DNA-profiling and Information Technology: A New Weapon for Crime Detection and Prevention?

1. INTRODUCTION

For many decades now criminal investigators of (violent) crimes have collected evidence of the suspect, at the scene of crime and/or from the victim itself to 'individualize' the evidence found.\(^1\) Most common is the detection of fingerprints, blood and semen traces with the aim of comparing them with existing files and with the ones of the suspect to attribute the result to the true offender, thus solving a crime case. The high convincing power of such evidence is – especially regarding fingerprints – due to the fact that every human being has its own unique fingerprint. Although the techniques for fingerprinting have been constantly improved only the invention and subsequent introduction of DNA-profiling (also called DNA-fingerprinting) in criminal investigations has marked a 'revolution' in the area of serology.\(^2\) At the same time information technology has been used by law enforcement agencies for quite a while now. In addition, DNA-profiling has become more widespread and thus is used in an increasing number of cases. Hence, a powerful double-impact is achieved by the extremely fast progress and possibilities in information technology as well as data-processing\(^3\) and the increased use of DNA-profiling in the daily work of police and prosecution authorities. In this article the impact of DNA-profiling in alliance with information technology in the field of crime prevention and detection is examined. Special attention is given to the dangerous potentials which DNA-profiling and information technology could cause, particularly regarding privacy rights.

Since DNA-profiling involves complicated micro-biological issues, it is imperative to have an understanding of what DNA is and how the DNA-profiling is conducted. Therefore, in the first part I will very briefly explain what DNA is and how the DNA-profiling is performed.

In the second part, the issue of whether the DNA-profiling can be a new wonder weapon for crime prevention and detection in general is discussed. For this purpose I shall outline the legal status of DNA-profiling in various countries. Thereafter, the impact that DNA-profiling

---

* Law Student, Frankfurt, Germany.

DNA-profiling and Information Technology

can and will have in conjunction with information technology on crime prevention and privacy rights will be analyzed.

The final part of the article will give an outlook to future developments and some critical remarks about DNA-profiling in general.

2. THE TECHNIQUE OF DNA-PROFILING

1. The DNA

In 1944 Oswald Avery made the breakthrough discovery that DNA is the basic genetic material. A few years later, in 1953, James Watson and Francis Crick discovered the molecular structure of the DNA. Yet, it was only in 1986 that the geneticist Alec Jeffreys used the DNA-profiling for the first time in a criminal case involving two girls who had been raped and strangled in England.4 Since then DNA-profiling spread to the United States and later to continental Europe.

Life on earth is based on cells; almost every cell has a nucleus; in the nucleus of every cell is DNA (deoxyribonucleic acid) and although the nucleus is very small it contains a dazzling amount of information. This information gives the instructions for the formation, structure and function of the entire human body.5 The DNA consists of two long strands that together form a double helix. Each of the two strands is composed of a backbone of alternating sugar (deoxyribose) and phosphate units. At right angles to this backbone various nitrogen-containing bases (adenine (A), thymine (T), guanine (G) and cytosine (C)) are connecting both strands of the DNA. The specific sequence of these bases determines the genetic instructions. The genetic instructions are contained in the chromosomes and the core of every chromosome consists of DNA. Each of the 46 chromosomes include a continuous, unbroken filament of duplex DNA which is coiled with other components of the cell. Thus, the precise sequence and the place they occur are the unique feature of the DNA. Furthermore, specific sequences of the bases mark the beginning and the end of the genes. Moreover, the place the chromosomes take (locus, loci) may not always be 100% identical in every human being. This variation is called ‘allele’. Normally, the variations of the alleles are extremely small and negligible, but especially in the regions between the genes a high number of (so called ‘hypervariable’) alleles are found. These hypervariable loci are so different within a population that it is assumed that every human being has its own unique, very specific hypervariable loci arrangement. This assumption – some geneticists say it is a fact – is the central advantage of which use is being made when a DNA-profiling is done.6 Therefore, the DNA-profiling is also called DNA-fingerprinting or genetic fingerprint.

Furthermore, two important points should be noted. First, the sequence of one of the two strands always resembles the sequence of the other strand, because only certain pairing relations between the two strands are possible: (A) will pair only with (T) and (C) only with (G). This is important in case only one strand is available or usable due to degradation or contamination because the DNA-profiling can still be done. Secondly, the hypervariable alleles