International Journal of Sciences

Research Article Volume 11 – May 2022 (05)

SEM-EDX and mtDNA Analyses of the Penis of Napoléon

Gérard Lucotte[1], Stéphan Borensztajn[2]

[1]Institute of Molecular Anthropology, Paris, France
[2]Institute of Physics of the Globe, Paris, France

Abstract: *Objective*: we report here results obtained concerning analyses of the putative penis of Napoléon. *Methods*: SEM-EDX and mtDNA analyses on samples of this penis are realized. *Results* : SEM-EDX studies show that the samples are relatively rich in calcium phosphate, and consequently that the "penis" is more likely a piece of tendon; mt-DNA analyses, realized on two samples, showed the presence of the 16184T mutation only, confirming that the tendon is well that of Napoléon.

Keywords: mtDNA Sequences, 16184T Mutation, Napoléon's Penis, SEM-EDX Analyses, Tendon

Napoléon's penis was allegedly amputated [**1**] during the Dr F. Antommarchi autopsy, shortly after Napoleon's death in 1821. Since then it has passed through several owners, and was finally purchased by the urologist J.K. Lattimer in 1977. More recently this penis was bought by M Sou Mong – an American collector – from Eva Lattimer (Lattimer's daughter), in May 2018.

In the present study we have studied a sample of this "penis" by SEM (Scanning Electron Microscopy) observations and by EDX (Energy Dispersive X-ray) analyses. We have also studied the mtDNA (mitochondrial DNA) of this sample, to establish if it is definitely a sample of Napoléon's origin.

Material and Methods

The material studied (**Figure 1**) concerns three (A, B and C) pieces of the sample, provided by Dr B. Cao.

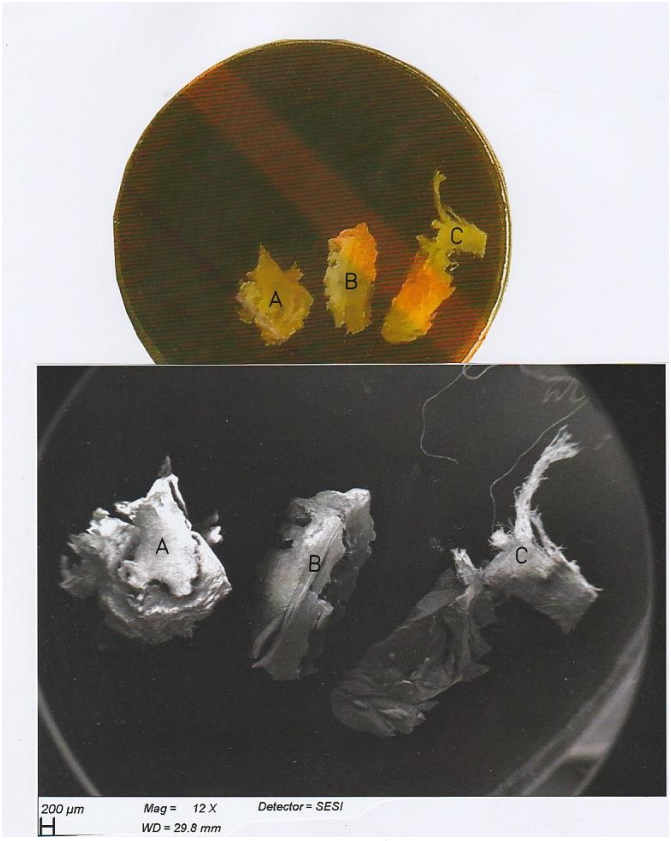

Figure 1 : *Above* : optical photograph of the three pieces (A, B and C). *Below* : SEM photograph (12x) of the three pieces.

