ORGINAL ARTICLE Received 5 February. 2018 Accepted 17 September. 2018

Vol. 5, Issue 4, 119-136, 2018

Journal of Exploratory Studies in Law and Management

ISSN: 2375-9887

jeslm.worldofresearches.com

Application of Novel Chemistry in Forensic Medicine

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A B S T R A C T

Forensic chemistry is a field of chemistry containing various branches of chemical science such as analytical, organic and inorganic chemistry. Besides, the new studies of chemistry in accordance with the nanoscience have been also employed to detect forensic facts. Among them, the methods related to analytical chemistry were more attended for forensic applications. Analytical chemistry as the both of classical and instrumental techniques are used in numerous fields of forensic chemistry including drug detection, biological samples of blood, sperm and urine, identification of fake documents, fingerprint, poisons, and gunshot residues. Hence, the coupling of separating techniques, spectroscopy, and computational data has opened a beneficial view rather than the forensic chemistry and its applications for crime scenes. In the present report, some of applications of forensic chemistry for numerous facts were studied as a reviewable investigation.

Keywords: Forensic Medicine, Instrumental Analytical Chemistry, Classical Chemistry.

INTRODUCTION

Forensic medicine today, as a specialist from among the various branches of medical science, has undergone various stages in the fate of its development and formation. The way that initially may have originated from the field of thought and performance of a person called the Shaman or the tribal witch, and today has come to extensive assemblies and numerous scientific associations with thousands of books and scientific papers. The examination of historical texts shows that in human conception societies, medical forensics has begun to develop along with medicine and judgment(Eriksson & Jones, 2017; Fahmy, 2018; Jha, Halder, & Choudhury, 2017). Learning about crime scenes can be interesting. This article describes the hypothesis of crime, the crime scene and how it is used to gather evidence of law enforcement agents. Knowledge and technology related to crime scene chemistry is one of the most important advancements in criminal investigations. First, the knowledge of chemistry strengthens law enforcement by finding hidden evidence. Secondly, and most importantly, it is possible to find evidence that is almost accurate. Each chemist generally studies organic chemistry and chemistry, but forensic specialists work in specialized chemistry fields. For example, an inorganic chemist can examine the effects of dust using a micro-chemical agent to detect the chemical composition of small particles. Another chemist may use chromatography to investigate and solve crimes during criminal analysis. The

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To cite this article: Khodadadi Dashtaki, Kh., Bahrami, N. (2018). Application of Novel Chemistry in Forensic Medicine. *Journal of Exploratory Studies in Law and Management,* 5 (4), 119-136.

scientist uses blood-colored materials on the scene of crime to test DNA detection in the crime scene. Physical contact between a suspect and a victim, a vehicle or a mass scene during a crime can often transfer materials such as blood, sperm, saliva, hair, fibers, paint, plastics and glue. Also, in the investigation of fire, the analysis of firefighting samples is necessary to detect the cause and source of the fire. The Legal Surgical Laboratory is responsible for reviewing, identifying or comparing the material obtained at the scene of the crime, about the victim, the accused, their garments, vehicles, weapons, tools and other items in the objects. To conduct these examinations, various serological, chemical, microscopic and instrumental methods are used(Barar, 2015; Ribaux et al., 2010). The fact is that forensic scientist is often a chemist. This is because the decomposition of gunfire, hairs or even blood traps, which can link a suspect to the crime scene, is most likely possible with chemical techniques and tools. In fact, modern criminal investigations are dependent on the limitations and capabilities of decomposition chemistry in performing the test. Breakdown chemistry is a branch of chemistry that focuses on identifying the amounts of material in a sample. The progress of chemical analysis allows the identification and measurement of substances in very small amounts using various techniques that are specific to the specific properties of each substance. For example, by chromatography, you can determine the exact amount of the sample to the ng / ml (less than one pack of sugar in an Olympic swimming pool). Also, in the case of metals, it can be 10 times higher. For example, using a sample evaporation technique at 10,000 ° C, it was possible to detect the presence of a toxic metal in a hair with a ratio of one gram of in-volume volume to four pools.

But the great challenge of decomposition chemistry applies to criminal investigations, beyond the identification of the presence of drugs, explosives or poison. It's about how to describe the material on the scene of crime and track it down to the scene. In fact, the combination of materials, such as glass fragments, color tracks, textile fibers, paper, or even ink used to write letters, can provide very important clues to the investigation of crime. The use of a combination of decomposition techniques even allows for the identification of the geographical origin or date of production of many materials. Judicial chemistry includes organic and mineral decomposition, toxicology, research on fire and serology. In each decomposition method, specialized techniques and instrumentation are used. The process may simply be a density gradient column for comparing soil samples or with the complexity of using a mass spectrometer or neutron activation decomposition to identify unknown material. A wide range of laboratory and instrumentation techniques are used in legal studies. These include ultraviolet, infrared, and photomultiplier spectroscopy, neutron activation decomposition, mass spectrometry, high performance liquid chromatography and atomic absorption spectrophotometry.

SOME OF THE IMPORTANT FINDINGS OF THE LEGAL PRACTITIONER ARE:

1. Traceability evidence:

Tracing evidence includes materials that are often microscopic and can easily be transmitted between victims, suspects, their clothes, vehicles, weapons, tools, and more. This type of material mainly includes color, hair, fibers, plastics and adhesive (tape). Also included are textiles, harvested fabrics, cosmetics, residual particles of bullets and ropes ... This type of material found during the research and aggregated with the sample Known or reference materials are matched using various chemical, microscopic and device techniques. Types of microscopes, spectrophotometers and chromatographic devices are used. Even the database allows an exam to process the color of the car's chip and potentially determine the model, model and year of the vehicle.

