

What lies behind the embalmed body of Rosalia Lombardo (1918-1920)?

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Abstract

Mummy studies help scientists to reconstruct both the evolution and manifestation of past diseases as well as the lifestyles and the habits of the ancient populations. They also help to gain insights into their funerary rites, which are a reflection of the community spiritual beliefs. Last but not least, the study of embalmed corpses reveals the evolution of the mortuary practices. After the 1840's, new embalming methods were developed; these coupled the use of chemical solution and arterial injection thus allowing the corpses to maintain their integrity (no external lacerations) together with a life-like appearance. An extremely interesting case of modern chemical embalming is that of Rosalia Lombardo (1918-1920), a two years old girl who died in Palermo. Her cadaver is housed in the Capuchin Catacombs of the Sicilian capital. Both her cause of death and the procedure used in her embalming are still enigmatic. Her embalming has been allegedly attributed to Alfredo Salafia, a renowned Palermitan embalmer. This paper addresses the most recent findings emerged from our re-analysis of Rosalia's case; furthermore, the cosmetic treatment of Rosalia's mummy is compared with those of Ernesto Salafia Maggio and Giovanni Paterniti, two individuals whose bodies were embalmed by Alfredo Salafia.

Keywords

modern embalming; anatomy; mummification; wax; restorative arts; history of medicine; mummy.

Introduction

Mummy studies are relevant both to clinical medicine, the history of medicine and the anatomical sciences (Brenner, 2014; Shin & Bianucci, 2021). Over the past three decades thanks to the application of modern scientific techniques, several pathological conditions of soft tissues and internal organs have been identified; this has allowed scholars to trace back the antiquity, evolution and manifestation of a multitude of diseases in historical settings (Shin & Bianucci, 2021). In parallel, the lifestyles and the habits of ancient populations, including their spiritual and religious beliefs, which are reflected into their mortuary rites, have been reconstructed (Shin and Bianucci, 2021). Through a careful analysis of the textual sources and the concomitant investigation of naturally mummified and embalmed bodies, scholars have

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progressively identified and characterised the compounds used to guarantee bodily preservation over time. Aside the anthro-paleopathological approach, our research team- the Human Embalming Project[®] team- is devoted to the analysis of the chemical and surgical techniques applied to cadavers in Southern and Central Europe (with a special, yet not exclusive, focus on 16th to 20th century mummies). We also attempt to reproduce these methods experimentally. Particular attention is paid to the analysis of the documents, texts and scientific publications concerning each single examined individual/community (Bianucci & Nerlich, 2022).

During the reassessment of published literature on the topic of mummification and embalming, we recently focused on the embalmed body of a little girl named Rosalia Lombardo, who died shortly before turning two-years-old on the 6th of December 1920 (Galassi et al., 2021).

Materials and Methods

The embalmed body of Rosalia Lombardo has been on public display in the Capuchin Catacombs of Palermo for decades (Nerlich & Bianucci, 2021). However her cadaver still represents a scientific enigma: her real cause of death (flu vs diphtheria), the exact chemical formula used in her embalming, and the arterial site of injection of the embalming fluid (i.e. femoral artery) have not been so far scientifically assessed (Nerlich & Bianucci, 2021; Galassi et al., 2021).

In February 2009, a group of mummy researchers (Piombino-Mascali et al., 2009) claimed the discovery of the unpublished memoirs of the Palermitan embalmer Alfredo Salafia (1869-1933). The manuscript was reported to contain also the secret formula of the “Perfection fluid”, an embalming fluid that allowed to maintain a cadaver in a “fresh state” (Piombino-Mascali, 2009; third edition 2012). These scientists also associated the embalming of the body of Rosalia Lombardo (1918-1920) with Alfredo Salafia and his work (Piombino-Mascali, 2009; third edition 2012; Piombino-Mascali et al., 2009; Panzer et al., 2013; Piombino-Mascali, 2020).

Rosalia’s facial features were morphologically compared with those of Ernesto Salafia Maggio (died in 1914) and Giovanni Paterniti (died in 1911), two individuals whose bodies were reported to have been embalmed by Alfredo Salafia (Piombino-Mascali, 2009; third edition 2012).

Results

A reassessment performed by our team has shown that:

- i. Salafia’s handwritten memoirs were discovered before the 2009 publications (Piombino-Mascali, 2009; third edition 2012; Piombino-Mascali et al., 2009); a book by Di Cristina et al. dated February 2007 entitled “La Dimora delle Anime” describes the existence and content of Salafia’s handwritten memoirs (Di Cristina et al., 2007; Galassi et al., 2021);
- ii. Only “extracts” taken from the Salafia’s memoirs have been published in their original Italian and English (Piombino-Mascali, 2009; third edition 2012; Piombino et al., 2009).