The pieces were studied by a SEM Auriga FEG-FIB (Zeiss), images being performed in secondary electrons (SE). Elemental analyses were realized by EDX ; each element analysis is given in the form of a spectrum, with kiloelectrons/Volts (Ke/V) on the abscissa and elemental peak heights (cps/ev) in

Published at: http://www.ijsciences.com/pub/issue/2022-05/
DOI: 10.18483/ijSci.2580; Online ISSN: 2305-3925; Print ISSN: 2410-4477

Gérard Lucotte (Correspondence)
06 98 82 92 61

ordinates. In highly-resolutive spectras, the ordinates are in logarithm scale, to accentuate the height of the little elemental peaks.

SEM-EDX mapping was realized using the main ray of each element .

DNA extraction for each piece was conducted using a standard method (0.5 M EDTA, sarcosyl 20% and proteinase K 10 mg/ml). The genomic DNA so obtained was purified using a commercial kit (NucleoSpin ® kit ; Macherey-Nagel, Duren, Germany), in accordance with the manufactured instructions.

The mtDNA genomic sequence interval of the Hyper Variable Sequence 1 (HVS1) from positions 15,991 to 16,390 was amplified by PCR (Polymerase Chain Reaction) with primers F15971 and R 16410. For each PCR, the DNA extracts for piece specimens were amplified in a 12.5 µl reaction mixture (2mM $MgCl_2$, 50 mM KCl, 10 mM Tris/ HCl pH = 9 , 0.1 % Triton X-100, 0.2 mM of each DNTPs, 0.1 µm of each primer) and 2.5 U of DNA polymerase (Ampli Taq Gold ; Applied Biosystems, Foster City, CA, USA). The amplification was carried out with an initial denaturation step at 95°C for 6 min. , followed by 35 cycles at 95 °C for 1 min. and 72 °C for 1 min.

PCR products were purified from agarose gel (QIA Quick PCR purification kit, Valencia, CA, USA). Both strands of all the amplified mtDNA fragments eluted from agarose gel slices were directly sequenced (Big Dye Terminator Cycle Sequencing Kit, Applied Biosystems) and separated (ABJ PRISM130X1 Genetic Analyser, Applied Biosystems). The sequences obtained were aligned against the Revised Cambridge Reference Sequence, to identify polymorphic sites. SeqScape software (Applied Biosystems) and Clustal analysis were used for pairwise alignments.

Results

The SEM photograph of **Figure 2** shows a little enlarged view (19x) of piece C ; it is constituted of three parts , nomenclatured **1**, **2** and **3**. Part **3** consists of fibrous material , and part **2** of beams of fibres. Part **1** is a more compact material , striated longitudinally.

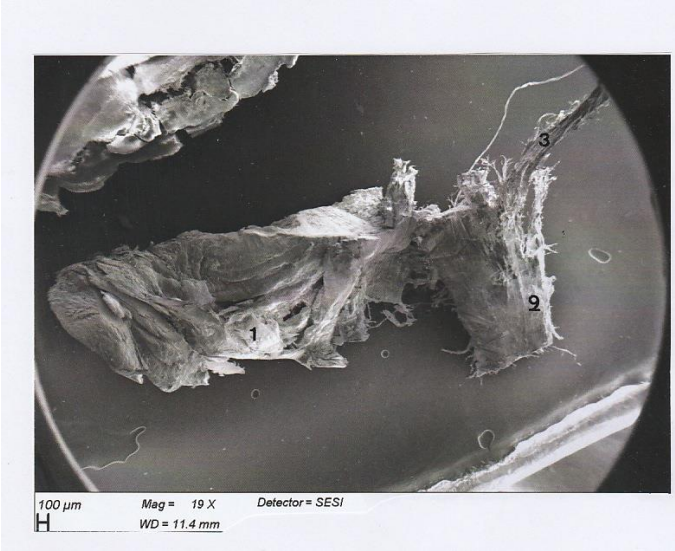

Figure 2 : SEM photograph (19x) showing the three different parts (**1**, **2** and **3**) of piece C.

Photograph of **Figure 3** shows an enlarged view (618x) of part **3** , where the fibers are standed out on the more compact rest of beams. In the corresponding spectrum, peaks of carbon, of oxygen and of nitrogen are the highest ; this spectrum indicates the composition of the organic matter of muscular fibers.

