B143 The Development and Validation of a Dual-Genus, Multiplex Polymerase Chain Reaction (PCR) Assay for African and Asian Elephants for Forensic Purposes

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After attending this presentation, attendees will understand how a multiplex PCR genotyping assay has been developed that will detect African and Asian elephant DNA simultaneously. Attendees will also understand how to efficiently create PCR assays for wildlife identification.

This presentation will impact the forensic science community by providing a standardized PCR assay that detects elephant DNA for use in wildlife investigations. The development of this assay fills a research gap in wildlife forensic science.

African (*Loxodonta africana)* and Asian (*Elephas maximus*) elephant populations are categorized under Appendix I or II of the Convention on the International Trade in Endangered Species (CITES), respectively.[1] CITES is an agreement that regulates plant and animal species throughout the world to ensure that international trade of their products does not impact their survival.[1] An Appendix I listing includes species that are threatened with extinction, thus trade of these plants and animals is highly restricted.[1] Species not facing extinction that require extra attention and regulations so they don't become exploited and over-utilized are listed in Appendix II.[1] The primary reason for the decline of these two animals is the illegal trade of their ivory. Other reasons for the decline in the elephant population are deforestation and human conflict.

Working toward conserving endangered and threatened species takes many forms throughout the world. Conservation efforts can include educating people of all ages, *in vitro* fertilization of healthy females, or surveying populations in the field. Wildlife forensic science can be defined as a field that promotes conservation efforts and the investigation of wildlife crimes through the use of scientific techniques that can be applied to the law.[2] Crimes against animals can be deterred and/or further prosecution sought through testing with forensic genetic techniques. The creation of novel genetic assays can greatly impact wildlife forensic science, not only in identifying the species, but also the individual from which the evidence originated. This information can also be used to track illegal trade routes throughout the world. Few publications describe the development and subsequent validation of tools and assays that can generate data of evidentiary quality.[2] Molecular genetics techniques can help enforce conservation efforts; however, they must be properly developed and validated in order to be of evidentiary quality for court systems.

In wildlife crime laboratories, species of origin can often be determined by morphology. This method is limited by the expertise of the taxonomist and the condition of the animal product. Ivory is commonly carved into small figurines and trinkets. Elephant meat, hair, and hide are traded, which can make it difficult to identify the species. These limitations have led to the development of genetic tests to identify species of origin in wildlife investigations. The targeting of Short Tandem Repeats (STRs) is used in this novel assay. African and Asian elephants do have highly similar genomes; however, in portions of these highly polymorphic regions, variation exists.

In this study a dual-genus, multiplex PCR genotyping assay to identify elephant DNA for forensic purposes was developed. By eliciting information from the variable areas of the elephant genomes, both genera of animals can be identified. Following the assay development, a rigorous developmental validation was conducted according to current community recommendations set forth by the Scientific Working Group for DNA Analysis and Methods (SWGDAM). The completion of this work provides an assay that can generate data of evidentiary quality for wildlife crime laboratories.

Reference(s):

1. *CITES.* Accessed July 30, 2017. https://www.cites.org/.

2. Ogden, R.,N. Dawnay, and R. Mcewing. Wildlife DNA forensics—bridging the gap between conservation genetics and law enforcement. *Endangered Species Research.* 9 (2009): 179-95. doi:10.3354/esr00144.

Multiplex Development, Elephant, STRs