polio virus is suspected and AFM is not being considered: continue with investigation.
     - Yes: Record the diagnosis date [Clinical] and continue investigation.
   - Obtain information on the clinical course of the disease and laboratory testing using the CDC *Suspected Polio Case Worksheet*.
   - Record the following in EpiTrax:
     - Patient's demographics (address, birth date, gender, race/ethnicity, primary language, and phone number(s)). [Demographic]
     - Date of onset of first symptoms. [Clinical]
     - Record date diagnosed - presumptive and final diagnosis date [Clinical]
     - Record outcomes: survived or date of death [Clinical]
     - Record hospitalizations: location and duration of stay [Clinical]
   - Through a credible immunization registry or medical record obtain information on history of OPV or IPV –containing vaccines
   - Obtain information on any injections received within 30 days prior to onset of illness (refer to page 2 of the CDC *Suspected Polio Case Worksheet)*

2) Interview the case or proxy to determine source and risk factors, focus period <30 days before case's onset for activities and contacts.
   - Record patient's occupation [Epidemiologic]
   - Travel: (note location, departure date, return date)
     - Case or household members travel to epidemic or endemic area
     - Case or household member exposed to person(s) from or returning to endemic areas (including short-term visitors to the household).
   - Case or household member with contact with a known case
     - Name of possible source, location of exposure, date of contact
   - Contact with an OPV recipient: Household or other close contacts (of last 30 days) who received OPV ≤ 75 days before onset of case's symptoms, note:
     - Contact's age and relationship to case.

  - Date when OPV recipient was in contact with case.
  - Vaccination date and person or agency administering. Work to collect information on manufacturer, lot number and dose of vaccine
- Information on any polio-like illness in the community or population.

3) Collect information from case for the Contact Investigation. (See below).
4) Examine the epidemiological information, record where the infection was most likely imported from. (Indigenous or out-of-county, state, or U.S.). [Epidemiologic]

Contact Investigation

1) Be aware of the following:
   - The period of communicability is not precise, examining activities 10 days prior to and after onset is a good rule but may need modification.
   - The virus has often infected susceptible close contacts by the time of initial case is recognized; surveillance for additional cases in settings associated to the case will be the priority of the contact investigation, as well as increasing the vaccination coverage in under-vaccinated groups.
2) Review the patient's occupation and activities that were collected during the case investigation to identify potential transmission settings.
3) Describe potential transmission setting(s):
   - Date(s) infectious case was present in the setting.
   - Risk that those in the setting could have been exposed to stool or oral secretions of the infectious person.
   - Define setting by age, vaccination and immune status of those usually present.
   - Collect information on any recent significant illness.
4) For small well-defined groups (household, classroom), attempt to collect information on each potential contacts' polio vaccination status, immune status, and recent significant illnesses.
   - Consider susceptible contacts as those with no written record of a complete polio immunization series.
   - A complete polio immunization series includes three primary doses and a single booster dose of IPV or OPV in any combination, when doses are received after 6 weeks of age and at intervals $\geq$ 4 weeks apart.
5) Susceptible contacts who were at risk of transmission should be added to the contact listing. [Contact]
6) Follow-up with at-risk contacts and transmission settings as instructed in Contact Management.

Isolation, Work and Daycare Restrictions

K.A.R 28-1-6 for Poliomyelitis* (Control of Cases)*:

- For each person hospitalized with a case, contact precautions shall be followed for the duration of the illness.

Case Management

1) Educate those with acute illness on measures to avoid disease transmission.
2) In 60 days, follow-up to see if there is any residual paralysis

Contact Management

1) If a contact listing was created because of the high possibility of disease transmission, follow-up with the listed contacts. [Contact]
   - Log information on symptoms screenings, immunization histories, testing, recommendations, and the disposition of the contact.
   - Continue following up with contact until 35 days after exposure.
2) For potential transmission settings, consult with local Health Officer, BEPHI, and Kansas Immunization Program to make decisions on the effective use of OPV and/or IPV. The following guidelines are presented:
   - The epidemiological data, which defines the community at risk by immunization coverage, age and immune status, will be used to determine whether OPV should be used in certain situations
     - OPV should never be administered to immunodeficient patients or their household contacts; IPV is recommended in such situations.
   - If the evidence indicates vaccine-associated disease, no outbreak control program is needed.
   - If evidence indicates wild-type poliovirus, an outbreak control program with vaccination planning is required.
     - Settings at risk of low vaccination coverage should be assessed for current vaccination status and offered vaccine, as needed.
     - All susceptible contacts 6 weeks of age and older with an incomplete or undocumented vaccination series or booster should be vaccinated on an accelerated schedule. (4-week intervals)
     - A booster dose of vaccine is recommended for all adults (>18 years of age) in susceptible communities and health-care workers at high risk for exposure who have completed a primary series but have not received an adult booster dose.
3) Report number of susceptible contacts receiving vaccination(s).
4) Report the final disposition of each contact investigated. [Contact]
5) Report any adverse event that occurs after the administration of a vaccine to Vaccine Adverse Events Reporting System at http://vaers.hhs.gov/index
6) Active surveillance community-wide should be initiated for 2 incubation periods (i.e., 70 days) beyond the onset of the last case in the area.