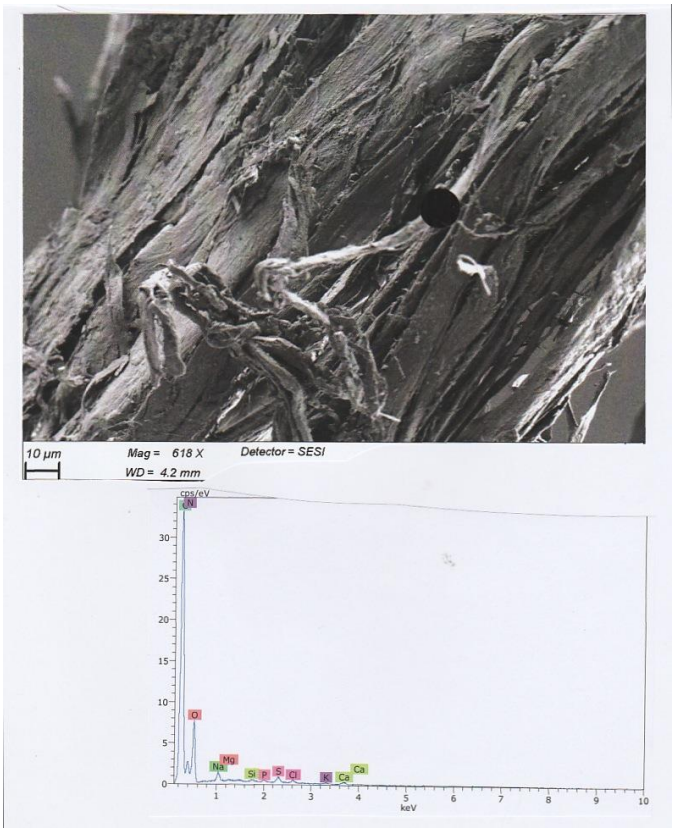

Figure 3 : *Above* : SEM photograph (618x) of a portion of the part **3** of piece C. *Below* : spectrum at the black spot. C : carbon ; N : nitrogen ; O : oxygen ; Na : sodium ; Mg : magnesium ; Si : silicium ; P : phosphorus ; S : sulphur ; Cl : chlorine; K : potassium ; Ca (two peaks) : calcium.

Photograph of **Figure 4** shows an enlarged view (128x) of part **2**, which are compacted beams of fibers. The corresponding spectrum is the same than that of the previous one, and indicates the composition of the organic matter of conjunctive fibers of the beams.

