Mine study demonstrates how quickly bacteria can evolve

April 30 2012, by Bob Yirka

(Phys.org) -- Two Earth and environmental scientists from the University of California have found that by observing bacteria in situ in an abandoned mine in northern California, they have, as they describe in their paper published in the journal *Science*, been able to observe how quickly a single nearly undisturbed species of bacteria has evolved in the wild.

Vincent Denef and Jillian F. Banfield have been studying the bacterium *Leptospirillum* that lives on the surface of both still and moving water in the Richmond Mine for over nine years. In so doing, they have found that the bacteria, which they believe initially inhabited the hot dark confines of the original caverns some 50,000 years, has experienced several evolutionary leaps over just the past several decades due to the introduction of bacteria from somewhere outside of the mine. In all, the two have identified six distinct strains of the bacteria, all of which evolved from the single original strain.

This has all been made possible by the nearly heroic efforts of the research team, and the harsh conditions of the mine. The Richmond Mine was developed from the caverns that existed in the area also known as the Iron Mountain Mine. As its name implies, excavations in the already existing caverns led to iron mining, which was eventually abandoned in the early sixties, leaving behind one of the most acidic water environments on the planet. Making study even more difficult is the fact that temperatures in the mine hold steady at a scorching 118°F with humidity near 100%.

To carry out their study, the two journeyed down into the mine on a periodic basis and collected bacteria samples from several different areas, then brought them back to their lab for DNA analysis. Over time they found they were able to identify six specific strains, each demonstrating an evolutionary leap as outside bacteria mixed with inside bacteria creating a new strain inside that was able to withstand the extreme conditions. But because of those harsh conditions, the researchers assume that many such pairings also likely resulted in new strains that were not able to survive and thus died out. But for those that have been able to survive, the team has found the mine and its bacteria colony to be a nearly ideal research lab; bacteria that exist without the constant need to adapt due to interactions with external environmental organisms.

As part of their study, they've found that all of the mutations they've discovered thus far have occurred in just the past several decades, indicating they may have come about as the result of human activities, but also demonstrating just how quickly bacteria can evolve in an almost pure, yet wild environment.

The two next plan to see if they pinpoint the origins of the external bacteria that have led to the evolutionary leaps inside the mine.

More information: *Science* 27 April 2012: Vol. 336 no. 6080 pp. 462-466 DOI: 10.1126/science.1218389