

How to make a mummy *by Len Bloch – TedEd*



Death and taxes are famously inevitable, but what about decomposition?

As anyone who's seen a mummy knows, ancient Egyptians went to a lot of trouble to evade decomposition. So, how successful were they?

Living cells constantly renew themselves. Specialized enzymes decompose old structures, and the raw materials are used to build new ones. But what happens when someone dies? Their dead cells are no longer able to renew themselves, but the enzymes keep breaking everything down. So anyone looking to preserve a body needed to get ahead of those enzymes before the tissues began to rot.

Neurons die quickly, so brains were a lost cause to Ancient Egyptian mummifiers, which is why, according to Greek historian Herodotus, they started the process by hammering a spike into the skull, mashing up the brain, flushing it out the nose and pouring tree resins into the skull to prevent further decomposition.

Brains may decay first, but decaying guts are much worse. The liver, stomach and intestines contain digestive enzymes and bacteria, which, upon death, start eating the corpse from the inside. So the priests removed the lungs and abdominal organs first. It was difficult to remove the lungs without damaging the heart, but because the heart was believed to be the seat of the soul, they treated it with special care. They placed the visceral organs in jars filled with a naturally occurring salt called natron.

Like any salt, natron can prevent decay by killing bacteria and preventing the body's natural digestive enzymes from working. But natron isn't just any salt. It's mainly a mixture of two alkaline salts, soda ash and baking soda. Alkaline salts are especially deadly to bacteria. And they can turn fatty membranes into a hard, soapy substance, thereby maintaining the corpse's structure.

After dealing with the internal organs, the priest stuffed the body cavity with sacks of more natron and washed it clean to disinfect the skin. Then, the corpse was set in a bed of still more natron for about 35 days to preserve its outer flesh. By the time of its removal, the alkaline salts had sucked the fluid from the body and formed hard brown clumps. The corpse

wasn't putrid, but it didn't exactly smell good, either. So, priests poured tree resin over the body to seal it, massaged it with a waxy mixture that included cedar oil, and then wrapped it in linen. Finally, they placed the mummy in a series of nested coffins and sometimes even a stone sarcophagus.

So how successful were the ancient Egyptians at evading decay? On the one hand, mummies are definitely not intact human bodies. Their brains have been mashed up and flushed out, their organs have been removed and salted like salami, and about half of their remaining body mass has been drained away. Still, what remains is amazingly well-preserved. Even after thousands of years, scientists can perform autopsies on mummies to determine their causes of death, and possibly even isolate DNA samples. This has given us new information. For example, it seems that air pollution was a serious problem in ancient Egypt, probably because of indoor fires used to bake bread. Cardiovascular disease was also common, as was tuberculosis. So ancient Egyptians were somewhat successful at evading decay. Still, like death, taxes are inevitable. When some mummies were transported, they were taxed as salted fish.