Ancient skeleton shows leprosy may have spread to Britain from Scandinavia

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Foot bones of the Great Chesterford skeleton. Credit: University of Southampton

An international team, including archaeologists from the University of Southampton, has found evidence suggesting leprosy may have spread to Britain from Scandinavia.

The team, led by the University of Leiden, and including researchers from Historic England and the universities of Southampton, Birmingham, Surrey, and Swansea, examined a 1500 year old male skeleton, excavated at Great Chesterford in Essex, England during the 1950s.

The bones of the man, probably in his 20s, show changes consistent with leprosy, such as narrowing of the toe bones and damage to the joints, suggesting a very early British case. Modern scientific techniques applied by the researchers have now confirmed the man did suffer from the disease and that he may have come from southern Scandinavia.

Archaeologist Dr Sonia Zakrzewski, of the University of Southampton, explains DNA testing was necessary to get a clear diagnosis: "Not all cases of leprosy can be identified by changes to the skeleton. Some may leave no trace on the bones; others will affect bones in a similar way to other diseases. In these cases the only way to be sure is to use DNA fingerprinting, or other chemical markers characteristic of the leprosy bacillus."

Great Chesterford skeleton. Credit: University of Southampton

The researchers tested the skeleton for bacterial DNA and lipid biomarkers to confirm the man had definitely had leprosy and to allow them to carry out a detailed genetic study of the bacteria that caused his illness.

Professor Mike Taylor, a Bioarchaeologist from the University of Surrey, says: "Not every excavation yields good quality DNA, but in this case, leprosy DNA isolated from the skeleton was so good it enabled us to identify its strain."

The results showed the leprosy strain belonged to a lineage (3I) which has previously been found in burials from Medieval Scandinavia and southern Britain, but in this case it originates from a much earlier period, dating from the 5th or 6th centuries AD.

The identification of fatty molecules (lipids) from the leprosy bacteria confirmed the DNA results and also showed it was different from later strains. Emeritus scientist David Minnikin, from the University of Birmingham, says: "With Leverhulme Trust support, we recorded strong profiles of fatty acid lipid biomarkers that confirmed the presence of leprosy. However, one class of the lipid biomarkers had distinct profiles that may distinguish these older leprosy cases from later Medieval examples."

Isotopes from the man's teeth showed that he probably did not come from Britain, but more likely grew up elsewhere in northern Europe, perhaps southern Scandinavia. This matched the results of the DNA, and raises the intriguing possibility that he brought a Scandinavian strain of the leprosy bacterium with him when he migrated to Britain.

Project leader Dr Sarah Inskip of Leiden University concludes: "The radiocarbon date confirms this is one of the earliest cases in the UK to have been successfully studied with modern biomolecular methods. This is exciting both for archaeologists and for microbiologists. It helps us understand the spread of disease in the past, and also the evolution of different strains of disease, which might help us fight them in the future. We plan to carry out similar studies on skeletons from different

locations to build up a more complete picture of the origins and early spread of this disease."

Although leprosy is nowadays a tropical disease, in the past it occurred in Europe. Human migrations probably helped spread it, and there are cases in early skeletons from western Europe, particularly from the 7th century AD onward. However the origins of these ancient cases are poorly understood. The study of the Great Chesterford skeleton provided an important opportunity to shed light on the early spread of leprosy.

The results of the study will be published in the journal *PLOS ONE* .

Provided by University of Southampton