J. Biol. Res. 2005 n. I - Vol. LXXX - Rubbettino - Soveria Mannelli

The Mysterious Mummy of Cagliari

Rosalba Floris[1], Giovanni Floris[1], Valeria M. Nurchi[2], Antonio Argiolas[3], Giovanna Coinu[4]

[1] Dipartimento di Biologia Sperimentale, Sezione di Scienze Antropologiche,
[2] Dipartimento di Scienze Chimiche,
[3] Dipartimento di Diagnostica per Immagini, Policlinico, Università di Cagliari
[4] Università di Pisa

KEY WORDS: mummies, autopsy

Abstract

In the Anthropological and Ethnographical Museum of University of Cagliari are custodied two mummies, a male and a female one. Subjected to autopsy in 1895, the latter is wrapped by mystery. It is considered she could be a victim of a murder. In the light of modern techniques of inquiry, a multidisciplinary team of research tries to throw light on some main aspects:

- ***The woman's age***
- ***The reasons of death***
- ***The causes of mummification***

The achieved data are compared with those reported in the account of the autopsy, published by Gaetano Corrado in 1899.

Historical introduction

Since 1970, two mummies have been kept at the Anthropological and Etnographical Museum of Cagliari University from the Forensic Medecine Institute of the same University. It was known that they were part of a group of mummies, belonging to Pichinotti's family, noble young branch of the Alagon, Earls of Villasor. In 1998, during the move of the Experimental Biology Department, and the Museum to the new university campus, a written work of Gaetano Corrado (1899) was found, in which he threw light on one of the mummies.

19th Century. Gaetano Corrado, professor of Forensic Medicine, in his work deals with a female mummy, that was kept at the Museum of Anatomy in 1894. Since the particular aspect of this mummy and collected evidences intrigued him about the causes of death and mummification, he asked the Chancellor to get it, together with another mummy from the Monastery of Bonaria. He reported this mummy, together with others, had been found in 1876 into the ruins of San Francesco's Church in Stampace district of Cagliari. A photo

Fig. 1 - Photograph of the mummy body during X-ray analysis.

of the entire body is presented in Figure 1. At the discovery time it was said that "the woman, illicitly impregnated, was strangled during the pregnancy or after the birth". The Figures 2 and 3 show two different images of the head that can justify the hypothesis of strangulation. Corrado performed the autopsy, determined the main anthropometric measurements, investigated the present status of acari and made histological and chemical analysis using all procedures known at that time. His conclusions were that the woman was 165 cm tall, her weight ranged from 60 to 80 Kg, her age was between 50 and 60 years and, chiefly basing on the age, he ruled out her pregnancy. Likelihood she died for natural death after an illness, during which she was treated with an antimony compound (probably potassium antimony tartrate, known as tartar emetic), but he did not exclude a violent death.

Regarding the mummification process and the weight loss, he attributed a huge role to acari action besides to that of the soil and the climate of the town.

21th Century. According to the present trends, a multidisciplinary study, using not invasive techniques (Rx, Tac), has been undertaken and anthropological, chemical, and medical researchers are involved with the aim to obtain further information.

Results and discussion

Chemical analysis. It was our purpose to determine

Fig. 2 - Photograph of the mummy head from one side.

Fig. 3 - Frontal photograph of the mummy head, from which can be inferred the legend of strangulation.

