



CAPILLARY BLOOD SAMPLING PROTOCOL

The high potential for lead contamination of specimens during collection is well known,¹⁻³ and some have suggested special steps to minimize the likelihood of contamination. These include thorough scrubbing of the hand and finger with soap and then alcohol,⁴⁻⁵ using dilute nitric acid⁶⁻⁷ or using silicone or a similar barrier spray.^{3,8-10} In three recent CDC-funded studies, results showed that using a silicone barrier spray did not reduce contamination errors in capillary blood collection protocols.¹¹⁻¹³ However, results of these studies also showed that capillary blood collection by fingerstick had very low (<10%) contamination error rates.

Various types of plastic microcollection containers (150 - 250 μ L) are currently available and being used successfully to collect capillary blood from young children. Plastic containers are better than glass microhematocrit tubes, because the latter have been known to break, causing injury to laboratory personnel. The following procedure for collecting capillary blood specimens by fingerstick is recommended.

A. Materials Needed

- ▼ Soap
- ▼ Alcohol swabs. If a surgical or other disinfectant soap is used, alcohol swabs can be eliminated.
- ▼ Sterile cotton balls or gauze pads
- ▼ Examination gloves
- ▼ Lancets. The type of lancet used is largely a matter of personal preference as long as sterility is guaranteed.
- ▼ Microcollection containers. The laboratory

should be consulted beforehand about the type of device it will accept. Some laboratories will provide "lead-free" tubes for blood lead screening purposes.

- ▼ Adhesive bandages.
- ▼ Trash bags suitable for medical waste and containers for sharps. Bags containing medical waste should be clearly identified as such.
- ▼ Storage or mailing containers if needed. If specimens require shipment, follow the U.S. P.S. or other appropriate regulations for the transport of body fluids.
- ▼ Laboratory coat and protective glasses.

Materials used in the collection procedure that could contaminate the specimen (for example, blood containers, alcohol swabs, and barrier sprays) must be lead-free. **Before selecting equipment for use in blood collection, consult the laboratory about its requirements.** In many cases, the laboratory will recommend or supply suitable collection equipment and may precheck the equipment for lead contamination. Some instrument manufacturers also supply collection materials that are pretested for lead content.

B. Preparing for Blood Collection

All personnel who collect specimens should be well trained in and thoroughly familiar with the collection procedure and the use of universal precautions against the transmission of blood-borne pathogens. The skill of the collector will greatly influence the specimen quality. All

equipment should be within easy reach. The environment should be clean, secure, and as nonthreatening to the child as possible. Any necessary consent should be obtained before specimen collection begins, and the procedure should be explained to the child and the parent or guardian. Used materials should be immediately discarded into appropriate medical waste containers

C. Preparing the Finger for Puncture

NOTE: Puncturing the fingers of infants younger than 1 year of age is not recommended. Puncturing of the heel or toe may be more suitable for these children.¹⁴

Collection personnel should wear examination gloves whenever the potential for contact with blood exists. If the gloves are coated with powder, the powder should be rinsed off with tap water.

The child's hands should be thoroughly washed with soap and then dried with a clean, low-lint towel. Plain, unprinted, nonrecycled towels are best.¹⁵ If desired, collection personnel can use a brush to clean the finger; brushing the finger during washing can increase blood circulation in the finger.⁹ Once washed, the clean finger must not be allowed to come into contact with any surface, including the child's other fingers.

The finger to be punctured (often the middle finger) must be free of any visible infection or wound; it should be massaged to increase circulation before being punctured with the lancet. This massage can be done during or after washing.^{9, 10}

Steps for Preparing the Child's Finger

1. Select examination gloves. If necessary, rinse them to remove powder.
2. Wash the child's hands thoroughly with soap and water, and then dry them with an appropriate towel.
3. Grasp the finger that has been selected for puncture between your thumb and index finger with the palm of the child's hand facing up.
4. If not done during washing (see preceding notes), massage the fleshy portion of the finger gently.
5. Clean the ball or pad of the finger to be punctured with the alcohol swab. Dry the fingertip using the sterile gauze or cotton ball.

