

## DNA AND EVIDENCE COLLECTION PRINCIPLES

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Along with numerous other law enforcement personnel from the state, I attended a workshop on the collection and preservation of DNA evidence which was held at the Wallace State Office Building on December 4th of 1995. Much has been written on the subject of DNA, and the topic has been the object of at least a few recent meetings of the Iowa Division of the IAI. The purpose of the workshop was to familiarize those present with what, through research and practice, has come to be accepted as proper methods of collecting DNA evidence. The dawn of a new age has arrived in the form of DNA research and testing. We as law enforcement, especially those of us who work the crime scenes, need to be aware of what we can do "in the field" to assure proper evidence collection principles are followed. Only then will the groundwork for successful evidence examinations be in place when we submit the case to our state lab in Des Moines.

### Polymerase Chain Reaction

Polymerase Chain Reaction (PCR) is the DNA technique which is being practiced at the DCI Lab in Des Moines. According to DCI Criminalist Michael Peterson, PCR is a sensitive, fast, and highly discriminatory method of analysis. One of the most essential aspects of DNA examination at the forensic lab level, is that a very basic knowledge of evidence collection principles is necessary at the initial stage. PCR allows the criminalist to examine evidence which has been properly collected and preserved with expectations that accurate results will be found as a result of the analysis.

### Impact and Exchange

It is widely embraced within the law enforcement forensic field that, to at least some degree, the process of impact and exchange occurs at every crime scene. For example, a "run" vehicle impacts the accident scene and exchange

occurs with the transfer of paint to the victim vehicle; a burglar impacts a scene with the approach on foot and may leave footwear impressions during the exchange process. As law enforcement officers and crime scene technicians, it is our job to collect and preserve evidence at the scene - evidence which may connect the suspect to the offense.

The collection of evidence which will be subjected to DNA analysis is best accomplished by the seizure and submission of the original item. For example, it would be desirable to submit undergarments worn after a sexual assault for analysis - rather than cutting or swabbing the item. Sometimes, however the submission of the original item is impossible or impractical. Imagine a stabbing or shooting scene where there is considerable blood loss on a tile or linoleum floor. The act of swabbing the evidence is then used to collect samples for DNA analysis.

### Swab Method

It is preferred that swabs which are to be submitted to the Division of Criminal Investigation be made with cotton tipped swabs (i.e.: Q-tip™). The process is simple and the following outlines the procedure:

(1) slightly moisten a cotton tip swab with clean water

- concentrate the stain as much as possible.
- avoid potential sample-to-sample contamination during the entire process.
- avoid potential contamination by the collector (wear protective clothing and gloves).
- if you choose to collect with cotton balls or gauze pads, it is necessary to thoroughly clean the forceps (if used) between each sample.

(2) Air dry. - Do not use a hair drier -

(3) Package separately in paper - no plastic bags-

(4) Keep out of direct sunlight.

Eliminating the chance of cross (or sample-to-sample) contamination and contamination from the collector cannot be stressed enough. There are a couple things you can do in advance which will a) make the job easier; and b) reduce and possibly eliminate the chance of contamination...

Preparation is the key word when it comes to DNA evidence collection. You wouldn't wait until the night of a multi-thousand dollar safe burglary to order fingerprint and footwear casting supplies from the manufacturer, would you? Some very low-cost supplies can be purchased in advance which will "keep" for a considerable amount of time. Paper, plastic, or wooden shaft swabs all work fine, but the durability of the wooden shaft swabs should be considered. By keeping a styrofoam block in your evidence kit, the wooden shaft swab can be placed, shaft side down, into the styrofoam block and allowed to dry. Prior to doing so, you may want to affix a small sticker/label (which can be purchased in sheet form or in roll dispensers) to swab on which an evidence number is labeled. It was even suggested that a piece of double-side adhesive should be placed on the bottom of the styrofoam. This will eliminate the block from tipping over as the swabs are mounted for drying. When the swabs are dry, they

should be placed in separate envelopes for preservation. Plain letter envelopes work well, although manilla envelopes are equally adequate.

The cotton swabs, a small glass jar (with a secure lid) of water, latex gloves, envelopes, stickers, a marker, and the styrofoam can be packaged neatly in a small tackle box. (I prefer a \$1.49 pencil box from a local discount store.) NOTE: In the interest of really saving time at a crime scene, package the swabs in individual envelopes in advance. This reduces handling at the scene - and if using manilla envelopes, place the swabs tip-side-in so that you can remove them without touching the cotton itself.

#### Tape Lift

Dried blood samples can be conveniently lifted from a non-porous object with fingerprint tape. This process is beneficial in that the size and shape of the stain may in fact be preserved on the lift. Of course, the lift should be placed sticky side down on a sheet of plain notebook paper. It is suggested that paper be used (rather than plastic or a fingerprint backing sheet) due to the fact that the paper will allow the sample to "breathe".