- iii. Quite surprisingly, to date, no full-length independent review of the manuscript has been published (Nerlich & Bianucci, 2021; Galassi et al., 2021).
- iv. No written statement by Alfredo Salafia that he embalmed the little cadaver of Rosalia has been published (Nerlich & Bianucci, 2021; Galassi et al. 2021).
- v. No direct visual examination of her body occurred and no small biopsies nor swabs were taken from Rosalia's face, hair, body, dresses and coffin (Galassi et al., 2021). Therefore, no toxicological evidence that Rosalia was embalmed with the "Perfection fluid" exists (Nerlich & Bianucci; Galassi et al., 2021). Similarly, no molecular investigation were performed to ascertain whether the child had died of flu or diphtheria, as claimed by Rosalia Lombardo's relatives (Lanza, 2010).
- vi. No experimental reproduction of Salafia's "Perfection Fluid" has been so far successful (Bianucci et al. 2022).

An additional element was overlooked. In their 2009 paper, Piombino-Mascalì et al. (2009) wrote that Salafia's "*precious memoir discloses his occasional use of paraffin wax diluted in ether, hypodermically introduced into the deceased's face in order to keep the features life-like and plump, which reveals his great attention to the details of cadaver preparation such as the facial expression and the overall appearance of embalming the deceased*".

In 2013 the Multidetector CT investigation (performed in December 2010) of Rosalia's mummy was published (Panzer et al., 2013). With reference to the use of wax, the authors stated: "*...also we could not find clear evidence of the application of a facial paraffin treatment although it seems very likely that this method was used considering how perfectly preserved Rosalia's face appears to be*" (Galassi et al., 2021).

Interestingly, in 1981, Prof. Andrzej Niwiński published a paper in which the use of wax injections in Rosalia's embalming was described: "*In the Franciscan monastery in Palermo, among the famous mummies which can be seen in this rather gruesome cemetery, there is the mummy of a little girl, Rosalia Lombardo who died in 1920. The excellent preservation of the corpse (Pl. II) has been obtained through injection of liquid wax*" (Niwiński, 1981) (Figure 1a).

Professor Niwiński's publication represents his contribution to the conference proceedings of a congress which took place in 1979 [L'égyptologie en 1979: axes prioritaires de recherches (actes du colloque organisé par le CNRS dans le cadre du 2e Congrès international des égyptologues, Grenoble, 10-15 Septembre 1979)].

Discussion and Conclusions

Besides the important wax issue, Professor Niwiński's is the *de facto* the very first English-language anthropological publication that discusses the case of Rosalia Lombardo. Quite surprisingly, this paper has never been mentioned by scientists who have recently studied Rosalia's mummy (Piombino-Mascalì, 2009; third edition 2012; Piombino-Mascalì et al., 2009; Panzer et al., 2013; Piombino-Mascalì, 2018; Piombino-Mascalì, 2020).

As further clarified by Prof. Niwiński himself (private communications with Dr Raffaella Bianucci dated November 11th, 2020 and November 12th, 2020 reproduced with permission), in 1979, he read a leaflet printed most likely for the Franciscan Catacombs in Palermo, which was brought to Poland and given to him by an acquaint-



Figure 1. a: Plate II taken from Prof. Andrzej Niwiński's above mentioned paper. Available at: https://www.persee.fr/doc/bmsap_0037-8984_1981_num_8_3_3844, Accessed on June 13th, 2022; b: Close up of Rosalia Lombardo's face (scan copy of postcard from FMG's personal archive); c: A picture of Rosalia Lombardo dated the 23rd of February 2008 (Credits: Dr Giuseppe Carotenuto) shows the first signs of oxidation; d: Despite the mummy being introduced in a high-tech case, the oxidation proceeds rapidly (© Mark Benecke, Entomol heute 2019, SI; Reproduced with permission).

ance. According to Niwiński, the leaflet, which has been lost over the years, showed the picture of Rosalia (reproduced in Niwiński's paper, 1981) (Figure 1a) accompanied by a text stating that she had been embalmed with a liquid wax injection [*The excellent preservation of the corpse has been obtained through injection of liquid wax*].

Prof. Niwiński's eye witness testimony supports the notion that the use of wax in the embalming of Rosalia was already common knowledge, which predates by thirty years the 2007-2009 discoveries. Historical postcards show that Rosalia's face was originally plump and glowing with a greasy tuft of hair falling on her forehead, thus, suggesting a meticulous cosmetic treatment of her face (Figure 1b).

Although the knowledge that Rosalia's face underwent a cosmetic treatment dates back at least to the Seventies, the chemical composition and exact concentrations of the compounds used in her cosmetisation are unknown. This leaves the enigma of her remarkable preservation temporarily unsolved and calls for more in-depth investigations. Over the past decades, the face of Rosalia Lombardo has undergone a progressive process of degradation (Figure 1c); despite her introduction in a high technology passive display (Samadelli et al., 2019), the oxidation process progresses rapidly (Figure 1d).

Alfredo Salafia developed a method of preservation of the cadavers in a "fresh state"; this method was successfully demonstrated in the treatment and restorative arts applied to the corpse of Italian Prime Minister Francesco Crispi (died August 1901) (Johnson et al., 1993). Similar successful embalming procedures were performed with the bodies of other important Italian personages and commoners who could afford the treatment (Piombino-Mascalì, 2009; third edition 2012). He also demonstrated the validity of his method in New York where the trademark of the "Perfection Fluid" was patented on the 16th of November 1911 without disclosing the embalming formula (Galassi et al., 2021).

