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Natural mummies from Predynastic Egypt reveal the world's earliest figural tattoos

Renée Friedman [a, b, *, 1], Daniel Antoine [b, **, 1], Sahra Talamo [c], Paula J. Reimer [d], John H. Taylor [b], Barbara Wills [b], Marcello A. Mannino [e]

[a] Faculty of Oriental Studies, University of Oxford, Pusey Lane, Oxford, OX1 2LG, UK
[b] The British Museum, Great Russell Street, London, WC1B 3DG, UK
[c] Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, D-04103, Leipzig, Germany
[d] ^{14}CHRONO Centre, Queen's University Belfast, Belfast, BT7 3EZ, UK
[e] Department of Archaeology and Heritage Studies, School of Culture and Society, Aarhus University, 8270 Højbjerg, Denmark

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ABSTRACT

The application of tattoos to the human body has enjoyed a long and diverse history in many ancient cultures. At present, the oldest surviving examples are the mainly geometric tattoos on the individual known as Ötzi, dating to the late 4th millennium BCE, whose skin was preserved by the ice of the Tyrolean Alps. In the Egyptian Nile valley, the arid climate has also promoted extensive soft tissue preservation. Here we report on the tattoos found during the examination of two of the best preserved naturally mummified bodies from Egypt's Predynastic (c. 4000-3100 BCE) period, making them the earliest extant examples from the Nile Valley. Figural tattoos that mirror motifs found in Predynastic art were observed on the right arm of one male and the right arm and shoulder of one female, demonstrating conclusively that tattooing was practiced in prehistoric Egypt. These findings overturn the circumstantial evidence of the artistic record that previously suggested only females were tattooed for fertility or even erotic reasons. Radiocarbon testing and datable iconographic parallels for the motifs indicate that these tattooed individuals are nearly contemporaneous with the Iceman, positioning them amongst the bearers of some of the oldest preserved tattoos in the world. At over five thousand years of age, they push back the evidence for tattooing in Africa by a millennium and provide new insights into the range of potential uses of tattoos in pre-literate societies by both sexes, revealing new contexts for exploring the visual language of prehistoric times.

1. Introduction

Interpretations of the artistic record and certain tool assemblages suggest the application of tattoos to the human body has enjoyed a long and diverse history in many cultures, perhaps going back to the Palaeolithic (Deter-Wolf, 2013; Deter-Wolf and Peres, 2013; Deter-Wolf et al., 2016). Absolute proof of this practice depends on the survival of human skin. The British Museum curates seven well-preserved examples of naturally mummified individuals from Egypt's Predynastic period (Dawson and Gray, 1968), the era preceding the country's unification by the first pharaoh at around 3100 BCE. All visible skin on these mummified individuals was examined for signs of body modification as part of a new program of conservation and research. Tattoos were discovered on two of the seven mummies: one male (EA 32751) and one female (EA 32752). Originally buried in shallow graves, their bodies were naturally desiccated by the heat, salinity and aridity of the Egyptian desert. The bodies show none of the signs of the deliberate and invasive embalming that define later Egyptian funerary traditions, although some form of external treatment cannot be excluded (Jones et al., 2014). In addition to extensive skin and muscle survival, CT scans have revealed the remarkable preservation of the internal organs (Antoine and Ambers, 2014; Taylor and Antoine, 2014). All seven individuals are reported to come from the site of

* Corresponding author. Faculty of Oriental Studies, University of Oxford, Pusey Lane, Oxford, OX1 2LG, UK.
** Corresponding author. The British Museum, Great Russell Street, London, WC1B 3DG, UK.
E-mail addresses: friedman@hierakonpolis-online.org (R. Friedman), dantoine@britishmuseum.org (D. Antoine).
[1] These authors contributed equally to this work.

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Gebelein located in the southern part of Upper Egypt, but little else is known of their burial context, identity or status. Six of them (EA 32751-32756) were obtained for the museum in 1899 by Sir E.A. Wallis Budge, who claimed to have been present at their excavation (Budge, 1920). The seventh body (EA 57353) was purchased subsequently at auction from the collection of de Rustafjaell (Dawson and Gray, 1968; de Rustafjaell, 1909). Although the veracity of Budge's account has been questioned, his description of the grave goods and burial setting, as well as the flexed position of the bodies and still surviving remnants of animal hide, matting and linen covering them, are all typical attributes of the Predynastic burial tradition. The radiocarbon results, supported by isotopic data, on hair and bone collagen sampled from six of the bodies for this study (see below) now confirm this attribution, with collective dates ranging from 3932 to 3030 cal BC (68.2% probability).

2. Materials and methods

2.1. Infrared imaging and the Gebelein mummies

As part of an on-going programme of reanalysis and conservation, the skin of each Predynastic natural mummy was examined using infrared imaging under both flash and ambient light conditions with a hand-held Panasonic Lumix DMC ZS19 camera, converted to 720 nm infrared by Kolari Vision. Tattoos were detected on the observable areas of the bodies of two individuals: EA32751, a male known as Gebelein Man A and currently on display in The British Museum's Early Egypt Gallery (Room 64), and EA32752, a female known as Gebelein Woman.

