SAMPLE CONTROL - GENERAL

To maintain the integrity of the samples analyzed at the MUFSC, methods of proper sample handling and general laboratory techniques have been established. The objectives of the policies are to avoid sample loss and to prevent contamination, or any other deleterious alteration of the samples.

General Laboratory Policies:

Upon receipt of samples, abnormalities or departures from normal or specified conditions are documented. The submitter/client is contacted for further instructions before proceeding with analysis.

Samples are processed under strict conditions. Samples can be processed in workstations or a biological safety cabinet during steps of the analytical procedure that pose particular risk of producing or being affected by contaminants. Chain of Custody (COC) documentation is maintained.

Work areas/surfaces and non-disposable tools are decontaminated before and after use. Disposable bench paper is used when appropriate. Sterile disposable materials are used where possible and disposed of immediately following use.

Disposable gloves are worn when working in the laboratory. Gloves are changed frequently to avoid contamination. Nothing should be touched with bare hands in any laboratory. Hands are washed frequently.

Dedicated lab coats are worn in the laboratories. The lab coat will be worn with buttons fastened and the sleeves fully extended (i.e. not rolled or pushed up). Gloves will be worn over the end of the sleeves so there is no exposed skin from the arm. Face masks shall be worn when working on the bench-top with samples.

Individuals exiting each laboratory are required to walk across a hard surface tacky mat to decontaminate the soles of their shoes.

Eating, drinking and applying cosmetics are prohibited in all laboratories. Open-toe shoes are not permitted in the laboratories. Any practice that might unnecessarily introduce foreign DNA into the work area is avoided.

Evidentiary samples (Reference Standards/known and Forensic samples/questions) are handled at separate times and space. When handling original items, samples are opened one at a time. In general, questioned items are tested before reference items. Handling items “at separate times” means that one item is handled, placed into storage, the work area is cleaned, and then the second item is opened and handled.

Amplified DNA product is never brought into the pre-amplification sample handling laboratories (Processing Lab and DNA Prep Lab). Materials potentially infected with amplified product (e.g. 96-well tray racks) may be brought into the DNA Prep Laboratory if those items are cleaned with the proper decontamination procedure (e.g. soaking in bleach, autoclave, etc.).

Original database samples are stored in designated secure storage areas. Original parentage/relationship samples are stored in designated secure storage areas. Original forensic samples are stored in designated secure storage areas. Whole blood samples are stored at 4°C and stains are stored so as to preserve the integrity of the sample and prevent bacterial growth. Amplified samples are stored frozen at -20°C in the PCR Laboratory. Samples are returned promptly to appropriate storage conditions after use.

Evidence Samples:

Only the original item received is considered evidence. The evidence package will be marked with a unique identifier (case ID). Cuttings, extracts, amplified products, etc. are considered work product.

The amount of each item that may be consumed by the MUFSC is a variable that will be dictated by the submitting agency. The sample will not be completely consumed unless permission has been granted in writing from the submitting agency.

Upon completion of analysis, all forensic and criminal paternity samples/evidence are returned with the appropriate report(s). Civil paternity samples are maintained for a minimum of six months after the release of the parentage testing report. Database samples are maintained by the MUFSC as a secondary storage site.

Label all work products with complete identifying information.

- Tubes must be labeled with unique sample ID and initials.
- 96-well trays must be labeled with case ID (main reference if more than one case included on the tray), extract number or amplification number and initials.
- Strip tubes orientation (such as “C3” for row C column 3) must be clearly marked. The case ID (main reference), extract number or amplification number and initials must be on one tube in the strip.

Pipetting:

Pipetting is the most apparent source for potential errors in sample handling. For this reason, proper techniques are employed such as those listed below.

