

Searching for an ancient syphilis DNA in newborns

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Pictured are the left femur, two right humerus and a right hemifrontal bone belonging to at least two newborns found at "La Ermita de la Soledad" in Huelva. All show signs of bone lesions diagnosed as congenital syphilis. Credit: Universitat Autònoma de Barcelona

The ancient bones of newborns are very useful to recover the ancient DNA of the bacteria causing syphilis, the *Treponema pallidum pallidum*. This is the conclusion reached by a study led by Universitat Autònoma de Barcelona (UAB), which was able to obtain the genetic material from the bacteria in more than one individual, in what is considered to be the oldest case known to date. Several previous intents had only achieved to yield this material in one occasion and from only one individual.

Studying syphilis represents a challenge for researchers, in part because

of the impossibility of using or genetically manipulating [cell cultures](#), given that the [subspecies](#) of *T. pallidum* cannot be differentiated morphologically using immunofluorescence or [electron microscopes](#). This makes diagnosis extremely difficult and complicates epidemiological and phylogenetic analyses. In contrast, molecular typification has revealed to be a useful method with which to detect some of these subspecies, such as the one affecting humans, the *T.pallidum pallidum*.

Palaeopathology - the science that studies diseases in ancient human remains - benefits from these molecular techniques to identify specific varieties of ancient syphilis and generate information that is useful for the phylogenetic reconstruction of modern varieties. They additionally can help to discover the historical development of the disease and its moment of origin in the continent - a highly debated issue amongst scientists - and its [geographic distribution](#) and epidemiology.

In this study, published in [PLoS ONE](#) and led by Assumpció Malgosa, professor of Physical Anthropology at UAB, researchers extracted the bacteria's DNA from four bone fragments of two newborns showing clear signs of having suffered from congenital syphilis. The remains were recovered from the crypt of "La Ermita de la Soledad" (16th-17th centuries), located in the province of Huelva in the northwest of Spain.

It is the first time this ancient bacteria is obtained from more than one subject. Although researchers had tried extractions on several occasions, they were successful only once, with an adult individual dating some 200 years back. Although unable to pin down the exact year, researchers are convinced that the remains of the newborns in Huelva are of an earlier date. That would make them the oldest finding reported until date in the detection of this bacteria's DNA.

The difference between this and previous studies lies in the fact that

researchers were able to analyse the remains of newborns bearing clear signs of having suffered from congenital syphilis. "We believe the difficulty in obtaining [ancient DNA](#) bacteria from adults is due to the development of the disease in individuals. Recent studies indicate that newborns are more sensitive to bone damage in the first stages of the disease, due to a rapid dissemination in the skeleton of a high number of spirochetes, which after death would leave their DNA that would be preserved by its association to hydroxyapatite in bones. In the case of adults affected by venereal syphilis, the amount of bacteria in bones is reduced as the disease advances to later stages, making it very difficult to extract samples from the bones", explains Assumpció Malgosa.

Researchers' hypothesis was that the amount of bacteria in [newborns](#) is enough to guarantee the preservation of DNA and that the younger an individual affected by the disease, the greater the probability of amplifiable DNA preservation. "And now we have demonstrated it with this research", Malgosa states.

She also considers worth noting that a number of studies have shown the presence of bone lesions in early syphilis, and this "opens up the possibility that affected skeletons of young adults, who died during the early stages of [syphilis](#), might also contain amplifiable DNA. However, the doubt remains on how to identify those cases before attempting destructive analysis".

The research represents "a huge step forward in the study of changes in the *T.pallidum* genome and how they affect individuals throughout history. With this information, inferences on the present and future of the disease can be very important", concludes Assumpció Malgosa.

Provided by Universitat Autònoma de Barcelona

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