#### Control Samples

When conducting DNA analysis, the criminalist needs to have a "control" sample to compare with the suspected swab/evidence. For this reason, the crime scene examiner needs to document,

collect, and preserve a control sample with the same care that the suspect sample is treated. It was suggested in the seminar that the control sample be collected prior to the suspect sample/s, and the reason was obvious. (Well it was after they explained it to me!) By collecting the control sample first, there is less chance of contaminating it with the blood or other biological fluid as the subsequent swabs are being collected. Also, make sure the same fluid used to dampen swabs is used to collect both the control and suspect samples. Criminalist Peterson suggested that if cuttings of suspected stains from an object are being submitted for analysis (i.e.: a couch) that the control samples themselves also be cuttings, rather than swabs or fibers.

#### Other Evidence

Known biological specimens can be collected from living and deceased persons easily, and we, as crime scene investigators have been doing so in the form of sexual assault kits and blood tubes. Blood should always be collected and preserved in any of three tubes\*:

- a) gray - NaF (blood/alcohol)
- b) purple - EDTA
- c) yellow - ACD (sexual assault kit)

\*red top (plain) or green top (heparin) tubes SHOULD NOT be used for the collection and submission of blood for DNA analysis.

Cheeks swabs can be collected from individuals. It was suggested by Criminalists from the DCI that

were in attendance that this method yields a good sample and has other factors about it that make it a good choice for specimen submission.....

a) it is non-threatening, in that individuals feel less intimidated with the procedure

b) the cells which are collected on the swab from inside the mouth are plentiful

c) the procedure is quick and simple:

- cotton tipped swab is scrubbed on the inside of cheek
- no food or drink for 20 minutes prior to the collection
- preferred that the procedure not be used if the mouth is bleeding

#### Deceased Individuals

Common sense and knowledge of previously approved practices seem to be the rule when deceased individuals are concerned, particularly when the body is severely decomposed and blood work is not possible. If hairs are collected for submission, be sure the Medical Examiner includes pulled hairs. The tissue associated with the hair root is needed in analysis. Other samples which can be submitted include bones (rib or long bones), teeth, muscle tissue, and associated property which may be found with the body...hairbrush, toothbrush, etc.

#### Questioned Evidence

The following samples were given as possible candidates for DNA analysis:

- saliva: cigarette butts, ski masks, envelopes, stamps, breast swabs

- seminal fluid: oral, rectal, vaginal swabs, clothing, etc.

- blood: (if the stain is visible, DNA results are possible)

-hair

Urine and feces are not candidates for DNA analysis.

#### Miscellaneous Precautions and Concerns

1) Biological samples contaminated with soil are not good candidates for DNA work, and some substrates compromise DNA testing (denim and leather are two such examples.) As we have all known for years, the fact that the samples be allowed to dry was stressed throughout the seminar. Again, plastic IS NEVER an acceptable packaging material/container. Be careful not to subject samples to prolonged exposure to UV or sunlight.

Finally, maintain the samples at ambient conditions or cooler. Room temperature is acceptable, refrigeration is desirable, and freezing samples is the best.

2) Wear protective clothing whenever collecting and working with DNA evidence. Since the crime scene examiner is subjected to exposure to the elements, it was suggested that the protective clothing be changed if returning to the scene after leaving each time.

Remember - practice common sense. Don't let the collection and preservation of biological evidence be intimidating. If sound

procedures are followed, successful and thorough crime scene work can be accomplished in a safe manner, with valuable evidence in hand.

Special thanks to all the Iowa DCI Criminalists who have made this article possible. They are a dedicated bunch of people.

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#### SMALL ITEM SUPERGLUING

#7 CRIME LAB CONFERENCE - IAI.BBS.

Start with some small cotton pipe cleaners. They have to be cotton type, not nylon. The DILLS brand works quite well. Take a plastic cup and punch a whole in the bottom of it and insert the pipe cleaner into the whole and bend it so it is not protruding out of the opening. Take any kind of superglue, so that it contains a cyanoacrylate compound or derivative, and place a small amount of glue on the pipe cleaner that is suspended in the cup, usually 4-7 drops is sufficient. Place the cup over the item which is to be superglued, and hold the cup in place for about 60 seconds. If desired, place a test print on the inside of cup to check for proper fuming and development.

The pipe cleaner-cyanoacrylate will begin to fume usually with in about 20 seconds and will fume heavily about 10 seconds after beginning. You will need the item which was fumed to air dry for a few minutes before applying powder, as sometimes humidity develops as this combination does put out some heat. This is actually beneficial in that it can cause an older print to absorb some moisture and yield better results.