

Chapter 14 Lab Using DNA to Identify Human Remains

Problem

How can pedigrees help scientists identify human remains?

Introduction

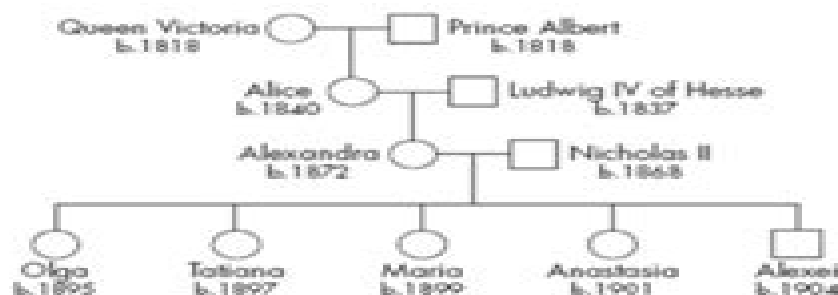
DNA has helped solve countless crimes and some intriguing mysteries—including the fate of the Romanovs. For 300 years the Romanov family ruled Russia. The last Romanov ruler was Tsar Nicholas II. His wife, Tsarina Alexandra, was descended from Queen Victoria of England, as shown in Figure 1.

In 1917, revolution swept through Russia. The royal family was captured and held prisoner until they were killed on July 16, 1918. The official report said that all the bodies were burned and then buried in a single grave. However, some witnesses said that one or two of the children were not buried with the others, and for many years there were rumors that Anastasia had survived.

The new government did not allow any research into the fate of the Romanovs. The house in which they were killed was destroyed, and the burial site was kept secret. In 1991, after the breakup of the Soviet Union, scientists were at last allowed to examine the burial site and remove the bones.

In this lab, you will investigate how the scientists classified the skeletons that they found. You will also figure out how pedigrees helped the scientists find living relatives whose DNA could be compared with DNA extracted from the bones.

Figure 1 Simplified pedigree for Tsarina Alexandra



Using Dna To Identify Human Remains Worksheet Answers

Elisa Wurmbach



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Popular Mechanics, 2000-01 Popular Mechanics inspires instructs and influences readers to help them master the modern world Whether it s practical DIY home improvement tips gadgets and digital technology information on the newest cars or the latest breakthroughs in science PM is the ultimate guide to our high tech lifestyle *Forensic Genetic Approaches for Identification of Human Skeletal Remains* Angie Ambers, 2022-11-15 Forensic Genetic Approaches for Identification of Human Skeletal Remains Challenges Best Practices and Emerging Technologies provides best practices on processing bone samples for DNA testing The book outlines forensic genetics tools that are available for the identification of skeletal remains in contemporary casework and historical archaeological investigations Although the book focuses primarily on the use of DNA for direct identification or kinship analyses it also highlights complementary disciplines often used in concert with genetic data to make positive identifications such as forensic anthropology forensic odontology and forensic art sculpting Unidentified human remains are often associated with tragic events such as fires terrorist attacks natural disasters war conflicts genocide airline crashes homicide and human rights violations under oppressive totalitarian regimes In these situations extensive damage to soft tissues often precludes the use of such biological samples in the identification process In contrast bone material is the most resilient viable sample type for DNA testing DNA recovered from bone often is degraded and in low quantities due to the effects of human decomposition environmental exposure and the passage of time The complexities of bone microstructure and its rigid nature make skeletal remains one of the most challenging sample types for DNA testing Provides best practices on processing bone samples for DNA testing Presents detailed coverage of proper facilities design for skeletal remains processing selection of optimal skeletal elements for DNA recovery specialized equipment needed preparation and cleaning of bone samples for DNA extraction and more Highlights complementary disciplines often used in concert with genetic data to make positive identifications such as forensic anthropology forensic odontology and forensic art sculpting Forensic Anthropology: Identifying Human Remains Amy Sterling Casil, Forensic anthropologists sometimes call themselves speakers for the dead They study human remains to help solve crimes identify missing persons and discover the identity of unidentified remains Forensic anthropologists can work with law enforcement and other government agencies They can also travel around the world to recover and analyze remains They can work as part of archaeological teams to discover what happened at the site of an ancient battle help to confirm the identity of a famous person from historical times or help to identify people who have lost their lives in a plane crash or other disaster Forensic anthropology began in the early 20th century and continues to evolve today using DNA analysis and data to reveal the appearance the identity and potentially the cause of death of human remains **Recovery, Analysis, and Identification of Commingled Human Remains** Bradley J. Adams, John E. Byrd, 2008-02-23 Mass fatality events can result in the intermixing or commingling of human remains Commingling of human remains presents an added challenge to all phases of the forensic

