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EDITORIAL

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FORENSIC GENETICS AND GENOMICS IN PERU: CURRENT SITUATION AND FUTURE CHALLENGES

LA GENÉTICA Y GENÓMICA FORENSE EN EL PERÚ: SITUACIÓN ACTUAL Y DESAFÍOS FUTUROS

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EDITORIAL

Forensic Genetics is defined as a field of knowledge that employs both genetic concepts and molecular tools. It is used for solving cases where it is necessary to ascertain the identity of individuals allegedly involved in a criminal act, to establish kinship links, to identify missing persons, etc. Forensic Genetics, as of now, mainly uses molecular markers such as STRs (short tandem repeats), SNPs (single nucleotide polymorphisms), and INDELs (insertion/deletion) [1]. To use these markers, the process typically starts with DNA extraction, followed by multiplex polymerase chain reaction, capillary electrophoresis, and analysis with specialized software to obtain a genetic profile unique to each individual.

There are two public entities in charge of criminal investigations, identification of missing persons, and kinship verification in Peru, which are the National Police of Peru (PNP, by its Spanish acronym) and the Public Ministry. These entities employ Forensic Genetics for human identification but do not prioritize the creation of new DNA identification methodologies, the study of allele frequencies in Peruvian populations, or the implementation of markers specific to the Peruvian population. Therefore, since 2018, population studies have been conducted to assess the allele frequencies of molecular markers frequently used for human identification. These investigations have been carried out in various Peruvian populations due to the country's diverse population, providing reference data applicable to mestizo, Aymara, coastal, highland, and jungle populations for identification processes involving individuals from these groups [2-6]. Despite the efforts made to date, many populations still need to be studied to encompass the full diversity of individuals residing in Peru. Although Forensic Genetics is a powerful tool for identification processes, it has limitations, for example, in cases of degraded DNA, ancient bone samples, etc. It also identifies only STRs, SNPs, or INDELs in a region of the genome.

To improve identification processes beyond the scope of molecular tools used in Forensic Genetics, Forensic Genomics emerges, using next-generation sequencing technologies and allowing a large number of molecular markers to be sequenced across the genome [7]. Using Forensic Genomics, autosomal STRs, X-STRs, Y-STRs, SNPs, and information related to an individual's phenotype and biogeographical ancestry can be simultaneously sequenced. Forensic Genomics allows the identification of differences within the same allele of a marker by sequencing genome regions, thus identifying both the length and the nucleotides that compose it.

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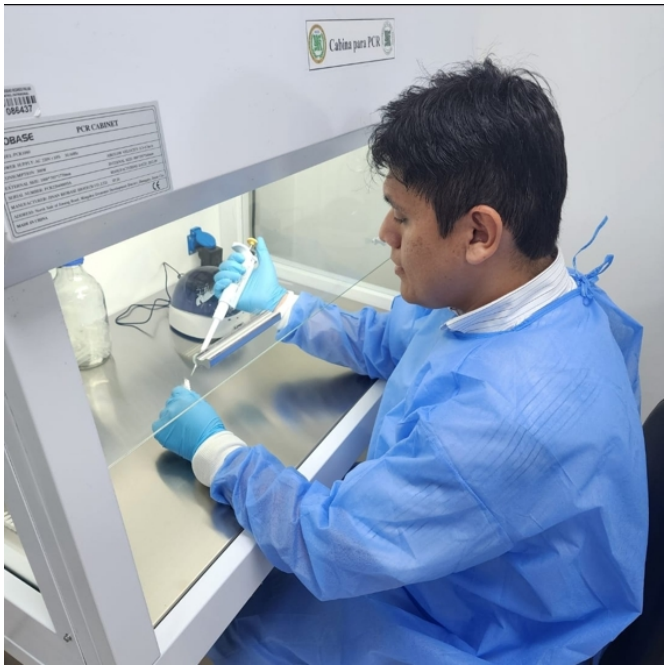
Forensic Genomics is already a routine protocol in some European and Asian countries, but in Peru, as of the date this author is aware, state entities working in DNA identification processes (PNP and Public Ministry) have not yet implemented Forensic Genomics technologies due to the time required for sample processing, the necessary equipment, and the high costs of sample processing. To reach this field, research must be developed in Forensic Genetics and naturally progress to Forensic Genomics. Therefore, the Molecular Epidemiology and Genomics laboratories at Instituto de Investigaciones de Ciencias Biomédicas of Universidad Ricardo Palma are promoting studies of various Peruvian populations to cover the most representative populations of our country, thereby creating databases of allele frequencies that faithfully represent the Peruvian populations and serve as input for human identification processes.

Additionally, as the next challenge, studies of Peruvian populations using Forensic Genomics techniques will be encouraged to generate reference data that can be used by forensic laboratories in human identification processes with this new technology.



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