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NANOTECHNOLOGY IN THE FORENSIC SCIENCE

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We live in the 21st century. This is the time of the high technologies and the great discoveries. The modern science opens up the new feasibilities of the up-to-date and unconventional research methods development. Special attention is paid to the nanotechnologies. Nanotechnology concentrates on the creation and use of materials, facilities and technical systems. To clarify, their existence and functioning is determined by the nanostructure (from 1 to 100 nanometers). Nowadays this kind of science is applicable for many features of our life including crime investigation, law enforcement and forensic medicine. The possible application of nanotechnologies in these fields has substantially transformed the processes of investigation by making them more effective, more rigorous and simple to implement. So, that is why this adequate technology has gained tremendous significance. The employment of nanotechnology in forensic activity can increase the amount of evidence several times. But this method requires spending a lot of money on the modern equipment. Does the result justify the means? Is the nanotechnology a step into the future or a waste of time?

The tendency of using not only conventional physical and chemical methods, such as chromatography, spectrophotometry, atomic absorption analysis, but also the modern high-precision methods occurs in the work of the forensic examinations. These techniques based on the nanotechnologies. The current and effective forensic methods reduce the time of the forensic examination process and give a more accurate result with the lowest labor costs and at the same time obey the principle of the reasonable consumption. The nanotechnology contributes to forensic sciences in two ways. Firstly, it can detect and analyze samples in the nanoscale. Secondly, the nanomaterials wield the modified properties that can aid the collection and detection of the evidence which cannot be gained previously.

The latest nanotechnology-based approaches serves police officers analyze the evidences immediately on the scene of crime. It not only saves time of analysis but also decreases the chances of error. Nowadays, in the forensic investigation process, the different nanopowders are used to confirm the latent fingerprints on the various surfaces. The sensitivity of the fingerprint procedure has multiplied diversity because of the substitution of the existing materials such as carbon black, aluminum flake, and gentian violet with much smaller nanoparticles. This makes it easier to spot old or faint fingerprints, and those left on the difficult surfaces. The nanoparticles bind with the fingerprint's pattern and make it visible. For example, fluorescent nanoparticles improve the effect of the fingerprint by glowing in the dark and telling the patterns in a more obvious manner.

One of the most promising applications of the nanotechnology appears to be in perfecting and enhancing DNA analysis. Nano-techniques have made extracting, amplifying, separating and sequencing DNA quicker and practical. Nowadays, magnetic nanoparticles are used to extract DNA from the different biological sources like a blood, hair, skin, semen, and saliva. It's also possible to analyze DNA sequence using AFM by putting the sample in the carbon nanotubes. AFM (Atomic Force Microscope) is a type of high-resolution scanning probe microscopy (SPM). The basic components of AFM consist of a microcantilever with a very sharp probe (tip) at the end to scan the sample surface. Typically, the cantilever is made by silicon or silicon nitride. Most part of AFM works efficiently in the ambient air or a liquid

environment. AFM aids the inspectors to investigate body offences, by discovering the age of the blood sample and deducing some phenotypic features of the owners of that DNA: geographical origin, the color of the eye, skin, and hair, stature. AFM is also helping the detective in revealing the substances present in the urine. In 2013, McCord developed a system that mixes urine with gold nanoparticles and analyses the signal emitted when the mix is illuminated by a laser. This method helps to detect a wider variety of drugs, substances and medicaments. What's more, Cranfield University developed plastic to recognize various narcotics at Silsoe in Britain eliminating costly and time-consuming drug testing labs. It is required to dip a gadget the size of a conventional pen in a simple saliva sample at the crime scene to affirm the absence or presence of drugs rapidly [1].

In the future with the permanent development of the nanotechnology, forensic scientists will be encountering various evidences in the nanoscale. Forensic scientists will need to know more information in the nanotechnology related fields. As can be seen, a compatibility of the forensic science and the nanotechnology is a realistic thing. It can be achieved by putting an emphasis on developing educational researches to help provide the skilled workforce and additional tools needed to advance the nanotechnology. The main challenge is to make procedure low-cost and available. But anyway the result justifies the means. The introduction of nanotechnology into the forensic process leads to a new, more simplified forensic process. It all means that is the nanotechnology a step into the future.

Библиографический список

1. Dr. E. N.Ganesh. Application of Nanotechnology in Forensic Science. 2016.