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NEWER TECHNIQUES IN FORENSIC MEDICINE AND TOXICOLOGY – A REVIEW

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ABSTRACT

Application of science to matters of law - has made great strides in recent years, as advances in technology have given forensic experts a variety of new tools. DNA Analysis is a major tool for unlocking the mysteries of human identity and it is widely used. Image enhancement technologies are enabling investigators to read clues such as finger prints, foot prints and bite marks. With advanced techniques, forensic experts get the warrant for the victim's personal computer. With software and hard ware technology experts are now able to look at the hard drive in forensic way there by recreation of the deleted files, messages and chats are possible by which the motive behind any crime is tracked. This article aims at explaining the newer techniques and technologies used today in the field of forensic science for resolving the crimes.

Keywords: Forensic, technology, investigators, finger prints.

INTRODUCTION

There is steady increase in the crime level in the modern world with advancement in the technology using modern gadgets, mobile phones, guns. With more affinity to the social networks there is an increase in the number of cybercrimes today. Hence, there is a high need for forensic field to update and progress in the field. But the accuracy and reliability play vital role before newer techniques are adopted into this field as it involves the judgment and conviction of the guilty. With the advancement in science and technology various principles, devices, equipments are modulated and used for this purpose.

A number of factors are taken into consideration while adding these technologies into the field of forensic medicine. Viz., a particular technology must be actively used in the field, a particular technology must have been accepted by the leaders in the field with respect to their applicability and reliability (of more than 80%), a technology must be able to provide advanced information that is not readily available by other techniques.

New advances in the forensic science technology are taking investigations to an entirely different level by assisting investigations as they solve crimes. These techniques are spreading rapidly around the globe helping investigators and forensic experts solve the most brutal and challenging crimes today like murders, rape etc

Materials and Methods

In this article number of newer techniques which are currently used have been explained

Finger print Technology

Sheffield Hallan University, a biomedical research centre has developed new finger printing technology using turmeric powder, an age old spice of Indian cuisine. Procedure is simple – dust the powder of turmeric on to the fingers, lift and send to mass spectroscopy researchers to check for drugs, fatty acids and other molecules on the print. The findings are then passed to the forensic investigators.

Forensic DNA analysis:

Earlier techniques included Restriction Fragment Length Polymorphism (RFLP), Human leucocyte antigen analysis and amplification fragment length polymorphism. More recent developments include mitochondrial DNA and short tandem repeats, Y chromosome and single nucleotide polymorphism.

In earlier days DNA samples that were small or degraded were beyond the reach of DNA – typing techniques. Now a revolutionary process called polymerase chain reaction or PCR, enables a reproduction of even small amounts of DNA. With PCR, even a single hair root can be used to produce even larger volume of DNA, saliva found on the back of licked postage stamp can provide enough genetic material to conduct DNA test.

Finger print techniques:

Finger prints are accepted by the court as good evidence for personal identification. Forensic laboratories can process physical evidence using various methods, like dusting with powder using chemicals such as iodine, nin hydrin reagents, silver nitrate, fluorescent reagents etc along with advanced technology in instrumentation and illumination to enhance the latent prints like arzon laser, X- Ray detection, vacuum coating with various light sources.

Laser ablation inductively coupled plasma mass spectrometry:

When a broken glass is involved in a crime, collected pieces of glass can become an important specimen and evidence to collect and reveal important clues like direction bullets, force of impact, type of weapon used in the crime etc. this machine breaks glass sample from a crime scene into any size to their atomic structure. Then forensic experts will be able to match even the smallest shard of glass found on the clothing to a glass sample from the crime scene.

Alternative light photography:

Here the camera such as omnichrome uses blue light and orange filters to clearly show the bruising below the skin surface. So this machine helps to clearly ascertain the depth of physical damage even before it is visible on the skin.

Video spectral comparator 2000: This is one of the most valuable forensic technologies available today. With this machine experts can visualize hidden, obscured writing and determine the quality of paper. It is sometimes even possible to complete the analysis even after piece of paper is damaged by water or fire and looks unintelligible to the naked eye.

