

Analyses for trace elements at ARUP are performed in a clean laboratory environment that includes a system of positive-pressure and HEPA-filtered air. Since detection limits for many trace elements are calculated in parts per billion, this helps minimize environmental contamination of specimens. Contamination control is also needed during specimen collection to provide results that are accurate and clinically useful.

URINE COLLECTION

Although it is nearly impossible to obtain a completely uncontaminated urine specimen, steps can be taken to greatly minimize environmental contamination. Refer to the ARUP Laboratory Test Directory for specific instructions when collecting specimens for cadmium exposure testing (<http://www.aruplab.com/guides/ug/tests/0025013.jsp>).

Spot Collection

- First-morning urine is recommended for a spot or random collection.
- Avoid collecting the specimen in an area where environmental contamination is likely to occur. In an industrial or construction setting, it is important that clothing worn in the workplace be removed prior to specimen collection to prevent dust on the clothing from contaminating the specimen.
- Wash and dry hands thoroughly prior to collecting urine.
- Use a clean plastic container for sampling and collection.
 - The containers must not have metal caps or glued inserts.
 - The containers should not be colored due to metals found in dyes.
- Minimize contamination of the sample by avoiding contact with the inside of the container or lid.
- Acid preservative is not necessary if the specimen is refrigerated.
- Transport urine in two 4 mL trace element free transport tubes (ARUP item 43116).
- Pour the collected specimen into the transport tubes. Do not use any utensils (e.g., syringes, needles, or pipettes) in the collection or transfer of the sample.

24-Hour Collection

- Avoid collecting the specimen in an area where environmental contamination is likely to occur. In an industrial or construction setting, it is important that clothing worn in the workplace be removed prior to specimen collection to prevent dust on the clothing from contaminating the specimen.
- Wash and dry hands thoroughly prior to collecting urine.
- For an intermediate collection device, instruct patient to use a clean, plastic container that is about two cups in size.
- Minimize contamination of the sample by avoiding contact with the inside of the container or lid.
- Immediately pour the urine to the 24-hour container and secure the lid after sample is introduced.
- Wrap the sampling container and the 24-hour container in a clean polyethylene bag between collecting samples; this will prevent the transfer of dust to the specimen.
- Acid preservative is not necessary if the specimen is refrigerated.
- Transport urine in two 4 mL trace element-free transport tubes (ARUP item 43116).
- Pour the collected specimen into the transport tubes. Do not use any utensils (e.g., syringes, needles, or pipettes) in the collection or transfer of the sample.

WHOLE-BLOOD AND SERUM COLLECTION

A common misconception is that the preservative of a tube can contaminate a specimen, but the materials comprising the tube and the tube top are more of a consideration. Rubber stoppers in collection tubes other than the royal blue tube are known to contain several elements that can contaminate a specimen and interfere with testing. In a tube other than royal blue, contamination can be introduced as the needle punctures the stopper. Most of this also holds true for transport tubes. A sterile tube is not necessarily a trace element-free tube. Most of this also holds true for transport tubes.

Preparing for Whole-Blood Collection

- Samples should be collected in a royal blue EDTA tube. EDTA is used as an anti-coagulant over heparin because heparin is only effective for 24–36 hours. ARUP provides the 6 mL BD brand royal blue EDTA vacutainer (ARUP item 16313).
- Use only stainless steel needles.
- Use non-powder gloves when handling and collecting.
- Wash the collection site with soap and water, followed by an alcohol swab. Some studies indicate that using alcohol alone is not as effective at preventing trace elements contamination. When multiple blood specimens are to be collected from one patient, the trace elements sample should be collected first. Once the phlebotomy needle punctures another rubber stopper, it is contaminated and should not be used for trace elements specimen collection.

After Collection

- To prevent clotting, invert the royal blue EDTA tube 8–10 times.
- Specimen can be transported in the BD brand royal blue EDTA tube. Other brands of royal blue tubes may be glass and should not be used for transport.
- Avoid opening the royal blue EDTA tube. If pouring off, use the trace element-free transport tube (ARUP item 43116). These transport tubes come precapped to avoid contamination. Remove the cap just before pouring off and place cap on the trace elements transport tube immediately.
- Do not use any utensils (e.g., syringes, needles, or pipettes) in the sample tube.

Serum Collection

For assays requiring serum, the required collection tube is the royal blue trace elements serum tube. This tube was previously called a royal blue no additive tube, but the BD brand tube now contains spray-dried silica as a clotting aid. ARUP provides the BD brand royal blue tube (ARUP item 16359).

Preparing for Collection

- Samples should be collected in a royal blue trace elements serum tube (ARUP item 16359).
- Use only stainless steel needles. Use non-powder gloves when handling and collecting.
- Wash the collection site with soap and water, followed by an alcohol swab. Some studies indicate that using alcohol alone is not as effective at preventing trace elements contamination. Do not use iodine-containing disinfectants.
- When multiple blood specimens are to be collected from one patient, the trace elements sample should be collected first. Once the phlebotomy needle punctures another rubber stopper, it is contaminated and should not be used for trace elements specimen collection.

After Collection

- Invert the royal blue trace elements tube 8–10 times to mix the clotting aid and the blood.

- Allow the specimen to sit at room temperature for 30 minutes. Centrifuge the specimen at 3000 rpm for 5–10 minutes.
- Immediately pour off the serum into a trace element-free transport tube (ARUP item 43116). Samples collected for zinc testing should be separated from cells within two hours of collection. For all other trace minerals serum tests, serum should be separated within six hours of collection.
- Do not use glass tubes when testing for aluminum if using royal blue collection tubes from another manufacturer.

Trace Elements Whole Blood, EDTA, and Serum Collection Tubes