2. Analysis of fire remnants:

In analyzing and analyzing the erosion of fire, it examines the evidence gathered in firefighting scenes, which is part of the activity of the judicial chemistry laboratory. The purpose of this study is to determine if there is a flammable liquid? Most of the flammable liquids are petroleum products, however, other non-oil products can also be identified. Firefighting evidence is packed in construction molds, colored cans or fire-fighting bags, and is generally protected from drugs or clothes. The examination method involves extracting combustible liquids from evidence using one of the three extraction techniques or a combination of techniques. Extraction is used for this purpose by extracting from the high space of the sample and extracting the solvent that the extract is then injected into a gas chromatography-mass spectrometer and identified by analyzing the information of the template.

3. Toxicology:

Toxins were initially used by Egyptians, ancient Greeks and Romans. Democritus is probably the first chemist to study poison and some of his findings refer to Hippocrates. At that time, poisons were used for murder and a means of execution. Socrates, a philosopher condemned to death by drink. Ancient Roman civilization (in 82 BC) had laws against poisoning. Prior to the development of systematic and scientific criminal investigations, guilt was largely determined by evidence in the position and evidence of rumors. Arsenic was a poisonous poison during the Roman era(J. A. Siegel & Saukko, 2012).

Toxicologists examine a wide range of substances, such as blood, urine and blood gases, to prove toxins and drugs. Many businesses now require screening of employees; the responsibility of technicians is to differentiate between drugs and illegal metabolites of foods such as poppy seeds. Such degradation tests may simply be a thin chromatography paper or a complex gas chromatography or electrophoresis in the serological diagnosis of blood samples. After death due to unknown, samples from the lung, blood, urine, vitreous sac of stomach and victim to examine the toxins and drugs are examined. Insects that are found near the body are also collected and examined. They may actually absorb the effects of the drug or poison from the body, and in fact, the effects of poison are sometimes found in the insects, long after their concentration in the body is less than the detection.

4. Glass samples:

When broken glasses are involved in the mass scene, collecting small pieces can even be key to finding important clues, such as bullet orientation, impact force, or type of weapon used in a mass. Through the ability to detect highly sensitive isotopes, the laser-driven slow-acting laser and plasma-induced placement with a mass spectrometer (LA-ICP-MS) cut glass samples to approximately the size of their atomic structure. Then, forensic scientists can match even the smallest glass in clothing or on a sample in the crime scene.

THE ROLE OF ANALYTICAL CHEMISTRY IN LEGAL SCIENCE

Decomposition measurements are essential for everyday life. For example, to determine the composition and quality control of products, environmental protection and health monitoring are essential. As a result, decomposition chemistry has a great impact not only on chemistry, but also on biochemical and medical sciences, medicine, food, medicine and medicine. Judicial chemistry is the use of particle chemistry in law, and involves examining physical effects such as body fluids, bones, fibers, and narcotics. Success in parsing chemistry requires the ability to accurately measure, appreciate the principles and functioning of modern devices, and problem solving approaches. This course aims to develop these skills, emphasizing the use of mass spectrometric techniques and chromatography as a strong coupling for legal, atmospheric and biological systems. As technology brings about every aspect of our lives, there will be some progress in deciding

criminal cases in the future. For example, retinal scans have been used to track the true evidence and technology of crime solving. The following is an explanation of some of these methods.

Alternative light photography

A forensic nurse will be able to instantly determine how much physical suffering the patient suffers, which can be the difference between life and death. Although there are plenty of tools to help make these contacts quickly and accurately, photographic light replaces one of the most interesting tools to help see the damage even before it's visible to the skin. A camera like Omnikirom uses filters for blue and orange to clearly show bruises below the skin.

High-speed ballistic photography

You might not think that forensic scientists use it as a tool to understand how bullet holes, bullet sores and glass shutters are. Almost anyone, from a criminal investigator to a gun examiner, can use a high-speed camera without additional training or training. Being able to detect and deal with bullet paths, trauma symptoms and exits can be reviewed by a legal scientist.

Compare video spectrum 2000

For crime scene investigators and forensic scientists, this is one of the most valuable legal technologies anywhere in the world. Using this device, scientists and researchers can look at a piece of paper and determine obscure points or hidden notes, paper quality, source, and prominence. Occasionally

Compare video spectrum 2000

For crime scene investigators and forensic scientists, this is one of the most valuable legal technologies anywhere in the world. Using this device, scientists and researchers can look at a piece of paper and determine obscure points or hidden notes, paper quality, source, and prominence. Sometimes it can complete analyzes even after a piece of paper has been damaged with water or fire so that it cannot be understood by the naked eye.

Digital Monitoring for Xbox (XFT Device)

Most people do not consider a gaming system a potential place to hide illegal information, which is why criminals use it a lot. XFT is being developed in one of the new legal technologies for digital forensic professionals to provide access to hidden files on Xbox hard disks. The XFT is also set up to record sessions of access for real-time playback at court hearings.

Reconstruction of the three dimensional medical face:

Although this legal technology is not reliable, it is definitely one of the most interesting forensic pathologies, legal anthropologists and forensic scientists. In this technique, with the help of the 3D face image software, a human being, like human beings, is rebuilt and its physical appearance is extracted.

DNA Sequencer

Most people are familiar with the importance of testing DNA in a forensic laboratory. However, most people do not exactly know which DNA tags and how they are used. Most forensic specialists and criminological technicians use the DNA profile to identify criminals and victims using trace evidence such as hair and skin samples. In cases where these specimens are highly degraded, however, they are often converted into more powerful DNA sequences, which allow them to make bones or teeth To determine the specific sequence of the DNA core, the DNA of the person, and the production of a "droid" or a unique DNA pattern that can identify a person as a suspect or criminal suspect.

