# Bacteria reveal secret of adaptation at Evolution Canyon

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Bacteria living on opposite sides of a canyon have evolved to cope with different temperatures by altering the make-up of their 'skin', or cell membranes. Scientists have found that bacteria change these complex and important structures to adapt to different temperatures by looking at the appearance of the bacteria as well as their genes. The researchers hope their study, published in the August issue of *Microbiology*, will start a new trend in research.

'Evolution Canyons' I and II are in Israel. They are similar, each with a hot south-facing slope and a cooler north-facing slope. The sun-exposed 'African' south-facing slopes get eight times more solar radiation than the shady, green, lush 'European' north-facing slopes. Scientists studied 131 strains of Bacillus simplex and found that bacteria on different slopes have evolved differently, forming different 'ecotypes' of the same species.

"We expected that 'ecotype' formation was linked to temperature but we had no initial clue of which specific cell attributes could have led to the adaptation," said Dr Johannes Sikorski from DSMZ in Germany. "To find out, we definitely had to study the appearance of the bacteria, not only their genes."

The cell membrane is one of the most important and complex parts of a cell. Membranes contain different fatty acid molecules; the branching type can change depending on temperature to keep the cell alive. The researchers found significant differences in the fatty acids of several

ecotypes that live on different slopes in Evolution Canyon.

"Bacteria respond to temperature by altering their fatty acid composition in a constitutive, long-term fashion," said Dr Sikorski. We found that 'African' ecotypes from the hot slopes had more heat-tolerant fatty acids and 'European' ecotypes from the cool slopes had more cold-tolerant fatty acids in their membranes."

In most modern evolutionary studies, scientists rely on genetic data alone. Dr Sikorski and his colleagues focussed on the result of the genetic changes instead: what the bacteria look like. "It is not a 'sexy' technique like genomics or proteomics but it gives a more comprehensive insight into the result of adaptation of the cell membrane," said Dr Sikorski.

"Right now it is not possible to deduce the composition of a cell membrane using genomics or proteomics alone. To understand evolution we need to explain the consequences of genetic differences for the organism in its natural environment."

Source: Society for General Microbiology