



**HUMAN BIOLOGICAL MATERIAL: HAIR RESEARCH (EXAMPLE OF
DNA)**

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ABSTRACT

We know that a scene of occurrence of a crime is the place It is a starting point for the investigator, which provides him with the information on the victim and the suspect, and to reconstruct the crime.

A proper analysis of the crime scene can give the investigation the right direction to solve the crime. At the moment, an important factor is the identification of traces from the scene. One of these traces can include traces of biological origin. The source of traces of biological origin are hair, organs and tissues of the human body, bones and their fragments. and in this article, the work on the study of biological traces from the metsa incident on the example of human hair was considered.

Key words

Crime scene, hair , genotype, allele, locus , " PrepFiler™ ", DNA Extraction, Identification, Real time PCR, PCR.

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Introduction

We know that a scene of occurrence of a crime is the place where a particular crime has been committed or where physical evidence of such crime is found when it is first brought to the notice of the police. It is a starting point for the investigator, which provides him with the information on the victim and the suspect, and to reconstruct the crime.

A proper analysis of the crime scene can give the investigation the right direction to solve the crime. At the moment, an important factor is the identification of traces from the scene. One of these traces can include traces of biological origin. As is known, traces of biological origin can be formed by blood, semen, saliva, sweat, vaginal secretions, urine, feces and other secretions of living organisms. They also include hair, organs and tissues of the human body, bones and their fragments. The source of traces of biological origin is the human body, its organs.

In this article we will focus on one of such biological traces as hair.

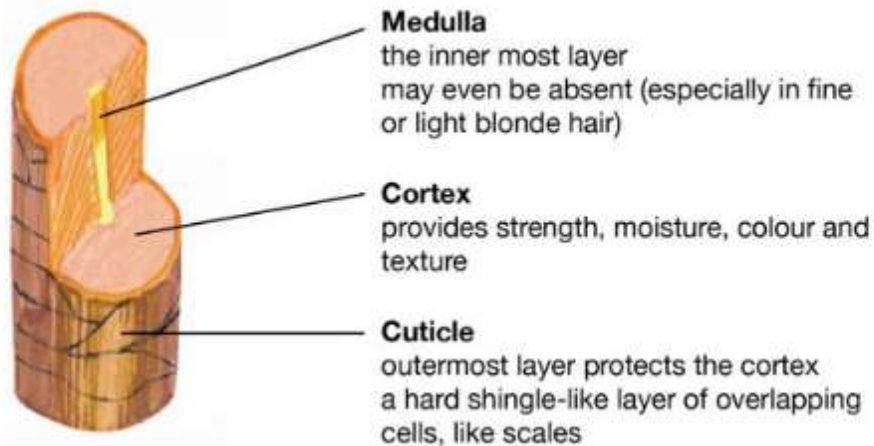
Hair samples are one of the most important resources in the forensic analysis of crime scenes, often providing valuable information that can help to lead to the identification of a suspect or victim.

Hairs are slender fibrous outgrowths projecting from the skin that possess different microscopic characteristics such as shape, color, and root appearance. Variability in such features can help forensic scientists to determine age, gender, and racial origin of the person that shed the hair, as well as allowing one to determine which area of the body hair has come from. Hair can also be used to extract DNA for analyses that can help to narrow down who may have been involved in a crime.

Humans shed an average of approximately 100 head hairs per day, and because hair can be easily transferred during physical contact, it is commonly submitted as forensic evidence to help establish associations between people (e.g. a victim and suspect) and/or people and a crime scene.

Such associative evidence is especially useful in violent crimes where physical contact is likely to have occurred such as sexual assault, homicide, and aggravated assault. Crimes less likely to have involved physical contact such as armed robbery would typically involve collecting clothing or other items that may have picked up hair that could be used to identify suspects.

Hair consists of two parts: a long growth and a follicle. A long tumor is what you see above the surface of the skin. The follicle or hair root is located under the surface of the skin. Hair Layers: Medulla is the innermost layer. It consists of soft structures of rounded cells. The cortex is the middle part of the hair, which contains the pigment that gives the hair its color and elasticity.



(Figure 1)

We always come across the following questions in the process of conducting research from hair samples: Can you get DNA from hair? The answer is a big YES! Is DNA always available in a hair sample? The answer is no! DNA research from hair how is it done? DNA research from hair is carried out for paternity determination and forensic biological examination. Forensic laboratory personnel have their own methods of successfully extracting DNA from a given hair sample. The laboratory has the best research methods and resources.

Typically, hair samples found at a crime scene will not contain the follicle portion of the hair. What do research staff do in this situation? Although the probability of obtaining a result is very low, a comprehensive and complete DNA analysis is carried out to check the DNA. In addition, it is used to determine paternity or to identify the person, if the follicle of the hair is present. If the root does not exist, the probability of achieving the result is low. Hair follicle detection is done under an electron microscope, and we can conduct research only when we see a hair follicle. Research is conducted even when there is no follicle, but we are not guaranteed to get the result we need.