Carbon periodicity 14 Judiciary

Carbon periodicity is used to identify the life of unknown remains of human and archaeological findings for a long time. Since the amount of radiocarbon (calculated at a carbon-

14 time) has increased over the past 50 years and has fallen to separate levels, now this technique can be used to identify legal remnants.

Magnetic fingerprint and automatic fingerprint identification (AFIS)

Using these legal technologies, crime scene researchers, forensic scientists and police officers can quickly and easily compare a fingerprint in a crime scene with a large virtual database. In addition, the combination of magnetic fingerprinting dust and without touching allows for the full effect of fingerprints in the crime scene without contamination for judicial researchers.

Screening chemical tests

Chemical screening methods are the default tests that are usually used to initiate the identification process. These simple reactions cannot detect the substance without uncertainty. However, they provide initial confirmation for the presence of a particular functional group or a general molecular structure. In chemical screening experiments, when the reactants are mixed with the compounds containing a specific functional group, they create a specific color. Although not clear, these preliminary tests will determine which method is appropriate for the detection of the substance. Interpretation and reporting of colors can be influenced by sample concentration, the presence of diluents and drugs, age, diet, and test response time. Also, color transfer and instability may lead to the formation of colorful complexes.

Chemical Formation Color

The visible light (white light) contains a mixture of electromagnetic wavelengths varying between about 350 nm (violet) to 750 nm (red). If some of these wavelengths are removed from white light, they will no longer be seen as white. All materials are composed of atoms and molecules. If a body is colored, the atoms or molecules absorb a portion of the white light. Therefore, it removes it from the visible range. The color that is seen is not the light absorbed by the object, it is essentially the wavelength that reflects it. For example, if red light (750 nm) is absorbed by the body, the red is removed from white light and the object is seen in green (a mixture of reflected wavelengths). The ability and capacity of an object to absorb light into its chemical properties, including molecular structure, bonding energy and electron structure. Changes in chemical properties can lead to a change in color. Chemical reaction is a process that leads to chemical change. Therefore, the chemical reaction can produce different colored materials if the absorption capacity of the reactants is altered. Color screening experiments create distinct colors by changing the properties of light-absorbing controlled substances. These changes are often related directly to a small change in the direction or position of the electron in the structure. The location of electrons in a three-dimensional structure of a molecule is one of the determinant factors of color.

Color screening agents use four general mechanisms to create a specific color change; all based on the change of location or direction of the electrons:

- A screening agent eliminates the electron directly from the test compound.
- A screening agent adds an unpaired electron to the test compound directly.
- The color and intensity (shadow) of the products produced in the test
- A screening agent adds an unpaired electron to the test compound directly.
- The color and intensity (shadow) of products produced in chemical screening tests may be tested under the influence of soluble acidity.

For example, the Duconviz-Levine test is a well-known standard that can affect the pH of the solution in identifying the cannabis resin to create a color change. By adding a duconavirant reaction to a sample of suspected cannabis resin, pH changes by adjusting pH by hydrochloric acid. The Chen test is an example of how the intensity is affected by pH. In the Chen test, as in the buconoid test, no color change is observed until the pH is adjusted. Therefore, the color intensity depends on how the pH is set. Using a weak opening (a solution of bicarbonate) to adjust the pH

produces a shadow that is significantly different from the shadow produced by using a strong open (hydroxide solution). The sequence of reactants in the multi-stage color test is very important because an error may result in a different result (color). For example, the use of MDA or MDMA should create a green-to-black transition. However, the sequencing of a violet passage into black creates.

Chemical Color Testing Restrictions

Color screening tests are non-specific. They are used only to confirm the presence of a functional group or a characteristic structure. They cannot positively identify a substance. However, they can show the presence of a particular class of composition. Unfortunately, all compounds do not respond to color chemistry tests, and in some cases screening tests are far more complicated than legal ones. For example, some tryptamines do not have any known chemical color test, and color testing is more complex for hydroxybutyric acid. These limitations should not prevent the use of colored chemistry tests. They are a great way to separate the classes of compounds.

Chemistry Color Testing Procedures

Chemical color tests are usually carried out by transferring a small amount of the material into a test tube. Then the test reactor is added to the material. Some tests may be performed sequentially using several reactions. In these cases, the results of each step are observed and written. Positive and negative controls should be run on a regular basis to ensure the reliability of the test responses. Below are some general principles for performing chemical color tests:

1. Place a small amount of the sample in a glass container or test tube. 2. Add a few drops of chemical reagents and record a quick color change. 3. Continue the experiment if more reagents are needed. Add a few drops of subsequent reactants and record a sudden color change. 5- Continue as much as you need. 6. Make the resulting information fully documented.

Also, photographing a chemical color test may provide sufficient documentation that shows short-term transit that may be observed during the survey and accurately record the selected results.

A number of color screening tests are presented below(Khan, Kennedy, & Christian, 2012; Khan, Kennedy, & Christian Jr, 2011):

-Chen test:

The reactant 1 consists of 1% w / w copper sulphate (CuSO4) in water and 2 reactant containing 8 g of sodium hydroxide in 100 ml of water (2 M NaOH). Then, add 1-2 mg or 1-2 drops of the suspect sample in a special dye screen and add 2 drops of Reagent 1 and 2 drops of Reagent 2 to the dye and note the color. In the presence of ephedrine, pseudoephedrine, phenylpropanolamine and lidocaine, purple color is produced. Note that this test needs to be monitored because the colors of the reactants are bright blue. Here, the complex of copper structure creates color. Copper (II) lies between the two desired molecules.