process As the number of individuals increases so does the complexity of the forensic investigation and the skills needed for case resolution In Recovery Analysis and Identification of Commingled Human Remains top professionals illustrate successful techniques for sorting and determining the number of individuals the role of DNA ethical considerations and data management Instrumental to the forensic community Recovery Analysis and Identification of Commingled Human Remains provides case examples and an in depth review of experiences methods and research related to commingling

Biological Affinity in Forensic Identification of Human Skeletal Remains Gregory E. Berg, Sabrina C Ta'ala, 2014-12-13 Ancestry determination in the identification of unknown remains can be a challenge for forensic scientists and anthropologists especially when the remains available for testing are limited There are various techniques for the assessment of ancestry ranging from traditional to new microbiological and computer assisted methods Biological Affinity in Forensic Identification of Human Skeletal Remains Beyond Black and White presents a range of tools that can be used to identify the probable socio cultural race category of unknown human remains Gathering insight from those who have made recent improvements and scientific advances in the field the book begins with the historical foundations of the concept of biological affinity and the need for increased research into methods for determining ancestry of skeletal remains The contributors cover a range of topics including Ancestry estimation from the skull using morphoscopic and morphometric traits and variables Innovative methods from metric analyses of the postcrania and new approaches to dental non metric variation The biological diversity of Hispanic populations and use of discriminant function analysis and 3D ID software to determine ancestry Methods of age progression and facial reconstructions to create two dimensional 2D and three dimensional 3D facial composites for missing people The preparation of skeletal remains for DNA extraction and sampling and mtDNA methods that are available for identification of haplogroups e g ancestral populations No single method or technique is adequate in the assessment of ancestry For accurate determinations the use of traditional and new techniques combined yields better results This book demonstrates the large repertoire of tools available to those tasked with these challenging determinations

The Use of Forensic Anthropology Robert B. Pickering, David Bachman, 2009-01-22 A forensic investigation requires a team of specialists from many different scientific fields of study along with legal and law enforcement specialists In recent years the range of cases on which forensic anthropologists have been consulted has expanded dramatically The Use of Forensic Anthropology provides these professionals with guidelines for

DNA Assay Development and Validation for Pigment-related Features to Assist in the Identification of Missing Persons and Human Remains Elisa Wurmbach, 2013 Just recently the seven plex system was improved by adding one SNP rs12896399 which is located in the 5 region of SLC24A4 and by changing the instructions Hart Kimura et al 2013 More precise predictions were achievable by including blue to the eye colors brown green not blue and not brown and light to the skin colors not dark and not light The number of positive descriptions was also significantly increased while keeping the error rates low as approximately 5% Hart Kimura et al 2013 These eight SNPs were

