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Microbiological Method for Forensic Identification of a Man: Problem Setting

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Abstract: The study specified the problem of microbial flora microbiological studies improvement for a human skin in the context of an effective law enforcement and the fight against the most socially significant crimes. The high scientific and practical potential of the resident microflora is conditioned by the nature and the composition of skin bacteria which together with sweat and fat substance remain on a man's clothes and environmental things. This process is more complicated but also more important for the purposes of law enforcement, rather than a person's identity determination according to the bacterial colonies on the ridges of papillary patterns. As the researcher summary, the key issues in forensic microbiology have a positive solution and practical importance for the investigation activity.

Key words: Oil factor (smell) receptors, odorology, perspiration, odor molecule, expertise, volatile metabolites, microbiology

INTRODUCTION

The scent of flowering plants in the spring, the aroma of fresh bread, the "odor" from the places for solid waste storage all these are smells, the specific sense of volatile odorants presence detected by chemical smell receptors located in the nasal cavity of animals and people. A man is capable to perceive >10 thousand different odors and to identify them, animals perceive much more odors. For example, the olfactory ability of dogs are better than a man's ones 800 thousand times.

The carriers of scents are the volatile aromatic substances that can cause olfactory sensations as a group of substances. This category includes volatile substances that cause olfactory sensations (sense of smell, the ability to detect the smell of substances dispersed in the air or dissolved in water for the animals living in it) affecting the olfactory (smell) receptors of mammals (Schoon, 1994). However, the nature has volatile substances which are odorless. Their perception takes place on the basis of vomeronasal organ operation which is developed among humans in varying degrees but it is more effective among animals (dogs and so forth).

The odors are studied by odorology and forensic odorology through the forensic activities and the use of its results for Justice. Currently, forensic odorology is a full section of forensic technology and olfactory studies are widely used by law enforcement in the criminal justice system (Gribanov, 2015). Further, improvement of this activity is associated by us with the microbiological method of a man forensic identification.

MATERIALS AND METHODS

The application of the dialectical method and the general provisions of the theory of knowledge, logic, the systematic approach to the stated problem stated, the provisions of the general theory of criminology and forensics as well as some natural sciences (e.g., biology) contributed to the achievement of the stated purpose.

RESULTS AND DISCUSSION

The analysis of current scientific evidence suggests that so far the whole process of odorous substance (smell) generation among living beings is not investigated completely, although the theories explaining this process in terms of its perception are known fairly well: the corpuscular theory, the theory of empirical classification, wave theory, structural similarity theory, spectroscopic theory, the theory of the genetic mechanism for proteins and odor receptors encoding, etc.

Only one fact may be considered as an absolute one: sweating is one of this process final steps. However, one may only guess about the mechanism of a smell foundations origin and the way that it passes until its release by a body. However, this process is known on the level of a phenomenon. The formation of olfactory molecules occurs on the basis of a cell that dies, having performed its biological purpose. It turns into a slag and is excreted from a body in various ways including by the excretion of sweat and grease glands. Transport functions in this case are performed by blood. Thus, "slag" excreted by sweat contains the basic components of individual odor which is called volatile metabolites.

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Sweat as a human skin excretion is the subject of a biological origin and the subject of legal and biological studies. As the judicial and investigative practice shows this object is considered quite often by law enforcement agencies especially during the investigation of crimes against a person.

The study of objects that contain sweat is based on the study of bacteria. They are the main carriers of information about a particular person. They may also carry identification signs that may "bind" sweat containing objects to a specific subject (Starovoitov and Panfilov, 2002).

Unfortunately, the data of scientific biological research and the expert practice of crime investigations of indicate that in forensic aspect the bacteria as a biological object of crime investigation does not have a sufficient attention. However, the prospect of scientific and practical forensic development is obvious.

It will be fair to note that the study of bacteria on the basis of microbiological methods was performed previously to determine the type and source of fibrous materials damage, the diagnostic signs of microbiological damage on fabrics through the morphological analysis and the analysis of microbial pigments, the microbial diagnostics of soils, identification of an oil product type. The development of scientific and methodological aspects of the forensic examination to study the bacteriological pollution of environment is a perspective one.

However, microbiological studies of microbial flora of human skin should be recognized as the most socially significant and promising for an effective enforcement during the fight against crime.

In this context let's denote some vectors of this trend development and a scientific perspective. We must start with the history of forensic expertise development for the purpose of a person identification from the moment when his traces in particular, latent grease and sweat fingerprints became especially important from forensic point of view. This fact is well known to criminologists, it belongs to the second half of the 19th century.

We believe that was the period when the first scientific bases of a man's hand traces identification through the use of microbiological knowledge. In the middle of the 20th century with the development of scientific knowledge about bacteria, covering a man's hands and the bacteria transition with a grease and sweat agent to the contact surface of a trace revealing object the scientific publications about the possibility of obtaining a "bacterial prints" appeared (O'Neill, 1941). However, during that period of time, due to the level of the relevant scientific knowledge development the "bacterial" technique was considered not suitable for practical enforcement as for bacterial identification of a hand's trace the hand prior to contact with a trace revealing object had to be in perfect conditions (in a warm and humid environment). However, this problem was not forgotten. According to foreign forensic publications, the bacterial identification of grease and sweat traces started to be investigated on the basis of an innovational approach for that period of time a sweat and grease substance of a hand trace and other naked parts of a man's body were used as a nutritional environment for designated bacteria (Harper *et al*., 1987). For this approach, the property of the strain Acinetobacter calcoaceticus (the type of bacteria used as an indicator in the biological testing of drinking water). It is the generation property using the substance of a grease and sweat track. This means that upon the contact of specified species bacteria with the trace left on a track accepting object by a man's finger or a hand, they begin to multiply and form colonies on the ridges of papillary patterns. The result of their growth is the "appearance" of certain papillary patterns capable of ensuring the identification of a specific subject.