- Dale-Coupon Test

The reactant 1 contains 0.1 g of cobalt (II) acetate, or cobalt acetate tetra hydrate, 0.2 milliliters of pure acetic acid, 100 milliliters of pure methanol and reactant 2 containing 5 milliliters of isopropyl alcohol, 95 milliliters of methanol Prepare the net. Then, add 1-2 mg or 1-2 drops of suspect specimen in a special container and then add 3 drops of 1 and 3 drops of Reagent 2 and note the color. In the presence of glutamate, theophylline, chloro-oxazone, all barbiturates (a type of sleeping pill), except for thiobarbes, is a violet color. It should be noted that in the presence of dinatinin, a blue color is created. The created colored complex consists of cobalt (II) and two target molecules that are stable with two molecules of isopropyl amine.

- Nitric acid test:

Add 1-2 mg or 1-2 drops of specimen in a special container and add a thick drop of nitric acid to it and note the color. Orange-red, confirming the presence of morphine; orange, confirming the presence of coleine and yellow, confirming the presence of heroin. The aromatic ring protein in heroin, codeine and morphine (benzene ring) is located in the ortho position. The highly polar NO2 group creates these colors by creating an intra-molecular ring through a hydrogen bond.

- Amine Test Type One:

Reactant 1, containing 1 g sodium nitroprusside (nitrofricinide), 10 milliliter acetone, 90 milliliters of distilled water and reactant 2 containing 2% sodium carbonate in water. Pour 1-2 milligrams or 1-2 drops of specimen into a special container and add 1 drop of the reactant 1, then add 1 drop of the reactant 2 and note the color. The blue color confirms the existence of the first type of amine.

- Amine Test Type II:

Reagent 1 contains 1 g sodium nitroprusside (nitrofricinide), 10 milliliters acetaldehyde and 90:

Reactant 1 contains 1 g of sodium nitroprusside (nitrofricinide), 10 milliliters of acetaldehyde and 90 milliliters of distilled water and reactant 2 containing 2% sodium carbonate in water. Pour 1-2 milligrams or 1-2 drops of specimen into a special container and add 1 drop of the reactant 1, then add 1 drop of the reactant 2 and note the color. A number of amines of the second type are created by this blue-water test, such as MDMA, methtazin. It is noteworthy that this test can not be used to identify ephedrine, ketamine, and quaternary additions.

- Third-Amine Test:

Neutralized reactant consists of 2% cobalt (II) thiocyanate solution in water and acidic reaction solution containing 2% cobalt (II) thiocyanate solution in water, a few drops of concentrated hydrochloric acid. Pour 1-2 milligrams or 1-2 drops of specimen into a special container and add 1 drop of the reagent and note the color. A number of third-generation amines are produced in neutral in a neutral environment such as ketamine, acidic cocaine, pethidine, methadone, methylphenidate and metacqualone. Also, a number of third-generation amines are produced by the test in acidic environments such as cocaine, phenoclidine, pethidine, methadone, methylphenidate and metacqualone.

- Doucinous-Lavigne test

Reagent 1 containing petroleum ether, reactant 2 containing 97.5 milliliters of 2% vanillin solution in methanol (pure), 2.5 milliliter acetaldehyde, prepare reactant 3 containing concentrated HCl and reactant 4 containing chloroform. Follow the steps given in the following steps: Fill the herbal material with petroleum ether. Add extra petroleum in a special dish to the screen and allow it to evaporate. Then add a few drops of the reactant 2 followed by a few drops of the reactant 3 and note the color. Finally add a few drops of Reagent 4 and note the color in the chloroform layer. The presence of this test for the presence of cannabis resin requires two observations: the creation of violet color after adding the reactant 3, and then adding the reactant 4, the color should be transferred to the chloroform.

High Performance Liquid Chromatography (HPLC) is a tool widely used in legal science. HPLC is used in the decomposition of drugs, toxicology, decomposition of explosives, inks, fiber and plastics decomposition, and several legal uses can be named. Like all chromatographs, HPLC is based on the selective distribution of the molecules desired between two phases. Here, the moving phase is a solvent or solvent mixture that flows under high pressure over stained phase coated beads. When moving through the column, the molecules in the selected sample partition are in equilibrium between the moving phase and the stationary phase. Those who communicate more closely with the stationary phase will retreat from molecules that are increasingly scattered with a

moving phase. As a result, the example presented in front of the column appears in separate bands (peaks), the bands that appear at first appear to be components that communicate at least with the stationary phase. And then move faster than the column. The components that appear at the end are those that communicate more closely with the stationary phase and therefore move through the column slowly. The detector is placed at the end of the column to identify the components to be used. Occasionally, the oxidizing solvent is combined at specific times with certain components. This is a pure or almost pure sample of a favorite component. This technique is sometimes known as preparation chromatography.

Gas chromatography (GC)

Gas Chromatography (GC) is a device that is legally used in the decomposition of drugs, burning, toxicology and the decomposition of other organic compounds. GC uses common basic properties for all types of chromatography, separation based on the selective dispersion of compounds between different phases of the material. Here, the moving phase is an inert helium gas (He), hydrogen (H2) or nitrogen (N2), which is referred to as a moving phase (or carrier gas), and the other is a waxy substance (called the stationary phase) which is coated on a solid support material found within the chromatography column. In older GC systems, the stagnant phase is covered on small particles and is placed on a coil in glass panes of approximately the same diameter as the pencil and 6 to 12 feet long. Hot gas flows on the granules, which allows the contact between the sample molecules in the gas phase and the stationary phase, called "Closed-column chromatography", which is widely used for the decomposition of materials Drugs, Semiotics, and Magic. In the mid-1980s, column chromatography began to be replaced with a GC muine column, in which the liquid phase was covered on the inner walls of a thin tapered tube (about a diameter of a spaghetti noodle) that could be applied anywhere 15 to 100 meters in length, also connected to the winding. Capillary column chromatography represents a significant improvement in this field and improves the ability of columns to separate multiple molecules in complex drug and simulation samples.