integrated into a forensic kit that is easy fast and inexpensive This test has potential for upgrading A multiplex SNP assay fitting these criteria would involve a multiplex PCR followed by a multiplex primer extension reaction leading to fluorescently labeled oligonucleotides of distinct length Multicolor capillary electrophoresis separates and detects these oligonucleotides It is possible to apply this assay on degraded DNA typically found in decomposed human remains due to the design of small PCR products This is important for forensic applications Furthermore development and validation were cost efficient since all required equipment including the software was already available in house The utilization of this multiplex SNP assay to predict pigment related features will greatly enhance current efforts of collecting data from human remains to facilitate identification It may be incorporated into the Office of Chief Medical Examiner DNA Missing Persons Group and the Forensic Anthropology Unit s multidisciplinary effort to reduce the number of unidentified human remains in New York City and New York State A project funded by the National Institute of Justice Using DNA Technology to Identify the Missing **Human Skeletal Remains** Teresa A. White, Hillary R. Parsons, Samuel S. White, 2025-09-12 Human Skeletal Remains is a step by step field guide to teach proper recovery techniques when a forensic anthropologist is unavailable for immediate scene responses In the absence of a forensic anthropologist the investigator assumes the responsibility of ensuring the complete and accurate recovery of skeletal materials from scenes This could be problematic if the investigator has not had specialized training in human remains recoveries To help investigators carry out this task the authors developed this guide using 328 full color demonstrative photos with easy to follow instructions on how to identify and recover human skeletal remains using scientifically defensible methods It is an excellent resource for law enforcement medicolegal death investigators CSIs anthropologists medical examiners coroners evidence recovery technicians students and other forensic professionals Features Side by side photographic comparisons of adult and juvenile human remains with nonhuman bones Start to finish demonstration of proper recovery techniques involving scenes with surface scattered and buried human remains Preservation considerations with respect to cultural sensitivity and ethical practices Human Skeletal Remains is an illustrative tool designed to accompany you on scene Use it to identify the bones you locate then follow the instructions to recover them Get it dirty Effects of Processing Techniques on the Forensic DNA Analysis of Human Skeletal Remains JL. Arismendi, LE. Baker, KJ. Matteson, 2004 Human remains processed by forensic anthropologists may potentially be used for genetic analysis Therefore the condition of the deoxyribonucleic acid DNA in processed remains may become an issue for future analysis Processing techniques employed by anthropologists are highly variable and scanning electron microscopy reveals significant alterations to the bone surface depending upon the technique used Such damage to the bone indicates differences may exist in quality and quantity of DNA extracted This study assessed how five processing procedures used by major forensic anthropology laboratories around the country affects the amounts of DNA extracted from human rib bones and the subsequent DNA analysis The DNA was analyzed using the short tandem repeat STR locus CSF1PO and amelogenin

The findings indicate processing procedures used by forensic anthropologists do not adversely affect DNA analysis but prolonged exposure to heat during processing may decrease the yield of information from the DNA

Commingled Human Remains Bradley Adams, John Byrd, 2014-06-04

Commingled human remains are encountered in situations ranging from prehistoric ossuaries to recent mass fatality incidents. *Commingled Human Remains: Methods in Recovery, Analysis, and Identification* brings together tools from diverse sources within the forensic science community to offer a set of comprehensive approaches to resolving issues associated with commingled remains. This edition focuses on forensic situations although some examples from prehistoric contexts are also addressed. Commingling of bones and other body parts is a major obstacle to individual identification that must be addressed before other forensic determinations or research can proceed. Regardless of the cause for the commingling—transportation disaster, terrorist attack, natural disaster, genocide, etc.—it is critical that the proper experts are involved and that the proper techniques are employed to achieve the greatest success in making identifications. Resolution of commingling nearly always requires consideration of multiple lines of evidence that cross the disciplinary lines of modern forensic science. The use of archaeology, DNA, and forensic anthropology are several areas that are critical in this process and these are core topics presented in this book. Even a relatively simple mass fatality event can become very complicated once body fragmentation and commingling occur. Expectations associated with all phases of the process, from recovery of remains to their final identification and release to next of kin, must be managed appropriately. A powerful resource for those working in the forensic sciences who need to plan for and/or address the complex challenges associated with commingled and fragmentary human remains. Written by an international group of the foremost forensic scientists presenting their research and candid experiences of dealing with commingled human remains, offering recommendations and providing lessons learned which can be invaluable to others who find themselves facing similar challenges. Contains chapters on remains recovery, laboratory analysis, case studies, and broader topics such as mass fatality management and ethical considerations.

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