However, not only this bacteria property makes an interest for research in order to develop and use in law enforcement of forensic microbiological methods. We have already drawn attention to the fact that the microbiological studies of a man's skin microbial flora may well contribute to a wider range of an effective law enforcement in the investigation of crimes against a person, especially for crimes performed in uncertainty conditions when the determination of a suspect is the first and the main task of an investigation.

There is a scientific fact that the skin microflora is the collection of different microorganisms. These microorganisms use human skin as the environment and are the result of a tolerant coexistence in the process of interaction with a man as a biological self-organizing system. It is interesting to note that human skin microflora varies depending on the area of a human body where this microflora is localized. According to its bacterial composition, it is different in the armpits, crotch, face, trunk, toe webs of hands and feet and other similar objects. The character of microflora is directly related to a person's age, the way of his life, constant (temporal) staying in certain climatic conditions, the characteristics of his body (the degree of hirsutism, skin diseases, etc.), physiological structure (functional activity of an excretory system, etc.) and a body condition (a disease nature and course), a mental state in a certain period of time and in certain situations. Besides, the specified microflora may acquire the characteristic peculiarities from the impact of objective (staying in prison, the performance of labor

functions at a hazardous work, long stay in a hospital) and subjective factors (long-term use of deodorants, perfumes, alcohol).

Human skin is never completely clean and sterile. A man can't change the permanent microflora of his skin. He also can not influence in any way on its structure as the microflora is restored quickly by the release of bacteria from grease and sweat glands. This occurs even when a skin contact with other parts of a human skin or with an external environment is temporarily ceased for one reason or another.

Conventionally, human microflora is divided into a resident one the beneficial bacteria that adapted and co-exist with it and a transient one the bacteria accidentally fell on a human skin (their composition is determined by the bacterial component of an external environment and our immunity with respect to these bacteria resistance).

In this regard, of course, a great scientific and practical interest is presented by resident microflora, since the nature and the composition of skin bacteria which together with sweat and grease substance remain on a person's clothes and environmental subjects could contribute to the process of his microbiological identification. This process is more complex but also a more important for the purposes of enforcement due to obvious reasons rather than the establishing of a person's identity using the bacterial colony on the ridges of papillary patterns that "shows" certain papillary patterns which may provide a fingerprint identification. This fact was described above.

The ways of this knowledge development are different. You may perform a direct study of flora and it is possible to study human microflora in complex in conjunction with other substances and objects which are around him in everyday life as a rule. Today only one very important fact is clear the microbiological identification of a person is objectively possible and forensic microbiology has good prospects of its development for law enforcement purposes. However, it is clear that the relevant scientific research will require serious material costs and time.

Arguing this thesis regarding the above stated contents of this study an example may be provided which is quite well known in scientific circles and illustrates well the perspectives of relevant studies.

In 2010, the experts from the University of Colorado (USA) in order to determine the prospects of human skin microflora study organized and conducted a scientific experiment. For the purposes of the experiment nine computers were provided by the means of a random sample. Bacteria were collected from the keyboard keys which organizers compared with the bacteria from the fingers of experiment participants (>200 people including regular computer owners). The composition of bacteria unmistakably pointed to computer owners each of them was "attached" to his computer. This experiment gave a few interesting results. The difference between men's and women's bacterial flora was determined as well as determine the approximate time of bacteria "survival" which are left by a man on the contact sites. It made about 2 weeks. The experts in the field of criminology and forensics know the practical importance of these simple facts to detail the circumstances of a crime investigation, especially in situations where an alleged offender is not determined yet.

Thus, you may continue to give examples and prove the practical significance of a man's microbiological trace application for the purposes of law enforcement. However, the obvious fact is that the issues of forensic microbiology have good prospects for its development.

CONCLUSION

As the summary of an implemented study, we believe, it is useful to highlight some prospects of forensic microbiology, the applied value of which is obvious for law enforcement (investigation one) activity at the level of the phenomenon:

- The establishment of stability time factor concerning the bacteria content on the skin of a single person hands
- The identification period of this individualizing feature
- The establishment of the microbial flora regional affiliation for the persons living in certain areas
- The determination of a temporal characteristic event concerning their change at different sites for the diagnosis of a man properties and conditions

We may continue the study. However, there is a well-known dialectical statement that the cognition of any object at phenomenon level can only be based on the initial knowledge of this object nature. This situation requires the development and justification of a relevant doctrine on forensic microbiology, the contents of which have a scientific and applied conceptual, terminological system, the classifications and other elements of the fundamental theoretical scientific knowledge. Only on this basis one may fully develop the appropriate practical ways and the means of forensic detection, the procedural fixing and the withdrawal of microbiological traces of a man and their forensic biological expert examination in a criminal justice system.

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