Nuclear DNA and Mitochondrial DNA Research

Another way to test DNA in hair samples is through mitochondrial DNA. it is located in the cell's mitochondria, a type of cell organelle located in the cytoplasm. Its function is to provide the cell with energy. Mitochondrial DNA is more abundant than nuclear DNA. present in a human cell (there are thousands of copies of mitochondrial DNA).



The use of hair samples for DNA identification includes:

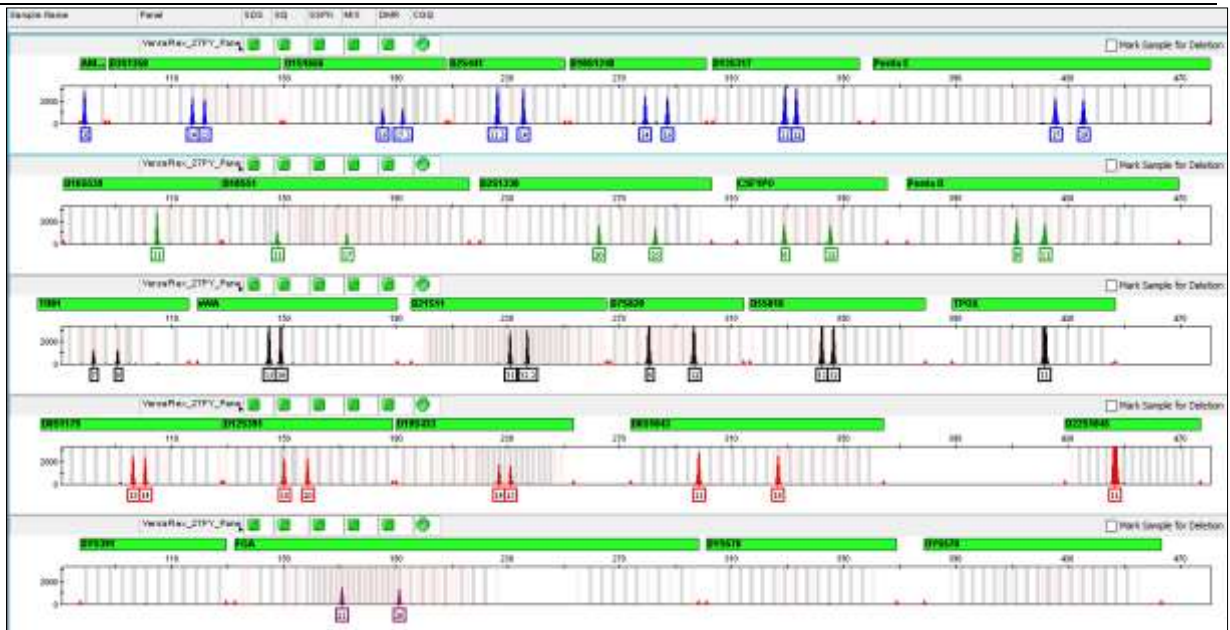
-Dye - the hair cuticle can be dyed with chemicals. Dyes can penetrate the spaces between the cells that make up the hair cuticle. Hair dyes usually contain peroxides (R-O-O-R) which contribute to the breakdown of DNA in the hair. Peroxides break the phosphodiester bonds in DNA.

-Other factors that can affect the result of DNA identification in a hair sample include the time of sample collection, the method of sample collection, storage and exposure to chemicals such as soaps and detergents, and other external factors such as temperature extremes.

Methods and DNA Extraction:

Obtaining genetic information from a hair sample for DNA typing includes the following steps: sterilization, DNA extraction, quality control, polymerase chain reaction (PCR) and profiling. After extraction of ancient DNA from hair, autosomal short tandem repeat (STR) analyzes were repeated for each sample using AmpF ℓ STR $\text{\textcircled{R}}$ MiniFiler TM and Identifiler TM kits.

Standard protocol DNA extraction from hair samples using the PrepFiler TM kit. The PrepFiler TM DNA Forensic Extraction Kit is a magnetic DNA extraction method. This kit is used to extract DNA from hair roots according to a special protocol. The kit is suitable for handling samples containing potential polymerase chain reaction (PCR) inhibitors. In order to analyze the identity of the hair, first of all, we conduct an electron microscopic analysis of the hair root, cut it to a size of 1.5-2 cm, and take a sample of the follicle part of the hair through an electron microscope and place it in a test tube. We use the following method: 1.0 M-dithiothreitol (DTT) 3 μ l is added to 200 μ l of PrepFiler TM Lysis buffer, the liquid is shaken thoroughly for 5-10 seconds and placed in a thermoshaker at 70°C, 900 rpm for 40 minutes. After the end of the lysis process, DNA is extracted from the magnetic method by the "AutoMate Express TM Forensic DNA Extraction System" using the "Prep Filer TM " kit. In order to find out the amount of DNA in the obtained liquid, it is qualitatively and quantitatively analyzed (Real time PCR) and the polymerase chain reaction is carried out using the "VersaPlex TM 27PY System" kit:



(Figure 2)

Results: The extracted DNA was evaluated quantitatively and qualitatively. Qualitative and quantitative analysis of DNA obtained by electrophoresis showed the quality of the sample and observed capillary electrophoresis lines.

The obtained result indicates that the hair sample provided for the study is suitable for identification, and as a result can be used for investigation.

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