- Repeat pipettors are used only for the dispersion of reagents and never after liquid DNA has been added to the tube.
- Multi-channel pipettors are used whenever possible to reduce contamination between samples.
- Dispersal of aerosols is limited. The last bit of sample is never blown out from a pipettor. Splashes are avoided.
- All liquid is centrifuged to the bottom of a closed tube prior to opening, when applicable.
- All tubes are opened carefully. Use of a microcentrifuge tube opener may aid in opening tubes.
- Disposable pipette tips and microcentrifuge tubes are used with all samples.
- Irradiate disposable plastic consumables (e.g. microcentrifuge tubes) prior to use, if appropriate.
- Filter tips are used with single channel pipettors. The tip is placed on the pipettor immediately before use. A sterile pipette tip is used for each sample.

Good Laboratory Practices:

Good laboratory practices help to ensure that the condition of the samples is not compromised. Errors in sample handling are more readily averted following the practices described below.

- Noise and distractions are kept to a minimum.
- Visitors are not permitted in the laboratories while analysts are working.
- Tours are announced in advance to allow analysts to schedule their work accordingly.
- All documentation is completed promptly.
- Permanent ink is used to document information on worksheets and on items for identification.
- Manageable numbers of samples are processed concurrently.
- Sample placement in worksheets, sample trays, sample lists, and injection lists is carefully documented.
- Keep liquid DNA extracts separate from stock tubes of laboratory regents as much as possible.
- When performing a laboratory technique, the orientation of tube racks, tray racks, disposable pipette tips, and waste containers should be arranged in a manner that prevents the analyst/technician from reaching over sample tubes during setup.
- In general, there should always be a barrier between the analyst/technician and the sample. Examples include the sash of a hood, a closed tube, a closed envelope, and a mask. Wear a mask when performing laboratory techniques on the bench-top that requires the opening of sample containers.

- Keep exposed skin to a minimum in the laboratory. In addition to the chemical and biological exposure concerns, exposed skin can result in contamination of a sample. All analysts/technicians who enter the lab (especially the DNA Prep Lab) are potential sources of contamination.

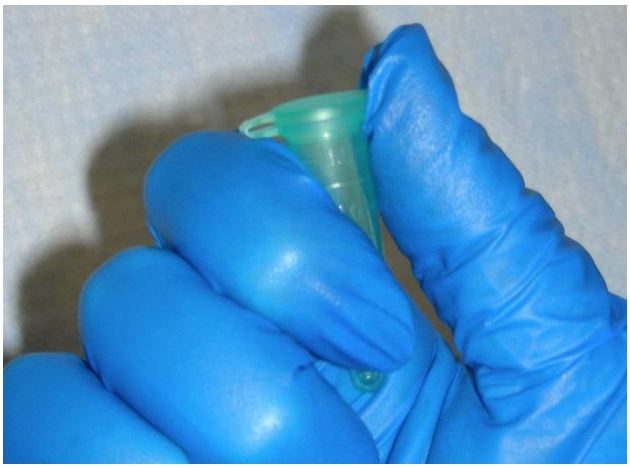
Example Good & Bad Laboratory Practices:

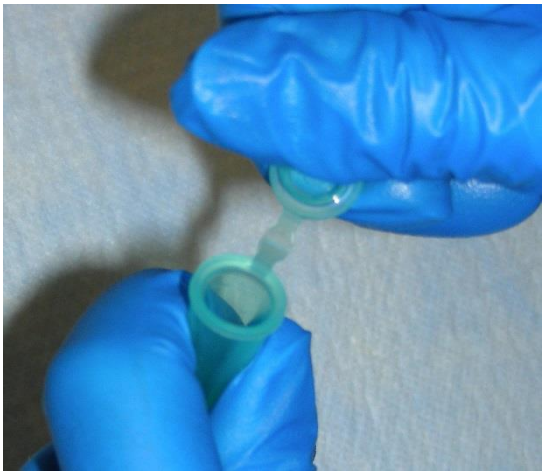
The MUFSC recognizes that there is no "one correct way" to perform certain procedures in the laboratory. However, there are definitely practices and habits that all laboratory personnel should avoid. The following images provide examples of both good and bad practices of various laboratory steps.

