Research on the Application of DNA Database in the Investigation of Combined Cases

ZHAO Feng¹, ² and XU Hua³ *

¹Key laboratory of Evidence-Identifying in Universities of Shandong, Shandong University of Political Science and Law, Jinan 250014, China;
²Judicial identification center of Shandong University of Political Science and Law, Jinan 250014, China.
³The Department of Endocrinology of Jinan Fifth People's Hospital, Jinan, Shandong 250022, China

*E-mail: sfjd@sdupsl.edu.cn

Abstract: DNA technology, as a more scientific method of physical evidence testing, is playing an increasingly important role in solving criminal cases. With the wide application of DNA, DNA has become one of the key evidences of forensic science. The DNA database is closely related to the investigation work. The combination of the DNA database and the investigation can not only improve the efficiency of the case investigation, but also promote the detection of major cases. The extensive application of DNA technology has promoted the development of DNA database. With the continuous expansion of database, the problem of intelligent management level and sufficient sharing between libraries is becoming more and more prominent. This paper discusses the problems existing in the application of database in the investigation of parallel cases and emphasizes the importance of perfecting the database supervision system. The relationship between database application and rights protection is analyzed, and finally the supervision system of DNA database is proposed through legislation.

1. Introduction
Forensic DNA database has become a powerful tool for public security organs to achieve diversified and accurate attack on crime. However, with the continuous development of society, the modern public security work needs more and more court databases. The existing DNA database can not fully meet the practical needs, and needs to be improved[1]. This paper will analyze the problems of DNA database, and put forward suggestions for the construction and improvement of DNA database in the future.

2. Problems of database in the investigation of combined cases

2.1 Regional communication is patchy
In some criminal cases, criminal suspects may commit crimes in different regions. This situation requires mutual coordination and investigation by various public security organs, and is responsible for the public security organs in the host area. In the process of investigation of such criminal cases, it
is necessary to compare the DNA information of biological evidence at the scene of all cases, so as to determine whether the DNA typing results in different areas are the same. In the construction of DNA database, if the information of basic DNA database is not uploaded to the superior database in time, it will be very difficult to retrieve the DNA information in case investigation. The technicians who manage the DNA database can not retrieve other DNA database information at will[2]. At present, the database resources between provinces and regions can not be interconnected, which makes the cross regional retrieval of public security organs in the investigation of combined cases obviously restricted.

2.1.1 The network management is not perfect. Forensic DNA database is a huge information retrieval system. At present, it is divided into central level, provincial level and municipal level. The supervision of these databases is not perfect. The current supervision and management only depends on the internal personnel of the public security organs, which is far from effective. Due to the lack of effective means of supervision and management, it is easy to cause the operation of individual DNA technicians is not standardized or does not meet the requirements of the law. In the process of investigation, it is easy to increase the difficulty of case detection or cause wrong cases, and the consequences are very serious.

In the current mode of investigation, the thinking of combining cases is very important, which needs to gather more public security business contents. At present, due to the imperfect network management, it is easy to cause the disharmony between the management of database and the thinking of combined investigation. Therefore, the database management system can not adapt to the modern thinking of combined investigation. The relationship between different databases is not close enough, and Internet technology can not be fully applied to DNA database management, which is a key problem in the development of DNA database. Therefore, DNA database management mode needs to be further strengthened[3-4].

2.1.2 The problem of infringement of power is easy to appear in the retrieval. With the continuous enhancement of citizens’ legal consciousness, citizens pay more and more attention to the protection of individual rights. The construction of forensic DNA database may involve the infringement of ordinary citizens' rights, which is also a common problem faced by many countries. In order to solve the case as soon as possible, investigators may need to conduct a large-scale DNA data comparison in the process of combined investigation, which may involve the former section database, Y-STR database and missing person database. For example, in the screening of DNA data using Y-STR database, if the comparison is successful, it may violate the privacy right of the whole family of the examinee, and even have adverse social impact[5]. Therefore, it is urgent to improve the corresponding protection mechanism and system.

2.2 Incomplete sharing of DNA database resources

2.2.1 The sharing of database information between regions is incomplete. According to the administrative division of different levels, a three-level DNA database is established. The information resource sharing mechanism is an important link to connect the three-level database. The databases of different cities in the same province can not be retrieved by Internet. If the case is solved and information retrieval is carried out as soon as possible, the database in different regions should be queried separately, which will affect the efficiency of retrieval and case solving.

The municipal database is a comprehensive DNA data of the city, which may be missed or missing when it is transmitted to the provincial database. Therefore, when searching provincial databases, the results of comparison will be affected because of the lack or omission of DNA information. The resource sharing of DNA databases in China is not sufficient in regional space, and the interconnection between provincial databases and local databases has not yet reached[6-7].
2.2.2 Lack of resource sharing between different types of databases. There are three kinds of DNA databases in China, including former section database, scene database and missing persons database. These three categories are relatively independent. In the process of investigation, the technical personnel often think of applying DNA database when deciding the suspect. DNA technicians usually search in the former science library, if they fail to retrieve, then search in other databases, but the probability of successful retrieval is even lower. In this case, the investigation process may be stopped or blocked.

