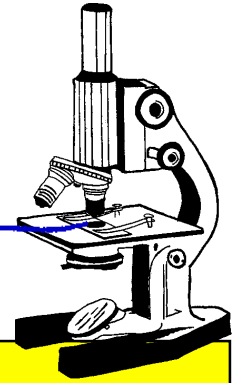


A CURRENT  
EDUCATIONAL  
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ENFORCEMENT  
AGENCIES

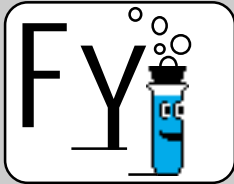
A Closer Examination From The Benchtop...

# UNDER the SCOPE



MISSOURI STATE HIGHWAY PATROL • CRIME LABORATORY DIVISION

PHONE: 573-526-6134  
FAX: 573-751-9922



DO NOT PACKAGE DNA SAMPLES IN PLASTIC, EVEN IF DESICCANT TABLETS ARE IN THE CONTAINER. PAPER PRODUCTS ARE BEST FOR STORING DNA SAMPLES.

MULTIPLE DNA EVIDENCE ITEMS IN A CONTAINER ARE DIFFICULT TO INVENTORY AND REPACKAGE AFTER ANALYSIS.  
FOR THE DNA SECTION, PLEASE SUBMIT ONLY ONE ITEM PER CONTAINER.

WHEN COLLECTING VERY SMALL STAINS ON SWABS FOR DNA, COLLECT THE STAIN ON THE SWAB TIP. DON'T ROLL THE ENTIRE SWAB AROUND IN THE STAINED AREA BECAUSE THIS DILUTES THE STAIN TOO MUCH, REDUCING DNA RECOVERY SUCCESS. SINCE STAINS MAY BE VERY LIGHT IN COLOR, WRITE ON THE ANALYSIS REQUEST FORM IF THE STAIN IS CONCENTRATED ON THE SWAB TIP.



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## Y DNA Is Good For Certain Cases

In high school biology classes, teachers lecture students in fundamental principles of genetics. One of the most basic facts they teach is that normal females have two X chromosomes, while normal males have both an X and a Y chromosome, with the Y chromosome determining male gender. Since forensic scientists are always searching for techniques to improve the discriminating power of DNA, we have taken advantage of the concept that only males have a Y chromosome. The MSHP lab has recently validated and is on-line with a new DNA typing kit that develops a DNA profile from the Y chromosome. When used as a supplement to the routine DNA profiling kit, certain samples, like female/male mixtures, may now be resolved.

**A Genetics Lesson**—Females can only donate an X chromosome to a child. Thus, the male determines the sex of a child by donating either an X or a Y chromosome. The Y chromosome is usually passed unchanged from father to son throughout many generations. Any mutation in a son's Y chromosome, which is estimated to occur every fifth generation, alters his Y profile, resulting in a different Y DNA type from his father. Essentially, the Y chromosome from all the paternal males in a family line (grandfather, uncles, brothers, sons, grandsons, cousins, etc.) should all be the same, barring any mutations.

**How DNA typing kits work**—The routine DNA typing kit used on casework samples targets 16 different DNA locations across multiple chromosomes. A feature of this kit involves a specific site for gender characteristics only; that is, the profile displays either an XX or XY to let the analyst know if a Y chromosome (also referred to as male gender characteristics) is present. To advise our submitting agencies that we used this kit on a case, our reports indicate that Promega's PowerPlex 16 genetic loci kit was used to develop a DNA profile.

Now, if a routine DNA profile contains a Y chromosome, then the Y chromosome DNA typing kit may be employed to develop a Y DNA profile. To advise our submitting agencies that we used this kit on a case, our reports indicate that Promega's PowerPlex Y genetic loci kit was used to develop a Y chromosome DNA profile.

**When to use Y**—If a casework sample contains suitable human DNA, a routine DNA profile using the PowerPlex 16 kit will be developed. This lets the analyst know if a Y chromosome is present, and in what quantity. Next, the analyst will decide whether to perform Y DNA typing with the PowerPlex Y kit.

The Y kit was designed to assist with those samples where female/male mixtures are present, and a major and minor contributor to the mixture cannot be assigned. The majority of cases that fit this scenario are sexual assaults where a complete separation of the female and

male DNA could not be achieved, resulting in a mixture.

Until recently, mixtures could only be reported as just that, with contributors being included or eliminated from the profile. To obtain more information from such mixtures, analysts, at their discretion, now have the ability to generate a Y profile by targeting only the male DNA. On rare occasions, multiple males may be present in mixtures, resulting in a Y profile that is also a mixture.

**Reference Standards**—Don't be concerned if all submitted reference standards are not profiled with the Y kit. If an individual is eliminated as a contributor to a mixture with the routine DNA kit, no Y kit profiling will be performed. Only those male individuals who cannot be eliminated as a contributor to a routine DNA profile may be subjects for Y DNA profiling. Female standards will not be Y profiled, as they have no Y chromosome.

Continue to collect buccal (cheek) standards from individuals for comparison purposes as usual. Our procedure for recovering the DNA remains the same as with the routine DNA typing kit.

**Statistics**—Since the Y chromosome is inherited differently than other chromosomes we profile, the lab's routine statistical reporting method cannot be applied. The Y method utilizes Promega's PowerPlex Y Haplotype database. Statistics are reported as the number of times that the actual Y profile has been observed in a certain number of individuals in the database. Frequencies are not reported as trillions or billions that our submitting agencies normally expect to read in a report. The lab report will indicate how many individuals were in the database at the time the report was issued.

**Final notes**—Y DNA typing does not involve new technology, just different DNA locations on the Y chromosome. We have found Y DNA typing to be a powerful tool to supplement routine DNA typing when female/male mixtures result, particularly from incomplete DNA separation on sexual assault samples. The report will advise if Y chromosome typing was performed as well as any relevant statistical information.

At best, a Y profile can only associate the profile to a particular family line. Routine DNA typing may still be necessary to eliminate other males in the family if they are associated with the crime and cannot be eliminated with Y.

Furthermore, no submitting agency issues change for this new procedure—continue to put quality and thought into collecting and packaging of evidence. You do not need to specify Y DNA profiling on the lab analysis request form because we won't know if Y may help until we analyze the routine DNA profile.

If you should have any questions about the Y kit, and how it may affect your agency, please contact any analyst in the DNA section.