different element compositions (Ca, Mg, Fe, Cu, Zn, P and Sb) to compare them with the normal in humans for the first 6 elements and to evaluate a possible intoxication in the case of the last one on the bases of the findings reported by Corrado (1899) "From various analysis on stomach and intestine pieces, sampled in different sites, the antimony percent has a mean value 0,34%; being the total amount = g 25, the antimony still existing in these organs should be = 0,085 which represents 0,235 g of $C^4H^4K(SbO)O^6+1/2$, the most used antimony compound in those times……..".
The weight of the mummy of 6,09 Kg implies a decrease almost of 90%, significatively greater than the ~80% usually observed in autoptic samples dried in oven at 110°C for 24 hours. Tissue samples were collected for chemical analysis in the high part of abdomen. The sample was subdivided into 3 parts from which amounts of ~1 g, according to our procedure (Crisponi 1995) were accurately weighted using a four digit analytical balance and dissolved in an Erlenmeyer flask adding 10 mL of concentrated reagent grade HNO_3. The resulting mixtures were made to react at room temperature for 48 hours; when nitric digestion was completed the solutions were transferred into a 100 mL volumetric flasks, rinsing accurately the Erlenmeyer flasks with a 1% TritonX™ solution. The final solutions, diluted to the mark always with 1% TritonX, were ready for Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) measurements. The results expressed in mg/g of dry tissue are presented in Table 1. The reported results show a relative standard deviation% generally in the range 10 ÷ 20 which can be considered reliable, in the limits of sampling procedure, mummification process, ravages of time manipulations, and low number of examined samples; on the contrary calcium and magnesium present a larger variability which can be tentatively ascribed to external contaminations.

Sample	Weight (g)	Ca	Cu	Fe	Mg	P	Zn	Sb
1	1,1167	2,33	0,014	0,197	0,80	3,97	0,188	0,197
2	0,9304	6,45	0,011	0,226	1,38	4,06	0,161	0,258
3	0,6802	7,57	0,015	0,250	1,53	5,69	0,250	0,265
Mean value		5,45	0,013	0,224	1,23	4,57	0,200	0,240
S.D.		2,76	0,002	0,026	0,39	0,97	0,045	0,037
R.S.D. %		51	16	12	31	21	23	16

Table 1 - Values of some inorganic elements expressed as mg/g of dry tissue with mean values, standard deviations and relative standard deviation%.

Result comparison with reference values, which are reported in Table 2, for different tissues by Martin (1991) (Cu, Fe, Mg and Zn) and by us (Aragoni 1995, Faa 1997, and

	Cu	Fe	Mg	Zn	P
Mummy	0,013	0,224	1,23	0,200	4,57
Muscle	0,0039	0,281	0,724	0,255	
Heart	0,0132	0,333	0,853	0,125	3,9
Liver	0,0197	1,063	0,565	0,305	7,0
Kidney	0,0107	0,513	0,655	0,190	4,5

Table 2 - Reference values (mg/g of dry tissue) of some inorganic elements in different human tissues.

Crisponi 2001) for phosphorus, shows a good agreement with the only exception of magnesium. This confirms the goodness of procedure, so that we can reasonably confide in antimony finding.

We cannot judge the antimony value reported by Corrado being the procedure not described. His value corresponding to 0,235 g of $C^4H^4K(SbO)O^6+1/2$, if correct, is over the estimated minimal lethal dose for humans (0,1 g or 0,2 g) reported respectively by Wirth (1981) and Miller (1982). On the other hand the high level of antimony stored in tissues proves a continuous therapeutic use and it can also justify a final lethal overdose. Tongue posture and neck oedema described by Corrado (1899) are consistent with the symptomatology reported by Bencze (1994) and by the National Poisons Information Service of U.K. for antimony poisoning, but above all with the diseases for which tartar emetic was given according to the *controstimolus* theory in use at that time. On the other hand one of the uses of tartar emetic was also as abortive drug (Ferraris 1897), leaving outlet to fantasy.

Fig. 4 - X-ray photograph of right hand of mummy showing arthrosis.

Rx results. The radiological examination has highlighted frontalis hyperostosis, widespread marks of spondylitis, expecially on the backbone; lumbar scoliosis; enthesopathy on the right arm; arthrosis on both hands, knees and coxofemoralis articulations, and on the only left foot. An X-ray photograph of the right hand is presented in Figure 4. Sing's index (for the osteoporosis of the femoral neck valuation) is =3. No thraumatic lesion traces are present.

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