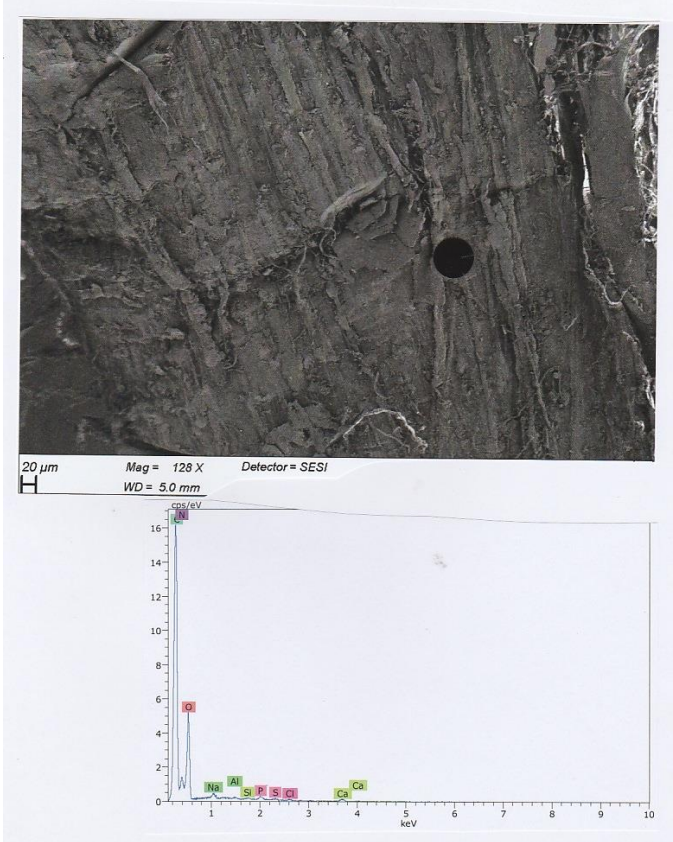

Figure 4 : *Above* : SEM photograph (128x) of a portion of the part **2** of piece C. *Below* : spectrum at the black spot.

The SEM photograph of **Figure 5** shows an enlarged view (72x) of some part of part **1**. It shows a complex overlapping of three portions of muscular fibers (striated transversally) and of some other portions of beams of conjunctive fibers, located on a smoother surface of dense material.

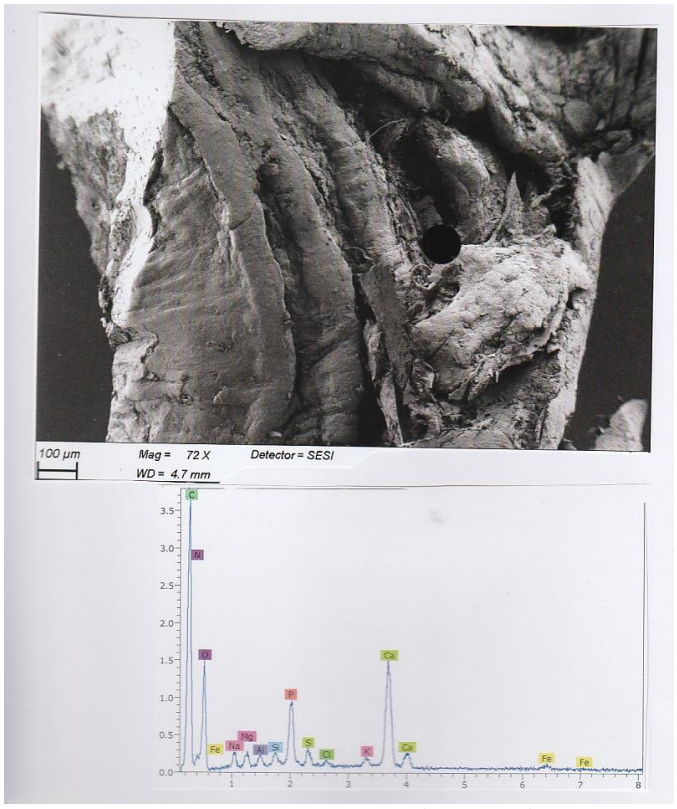

Figure 5 : *Above* : SEM photograph (72x) of a portion of the part **1** of piece C. *Below* : spectrum at the black point.

The corresponding spectrum is that of an EDX analysis located in a little dark area of the dense matter. In this spectrum, we re-found peaks of organic material but, among the little peaks of other elements, those of the phosphorous and of the calcium are greatly elevated compared to the values of their heights in previous spectras.

Table 1 : Normal composition (measured at their K-rays) corresponding from spectrum of figure 5.

Elements	**Normal composition (in wt. %)**	**Atomic composition (in wt. %)**
Carbon	0.00	0.00
Oxygen	0.00	0.00
Sodium	4.00	6.21
Nitrogen	0.00	0.00
Potassium	3.39	3.10
Sulfur	4.62	5.16
Chlorine	1.89	1.90
Aluminium	2.22	2.94
Phosphorus	**17.53**	20.23
Calcium	**54.47**	48.60
Silicium	3.00	3.82
Magnesium	2.82	4.15
Iron	6.06	3.88

Table 1 indicates the normal (i.e. without values of carbon, oxygen and nitrogen) composition of elements in the spectrum of figure 5 : the phosphorous value attains 17.53%, and the calcium value 54.47%.

