

Mummifying-balm recipe is older than the pharaohs

Egyptians used the same general formula to soak burial linens as early as 4200 bc.

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13 August 2014

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Techniques similar to that used to mummify Pharaoh Rameses II (1301-1235 bc), preserved at the Museum of Egyptian Antiquities in Cairo, emerged much earlier than previously thought.

Long before ancient Egyptians swaddled their pharaohs in balm-and-resin-soaked linens and placed them in treasure-bedecked tombs, their more egalitarian predecessors were using essentially the same embalming recipe.

The finding, published in *PLoS ONE*¹, pushes back known use of the multi-ingredient ointment by about 2,000 years, the authors estimate. The early blend includes a resin that probably came from at least 1,000 kilometres away from the gravesites, hinting that the region already had an established and extensive trade network.

The results will have archaeologists rethinking how mummification evolved, says Alice Stevenson, an archaeologist at University College London who was not involved in the study.

Previously, the earliest known use of resin for mummification in Egypt was around 2200 bc, says Stephen Buckley, an archaeological chemist at the University of York, UK, and a co-author of the new paper. It was thought that before then, bodies buried in the region's hot, dry sand had desiccated naturally. But now, Buckley and his colleagues' detailed analyses of linen samples unearthed in central Egypt more than 80 years ago suggest that nature had a little help.

Ancient recipe

The samples of funerary wrappings came from four graves at a site near the Nile river called Mostagedda, where they were excavated in the 1920s and 1930s. Soon afterwards, they were placed in museums, where they sat largely ignored for decades.



Ron Oldfield and Jana Jones

The linens used to embalm bodies in ancient Egypt were impregnated with materials that have antibacterial properties.

Carbon dating suggests that the oldest sample had sheathed a body interred around 4200 bc, and the most recent about 3150 bc. A microscope showed that the linens were impregnated with resins, says Buckley, and mass spectrometry later revealed a complex melange of substances. The bulk of the material was a mixture of animal fats and plant sterols (which are chemically similar to cholesterol).

But between 5% and 20% of the blend was made up of pine resin and aromatic plant extracts, and there were trace amounts of plant-derived sugars and natural petroleum, possibly gleaned from an oil seep. Many of these ingredients have antibacterial properties that would have aided preservation of a body, Buckley notes.

The animal fat in the balm probably came from sponges found on the sea floor north of Egypt, the team suggests. The pine resin can be traced back to southeastern

Anatolia, in what is now part of Turkey. The sources of other ingredients have not yet been identified, but the pine resin alone suggests that the Egyptians of the era, who left no written record and were largely pastoral, had established trade with distant regions.

Finally, the substance included moderate amounts of three compounds that typically form only when plant resins are strongly heated, hinting that the balm was deliberately cooked and not simply stirred together, the researchers contend.

"The discovery that these substances had themselves been deliberately processed before use points to a more sophisticated level of treatment of the dead than had previously been suspected at such an early date," says John Taylor, an Egyptologist at the British Museum in London.

Blends used in subsequent millennia, including during the pinnacle of Egyptian mummification that began around 2900 bc², used similar — although not identical — ingredients in the same general proportions, says Buckley. The lack of fundamental change in the recipe over that extensive interval is both “sensational and surprising”, says Jana Jones, an Egyptologist and textiles researcher at Macquarie University in Sydney, Australia, and a co-author of the research.

“It’s interesting to see that sort of recipe that early,” says Stevenson. Bodies interred in prehistoric Egypt had all sorts of burial treatments, she notes: “It was a period of great experimentation, and no two burials were identical.”

Nature | doi:10.1038/nature.2014.15717

References

1. Jones, J., Higham, T. F. G., Oldfield, R., O’Connor, T. P. & Buckley, S. A. *PLoS ONE* **9**, e103608 (2014).
2. Buckley, S. A., Clark, K. A. & Evershed, R. P. *Nature* **431**, 294–299 (2004).