- Chromatography ion

An ion chromatography (IC) is a device that can be used to detect anions (negative atoms or molecules such as Cl-) and cations (positive charge types such as Na +). IC for bullet-tracking (GSR) and explosive remnants of forensic science. The desired ions include ammonia (NH4 +), nitrate (NO3-) and chlorate (ClO4-), which are often detected using color variations or probabilistic tests. The benefits of IC in these cases are: specialty (probabilistic tests to positive and false negative) and increased sensitivity to the permissible limit for each billion (ppb). The portion is one billion cubic meters of microgram (1 microgram) per liter of water and one microgram of 0000010 grams.

- Atomic Force Microscopy

An important aspect of any crime investigation is the detection, safety, and breakdown of tracking evidence. Nuclear Power Microscopy (AFM) can be used to generate legal information. It can be used in examining potential forensic programs such as age determination, fingerprint scans, textile fibers, counterfeit evidence, ballistic missile decomposition and explosion testing, and pressure proof adhesive research. For examining bullets, balloons, explosive remnants and pressure sensitive adhesives with AFM, it can determine the elastic modulus, adhesion forces, energy dispersion, and the dielectric properties of tracking materials. It is also able to identify synoptic maps of these properties and compounds. Fuzzy imaging and spectroscopy of forces are important alternatives that can reproduce chemical identities. Judicial connection the force spectrometry is promising to estimate the age of red blood cells. If the surface roughness is not

affected, AFM-level imaging may add additional information to fingerprint, textile, and documentary tests. To overlap, partial marks are cleared and a mixture of fuzzy imaging biologic detectors can provide compound information. If the chemical identity of the tracking components is important, the AFM is combined with Raman spectroscopy (surface-to-peak amplification). By expanding to the high-resolution optical microscope, AFM-Raman technology can be a legal tool for evaluating and detecting, understanding the transmission of the detector, and determining the status of the presence and time of evidence.

EVALUATION OF CHEMISTRY FOR ANALYZERS OF DETECTORS

In this regard, the methods of decomposing some criminal and judicial detectors are explained:

Determination of the time span of blood

An invaluable insight into the time of the victim's death or interaction with the scene at the time the offense was committed. Forensic information can be used to support or reject allegations of victims, suspects and witnesses. However, there are currently no valid methods for determining the age of blood. Techniques that have been investigated worldwide for this purpose are high-performance liquid chromatography (HPLC), RNA degradation measurement(Anderson, Howard, Hobbs, & Bishop, 2005; Doty, McLaughlin, & Lednev, 2016), electron paramagnetic resonance (EPR) (Fujita et al., 2005; Lin et al., 2017) and hyper trusting imaging (HSI) (Cadd, Li, Beveridge, O'Hare, & Islam, 2018; Edelman, Van Leeuwen, & Aalders, 2012), and atomic force microscopy (AFM) (Strasser et al., 2007).

In the research of blood-stray dogs, trained to discover blood evidence and search for potential crime scenes in cases where a dead person may not be present. Crime scene locations are often obscure, and during the preliminary examination, evidence may not always be available. In unsafe cases, a criminal may attempt to clear biological evidence from the crime scene; however, tracking evidence that appears to be invisible to the naked eye may still be detectable. For example, it has been suggested that blood-strain dogs can detect blood in clothing that was washed up to five times or washed out on surfaces. With the aim of examining the limitations of diagnosis of dogs for diagnosis of blood and dogs for diagnosis of acne for hidden evidence of blood on washed laundry and comparing dog responses with presumptive chemical methods and research analytical methods has been. Blood was covered on cotton pads and was examined for up to five times with a conventional washing machine. After washing, the cotton samples dried up and help educate the blood and dogs to identify the ear when teaching law enforcement. Repeats of these specimens were tested with luminescent sperm by using solid phase microscopy and further analyzed by two-dimensional comprehensive gas chromatography with a time-of-flight mass spectrometry detector (HS-SPME-GC × GC-TOFMS). It placed. The results showed that the system of diagnosis of blood and the diagnosis of oily skin is a reliable complementary method for possible chemical tests and allergies to current scientific devices; some dogs can detect blood after five washings However, HS-SPME-GC × GC-TOFMS can only detect blood after being washed twice or less. This detection limit can be reduced for dogs with more training and more consistent training. Similarly, luminol was able to wash up to five barrels of blood, indicating that the odor abilities of these dogs could provide researchers with valuable information that may have occurred during the initial searches in some cases because of their testing Inappropriate chemical, ignored. This study showed the importance of diagnosing blood and crash diagnosis dogs for increased blood pressure, so that evidence gathered in a crime scene could be more highly evaluated(Rust, Nizio, Wand, & Forbes, 2018).

Fingerprint Review

The fingerprint is a picture of friction of the human finger, which includes external and external combinations. Recognizing, visualizing and capturing discontinuous fibers is an important part of criminal investigations (scenes). The endogenous sector consists mainly of skin debris and sweat glands, and fat deposits such as water, as well as many inorganic and organic materials. Human fist patterns are very distinct and are considered as a strong biometric feature for identifying a person. Visible images can be recorded using an intermittent light source or using photography. To visualize and analyze the fractured fingerprint, a wide range of physical, chemical and device technologies is now available to improve the contrast between the grooves and the surface of the object(Dutelle, 2014). However, due to environmental conditions, surface properties or the presence of specific contaminants still need to improve these fingerprint recognition methods. In addition, identifying external and inborn parts of the fingers may provide information such as personal habits and the health status of the donor. Different mass spectrometry (MS) techniques, combined techniques(Huang et al., 2016; Koenig, Girod, & Weyermann, 2011), Fourier transform infrared spectroscopy (FTIR) (Chan & Kazarian, 2006), high performance liquid chromatography (HPLC) (Dikshitulu, Prasad, Pal, & Rao, 1986), imaging Raman(Connatser et al., 2010) and atomic force microscopy (AFM) have been used to study fingerprint compositions(Jones, Downham, & Sears, 2010). Also, numerous studies have been carried out on chemical decomposition to determine the age of the fingers(Girod et al., 2016).