Figure 6 shows EDX maps of the phosphorus and calcium elements in a little surface portion of part **1** : these phosphorus and calcium elements are clearly

located in the same cartographied particles ; this means that phosphorus and calcium are constitutive elements of the calcium phosphate molecules.

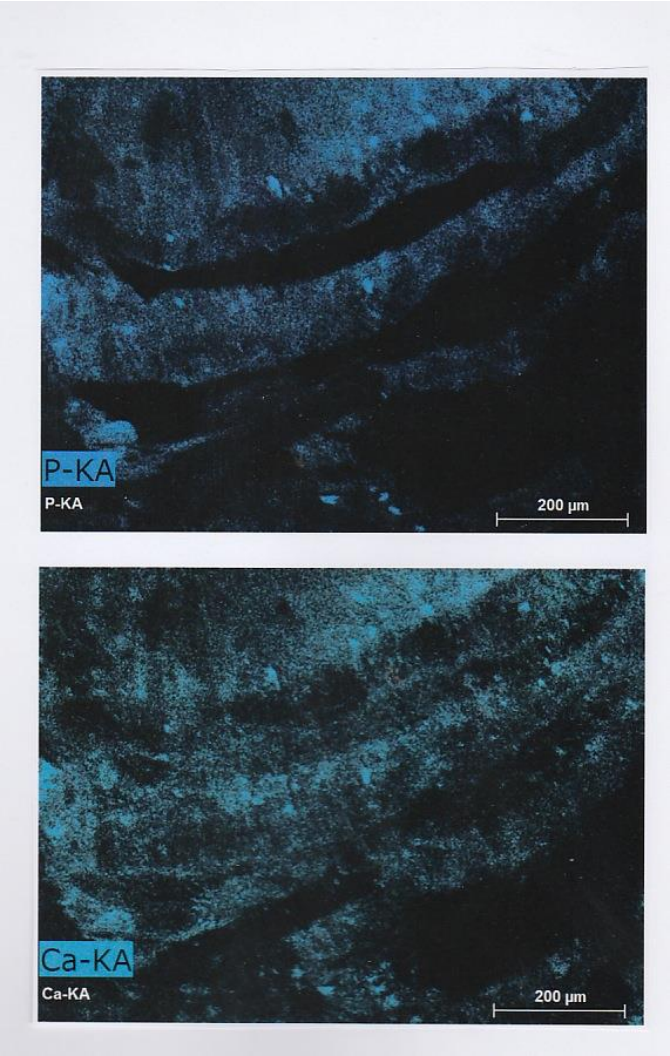

Figure 6 : SEM-EDX mapping of a little portion of the part **1** of piece C. *Above* : phosphorus map. *Below* : calcium map.

Photograph of **Figure 7** shows an enlarged view (65x) of piece A. The corresponding highly resolutive spectrum based on an EDX analysis located in a dark area of the dense matter has elevated peaks for the phosphorus and for the calcium elements. It is the same thing for piece B (**Figure 8**).