Among the numerous bodies embalmed by Alfredo Salafia were those of his brother, the renowned fencer, Cesareo Ernesto Salafia Maggio, known as Ernesto (1854-1914)(Figure 2a), and of the Deputy and Vice Consul of the United States, Giovanni Paterniti (died in 1911) (Foreign Service List, US Department of State, 1901) (Figure 3). These embalmed bodies are of particular interest because both are housed in the Capuchin Catacombs of Palermo (Piombino-Mascalì, 2009; third edition 2012; Piombino-Mascalì, 2018).

Following Piombino-Mascalì (Piombino-Mascalì, 2009; third edition 2012), both were embalmed using the same embalming fluid ("The Perfection Fluid") that was allegedly used to embalm Rosalia Lombardo. Quite surprisingly, none of two mummies embalmed by Alfredo Salafia has ever undergone multidisciplinary scientific investigations.

The body of Ernesto Salafia Maggio has been left to decompose over the decades (Figure 2b). The glass top of his coffin broke away (it was already broken as early as February 23rd 2008) and was never replaced (Le catacombe di Palermo, uploaded on Jan 29th 2018, <https://www.youtube.com/watch?v=yDpNv3DhQJ8>, minutes 13:34 to 14:04).

As a consequence, a drastic modification of the microclimate inside the coffin occurred. Water infiltrated into the coffin. Humidity along with the action of insects, bacteria and fungi has resulted in a progressive decay of his corpse half skeletonising the lower portions of his body.

The cadaver of Ernesto Salafia Maggio is not on display; nevertheless, it was filmed and shown to the popular audience in the National Geographic docufilm "Le catacombe di Palermo" in 2008 (uploaded on Jan 29th 2018, <https://www.youtube.com/watch?v=yDpNv3DhQJ8>, minutes 13:34 to 14:04).



Figure 2. a: An image of Ernesto Salafia Maggio (1895) taken from the inside of his book (see ref. 19) (Salafia Maggio, 1895) (Credits: scan copy of the photograph taken from FMG's personal archive); b: This photograph dated the 9th of June 2008 (Credits: Prof. Luca Sineo) shows the embalmed body of Ernesto Salafia Maggio lying in his original coffin. The cadaver shows an extremely poor state of preservation and is surrounded by dust and mold which have grown on his face.

This action raises bioethical concerns since it breaches the dignity of the deceased whose body has been shown in an evident state of abandon (Bianucci et al., 2022). Furthermore, no action has taken place to restore his body and coffin over the years.

Similarly, the body of the Deputy and Vice Consul of the United States Giovanni Paterniti lays in his original casket (Foreign Service List, US Department of State, 1901).

A historical picture (see ref. 16, p.94) and a photograph taken in 2008 (Figure 3) show that both the the head and the shroud cloacking the body are covered by a whitish material which appears morphologically consistent with mold.

Only a small portion of the left forehead and left periorbital region is not covered by the whitish material and allows revealing the presence of an apparently preserved skin. The area where the skin can be directly observed does not show the same glowing and plumpy appearance displayed by Rosalia's face.

Previous studies have investigated the impact of microbial contamination on the indoor air quality at the Catacombs and on a limited number of mummies (Piñar et al., 2013; Piñar et al., 2014). As stated by Piñar et al. (2013) *in some areas of the crypts, the amount of fungal spores present in the air exceed 2.000 spores m⁻³. Medically, this amount must be classified as posing potential health risk to the visitors. Indeed there are Italian Standards: UNI 10829 (1999) and UNI 10969 (2002) providing the guidelines to choose and control the indoor climate in order to keep correctly the artifacts. To date this guidelines have not been adopted to control the indoor air quality of the Catacombs of Palermo* (Piñar et al., 2013). Furthermore, *the analysis of samples taken from human mummies showed a contamination with halophilic microorganisms and the*



Figure 3. A picture of Giovanni Paterniti dated February 23rd 2008 (Credits: Prof. Luca Sineo) shows the presence of mold (?) on his face, on the shroud cloacking the body and the headrest.

surface of many mummies (heads, clothes and stuffing) was heavily contaminated with mold. A superficial growth of fungi was identified as well as deep infection materials (read organisms) (Piñar et al., 2013).

Similar studies have been carried out on insects and pests; these showed appalling conditions of degradation of the mummies and of the environment (Querner et al., 2018; Baumjohann & Benecke, 2019).

Since the two embalmed bodies prepared by Salafia in 1911 and 1914 represent the last examples of an early 21st century embalming technique, an immediate process of characterisation of the pests that colonise their bodies is ideally needed. This requires proper scientific multidisciplinary investigations and conservation procedures, which have not been carried out so far.

From a paleopathological and toxicological point of view, the embalmed body of Rosalia Lombardo has not revealed her secrets, as yet. Our findings suggest that her body should be re-investigated following strict scientific methods.

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Acknowledgments

Prof. Simon T. Donell (University of East Anglia), Prof. Luca Sineo and Dr Giuseppe Carotenuto (University of Palermo) are kindly acknowledged for their support in the project.