

DNA from Exhumed Bodies

Decomposition of a human body begins at the moment of death and is initiated by two mechanisms, autolysis, the breaking down of tissues by the body's own internal chemicals and enzymes, and putrefaction, the breakdown of tissues by bacteria. Secondary decomposition is accomplished by scavengers, such as insects, provided the body is accessible to them. The most common insects that are typically involved in this process include the fleshflies and blowflies.

The overall rate at which a body decomposes can vary greatly and is strongly influenced by a number of factors. Some of the more important factors that affect the decomposition rate include:

- Temperature
- Oxygen
- Insects
- Burial depth
- Trauma
- Humidity
- Rainfall
- Body size
- Embalming
- Clothing

An unembalmed adult body that is buried six feet deep in normal soil, without a coffin, takes approximately ten to twelve years to decompose fully to a skeleton, given a temperate climate. If the body is immersed in water, skeletonization occurs in approximately three years. If it is exposed to air, decomposition can occur within one year. Bodies that are exposed to cool, damp soil may develop a waxy substance called adipocere, caused by the action of soil chemicals on the body's proteins and fats. The formation of adipocere slows the rate of decomposition by inhibiting the bacteria that cause putrefaction.

Embalming

Since the 1920s, it has been standard practice for American morticians to embalm corpses, to delay decomposition. Embalming chemicals will repel most insects, and slow the process of bacterial putrefaction, but will not preserve a corpse indefinitely. In dry environments, an embalmed body may become mummified.

Cremation

The process of cremation involves incinerating the body at a temperature of 1,400 to 2,100°F for approximately two hours. During this process, the majority of the body is combusted and discharged through an exhaust system. The remains after cremation are bone fragments, representing about five percent of the body's original mass. Little forensic work has been done on cremated specimens; however, most experts believe it is unlikely that DNA would survive the cremation process. While a Japanese team has reported obtaining a DNA profile from cremated remains, the validity of their results remains controversial.

Exhumation

Attitudes toward exhumation vary wildly based on religious or cultural beliefs. Some Native American tribes believe that the body's spirit lives on and that to disturb a corpse is to disturb the spirit's life. Similarly, people of both Jewish and Muslim faith are averse to disinterment. Christians tend to have a more liberal exhumation policy. Both the Catholic and Protestant churches take the position that bodies shouldn't be disturbed, if possible. Saints have frequently been disinterred, upon canonization, so their remains can be dismembered and turned into relics.

Setting the Standard for Quality DNA Identification



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In modern society, exhumations are relatively common to obtain DNA to settle paternity suits and for criminal investigations.

U.S. laws governing exhumation are vague and disparate, varying from state to state. Most state regulations were derived from English common law, which prohibits the theft of items from a grave, but does not address theft or removal of bodies themselves. Historically, this was a matter left to the church. Only in the mid-19th century, when snatching corpses for medical experiments became endemic, did states pass laws prohibiting cadaver theft. Generally, people can apply to their state's attorney general for permission to exhume family members for any reason. Family disagreement on exhumation typically must be resolved in the courts.

DNA Samples

Recovery of DNA from exhumed remains is reasonably successful, however, not guaranteed. Generally a number of different sample types are collected, in the event that one does not yield suitable DNA. Arrangements for sample collection can often be made through a funeral home or whoever exhumes the body. Recommended sample types include the following:

- Fingernails
- Tissue Section (1 cm)
- Tooth
- Femur

Samples should be placed in a suitable container and shipped over night to the laboratory. If fresh tissue is shipped, samples should be frozen and shipped on dry ice.

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