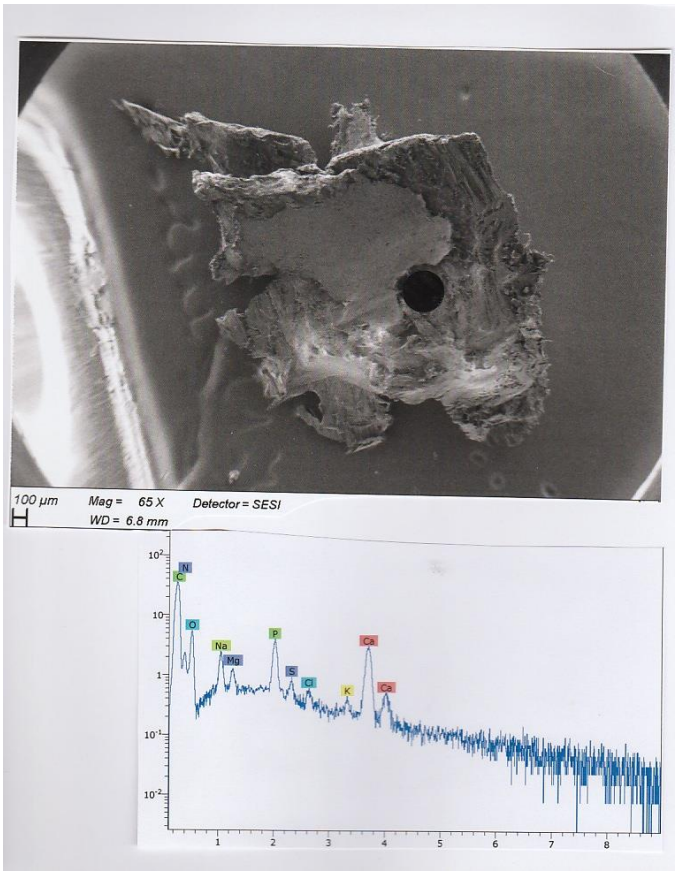

Figure 7 : *Above* : SEM photograph (65x) of piece A . *Below* : highly-resolutive spectrum at the black point.

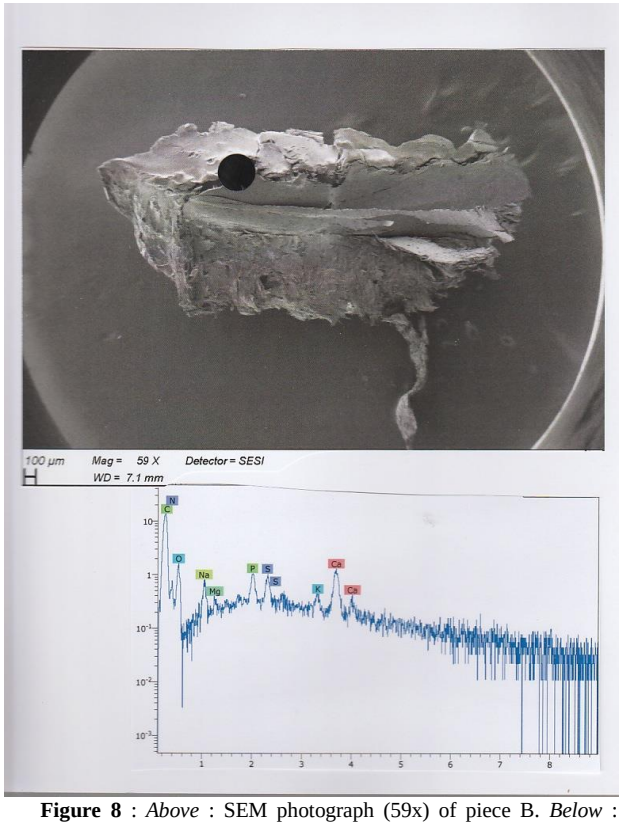

Figure 8 : *Above* : SEM photograph (59x) of piece B. *Below* : highly-resolutive spectrum at the black point.

So pieces A, B and part 1 of piece C contain substantial amounts of calcium phosphate , the main constitutive matter of the osseous material (that contains also some part of organic matter, and significant amounts of magnesium, of sulphur and of potassium). The amount of calcium in these pieces are however insufficient to consider them as osseous materials *per se* ; but they probably correspond to pieces of cartilages –or more likely tendons- that are relatively rich in osseous material.

The B piece was first used for DNA extraction and mtDNA sequencing. We found only one mutation in the HVS1 corresponding sequence : in position 16, 184, the cytosine is replaced by a thymine ; this transversion 16,184C >T, named 16184T, is the HVS1 mtDNA mutation characteristic of Napoléon [**2**]. Identical results concerning mtDNA sequencing were obtained for the A piece.

