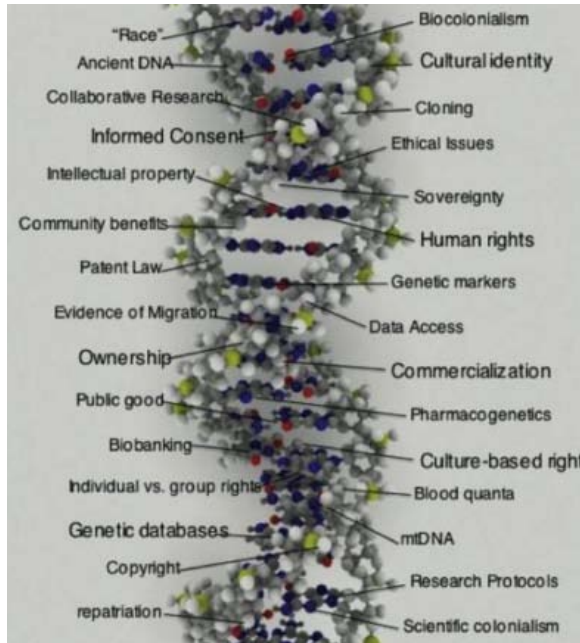




FACT SHEET

Presented by the Intellectual Property Issues in Cultural Heritage Project.

ANCIENT DNA (aDNA) What is it? Why is it important?



INTRODUCTION

As genetic research is increasingly applied to new areas of study, including in archaeological and heritage contexts, a range of questions arise concerning the social, ethical, legal, and political implications of ancient DNA. This fact sheet explains the nature and challenges of aDNA research, and why information from it is important and relevant to people today.

WHAT IS ANCIENT DNA AND HOW DO WE DECODE IT?

DNA (deoxyribonucleic acid) is a sequence of some three billion nucleotides that encodes genetic information. DNA is found in all living things, and is sometimes preserved in ancient human, animal, or plant remains. Because nucleotide sequences vary among individuals, groups and species, DNA is useful in identification and showing genetic/evolutionary relationships. There are three types of DNA/aDNA:

- Nuclear DNA contains the most information about an individual, but often there isn't enough preserved in archaeological samples for study;
- Y-Chromosome is a type of nuclear DNA that is only present in males and used for tracing paternal ancestry;
- Mitochondrial DNA (mtDNA) is found in the mitochondria of cells and used to trace maternal ancestry as it is passed from a mother to her children. MtDNA is more likely to be preserved in ancient samples because there are many more copies per cell than nuclear DNA.

WHY ARE ARCHAEOLOGISTS INTERESTED IN STUDYING aDNA?

- Historical Mysteries: Archaeologists identified the skeleton of King Richard III of England (1483–1485) by matching his DNA to a known relative, a 17th-generation great nephew.
- Human Evolution: In 2010, the complete genome of a young Neanderthal woman from Croatia (>38,000 years old) was sequenced. Recent studies indicate modern humans inherited between 1–3% of their genomes from Neanderthals.
- Ancient Diseases: Pathogens may still be present in the bones and tissue of past peoples. aDNA has been used successfully to identify ancient cases of Tuberculosis and Bubonic Plague.
- Living Descendants: Using aDNA, a direct genetic link was established between a woman who died 5,500 years ago, another 2,500 years ago, and a living Tsimshian individual from British Columbia.
- Sex Identification: DNA analysis provides a very specific and simple method of distinguishing between males and females irrespective of the condition of skeletal



remains or the age at death.

- Animal or Plant Identification: aDNA can be used to identify archaeological remains of animal and plant species to gain insight into prehistoric subsistence practices and the local economy.
- Migration Patterns: Comparing the DNA of ancestral remains found in one part of the world to that of people living there today can help to determine the migration patterns of human populations spreading out of Africa into Europe and Asia, and eventually to the Americas.

WHAT ARE SOME OF THE CHALLENGES OF CONDUCTING aDNA RESEARCH?

Researchers must consider the current social, political, cultural, and economic context of the community in which they work, and how research findings may be used now and in the future. Two areas that require particular care are:

- Informed Consent: Deciding who needs to provide informed consent for aDNA research is challenging. Since the deceased cannot provide consent, we must turn to their descendants. But how do we define and identify a “descendant”? Do all descendants—who may number in the thousands or millions—have an equal claim over the remains of their ancestor? What about the remains of now extinct peoples where no definitive cultural or genetic link to living descendants can be established?; and
- Intellectual Property: Who owns the information arising from aDNA research? Who controls how the information is shared now and in the future? Will the information be created and shared in a manner that is culturally appropriate according to the descendant communities?

HOW CAN aDNA RESEARCH IMPACT PEOPLE LIVING TODAY?

Although it is the DNA of ancient peoples being studied, the information obtained can impact the lives of living people. This is especially true for Indigenous peoples who are sometimes referred to as a “genetically vulnerable” population. Three realms where ancient DNA research has social, cultural, and political implications for people today are:

- Reducing identity to biology: A person’s identity is comprised not only of biological and genetic connections, but also sociocultural and geographic factors, family histories and lived experiences. What problems arise when one’s identity and ancestry is reduced to a molecular origin, such as when genetic markers are used for tribal enrollment?
- Repatriation: Genetic information can play a role in the repatriation of human remains by confirming (or in some cases failing to confirm) a direct genetic link between an ancient individual and living individuals or groups. In the case of Kwäday Dän Ts’ınchi (“Long Ago Person Found”), DNA analysis confirmed a genetic connection to individuals living in Canada and Alaska. Yet, repatriation is based on establishing cultural affiliation, which can be informed by, but is not exclusive to, biological identity.
- Land Claims: aDNA analysis may be helpful if it shows that the ancient occupants of the land are genetically similar to modern occupants. However, DNA analysis may also reveal that modern populations are not direct genetic descendants of the ancient inhabitants.

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