Environmental Measures

None.

Education

1) Persons in communities with low vaccination coverage should be warned of the potential risk for poliomyelitis and informed of vaccine availability.
2) If a situation calls for the use of OPV, those exposed to the vaccine or to the recipient should be made aware of the risks of VAPP.

MANAGING SPECIAL SITUATIONS

A. Outbreak Investigation:

- An outbreak is one or more case(s) of confirmed polio in a community. The situation should be treated as a public health emergency with appropriate resources allocated until additional cases have been ruled out.
- Notify KDHE immediately, 1-877-427-7317.
- Implement active surveillance:
  - Maintain for two incubation periods (70 days) following onset of the last case to identify any transmission from a subclinical case.
- Additional activities that may be required for case finding include:
  - Collection of stool and serum samples from the household members and other contacts associated with possible transmission settings.
  - Retrospective surveys of hospitals that serve the community at risk for diagnoses consistent with poliovirus infection, including acute flaccid paralysis (AFP), Guillain-Barré Syndrome (GBS), transverse myelitis, and viral or aseptic meningitis.
- Document measures that have been taken so far in the response and attempt to identify reasons for the outbreak.
- All epidemiologic data will be reported and managed through the Kansas outbreak module of the electronic surveillance system.

B. OPV Recipient in Settings with Immunodeficient Contacts:

- The OPV recipient should avoid close contact with the immunodeficient person for approximately 4-6 weeks after vaccination.
- If this is not feasible, rigorous hygiene and hand washing after contact with feces (e.g., after diaper changing) and avoidance of contact with saliva (e.g., sharing food or utensils) can be used but may be less effective.
- Maximum excretion of vaccine virus occurs within 4 weeks after oral vaccination.

C. School or Child Care Settings:

- Coordinate activities with school nurse and/or administration.

DATA MANAGEMENT AND REPORTING TO THE KDHE

A. Accept the case assigned to the LHD and record the date the LHD investigation was started on the [Administrative] tab.

B. Organize and collect data, using appropriate data collection tools including:
- The CDC Suspected Polio Case Worksheet can be used to collect information.
- During outbreak investigations, refer to guidance from a KDHE epidemiologist for appropriate collection tools.

C. Report data collected during the course of the investigation via EpiTrax**.**
- Verify that all data requested has been recorded on an appropriate EpiTrax [tab], or that actions are completed for a case lost to follow-up as outlined below.
- Some data that cannot be reported on an EpiTrax [tab] may need to be recorded in [Notes] or scanned and attached to the record.
- Scan and attach the CDC Suspected Polio Case Worksheet to the Epitrax record.
- Paper report forms do not need to be sent to KDHE after the information is recorded and/or attached in EpiTrax. The forms should be handled as directed by local administrative practices.

D. If a case is lost to follow-up, after the appropriate attempts to contact the case have been made:
- Indicate 'lost to follow-up' on the [Administration] tab with the number of attempts to contact the case recorded.
- Record at least the information that was collected from the initial reporter.
- Record a reason for 'lost to follow-up' in [Notes].

E. After the requirements listed under Case Investigation have been completed, record the "Date LHD investigation completed" field located on the [Administrative] tab.
- Record the date even if the local investigator's Case or Contact Management for the contact is not "Complete".

F. Once the entire investigation is completed, the LHD investigator will click the "Complete" button on the [Administrative] tab. This will trigger an alert to the LHD Administrator so they can review the case before sending to the state.
- The LHD Administrator will then "Approve" or "Reject" the CMR.
- Once a case is "Approved" by the LHD Administrator, BEPHI staff will review and close the case after ensuring it is complete and that the case is assigned to the correct event, based on the reported symptoms reported. (Review the EpiTrax User Guide, Case Routing for further guidance.)

ADDITIONAL INFORMATION / REFERENCES

A. Treatment / Differential Diagnosis: Red Book: 2015 Report of the Committee on Infectious Diseases. 30th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2015.

B. Epidemiology, Investigation and Control: Heymann. D., ed., Control of Communicable Diseases Manual (CCDM), 20th Edition. Washington, DC, American Public Health Association, 2015.

C. Case Definitions: CDC Division of Public Health Surveillance and Informatics, Available at: wwwn.cdc.gov/nndss/

D. Kansas Regulations/Statutes Related to Infectious Disease: www.kdheks.gov/epi/regulations.htm

E. Manual for the Surveillance of Vaccine-Preventable Diseases: Available at: www.cdc.gov/vaccines/pubs/surv-manual/default.htm

F. Poliomyelitis Prevention in the United States. MMWR 2000; 49(RR05); 1-22. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/rr4905a1.htm

G. Poliovirus Infections in Four Unvaccinated Children – Minnesota, August –October 2005. MMWR 2005; 54(41): 1035-1055. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/mm54d1014a1.htm

H. Additional Information (CDC): www.cdc.gov/ticks/index.html