

Study identifies prevalence of rickets among 16th century sailors

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The Mary Rose. Credit: Geoff Hunt c/o The Mary Rose Trust and Portsmouth Historic Dockyard

The bones of sailors who sailed on Henry VIII's Mary Rose ship have been analysed with the help of new laser technology to identify evidence of bone disease.

The famous vessel sank in battle on the 19 July 1545, resulting in over 400 men losing their lives. The environment of the Solent meant that the ship and the sailors were preserved in silt, which helped to keep them in remarkably good condition.

They were analysed with Raman spectroscopy - a pioneering, non-destructive laser technology, to identify evidence of [bone disease](#). The application of Raman spectroscopy to the study of bone diseases in historical populations was novel and the work has been published in the *Journal of Archaeological Science*.

Two sets of tibia bones - bones that appeared anatomically healthy and bones that were abnormal in shape - were obtained from The Mary Rose Trust, and compared to a 'normal' bone from someone who had recently died, which was supplied by the Vesalius Clinical Training Centre at the University of Bristol.

The deformations in the abnormal bones were suspected to be due to a [metabolic bone disease](#) such as rickets (the poor diet of the average person in the 1500s would have increased the prevalence of rickets). The results of the Raman study confirmed that the abnormally shaped bones did in fact have chemical abnormalities.

The bones were analysed at the Royal National Orthopaedic Hospital (RNOH) in Stanmore, North London, as part of a study by University College London (UCL), the Science and Technology Facilities Council (STFC) and The Mary Rose Trust.



Displayed are two bone specimens taken from sailors on board the Mary Rose, which sank in 1545. One bone (darker) has rickets and the other (lighter) does not. Some bones that appeared abnormal in shape were found to have rickets. The dark discolouration on the rickets infected bone is due to the effects of the conditions underwater.

The RAMAN study, funded as part of a £1.7 million grant from the Engineering and Physical Sciences Research Council, was led by Professor Allen Goodship at UCL.

Professor Goodship, who is also Director and Head of the Centre for Comparative and Clinical Anatomy at the University of Bristol, said: "There was an amazing similarity in the chemical composition of the normal bones from the Vesalius Centre donors and those that had been on the sea bed for over 400 years. The use of the Raman technique allow us to analyse these unique specimens without causing any damage."

The Raman technique shows potential as a tool for understanding the presence and prevalence of metabolic bone disease in historical populations and may have a place in modern-day detection of the

condition, with reports earlier this year warning that Britain is seeing a return of Tudor-era diseases.

Dr Jemma Kerns, RAMAN Clinical Study Manager at UCL and RNOH, one of the scientists who conducted the study, commented: "This is the first time that this [laser technology](#) has been used to study bone disease in archaeological human bone. We have identified chemical changes in the bones, without damaging them. There is strong evidence to suggest that many of the sailors had suffered from childhood rickets and we hope to apply the Raman technique to the study of modern day rickets."

Alex Hildred, Curator of Human Remains at the Mary Rose Trust, added: "The Mary Rose Trust has the responsibility for the remains of over 179 individuals who perished with the ship. Their provenance is absolute; they represent the crew of an English warship in July 1545. The human remains have potential to make a contribution to the public through research, education, display and interpretation. Their use to confirm the presence and prevalence of metabolic [bone](#) disease in the 16th century is one of these contributions."

More information: Jemma G. Kerns, Kevin Buckley, Anthony W. Parker, Helen L. Birch, Pavel Matousek, Alex Hildred, Allen E. Goodship, "The use of laser spectroscopy to investigate bone disease in King Henry VIII's sailors," *Journal of Archaeological Science*, Volume 53, January 2015, Pages 516-520, ISSN 0305-4403, [dx.doi.org/10.1016/j.jas.2014.11.013](https://doi.org/10.1016/j.jas.2014.11.013).

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