Discussion

At the origin of the penis story, we have the Vignali contribution. Abbé Ange Paul Vignali was a Corsican priest who had served as Napoléon's chaplain on St Helena. After Napoléon's death, his companions divided up some of the belongings not included in his will and share went to Vignali ; supposedly , Vignali took some souvenirs from the autopsy, a story which supported by the memoir of Napoléon 's valet Ali Louis Etienne St Denis [**3**].

After Vignali's death, he had retraced in Corsica at that time [**4**] ; his Napoleonic relics (including the penis) went to his sister and ultimately to her son Charles-Marie Gianettini, who sold them in 1916.

It is the British Society Maggs Bros Ltd (a bookselling Company based in London) that first bought the "penis" (with other relics). It was described in a catalogue as a "mummified **tendon** taken from (Napoléon's) body during post-mortem."

In 1924 Maggs Bros sold the Vignali collection to the American collector A.S.W. Rosenbach, a Philadelphia-based bookseller. He placed an order to Sangorski Sutcliffe (a Company specialized in the fabrication of luxurious boxes) to realize a ceremonial morocan orned by a N (the characteristic abbreviation of Napoléon) under a golden crown (**Figure 9**). In its interior was kept (right compartment) the penis, and in the left compartment some papers containing Napoléon's hair ; the penis was kept until now in that box.

Figure 9 : *Above* : the box (B). *Below* : photograph of a replica of the penis (P), presented in 2015 in 2015 by T. Perottet.

In 1927 Rosenbach exposed the penis on a velvet cushion at the Museum of French Arts in New-York, where it was described by American journalists as " a set of ill-treated lace in fallow deer skin" or as " a wrinkled portion of eel", or even as a " wrinkled piece of ox".

In 1947 the Vignali items were sold to the American collector D. Hyde (a collector of book and letters). When Hyde died, his wife returned the dissected tendon to the Rosenbach's successor John Fleming.

In 1960 the penis was bought by G. Gimelson, whom exposed it at the Christie's historic auction in London. In 1969 the penis was auctioned in Paris ; the expert J.C. Robert specified at this occasion that it was probably a piece of **rib**, according to the St Denis memoir.

In 1997 Dr John K. Lattimer, a Columbian University Professor, bought the penis (for 13000 AF) in Paris, at the French Company E. Chametier de Ribes. He scanned the organ and, as confirmed by his daughter, he had it X-rayed at the Columbia Presbytary Hospital. J.K. Lattimer concluded from his analyses that the organ is well a human penis of 3.8 cm of length (the size of a baby finger), "with a white wrinkled skin and beige dessicated flesh", according to the historian K. Abbott.

Table 2 : Successive terms used for the "penis" description

Dates	Authors	Terms
1924	Maggs Bros Ltd	A mummified **tendon**
1927	A.S.W. Rosenbach	Some **animal wrinkled piece**
1960	J.C. Robert	A piece of **rib**
After 1997	J.K. Lattimer	A **human penis**
More recently	E. Lattimer	Confirmation that is a **little human penis**

Table 2 summarizes the different successive terms used to describe the "penis". Lattimer never proved (by DNA analysis) that the organ is from Napoléon's origin.

Our own studies reported in the present article establish that the penis sample we studied by SEM-EDX do not correspond in fact to a penis, but more likely to a tendon (as described as such in the initial observations). Moreover, we demonstrate (by mtDNA study) that this sample is well a Napoléon's relic.

We return now on the precise terms used by Ali [**5**] for the description of the removed samples from Napoléon's body during the autopsy : "Antommarchi had extracted from a rib two little pieces, which he gave to Vignali and to Coursot."

Jacques Coursot assisted to the autopsy, and returned to France in 1821. He had brought back from St. Helena several samples (of Napoléon's hairs and beards), and piece of tendon that Antommarchi had stolen (secretely to the English) during the autopsy. This last sample is actually sealed in a glass box (**Figure 10**) at the Musée de Malmaison, near Paris. It is a little cylinder, of red colour, hardened by an unknown substance to better conservate it.