Judicial identification of body fluids

Detection of body fluids can be detected in various fields of the mass scene. The type of body fluid that is assigned to specific spots can provide useful information to the researchers and determine its origin. Body fluids are important because they can be the source of DNA evidence. Together with fingerprints, DNA is one of several types of physical evidence that can definitely identify a person. At the moment, you can use several tests to identify body fluids. These tests can be either prescriptive or verifiable, and depending on the results they have completed in further experiments. The main issue is the use of current methods for detecting specific body fluids and destructive testing for the sample. Most of the tests that are currently in use, such as luminol and starch, react to a specific fluid of the body's presence. Tests that can be used in more than one type of sample, such as intermittent light sources, can often give unusual responses to various body fluids. In addition, many biochemical tests, by using it through chemical reaction or exposure to radiation, damage the specimen. At this time, there is no general and non-destructive method that can be used to distinguish between body fluids. Identifying the effects of potential body fluid can be difficult for various reasons. Body fluids are heterogeneous in nature, especially when dried. They are complex biochemical compounds with significant changes within the sample. In addition, body fluids share several separate components, resulting in similarity between specimens. To overcome both these obstacles, a comprehensive and selective approach is needed. Several new developments in chemical analysis and spectrometry have recently been used for legal purposes. One of these methods is the ability to visualize blood in the fabric, using infrared thermal imaging (IR) (Brooke, Baranowski, McCutcheon, Morgan, & Myrick, 2010). By changing the fabric and the spectral region used for IR thermal imaging, blood test limits for acrylic, cotton, and polyester were studied. This method expanded and it became clear that thermal imaging could be used to diagnose blood in the fabric, after diluting it up to 1,000 times, and to apply the fabric in water vapor(O'Brien et al., 2015). X-ray fluorescence can lead to the detection of sperm and blood based on their elemental compounds(Trombka et al., 2002). Orfano visually distinguished the use of infrared spectroscopy to convert Fourier into a complete reflection of the periodic blood, salivary,

semen, and vaginal fluid(Orphanou, 2015). However, this particular study did not include sweat, and little method was suggested for their differentiation. The hydrogen core resonance method (1H NMR) was isolated and demonstrated between the serum, saliva, semen and urine using a statistical analysis of the main components (PCA) (Scano et al., 2013). However, this study did not include vaginal sweat and fluid, and used serum and semen instead of whole blood and sperm. Raman spectrometry is a very analytical method for many forensic cases. Raman mapping can be used instead of a single point at a single sample surface. Meanwhile, the selective nature of Raman spectroscopy enables it to discriminate between similar chemical species. Of course, its strength increases further when chemical analysis is applied to spectral data using chemical methods. Raman spectroscopy is applicable to the study of pure liquids, cells, mixtures and contaminated detectors. Raman spectroscopy can also distinguish between human and non-human blood, and also distinguish between blood and menstrual blood(Muro, Doty, de Souza Fernandes, & Lednev, 2016).

Textile fiber tracking research

Textile tracking can provide important information to judicial authorities in their efforts to rebuild crimes. Recent judicial textile research includes microscopic, chemical or mechanical analysis. Textile mechanical fibers focus on the elegance, twist of the fabric or knot. Fiber analysis can include examination of textiles that are exposed to various environmental conditions and found at various levels in the open space(Brüschweiler & Grieve, 1997). Additional information on judicial review can be found, for example, in the book by Robertson, Roux, and Wiggins (2017). The ability to use AFM to examine the parameters of textile fibers in the nanoscale to the micro-surface is investigated by Canetta, Montiel, and Adya (2009). This research is focused on the environmentally-conditioned, de-damped textile fibers. It was used in elevation photography to obtain height, inclination and average square roughness of cotton, wool and viscose fibers, exposed to clay and mud soils, river soils, lake water and sea water. They are Surface roughness is significantly different for all textile fibers and shows the time dependent on the growth medium. Various veins have been observed for various environmental conditions for cotton and viscose, while wool fibers are less affected by environmental stress conditions. The research confirmed that AFM can be used to detect the effects of exposure to different fibers. The atomic force microscope can be complemented by optical microscopy, electron microscopy (SEM) scanning and electron microscopy (ESEM). When using ESEM, there is no problem working with a high vacuum, but instead, it will no longer be exposed to unwanted conditions like a high pressure gassing environment. According to AFM, it should be noted that additional non-invasive techniques such as Raman scattering, Raman microscopy, FTIR, or spectrophotometric photodiode arrays are still needed to characterize the properties of chemical textile fibers(Meleiro & García-Ruiz, 2016). These spectroscopic techniques have become increasingly valuable techniques and are able to provide information about each color and the nature of the fabric. In addition, AFM in combination with Raman spectroscopy can play a crucial role in textile fiber research. It provides a non-invasive method for obtaining additional visual information about fabric properties and degradation. However, measuring AFM's force examines the mechanical strength of textile fibers in the effects of weather and ambient conditions (including cloths caused by washing).

