



# The role of Forensic science in Criminal investigation in Rwanda

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## Abstract

*Forensic science apply scientific technology to supply accurate information's reflecting the events that occurred at the crime scene. Forensic scientists are required to appear in court as expert witnesses. The DNA analysis may be used for identification from small amounts of evidence which deposited for long time or currently at crime scene before recovery by law enforcement. The disciplines of forensic science have an essential contribution to investigate the crime of genocide and the other serious criminals in Rwanda. It can be used also in disaster victim identification. This paper shows the role and impact of interdisciplinary forensic science and its prospects in investigations to be admissible in court of law in Rwanda.*

**Keyword:** Crime scene investigation, DNA, genocide, disaster, physical evidence, y chromosome.

## Introduction

Rwanda is located in eastern Africa few degrees south of the Equator. It is bordered by Uganda in the north, Burundi in the south, Democratic Republic of the Congo in the west and Tanzania in the east. Rwanda are exposed to the effects of genocide against Tutsi, drug trafficking, terrorism, human trafficking, explosives movement, organized crimes, cyber crimes, money laundering, homicides, rape, defilement, crimes involving officers and illegal trade. In 1994, the population of Rwanda was 7 million and they was composed by the Hutu (85%), the Tutsi (14%) and the Twa (1%).

In April 1994, the government of Rwanda called upon everyone the Hutu to kill each member of the Tutsi and in three months over 800,000 Tutsi perished, over 3 million of people flee as refugees in other countries<sup>1</sup>. Millions of people in Rwanda became orphans, traumatized, abused and others were left with severe body physical damages. The investigation of Genocide against the Tutsi was done by Human rights under supervision of International Criminal Tribunal for Rwanda (ICTR)<sup>2</sup>.

The international community created a jurisdiction through United Nation Security Council for the purpose of prosecuting people accused by the crime of genocide and related serious criminals<sup>3</sup>. The Tribunal is located in Arusha, Tanzania and has the offices at Kigali, Rwanda. Its Appeals Chamber is located in Hague, Netherlands.

In 2014, Ministry of justice, the Ministry internal security and Rwanda National Police (RNP) established National Forensic Laboratory. They also introduced forensic science and criminology courses at National Police University at Musanze in the northern province of Rwanda for further support the country's judicial services. Forensic science may have significant contribution to assist justice to investigate criminals

and the other serious violations in Rwanda.

Forensic science services starts by recognition and recovery of evidences at crime scene. It proceeds by apply scientific analysis of those evidences and to present the findings to the justice<sup>4</sup>. It may help investigators to investigate crimes like homicide, rapes, accident-related incidents, unidentified bodies, missing persons, fraud and forgery cases<sup>5</sup>. The testimony and witnesses were used as a source of evidences in Rwanda and those who proved guilty were prosecuted. However, Forensic science services might be the most significant crime fighting tool for the enforcement of law in Rwanda.

**The Crime Scene:** It is any place where the evidences may be located and gathered to help explain events. When processing a crime scene the deductive and inductive reasoning should be used in order to gain knowledge of the events occurred at the crime scene. The objectives of crime scene investigation are to collect, preserve, package, transport and document all physical evidence found at crime scene<sup>6</sup>. It may also establish the relationship between crime scene and suspects by matching the information from to the crime scene, witness and victims' interviews. When the crimes are committed; investigators try to determine what is happened and who is guilty.

The crime scene should be secured safely in order to avoid contamination of the evidences and Personal protective equipments (e.g. helmet, gloves etc) should be used. The police and other investigators use appropriate packaging and warning labels during processing the crime scene in order to minimize hazards to forensic laboratory technicians.

**Biological evidences:** Biological evidence are the evidences that are commonly recovered from crime scenes like bodily fluids, hair, tissue, bones, teeth, etc<sup>7</sup>. The examination of biological evidences not only provide exact identification of the

offenders but it may be excellent indicators of what was happened at crime scene. Due to the environmental factors, biological evidence should be collected from the crime scene as soon as possible in order to avoid contamination<sup>8</sup>. The samples collected are examined by specific techniques for identification through Forensic DNA analysis.

**Chemical evidences:** The chemical evidences are all chemical substances found at crime scene. Forensic chemists can analyze drugs, radioactive substances, chemical weapons and biological toxins<sup>9</sup>.

**Trace evidence:** It is the objects found at crime scene and they may provide clues to further lead towards the suspect and victim identification. The common trace evidences which can be found at the crime scene is fingerprints, footprint, handprint cut marks, criminal tools and guns<sup>10</sup>.

The forensic experts investigate and inspect the evidences. The evidences collected at crime scenes should be catalogued carefully and sealed in special containers to prevent contamination or degradation. First of all, the samples found at crime scene must be identified whether are for human, animal or plant in order to precede further investigation.

## DNA Molecule

The DNA (deoxyribonucleic acid) molecules are the genetic material of all living cells and many viruses<sup>11</sup>. It encodes an organism's genetic blueprint and DNA is unique to each person except identical twins. It may be used for solving crimes, paternity test, identification of missing persons and unidentified dead bodies<sup>12</sup>. The forensic scientists use two types of DNA such as nuclear DNA (nDNA) found in the nucleus and mitochondrial DNA (mtDNA) which found in the mitochondria<sup>13</sup>. These two DNA differ from each other by their structures.

