

The world's oldest bacteria

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A research team has for the first time ever discovered DNA from living bacteria that are more than half a million years old. Never before has traces of still living organisms that old been found. The exceptional discovery can lead to a better understanding of the ageing of cells and might even cast light on the question of life on Mars.

The discovery is being published in the current issue of *PNAS (Proceedings of The National Academy of Sciences)*. The discovery was made by Professor Eske Willerslev from the University of Copenhagen and his international research team.

All cells decompose with time. But some cells are better than others to postpone the decomposing and thus delay ageing and eventually death. And there are even organisms that are capable of regenerate and thereby repair damaged cells. These cells – their DNA – are very interesting to the understanding of the process of how cells break down and age.

The research team, which consists of experts in, among other things, DNA-traces in sediments and organisms, have found ancient bacteria that still contains active and living DNA. So far, it is the oldest finding of organisms containing active DNA and thus life on this earth. The discovery was made after excavations of layers of permafrost in the north-western Canada, the north-eastern Siberia and Antarctica.

Our project is about eg. examining how bacteria can live after having been frozen down for millions of years. Other researchers has tried to uncover the life of the past and the following evolutionary development by focusing on cells that are in a state of deadlike lethargy. We, on the other hand, have found a method that makes is possible to extract and isolate DNA-traces from cells that are still active. It gives a more precise picture of the past life and the evolution towards the present because we are dealing with cells that still have a metabolic function – unlike “dead” cells where that function has ceased, says Eske Wilerslev.

After the fieldwork and the isolation of the DNA, the researchers compared the DNA to DNA from a worldwide gene-bank in the US to identify the ancient material. Much in the same way the police compares fingerprints from a crime. The researchers were able to place the DNA more precisely and to place it in a context.

There is a very long way, of course, from our basic research towards understanding why some cells can become that old. But it is interesting in this context to look at how cells break down and are restored and thus are kept over a very long period. Our methods and results can be used to determine if there was ever life on Mars the way we perceive life on earth. And then there is the grand perspective in relation to Darwin's evolution theory. It predicts that life never returns to the same genetic level. But our findings allows us to post the question: are we dealing with a circular evolution where development, so to speak, bites its own tail if and when ancient DNA are mixed with new", says Eske Willerslev.

Source: University of Copenhagen

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