Examination of semen detection methods

Detection of semen in legal cases Often rape or sexual abuse is essential for the collection of evidence. Semen spots can be found in clothing (such as underwear, bed linen, carpets, towels, pillow covers), body (such as thigh, vagina and abdominal hair), and the scene of crime (such as in the floor or grass, etc.) Found. With a portable light source in the forensic medicine, which spans a range of 430 to 700 nm (ultraviolet and visible), filters are used. With high intensity light source at wavelengths between 415 and 490 nm, semen can be detected in darkness and daylight. Blood

grouping (ABO) is one of the oldest methods in the medical biology group. But today, due to the advanced digital fingerprinting technique, it is used to solve crimes such as rape. If the victim is raped by a person, screening of semen spots with the help of a light source and initial testing of these patches is carried out from different places under the victim's clothes. ABO blood group each semen spot is selected using the adsorption / oxidation method. These selected spots indicate a blood type that can be related to the blood group of the accused. Thus, the accused was condemned in this heinous crime. The diagnosis of sperm and semen is the most reliable method for researching rape, sexual violence, sexual assault, etc., which confirms sexual assault. Detection of sperm in rape, anal sex, male sexual relationship (sex with a human being with animals such as animals such as dogs, calves, sheep, etc.), misconduct by a woman, sexual intercourse with blood and sexual assassinations is. In general, sperm consist of sperm (10%), seminal plasma (90%) and epithelial cells (less than 1%). Spermatozoa is produced in the testicular spermatogenesis process. Spermatozoa contains fat, proteins like protamine and histone, etc., and enzymes such as tranzaminase and dehydrogenase. The length of the sperm from the head to tail is about 50 micrometers. The head is elliptical and the core occupies a large part of the head. The tail part is responsible for the movement of the sperm. Semen plasma is a mixture of male reproductive organs such as epididymis, prostate, vasodiferitis, red blood cells and urethra. Liquid plasma contains citric acid, ascorbic acid, lactic acid, fructose, potassium choline phosphate, proteins, free amino acids, ergotyonium, zinc, calcium, sperm, lipids, enzymes such as fibrinogenase, diastase, acid and alkaline phosphatase, glycidases, Betamunoderase, beta-glucosidase and beta-cortisol. There are some methods for detecting semen, some of which are listed below.

The source of response to other long-term responses is UV light (350 ≈ nm) that is invisible to the human eye. When the substance is lit, it absorbs its energy and light it with a lower energy (longer wavelength) of visible blue light. The advantage of this is that you can see the invisible spots that are not visible to the human eye. In this way, a mercury lamp creates intense light in the ultraviolet (400-320 nm) and visible light (400-450 nm), which can even detect biological spots on the day. The wavelength of the light can be adjusted using the filter. Combined with white settings (> 400 nm), orange (> 500nm) and red (> 590nm) lenses are used to prevent exposure and to use more fluorescent precision. Also, a chemical test for acid phosphatase is performed using four chemicals. Phosphatase acid releases the phosphate group from phosphate succinate, and then the phenol reacts with 4 amino acids in the presence of a potassium fluorescein and forms a reddish color. In another method, acid test confirms the enzyme extraction using agarose gel electrophoresis, where the extract of seminal spots is found in the tris buffer (pH 4.9) on the agarose gel. It is then exposed to 20 milliamperes for 30 minutes, and stained with 4-methyl amelbliferyl phosphate in ultraviolet light at 254 nm. The blue stripes indicate the presence of semen. After confirming the presence of semen, the ABO group is identified(Harel, Khairkar, Kulkarni, & Malve, 2015).

Checking forgery documents

Forgery of documents includes illegal alteration, deletion or extension of its contents. Maintaining evidence in procedural processes is also important in analyzing the document under discussion. The decomposition methods used to examine the document include thin layer chromatography (TLC), high performance liquid chromatography (HPLC) (Tebbett, Chen, Fitzgerald, & Olson, 1992), optic electrophoresis(Zlotnick & Smith, 1998), gas chromatography with mass spectrometer detector (GC / MS) (LaPorte, Wilson, Cantu, Mancke, & Fortunato, 2003), mass spectrometers with electrospray ionization, field depletion and laser absorption ionization matrix(Braz, López-López, & García-Ruiz, 2014; J. Siegel, Allison, Mohr, & Dunn,

2005) and less invasive techniques such as FTIR, Raman spectroscopy, near-infrared ultrasound imaging(Silva et al., 2014), And atomic force microscopy(Brandão et al., 2016).

Document inspectors are often required to examine the subject documents for determining the line, signature, type of paper, ink remaining, and ink and laser printers that vary in age and time. Therefore, chemistry and computer science are doing a great job in this regard. For example, an analytical study of crossing point's intersections has been carried out by identifying luminescent components in ink using various chemical techniques. Hence, several device decomposition techniques were tested to obtain sequences at intersection lines of the line to determine the sequence of line writing. One of the main goals of this study is to determine the chemical identity of the fluorescent compounds in the ink formulation. Here, chromium, spectroscopy and mass spectrometry are used to detect the components of luminescent ink, since fluorescent compounds such as crystal violet and methyl violet are known in the composition of inks that can be found in the future when the inks are deposited. At the intersection of the crossing line(Williamson et al., 2017). Also, as stated, many of the wet stamp inks, such as the master letter, flat head or roll, contain luminescent components. Optical comparison of two or more unknowns with the help of infrared (IR) camera systems is a standard approach to examination of documents. It can be seen that these components may vary within the paper, and in particular along a cross-section with the other ink(Hofer & Bako, 2016).