Puncturing the Finger

After the finger is prepared, the puncture and subsequent steps of forming a drop of blood and filling the collection container should be performed quickly and efficiently, since any delay can make collection more difficult (for example, the blood may clot or the child may resist). Several types of lancets are suitable for puncturing children's fingers. Lancets range from small manual blades and spring-loaded assemblies to disposable self-contained units. The latter are particularly attractive since the blade is automatically retracted into the holder after use, thus reducing the risk for self injury. Many devices are available with a selection of puncture depths suitable for small children or adults. Regardless of the type of lancet used, make the puncture swiftly, cleanly, and deep enough to allow for adequate blood flow.

The site of the puncture should be slightly lateral to the ball of the finger. This region is generally less calloused, which makes puncturing easier and possibly less painful.⁹ The first drop of blood contains tissue fluids that will produce inaccurate results; it should be removed with a sterile gauze or cotton ball.^{9,10}

A barrier material, such as silicone that is sprayed on the finger at this point in the process, will help a distinct "bead" of blood to form and may aid in blood collection. Blood that runs down the finger or around the fingernail is no longer suitable. Blood flows better when the punctured finger is kept lower than the level of the heart. Inadequate blood flow can be improved by gently massaging the proximal portion of the finger in a distal direction, then pressing firmly at the distal joint of the punctured finger (restricting blood flow out of the fingertip) and gently squeezing the sides of the fingertip. Avoid excessive squeezing or "milking" which will cause tissue fluid to be expressed, compromising specimen integrity.^{9,10}

Steps for Puncturing the Finger and Forming Drops of Blood

1. Grasp the finger and quickly puncture it with a sterile lancet in a position slightly lateral to the center of the fingertip.
2. Wipe off the first droplet of blood with a sterile gauze or cotton ball.
3. If blood flow is inadequate, gently massage the proximal portion of the finger and then press firmly on the distal joint of the finger.
4. A well-beaded drop of blood should form at the puncture site.
5. Do not let the blood run down the finger or

onto the fingernail.

E. Filling the Collection Container

The proper procedure for filling and capping collection containers is somewhat specific to the container used. As a general rule, contact between the skin and the container should be avoided. To prevent specimen clotting, blood must be thoroughly mixed with the anticoagulant after filling the container. Depending on the container and anticoagulant used, the agitation needed can range from gentle rocking to vigorous shaking. Some procedures call for the collection container to be rotated during filling so that anticoagulant will be distributed quickly through the sample.¹⁶ For collectors already familiar with fingerstick blood collection for other purposes (e.g., hematocrit or CBC), there is a tendency to not agitate the blood sample too strongly lest the red blood cells rupture. For blood lead tests vigorous agitation is not an issue because it is more important to prevent clotting than cell rupture.

To facilitate blood flow, many procedures call for the collection container to be held nearly horizontal, with a slight downward angle. Blood flow into the container should be uninterrupted to avoid getting air bubbles in the specimen. Most containers come with appropriate caps, and these should be applied immediately after collection. Again, consulting with the laboratory and knowing the manufacturer's recommendations are important to ensure specimen integrity and suitability for analysis.

Steps For Filling The Collection Container

1. Continuing to grasp the finger, touch the tip of the collection container to the beaded drop of blood.
2. Draw the blood into the container maintaining a continuous flow of blood.

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3. When the container is full, cap or seal it as appropriate.
 4. Agitate the specimen to mix the anticoagulant through the blood.
 5. Check that the container is properly labeled, and place it in an appropriate storage area.
 6. Stop the bleeding, and cover the finger with an adhesive bandage. Bleeding should stop quickly. If bleeding is slow to stop, apply pressure to the puncture site with a sterile gauze or a cotton ball. If bleeding continues after 3 to 5 minutes of applying pressure, consult a physician.

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