Medieval leprosy genomes reveal insights into the history of the disease

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An international team led by the University of Tübingen and Ecole Polytechnique Fédérale de Lausanne, including scientists at the University of Birmingham (UK), have found that the leprosy bacillus has not changed dramatically during the past millennium, according to research published today (13 June 2013) in the journal Science.

Leprosy is a devastating chronic disease and it is still found in 91 countries worldwide, with about 200,000 new infections being reported annually. It was a serious health issue in the UK and Europe until the late Middle Ages, but detailed information about the origins and recent evolution of Mycobacterium leprae, the bacterium that causes the disease, has not been revealed until now.

The scientists from Germany, Switzerland, Sweden, Denmark and other locations in the UK, reconstructed the genomes of a dozen leprosy bacteria from medieval and modern contexts revealing a common ancestor for all leprosy bacteria within the last 4,000 years. This correlates with the earliest skeletal evidence for the disease which dates back to 2000 BC in India. The scientists discovered that the bacillus had not changed dramatically over the past 1000 years.

The conclusions in this new study were based on genomic sequences, characteristic of M. leprae, obtained from five medieval skeletons that were excavated in Sweden, Denmark and Winchester in the UK. Leprosy genomes were also reconstructed from biopsies from seven live patients. The genome sequences from the medieval skeletons were then compared with those of 11 modern strains of the disease.

The team of scientists also showed that a strain of M. leprae once present in medieval Europe is found today in the Middle East, whereas other medieval European strains are nearly identical to those now found in North America, both in leprosy patients and wild armadillos, thus suggesting a European origin of leprosy in the Americas.

In the study, the Birmingham scientists characterized the medieval skeletons as authentic leprosy cases, using highly specific fats as biomarkers. Birmingham has the only laboratories in the world, which are using such biomarkers to pinpoint ancient tuberculosis as well as leprosy. A notable achievement of this research has been the identification of oldest known human tuberculosis case at 9,000 years old, and an even older case of tuberculosis in a 17,000 year old extinct bison. Professor David Minnikin, from the University of Birmingham's School of Biosciences, said:

'These comprehensive studies provide a sound framework for understanding the global history and current spread of leprosy. Knowledge of the location and origins of particular variants of the leprosy bacillus could be critical if problems develop with current anti-leprosy drug regimens.'

Notes to Editors

1. '**Genome-wide comparison of medieval and modern Mycobacterium leprae (http://www.sciencemag.org/content/early/2013/06/12/science.1238286.abstract)** ', published in Science, 1238286.

2. Images are available available to download here:

http://www.birmingham.ac.uk/Images/News/excavation-winchester.jpg (http://www.birmingham.ac.uk/Images/News/excavation-winchester.jpg)
http://www.birmingham.ac.uk/Images/News/jorgen-1.jpg (http://www.birmingham.ac.uk/Images/News/jorgen-1.jpg)
http://www.birmingham.ac.uk/Images/News/jorgen-2.jpg (http://www.birmingham.ac.uk/Images/News/jorgen-2.jpg)

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