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News in Science - Ancient bacteria take a breath - 07/02/2000

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Ancient bacteria take a breath

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Bacillus subtilis Pic:
N.Chamberlain & Betty Cox

Proteins discovered in ancient bacteria could provide evidence of the evolutionary beginning of the use of oxygen and thereby a clue to when and how life arose on Earth.

The discovery was made by a University of Hawaii research team, and appeared in the latest [Nature](#) journal. In animals, the proteins, myoglobin (found in muscle) and its close relative hemoglobin (the main protein in the red blood cell) play an essential role in oxygen transport and storage. The newly identified proteins may be the evolutionary ancestors of proteins involved in oxygen sensing as well as transport and storage.

The research team cloned the genes expressing these proteins, which were then purified and characterized. The newly discovered proteins from *Halobacterium salinarum* and the more widely known bacterium *Bacillus subtilis* help sense oxygen, allowing the organism to find a more favorable oxygen environment.





"The presence of oxygen in the earth's atmosphere some 1 to 2 billion years ago was both a blessing and a curse," says Maqsudul Alam, associate professor of microbiology. Oxygen is an energy-rich molecule that can provide an energy source for cellular function. However, oxygen can also be highly toxic. The challenge for bacterial cells is to sense, capture and store the oxygen for energy production without suffering the hazardous side effects. The newly discovered heme proteins appear to be responsible for oxygen sensing. Both *Halobacterium salinarum* and *Bacillus subtilis* also contain other heme proteins that convert the oxygen into useable energy for the cell.

"This finding advances efforts to trace when and where the evolutionary division between plant, animal and bacteria occurred, as well as how the resulting proteins evolved specific functions in different species," Alam explains. "In addition, it could suggest when and how life began and provide ways to trace the presence of life elsewhere in the Universe."

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M. Sleath - The Lab

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