

Identification of Remains of Jesse James Using Mitochondrial DNA

Jesse James (1847-1882), one of America's most legendary outlaws, cleverly eluded law enforcement for a number of years gaining an almost mythical stature. The circumstances surrounding his death have been the subject of some debate. In 1882, James was living with his wife Zerelda and their two children under the assumed name of Thomas Howard. The conventional view is that Robert Ford, a member of the James brothers' gang, shot him in the back of the head killing him instantly. However, some claim that somebody else died in his place and that James survived and fathered additional children.

Mitochondrial DNA

Mitochondrial DNA (mtDNA), sometimes referred to as the "second" genome, is found in the mitochondria, the cell's energy-generating organelle. While cells contain only two copies of a given nuclear gene, they contain several hundred to several thousand copies of mitochondrial DNA. Due to its high copy number, it is possible to obtain a mtDNA profile from a single cell. Thus, mtDNA is the genetic system of choice in cases where tissue samples are very old, very small, or badly degraded by heat and humidity.

Mitochondrial DNA is inherited strictly via a maternal route. The male genetic contribution is contained in the head of a single sperm and does not include mitochondria.

MtDNA Study

In July 1995, under a court order, a group of scientists lead by Anne Stone, James Starrs and Mark Stoneking, exhumed the purported remains of Jesse James and collected teeth and bone samples for DNA analysis. Simultaneously, they obtained blood samples from two maternal descendents of James' sister Susan.

Samples of bone and teeth from the exhumed remains, along with hair from an earlier exhumation, were extracted with the blood samples from the two maternal relatives. The entire HV1 region was amplified and sequenced.

Results

As shown in the table, insufficient DNA was present in the four bone samples and two of the four teeth samples. Sufficient DNA was obtained from two of the teeth and the two hair samples for accurate DNA sequence analysis. The DNA mutations in the HV1 region of the mtDNA in the exhumed samples were identical to those in the maternal descendents of Jesse James' sister Susan. This coupled with the fact that this particular pattern did not appear in a mtDNA database indicated that the exhumed remains were indeed those of Jesse James.

Results Showing mtDNA Mutations of Samples as Compared to Published mtDNA Reference

Sample	mtDNA Results				
	16126	16274	16294	16296	16304
Tibia	Insufficient DNA				
Femur 1	Insufficient DNA				
Femur 2	Insufficient DNA				
Femur 3	Insufficient DNA				
Molar Tooth 1	C	A	T	T	C
Canine Tooth	Insufficient DNA				
Molar Tooth 2	Non-reproducible Sequences				
Molar Tooth 3	C	A	T	T	C
Hair 1	C	A	T	T	C
Hair 2	C	A	T	T	C
Great Grandson*	C	A	T	T	C
Great Great Grandson*	C	A	T	T	C
Published Reference	T	G	C	C	T

*of Jesse James' sister Susan

Setting the Standard for Quality DNA Identification



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