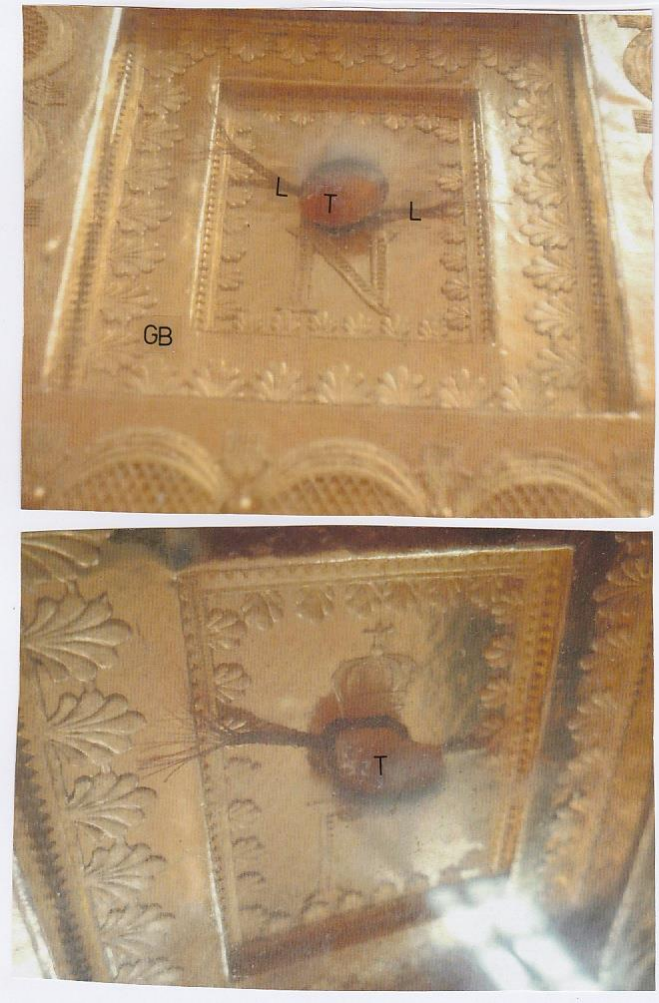

Figure 10. Photographs of the tendon sample, kept in a glass-box in the Malmaison Museum. *Above* : lateral view (GB : glass box ; L : links ; T : the tendon). *Below* : a more frontal view.

Conclusion

We have studied by SEM-EDX three pieces of flesh originating from the presumed penis of Napoléon : they are relatively rich in calcium phosphate, the main constituent of osseous tissues ; so they do not correspond to a penis organ but, most likely to a tendon or a cartilage.

Analyes of mtDNA, realized from two of these pieces, establish that these flesh samples are of Napoléon's origin.

We know that during Napoléon's autopsy conducted by Antommarchi in 1821, he subtilized two tendon

pieces that he gave to Vignali and to Coursot (two St. Helena resident persons at that time, who had his confidence). That is this first piece, kept later by Vignali's family , that was described until recently as a little penis organ.

Aknowledgments
We acknowledge Dr B. Cao who furnished to us the penis samples, and M.S. Mong for financial supports of the present work.

Conflict of Interest :
The authors declare no conflicts of interest.

References

1. Bierman, S.M. (1992). The peripatetic posthumous peregrination of Napoléon's penis. *The Journal of Sex Research*, **29 (4)** : 579-580.
2. Lucotte, G. (2010). A rare variant of the mtDNA HVS1 sequence in the hairs of Napoléon's family. *Investigative Genetics*, **1** : 1-5.
3. Bourachot, C. (2002). Mameluck Ali (Louis-Etienne Saint Denis). Souvenirs sur l'Empereur Napoléon. *Arléa Editeur*, Paris.
4. Macé, J. (2011). Buonavita et Vignali, destins croisés. *Revue du Souvenir Napoléonien*, **487** : 18-31.
5. Souvenirs de Saint-Denis, dit Ali, second Mameluk de l'Empereur ;V – la mort et les funérailles de l'Empereur (1921). *Revue des Deux mondes* , **65** : 40.