SUMMARY OF THE DOCTORAL THESIS

on *Forensic identification based on the image of the microrelief of the skin of the dorsal hand side*

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Forensic opinions in the field of the microrelief of the skin have been issued by dactyloscopic experts for years, but it is difficult to find any complete studies in the literature that provide evidence authorizing the use of principles analogous to dactyloscopy in the process of identifying traces of the microrelief of the skin. In view of the above, it has been considered appropriate to conduct tests and present the results in terms of the possibility of identifying a human being based on the image of the microrelief of the skin on the dorsal hand side.

The considerations in the thesis have been aimed at demonstrating whether, as part of the research process of traces of the microrelief of the skin, the basic identification conditions defined by dactyloscopy are met, i.e., whether the representations of the microrelief of the hand skin can be considered as traces of the surface structure of the skin whose individuality can be proven? Are the specific features, on which the identification is to be based, permanent and unchanging, and can they constitute the basis for predicting the area of the hand from which the mapping comes?

The structure of this dissertation corresponds to the adopted research assumptions. It consists of an introductory part, seven chapters and a summary. The introduction presents the problem of identifying an individual based on the hand skin image resulting from the lack of studies available in this area and the results of research that can be used in practice as part of expert opinions on hand skin traces. This part also presents the objective of the work and the scope of research planned to be carried out, along with the indication of the research subject, the type of research objects and possible research methods assigned to such fields of science as law, biology, and medicine, the achievements of which are derived from forensics – an interdisciplinary field of science.

The first chapter presents identification as a basic process occurring within the practical science of forensics, as well as the use of the identification tests results in criminal proceedings,

by considering the area of evidence and evidentiary law. By combining the identification process with a trace constituting evidence, the legal issue of assessing evidence has also been presented, in particular the role and importance of scientific evidence. It has become important to recall the existing standards for assessing evidence and the admissibility of scientific evidence in various legal systems.

In the second chapter, human skin has been analysed in detail, focusing primarily on the skin of the hand dorsal side, in order to demonstrate the existence of biological bases for identification similar to those already confirmed by dactyloscopy. By analysing the literature on the human skin structure, its cellular structure and the function it performs, some attempts have been made to find out the origins of skin wrinkles, the durability of the skin image, and the factors influencing the shape of fold lines. For this purpose, an analysis has also been carried out in terms of the anatomical structure of the hand, which provided the basis for separating research zones of the hand, enabling the organization of the process of observing research objects and formulating conclusions.

The next chapter contains an analysis of existing forensic identification methods based on the shape and structure of human skin, which also includes the identification of leather gloves traces. Based on the developed research methodologies and testing results on individual traces currently identified within dermatoscopic subspecialties, some attempts have been made to obtain knowledge about the regularities that occur in human skin mapping and conclusions drawn from the already developed research methodologies and procedures in order to be able to use the knowledge obtained in this way, specifically for examining hand skin traces, and when formulating conclusions, not to ignore the findings made so far in tests and practice.

The fourth chapter strictly carries out the task of checking the existence of a principle operating within the framework of dactyloscopic, cheiloscopic and otoscopic identification in the skin of the dorsal hand side, namely the individuality of the skin image. In this part of the thesis, by comparing hand skin images from different people, the image uniqueness of the microrelief of the skin has been confirmed in the research material collected as part of the work. To confirm individuality, images from various people have been presented on the overview tables, divided into 10 previously separated research zones, where the specific features occurring there have been marked. The above has been aimed at giving the viewer the opportunity to determine independently the lack of the bending lines convergence in the compared images.

The fifth chapter has been devoted to checking the invariance of the skin image of the dorsal hand side. By presenting images from the same person side by side, but taken at intervals, it has

become possible to formulate conclusions about the invariability of the course of the fold lines shaping the image of the microrelief of the hand skin. To illustrate the phenomenon of invariance, using the contour technique and the image blending technique, images of the same area of the hand, recorded at different times, have been superimposed on each other, on which the marked fold lines overlap or complement each other.

In the sixth chapter, an attempt has been made to create a catalogue of specific features of the microrelief of the hand skin. After a detailed analysis of the research methodologies already developed for the purposes of broadly understood dermatoscopy and using the already developed catalogues of specific features, the presence of individual features in the hand skin images has been checked. On this basis, the most common features of hand skin have been identified and collected in catalogues.

The last chapter is devoted to the forensic identification process, taking into account the individual stages of research, research materials and the types of conclusions that can be formulated as a result of the identification process as part of the opinion. The dermatoscopic trace has been discussed in terms of its possible detection and protection. Then, the methodology for collecting comparative material has been indicated, developed on the basis of own research and experience from other fields of dermatoscopy. Finally, focusing on the methodology of forensic identification tests, a methodology for identification tests of the skin on the dorsal hand side has been proposed.

The summary presents the results of verification of the thesis assumptions, indicates the achievement of the objectives and important additional findings made as part of the research, which have been proposed for use in identification research of traces of the microrelief of the hand skin.