Analysis of gun and explosive remnants

Bulb Residues (GSR), cartridges, and fire extinguishers, mainly containing material for fuel metabolism, fuel or steam burned, particles from ammunition primer, smoke, grease, lubricants and metal remnants of the cartridges. The organic compounds in the GSR are engine oils and guns used(Dalby, Butler, & Birkett, 2010). The GSR mineral analysis can provide important information for the legal reconstruction of incident events. Inorganic GSR decomposition techniques include neutron activation decompression, atomic absorption spectrophotometric (AAS) methods(Aliste & Chávez, 2016), induced coupling plasma (ICP) (Z. e. Abrego et al., 2012), scanning electron microscopy with degradation Energy scattering (SEM-EDX) (French & Morgan, 2015) and atomic force microscopy(D'Uffizi, Falso, Ingo, & Padeletti, 2002). The neutron activation decomposition often detects typical compounds of the GSR, such as Ba and Sb, but cannot be used for Pb. In addition, the samples should be irradiated, and this method is time consuming and expensive(Schwoeble & Exline, 2000). For Pb decomposition, typical AAS and ICP methods can be useful. It has been reported that high-resolution ICP-MS is usable for concentrations of Pb, Ba and Sb of less than 1 ng / ml (Sarkis, Neto, Viebig, & Durrant, 2007). SEM-EDX, as the gold standard for the GSR decomposition in judicial chemistry, is used to characterize the GSR morphologically and chemically, but this method spends a lot of time without particle detection. Organic GSR can be decomposed by coupling gaseous chromatography with a mass spectrometer detector (GC / MS) or high performance liquid chromatography (HPLC) (Taudte et al., 2014). In addition, the timing of the secondary mass spectrometer and Raman spectroscopy are applicable to both the inorganic and organic GSR characteristics(Z. Abrego et al., 2014). At present, interest in organic GSR is due to an increase in the general use of lead-free ammunition as a suitable substitute for the environment(Bergström, Ekstrand-Hammarström, Hägglund, & Wingfors, 2015). Laser-based spectroscopic techniques (LIBS) and electrochemical techniques can also be used to detect organic and inorganic contamination from gunfire immediately. The selective and efficient selection of even organic and inorganic remains of even modern munitions can be simultaneously recognized. Rapid laser beam scan detects and detects up to 5 different release lines in the target element in less than a minute with better repeatability than 11% of RSD and very small amounts per ng of mixed species of Pb, Sb, Cu, DNT and NG(Trejos, Vander Pyl, Menking-Hoggatt, Alvarado, & Arroyo, 2018).

In another method, the detection of simultaneous colorimetry of the metal salts in the remaining materials of the explosives is carried out using an analytical device based on the microfloid paper, which is presented below. The microfloat-based paper decomposition method (μPAD) has been developed to detect a small amount of explosives. This machine can simultaneously detect metallic salts using color detection. The μPAD is printed on a chromatography paper with a wax ink and creates a series of hydrophobic channels. Each channel contains a special set of reagents that changes the color of the reaction with a special metal salt. The machine is capable of performing six simultaneous experiments, including the identification of metal salts present in the explosive explosive remnants of the equipment. Metals identified by this method include lead, barium, antimony, iron, aluminum, zinc and magnesium. The detection time is less than 10 minutes and the detection limits for these metal compounds are from 0.1 to 0.4 μg. The paper chip is tested and used after several interferences, to a number of combinations Consider different combinations. This new device is useful for detecting post-explosion debris at any time and place, due to portability and ease of use(Chabaud, Thomas, Torres, Oliveira, & McCord, 2018).

Identification of illicit drugs

Marijuana is one of the most promising illegal drugs in the world. The origin of this is Caboevide Sativa. Also, salts of esters and isomers are prohibited. However, the main factor for ill effects is plant degradation. The main screening test used by the Brazilian Public Prosecutor's Police is a color test called Fast Blue Bor BB, in which a red color appears in the playing field. Cannabinoids, such as D9-THC, cannabinoid (CBN) or cannabidol (CBD), are indicated. The products are painted by chemical resonance imaging, cyclotron resonance spectroscopy, inductive dissolution test, ultraviolet-spectroscopy and thin layer chromatography (TLC) (dos Santos et al., 2016). Of course, screening tests have been discussed in detail about their identification methods.

Pressure sensitive adhesives

Pressure-sensitive adhesives (PSAs) usually contain a polymer base with appropriate and potent plasticizers, and unfortunately in a number of criminal activities such as assault, rape and theft to prevent victims and wear the eyes of the victims and provide explosives. They are used. The bar paper in reviewing and comparing legal and physical and chemical analyzes can be valuable in this regard. Typically, research on PSA involves the properties of physical fibers, chemical decomposition and the search for additional glue to the fingers and DNA. The physical fitness of the free ribbon can provide important evidence for the reconstruction of a crime and link a suspect to a crime scene(Katz & Halámek, 2016). Current methods for testing PSA include physical characteristics such as polarizing optical microscopy, GC / MS (Kumooka, 2007), FTIR (Cui & Frank, 2006), scanning electron microscopy (SEM) (Fang & Lin, 2015), X-ray fluorescence spectroscopy (XRF) (Sun, Quan, & Sun, 2013) and plasma Coupled Induction (ICP) (Khalina, Sanei, Mobarakeh, & Mahdavian, 2015). The information provided by these technologies is complementary and AFM can certainly be a valuable new member in this set of techniques. Especially since the production of PSA and its efficacy depend on the unique properties and adhesion of the applied polymers(Canetta & Adya, 2011).

CONCLUSION

In this report, the jurisprudence of chemistry, samples and methods were briefly discussed. Due to the diversity in the samples obtained in the scene of crime and of course judicial cases, judicial chemistry has been established. Detecting many crimes and attributing them to perpetrators and preventing the use of punishment on innocents shows the necessity of using

chemistry with different classical (chemical) methods and a device in jute science. However, each instance, by its own chemical nature, also requires its own method to distinguish the material with its own characteristics. The science of chemistry makes it possible to interpret the data obtained in judicial scenes, identify the materials and factors, and determine their amount. However, although the science of judicial chemistry has made remarkable progress in the beginning to the present, some of which are briefly mentioned in the report, it still needs to be improved in some branches. The knowledge of this science is felt.

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