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► **To cite this version:**

Michel Drancourt, Remi Barbieri, Elisabetta Cilli, Giorgio Gruppioni, Alda Bazaj, et al.. Did Caravaggio die of Staphylococcus aureus sepsis?. *The Lancet Infectious Diseases*, 2018, 18 (11), pp.1178. 10.1016/S1473-3099(18)30571-1 . hal-01935054

HAL Id: hal-01935054

<https://hal.science/hal-01935054>

Submitted on 15 Apr 2019

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Did Caravaggio die of *Staphylococcus aureus* sepsis?

Published Online
September 17, 2018
[http://dx.doi.org/10.1016/S1473-3099\(18\)30571-1](http://dx.doi.org/10.1016/S1473-3099(18)30571-1)

Caravaggio, also known as Michelangelo Merisi (1571–1610), was a revolutionary painter who influenced many artists during his lifetime and after his death (figure). The painter had a turbulent life during which he was involved in many fights and battles. Caravaggio left Rome after he was sentenced to death, and one final fight forced him to leave Chiaia in Naples around July 9, 1610. Navigating from Naples, Caravaggio's boat stopped at Palo, a port 20 miles from Rome, where he was arrested and incarcerated. After his release, Caravaggio arrived on foot at Porto Ercole in Tuscany where he died in the local hospital, aged 39 years with signs of malignant fever and sepsis, and he was allegedly buried in the nearby cemetery.¹

When searching for Caravaggio's skeleton in this old cemetery, a multidisciplinary team focused on any skeleton that would correspond to a man 1.65 m tall aged between 35 and 40 years at the time of death. Nine skeletons met these criteria, of which only one was found to date back to the beginning of the 17th century according to carbon-14 testing.¹ Analysis of the bones of this skeleton

revealed extremely high levels of lead, which was a discovery of great importance since Caravaggio was known to be careless when using lead for painting.¹ To confirm the hypothesis that this particular skeleton was that of Caravaggio, DNA comparison with the genetic profile of the other men named Merisi or Merisio, who were considered to belong to the same family, showed that 11 of the 17 Y chromosome microsatellite markers amplified in the ancient remains were compatible with the Merisi haplotype. At present, this haplotype is unique in the worldwide Y-STR Haplotype Reference Database, supporting with reasonable probability, despite the failed amplification of six markers due to human DNA diagenesis, the attribution of these remains to Caravaggio.¹ To identify an infectious cause of death, we analysed the teeth attributed to Caravaggio using the dental pulp.² Several hypotheses for Caravaggio's death were suggested, such as brucellosis, malaria, or sepsis secondary to an infected wound that Caravaggio received during his last fight in Naples. Concluding data suggested that the man whose skeleton was analysed died of *Staphylococcus aureus* sepsis. This hypothesis was confirmed using two methods of DNA detection: a non-specific metagenomic method³ and a specific quantitative PCR method targeting *S aureus*.⁴ Additionally, metaproteomic analysis of the teeth also revealed the presence of only one pathogen, *S aureus*.⁵

In these conditions, we can conclude that the man whose skeleton dated back to the beginning of the 17th century and was found in Porto Ercole died of *S aureus* sepsis. This hypothesis was supported by the identification of an osteomyelitic bone in the skeleton. Converging elements supporting this hypothesis also showed that this death is plausible in the context of Caravaggio's life and resulted from sepsis secondary to superinfection of wounds after a fight in Naples, a few days before the onset of symptoms.¹

We declare no competing interests.

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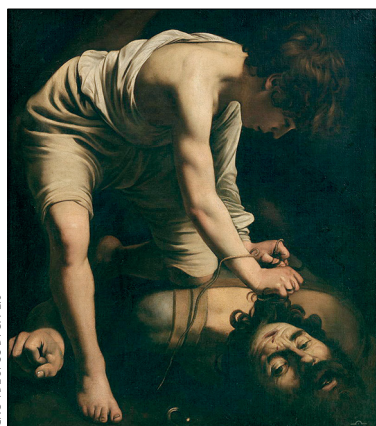
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- Vinceti S, Gruppioni G. L'enigma Caravaggio. Ipotesi scientifiche sulla morte del pittore. Rome: Armando Editore, 2010.
- Drancourt M, Aboudharam G, Signoli M, Dutour O, Raoult D. Detection of 400-year-old *Yersinia pestis* DNA in human dental pulp: an approach to the diagnosis of ancient septicemia. *Proc Natl Acad Sci USA* 1998; **95**: 12637–40.
- Rascovan N, Huynh H, Chouin G, et al. Tracing back ancient oral microbiomes and oral pathogens using dental pulps from ancient teeth. *NPJ Biofilms Microbiomes* 2016; **2**: 6.
- Mourembou G, Fenollar F, Socolovschi C, et al. Molecular detection of fastidious and common bacteria as well as *Plasmodium* spp in febrile and afebrile children in Franceville, Gabon. *Am J Trop Med Hyg* 2015; **92**: 926–32.
- Barbieri R, Mekni R, Levasseur A, et al. Paleoproteomics of the dental pulp: the plague paradigm. *PLoS One* 2017; **12**: e0180552.

A novel framework for the treatment of arboviral diseases

In their Personal View on arboviral diseases in the Pacific and tropical America, Didier Musso and colleagues¹ reviewed the epidemiological and clinical characteristics of these diseases and discussed their growing burden and the subsequent challenges for public health. The authors highlighted the unpredictability of disease emergence and weaknesses associated with the preparedness and response to such outbreaks, especially in diagnosis and research.

Recent outbreaks of chikungunya virus, West-Nile virus encephalitis, and Zika virus also provide important findings about such diseases. These



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Figure: David and Goliath – Caravaggio (Prado Museum)
The head of Goliath is a self-portrait of Caravaggio.