Remnants of the animal hide, matting and linen used to cover the bodies of these individuals are present but most of these wrappings were removed prior to their arrival at the Museum, most probably during excavation. The accessible skin on each individual was systematically photographed with the infrared camera in a series of overlapping views. The tattoos appeared distinctly as dark forms against the lighter areas of the skin, requiring no image manipulation. Given the fragile nature of the remains, the examination of each mummy was restricted to the areas easily accessible and most could not be lifted to examine the side on which they are resting. Bar one, these individuals had been buried in a crouched position on their left sides and stored in that position, so that generally only the right side of the body and full back was visible, although in some cases obscured by remnants of the original covering of hide, textile or matting, or hindered by poor skin preservation. The areas available for examination are summarized in Table 1. Only Gebelein Woman (EA32752) was robust enough to be examined on all sides. The limited access coupled with variable skin preservation leaves open the possibility that more tattoos were originally present and that others may be found on these individuals in the future.

The preserved skin of the tattooed mummies was meticulously cleaned by experienced conservators. The designs are not superficial and appear to have been applied into the dermis layer of the skin. The strong signature of the tattoos detected by the infrared camera indicates the pigment was predominantly carbon-based, presumably some sort of soot (see Poon et al., 2008). No testing of the pigments has yet been undertaken to determine its composition (see for example Pabst et al., 2009, 2010). The sex of the tattooed mummies was confirmed by CT scan. Three-dimensional images of the pelvis were scored using the dimorphic traits recommended in Buikstra and Ubelaker (1994) and Bruzek (2002). The scan also revealed that the male tattooed mummy's skeleton (EA 32751) was in the process of completing its growth and, based on the developmental data published in Scheuer and Black (2000), he was approximately 18–21 years old when he died (Antoine and Ambers, 2014).

2.2. Radiocarbon and isotope analyses

Both of the tattooed mummies (EA 32751 and EA 32752) are very well-preserved with little or no access to the skeleton. A small amount of bone recovered from the exposed skull of EA 32752 did not yield datable extracts (see below), and no bone could be sampled from EA 32751. To avoid damaging the body tissues, hairs were carefully removed from the heads and used for the radiocarbon analysis. The samples were pretreated at the ^{14}CHRONO Centre to remove potential contamination with a three step solvent extraction in a soxhlet distillation apparatus using first chloroform and methanol (2:1), then ethanol, and lastly water (Bruhn et al., 2001). In addition to the hair, two samples each of two standards (IAEA-C3 and TIRI B) were pretreated using the same method to ensure that there was no possibility of either ancient or modern carbon contamination from the solvent treatment. The samples were dried in an oven at 60 °C overnight, weighed into pre-combusted quartz tubes with an excess of copper oxide (CuO), sealed under vacuum and combusted to carbon dioxide (CO_2). The CO_2 was converted to graphite on an iron catalyst using the zinc reduction method (Slota et al., 1987). The $^{14}C/^{12}C$ and $^{13}C/^{12}C$ ratios were measured by accelerator mass spectrometry (AMS). The sample $^{14}C/^{12}C$ ratio was background corrected and normalised to the HOXII standard (SRM 4990C; National Institute of Standards and Technology). The radiocarbon ages were corrected for isotope fractionation using the AMS measured $^{13}C/^{12}C$ ratio which accounts for both natural and machine fractionation. The radiocarbon age and one standard deviation were calculated using the Libby half-life of 5568 years, following the methods of Stuiver and Polach (1977). No contamination from the solvent extraction was detected in either the modern IAEA-C3 or the circa one half-life TIRI B standards.

The other Gebelein mummies curated at the British Museum are not as extensively preserved and skeletal material could be obtained for radiocarbon dating. Bone collagen samples were successfully extracted at the Max Planck Institute for Evolutionary Anthropology (MPI-EVA; Leipzig, Germany) from non-tattooed Gebelein mummies for the radiocarbon and the isotopic analysis, following the pretreatment protocol based on Talamo and Richards (2011). In order to monitor contamination introduced during the pre-treatment stage, collagen from a cave bear bone kindly provided by D. Döppes (Klaus-Tschira AMS facility, Germany) was extracted with each batch of samples as a background. Elemental and stable isotopic data (percentage carbon and nitrogen content, carbon to nitrogen ratio, $\delta^{13}C$ and $\delta^{15}N$) of extracted collagen were measured in-house at the MPI-EVA, and approximately 5–6 mg weighed into pre-cleaned tin cups at the MPI-EVA and sent to the Klaus-Tschira-AMS facility (lab code: MAMS). Samples were combusted in an Elemental Analyser and CO_2 converted catalytically to graphite and dated using the MICADAS-AMS (Kromer et al., 2013). The isotopic values were measured at MPI-EVA on a Thermo-Finnigan Delta V Advantage isotope ratio mass spectrometer (IRMS) coupled to a Flash 2000 EA. Stable carbon isotope ratios are expressed relative to VPDB (Vienna PeeDee Belemnite) and stable nitrogen isotope ratios were measured relative to AIR [atmospheric N2 with an analytical error of 0.2‰ (1σ) for $\delta^{13}C$ and $\delta^{15}N$]. In addition, stable isotopes ($\delta^{13}C$ and $\delta^{15}N$) and carbon to nitrogen ratios were measured on the pretreated hair samples from the tattooed mummies at the ^{14}CHRONO Centre using a Thermo Delta V elemental analyser - isotope ratio mass spectrometer (EA-IRMS).

3. Results

3.1. Dating

Radiocarbon dating on hair from the two tattooed mummies,

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