Utilization of alternative diagnostic sampling techniques during an imported measles outbreak - San Diego, California, 2008

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BACKGROUND

Public Health Significance

- Determination of case status is a requirement for identifying, tracking, and controlling diseases of public health importance
- Clinical manifestations of various diseases may differ from person to person; therefore, laboratory confirmation is important in establishing case status
- While serologic testing provides physicians and public health officials with important diagnostic information, obtaining venous blood from infants and children may pose challenges
  - favorable anatomical attributes, such as a clearly visible and relatively large venous lumen, are often compromised in infants and children as a result of surrounding adipose tissue
  - venous blood draws on infants and children require the skills of staff trained and practiced in pediatric phlebotomy
  - securing access points (e.g., arms, wrists, hands) requires additional personnel to assist the phlebotomist
- Barriers to obtaining serologic specimens include resistance from the patient and/or parent to providing venous blood samples as well as limited availability of personnel experienced in pediatric phlebotomy
- The expeditious determination of case status is critical during communicable disease outbreaks
- Patients with airborne infectious diseases should not be referred to laboratories or healthcare facilities where airborne precautions cannot be implemented; obtaining blood specimens from patients in their homes is preferred

Imported Measles Outbreak, San Diego

- On February 1, 2008, the San Diego County Immunization Branch was notified of a positive measles IgM result in a child with a febrile rash illness and a history of recent travel to Switzerland, where a measles outbreak was ongoing
- The child had never received a measles-containing vaccine and held a personal belief exemption (PBE) from school immunization requirements
- While infectious, this child attended a school with a high PBE rate and was seen in four (4) different healthcare settings, resulting in the direct infection of six (6) susceptible children exposed at these sites

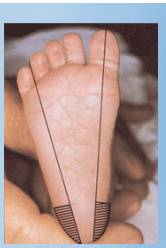

Figure 1. Hatched area indicates safe areas for heel puncture sites

Image credit: Georgia Department of Human Resources, Division of Public Health

Figure 2. Finger stick taken from the side of the pulp of the third finger with the palm facing up and the finger grasped between the collector's thumb and index finger

Image credit: www.sfhiv.org

METHODS

- Disease control measures were implemented, including isolation of suspect cases and health department coordination of specimen collection from suspect cases (i.e., limiting visits to commercial laboratories and additional healthcare facilities to decrease the opportunity for disease transmission)
- A public health investigation was initiated, including:
  - contact tracing and quarantine of exposed, susceptible persons
  - heightened surveillance
  - active case finding
- Laboratory confirmation was attempted on all suspect cases

SPECIMEN COLLECTION

1. Obtain supplies:
   - Two (2) to three (3) microcollection devices consisting of a capillary tube and a serum separator microtube
     - Heparinized tubes are acceptable
     - Consult your public health laboratory regarding acceptable collection devices
   - Sterile safety lancet (fully automated devices recommended)
   - Biohazard container
   - Gloves
   - Alcohol wipes
   - Sterile gauze
   - Band-aid
2. Label each serum separator microtube with patient name (or other identifier), date of birth, and date/time of specimen collection
   - if using capi-draw microcollection devices, make sure the capillary tube has not touched the serum separator gel; otherwise, capillary action may be compromised
3. Massage the puncture site to increase circulation and enrich blood flow
   - the heel is the recommended puncture site for infants 12 months of age or younger; the finger may be a suitable puncture site for children over 1 year of age
4. Clean the puncture site (heel or finger) well with alcohol; allow to dry
5. Puncture the heel (see Figure 1 for details on heel puncture sites) or the side of the pulp of the third or fourth finger with a sterile safety lancet
6. Wipe away the first drop of blood with sterile gauze
7. Touch the first capillary tube to subsequent free-flowing blood produced at the puncture site
   - through capillary action, blood will fill the tube
   - if blood flow is inadequate, gently massage the proximal portion and firmly press on the distal portion of the foot or finger (do not let blood run down the heel or finger)
   - holding the microcollection device at a downward angle may improve collection results
8. Repeatedly touch additional capillary tubes to blood produced at the puncture site until 2-3 tubes are filled. A minimum of 100 µl of serum is required; however, it is recommended that 2-3 capillary tubes be filled, even if the 100 µl volume requirement is met with the first capillary tube
   - allow large blood droplets to form; avoid contact between the skin and capillary tube
9. Express collected blood into the serum separator microtube by standing the microcollection device upright (capillary tube inserted in serum separator tube). After the capillary tube drains into the serum separator tube, lightly tap or shake the remaining blood out of the capillary tube
10. Stop the bleeding and cover the puncture site with a band-aid
11. Remove the empty capillary tubes from the serum separator microtubes and discard the capillary tubes and lancet in an appropriate biohazard container; cap the serum separator mircotubes
12. Keep collected specimens cool during transport (e.g., in a Styrofoam container with freeze packs)
13. Upon receipt at the laboratory, specimens must be microfuged before processing

RESULTS

- A total of eleven (11) additional children were infected; none had received a measles-containing vaccine
- Four (4) of the 12 case-patients (33%) were referred to commercial laboratory facilities to have their blood drawn for measles serology, increasing the opportunity for disease transmission in these settings
- Clinicians did not suspect measles in a child with recent international travel and febrile rash illness or in symptomatic children with exposure to a known measles case; appropriate infection control precautions were not implemented
- During the outbreak, obtaining venous blood draws on infant and child suspect cases was problematic for a variety of reasons
- Capillary specimens, collected via finger or heel stick, were found to be acceptable for measles serology
- Though less demanding than venipuncture training, public health nurses and communicable disease investigators did require some training and practice in capillary specimen collection
- Collection of capillary specimens alleviated some investigative burden, as public health nurses and communicable disease investigators were able to collect capillary specimens in patient homes; however, adequate specimens were not produced on every collection attempt
- Capillary specimen collection was often viewed by patients and parents as a more acceptable method of serologic specimen collection, as it was perceived to be a less painful and less invasive procedure

CONCLUSIONS

- While venous blood remains the standard specimen for serologic testing, employment of alternative diagnostic sampling techniques may be warranted when suspect case-patients resist venipuncture or when phlebotomists with expertise in pediatric venous blood draws are not available
- Capillary specimen collection by public health practitioners facilitates rapid testing of suspect case-patients and decreases the opportunity for further disease transmission by limiting the need to refer suspect case-patients to healthcare facilities or laboratories for specimen collection
- Employment of alternative diagnostic sampling techniques may enhance routine surveillance and outbreak response activities while expediting specimen collection, diagnosis, and determination of case status
- Local and state health departments would benefit from training appropriate public health practitioners in capillary specimen collection and requiring maintenance of specimen collection skills

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