The DNA data in the above three types of databases have certain repeatability, and if the sharing is not perfect, the use value of these databases will be affected. When searching in the same application system, it is not possible to search DNA samples in the above three databases at the same time. Different types of databases can not be shared, which will lead to more complicated DNA retrieval. Therefore, in many criminal cases, suspects are not only one, but without sufficient resources sharing, the investigation process will be severely limited[8-9].

3. Research on the improvement of DNA database

3.1 Optimization of cross regional retrieval program

In the case of combined investigation, there are more personnel involved and more regions. In the process of investigation, investigators use DNA database more times, often need to search across regions or systems. Because the cross regional retrieval needs the approval of the superior person in charge, the retrieval procedure is relatively complex. If this procedure is simplified, it will greatly improve the efficiency of investigation. For example, for cross prefecture level city comparison, the person in charge of the municipal material evidence identification department can submit an electronic application to the higher level public security organ in time[10-11]. The relevant person in charge of the higher level public security organ should approve online in time, and inform the public security organ that submitted the application of the search result in time, which can greatly improve the work efficiency and save more manpower and material resources.

3.2 Reasonably deal with the relationship between database usage and rights protection

In the process of DNA database construction, there may be privacy issues of the personnel in the database. At present, more and more attention has been paid to the protection of the rights of the warehousing personnel. Many countries are trying to improve the application of DNA database and the protection of legal rights of personnel in the database. In our country, these problems are constantly studied and improved. In the past, some scholars proposed to build a national DNA database to include all the DNA information of all citizens in the country into the database. However, more rights protection issues will be involved in the construction process of national DNA database. China has a large population, in this case, the infringement of rights involved in DNA data retrieval will be more prominent[12]. Therefore, it is not mature to establish the national DNA database.

3.3 Improve the information sharing of database platform

3.3.1 Strengthening the cooperation of DNA databases among regions. In order to fully realize the networking of various databases, the resource sharing among DNA databases is the first step. Resource sharing is a key problem in database construction, and the research and development of sharing platform is particularly important. In many criminal cases, most suspect suspects are in the same area for many times. The city level database only manages local DNA information, and the data content of the sample is the least. If the resource sharing platform is established between the different municipal databases in the same province, the information and the DNA classification results of the data base are interconnected, then the efficiency of DNA information retrieval is effective. And the success rate will be greatly improved. The sharing of resources between databases will provide efficient backstage support for the investigation of combined cases.
The content of data information in provincial database is larger than that in municipal database. At present, the database networking of various provinces is still unable to achieve. In this case, cross provincial investigation will be in trouble. In order to solve this problem, in order to facilitate the public security organs of the two places to merge cases and improve the efficiency, we can apply for cross provincial search on the Internet. The public security organ applying for retrieval should upload the DNA information of the biological samples extracted from the case scene to the sharing platform of the provincial database. The party applying for the retrieval should quickly retrieve the uploaded information, and publish the search results through the platform after the retrieval[13]. The effective use of cross provincial resource sharing platform can not only ensure the security of data transmission process, but also greatly improve the retrieval efficiency.

3.3.2 Improve the information sharing between different databases. In the process of criminal case investigation, forensic medicine plays a very important role. Forensic medicine needs to search DNA database information. Resource sharing among different types of databases can give full play to the retrieval efficiency of DNA databases. When inquiring information in different databases, DNA examiners should be good at finding the similar features of different scenes in combination with the case and case characteristics, so as to implement the combination of cases. Because the information in different databases is not the same, the sharing of different databases is very important for the investigation of cases.

3.3.3 Perfect the supervision and legislation system of DNA database. The perfect management of DNA database is an important guarantee for the operation of the database. In the investigation of combined cases, there should be a corresponding supervision mechanism while using the database. Through the supervision mechanism, we can reduce the adverse factors caused by human factors in the merger cases. In order to reduce the adverse factors, the best way is to legislate before building. Only with perfect laws can we ensure the orderly progress of various work. To this end, China has done a lot of related work, and published the industry standards and management guidance documents of forensic science DNA database. In the development of DNA database, there are many places to be supervised, especially the operation process of DNA professionals[14-15]. It is easy to make mistakes in the operation process of DNA professionals. Therefore, it is necessary to legislate to prescribe the punishment measures for serious consequences caused by mistakes of laboratory staff. Through legislation, to improve the work and process of technical personnel. As China pays more and more attention to the protection of the subject's privacy, according to the application characteristics of DNA database and the work done in privacy protection in China, relevant laws and regulations can be issued to constantly improve the supervision and legislation system.

4. Summary
Under the background of the rapid development of network and information technology, all aspects of DNA database also need to be continuously developed and improved in order to adapt to the development needs of the current new era. In the modern investigation mode, the requirements of database and the comprehensive ability of technical personnel are higher and higher. Therefore, the citizen's right of privacy needs to be protected and improved constantly. It is necessary to seek an ideal balance between the protection of citizen's privacy right and the application of DNA database in the investigation of combined cases. Only in this way can we ensure the effective and reasonable application of different DNA databases.

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