Opening Tubes:

Although opening a microcentrifuge tube is only a minor step of any analytical procedure, it is also a step that can easily become the source of cross-contamination.

In the image above, the analyst has taken care to avoid touching the inside rim of the tube. This method ensures that no sample has been transferred to the analyst's glove.





The two images above are examples of lower quality lab practice. In each example, the analyst is opening the tube in a manner that will potentially transfer liquid sample from the inside rim to her glove. If the glove becomes

contaminated and the analyst opens the next sample tube in the same manner, cross-contamination of one sample to another can occur.

Removing Consumables from Packaging:

Another seemingly minor step of a laboratory procedure that can introduce contamination is the removal of consumables from their packaging such as microcentrifuge tubes or 96-well trays.

The two images above are examples of good lab practice in which the analyst is removing consumables by carefully inverting the container and allowing the items to fall out. Minimal contact is made with the inside of the packaging or the remaining items in the container.

The images above are examples of lower quality lab practice. The analyst has reached into the containers to retrieve items. If the analyst's glove or lab coat was contaminated with DNA, that DNA could be transferred to all items in the container, which could contaminate not only this analyst's procedure, but the procedure of any other analyst who uses items from these containers in the future.

Gloves:

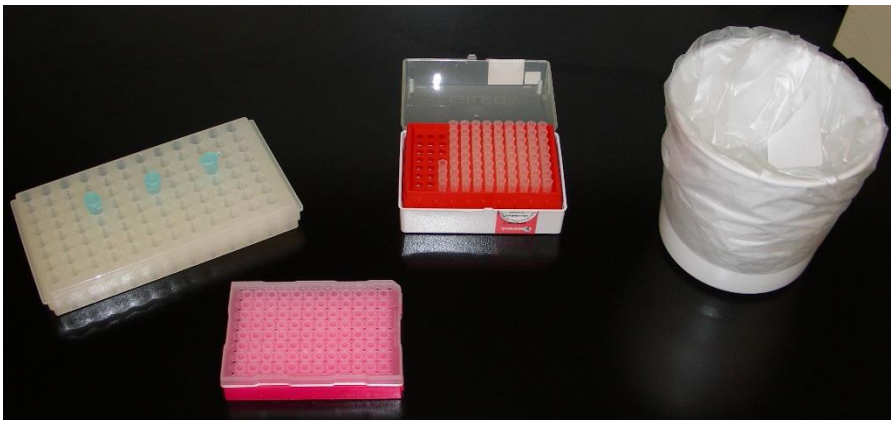
There are several varieties of latex and nitrile gloves in use at the MUFSC DNA laboratory. All personnel need to wear gloves before touching ANYTHING in the laboratory.

It does not matter which variety of glove is used, but the analyst needs to ensure the glove is long enough to be placed over or tucked under the lab coat sleeve (like the example above).

Any individual who enters the laboratory (especially a pre-amplification laboratory) is a potential source of contamination. We are constantly shedding skin cells, so any exposed skin can result in the transfer of cells to a sample tube. Exposed skin at the wrist is in closer proximity to samples than anywhere else. Therefore, gloves should not be worn as above.

Workspace Setup:

The following image is an example laboratory workspace that has been arranged in a manner that allows right handed analysts to attach a tip to a pipette, add samples to a 96-well tray, and dispense the tip into a waste container without reaching over the workspace at any time. This arrangement would be flipped left-to-right for a left handed analyst.



It is not a requirement for every analyst to setup their workspace exactly as the image above. In general, ensure that the waste container is spaced apart as far as possible from the remaining items, and that the arrangement is not causing the analyst to reach over an open 96-well tray, a rack containing sample tubes, a box of pipette tips, etc.

Exiting the laboratories:

A “tacky mat” is placed on the floor of the vestibule of each lab. All personnel exiting the labs will walk across this mat to remove any amplified DNA product from the bottom of their shoes.