In degraded, burned, old samples and hair sample without root where nDNA does not produce any results; mtDNA can generate the evidences. The nDNA is paternal and maternal inheritance but mtDNA is maternal inheritance. The generations from mother's lineage carry the same mtDNA<sup>14</sup>. The mtDNA may be used to predict the ethnicity or race of an individual. The DNA analysis may be used for identification from small amounts of evidence which deposited for long time or currently at crime scene before recovery by law enforcement<sup>15</sup>.

**Forensic DNA analysis:** The forensic scientists use the DNA analysis to identify the individuals by matching the genes from personal's items and stored samples with those for criminal suspects (Jeffreys *et al.*, 1985).

**Y-chromosome analysis:** The investigation of sexual assault has been the decisive issue for law enforcement of Rwanda and has profound impacts on victims' health by causing some

diseases, physical injuries, sexual and reproductive problems, as well as mental disorders. It is based on four different data sources: data from the police, from population by surveys, from forensic DNA analysis and from judicial system.

The Y chromosome is found only in males and it is paternal inheritance. It is transmitted from father to his son and it can provide information from male line; that means the son to his father and so on. The analysis of genetic markers on the Y-chromosome in a mixture of male-female DNA samples such as sexual assault can be specific to the males evidences (Ballantyne *et al.*, 2012). It may be used also when sexual assault committed by more than one offender to identify between the offenders<sup>16</sup>.

## Interdisciplinary Forensic Science

The interdisciplinary forensic science may have an essential contribution to investigate the crime of the genocide and the other related criminals. Forensic archaeologists can recognize the graves and identify the human remain like age, sex and race-2.

The forensic archaeologists are able to document, quantify the number of deaths, recognize body position and to describe the burial pit<sup>17</sup>. The information provided by forensic archaeologists may be used in the court in order to help justice better understanding what was happened. Forensic odontology is application of dentistry to legal problems by analysing the bite marks found on the victim's body<sup>18</sup>. Forensic anthropology is examination of human skeletal remain for law enforcement<sup>19</sup>. The forensic anthropologists may discover the evidences from the skeleton of many years.

The average annual temperature ranges of Rwanda are between 16°C to 20°C which is swayable to the development of some insects. The behavior of insects found at crime scene may provide information of when, where and how the crime was committed. Forensic entomology and Forensic entomotoxicology are used to investigate the causes and time of death. Forensic entomologists apply their knowledge of entomology to provide information for criminal investigations. Forensic entomotoxicologists use insects to determine the toxins or poisons in decomposed bodies<sup>20</sup>.

Traditional plant medicine, alcohol and drugs had been used by Rwandans since pre-colonial period. Not only drug trafficking level has increased, also the violence against humanity as results of drug abuse is at a significant level. In this cases Forensic toxicology may have significant role to fight against drug trafficking (or to sale and distribution of illegal drugs). Forensic toxicology deal with investigation of toxic substances or poisonous products in legal matters<sup>21</sup>. The main sources of poisons are domestic, agricultural and horticultural, industrial, commercial, drugs, medicines, food and drinks. Forensic chemistry applies quantitative ve qualitative analysis of

chemical evidences left on victims, suspects, objects and in solutions.

Improving a counterterrorism capacity remained a high priority for the Government of Rwanda. Therefore, Forensic ballistics may have a great contribution to detect, deter, disrupt, investigate and prosecute terrorist incidences. Forensic ballistics deal with firearms. It may provide the information of how they are used and why they are used in the practice of murder. Even if when the gun is not around at the crime scene, the experts in forensic ballistic can discover the evidence from the bullets, the nature of the wound and any other gun residues found at the crime scene.

### Disaster Victim Identification

Rwanda is vulnerable to a wide range of natural and manmade hazards (disaster). A disaster is an unexpected event causing the death or injuring many people and it leads to economic problems. The common disasters affecting Rwanda include; heavy rains, floods, landslides, droughts, earthquakes, traffic accidents, fires and explosions, terrorist attacks and epidemic diseases that leads to lots of lives, livelihoods, infrastructure, interrupting economic activities and development.

In disaster victim identification; first of all the kind of disaster must be determined whether is open or closed disaster. The open disaster is a catastrophic event that kill or injuring unknown individuals. The closed disaster is a catastrophic event kill or injuring individuals belonging to a fixed identifiable group for example aircraft crash with passengers<sup>22</sup>.

In the case of disaster victim identification, the information should be collected from victim's relatives, friends, doctors and at the place where the family is living and at a distant according to the wishes of the family. The hair samples, toothbrushes or other personal belonging to the victim should be investigated by DNA profiling.

### Conclusion

Forensic science may be used by Rwandan criminal justice as a crime fighting tool for domestic crimes and violations of international humanitarian law. It gives capabilities the police and scientists to bring peace, stability and justice to Rwandans. It may reduce the expenses of the government in terms of money to carry out tests abroad especially in Europe. It may protect the innocent people against false prosecution. Rwanda needs to develop scientific techniques and capabilities of scientist in order to have high quality of scientific evidences which is admissible in the court of law.

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