3D forensic facial reconstruction

This is one of the interesting technologies in the field of forensic medicine. Using this technology, forensic anthropologists and scientists try to reconstruct the face with 3D facial reconstruction software and real time human remains to give a possible exact physical appearance. This technology plays a vital role when skeletal remains are only available in case of mummified, putrefied or decomposed bodies.

High speed Ballistics photography:

This is a high speed camera used by Ballistics experts. This technique is used to understand the bullet holes, gunshot wounds, impact marks, matching the wounds with the bullets, exit wounds etc are studied.

DNA Sequencer:

Here forensic scientists and crime laboratory technicians use trace evidences available in the crime scene hair or skin and do the DNA profiling to identify the criminals and victims. In case of degraded, de-

composed bodies, old bones or teeth are used to determine the specific ordering of DNA nucleobases and generate a unique DNA pattern that can help to identify that person as a possible suspect or criminal.

Forensic DNA Analysis:

Magnetic finger printing and automated finger print identification: the crime scene investigators, forensic scientists and police officers can easily compare a given finger print at a crime place with an extensive database. Also by utilizing the magnetic fingerprinting dust and a no touch wanding allows the investigators to get a perfect impression of the finger prints without any contamination.

Forensic Carbon – 14 Dating:

This technique has been used to identify the age of unknown remains found in anthropological and archaeological findings. It is now possible to use this technique to identify forensic remains with the same technique using Carbon 14 dating equipment. Forensic experts who have a ready access to this machine can utilize this technique.

Link analysis software for forensic accountants:

Link analysis is a software which is of immense help to a forensic accountant to know about the strange financial activity, unusual digital financial activity and transactions, customer profiling, statistics to generate the probabilities of illegal behavior.

Hair as evidence:

"You are what you eat and what you eat ends up in the hair" – based on this basic idea scientists are working in a detailed manner on hair. A single strand of hair is capable of providing about the where about, nutritional status, place of living etc based on the isotopes with the difference in their weights and concentrations. As hydrogen and oxygen atoms make up H2O, mixture of heavy and light atoms get laid down in the growing tissues of animals that drink water. So with this knowledge as background it is possible to assess the deceased in many ways.

Image enhancement:

A number of non destructive photographic techniques have been developed to enhance imprints and impressions. These include use of filters to vary contrast and alternate lighting techniques. Images are also enhanced using chemicals. Any kind of impression can be improved by image enhancement technique. For example, Digital imaging techniques can significantly improve the intensity and clarity of bite marks.

Discussion

Forensic medicine aims for the documentation of medical and other forensic findings in living and deceased persons for the police and judiciary system. Though in other branches of specialty newer techniques are part of daily routine like, 3D – surface scanning, modern radiological procedures like computed tomography or Magnetic resonance imaging, today these are becoming more and more important parts of scientific research in forensic sciences as well.

DNA science has solved crimes which were considered unsolvable, also DNA has successfully traced out serial rapists, serial killers, identified the remains of soldiers missing in action, established paternity, helped medical detectives to track disease solving numerous controversies involving biological issues.

Today scientists are working towards detecting minute blood stains found in the crime scene.

Recent advances have found a way to detect even the minutest of bloodstains. It's accomplished using a technique called visible wavelength hyperspectral imaging. Here a camera is equipped with a liquid-crystal tunable filter that takes pictures in multiple wavelengths, distinguishing between blood and other dark stains. The method involves no contact with the substance of interest, leaving it untouched so other investigators can use it for forensic procedures including DNA analysis. Since even the best workers using existing technology can sometimes miss minute blood stains. SO, this technique will be of immense help in the days to come.

CONCLUSION

Crime is an important area of research and study because it raises the fundamental questions about civil liberty. Criminnological studies reveal several facts which help in understanding human behavior. With en extensive exposure to social media and also for the crimes happening around a criminal always finds solutions to make the crime appear natural, aiming at making the crime look obvious. Hence there is always a need and requirement from the experts to clearly understand the motive, style adopted and techniques and technologies adopted by the criminal to commit the crime. with the advancement of technology there is a wide scope for the experts to analyse and obtain a definite idea about the crime.

With the aid of these newer techniques it is possible today to investigate a crime and do the justice within a short time. These techniques are extremely helpful, applicable and reproducible to solve a case which seemed like a mystery.

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