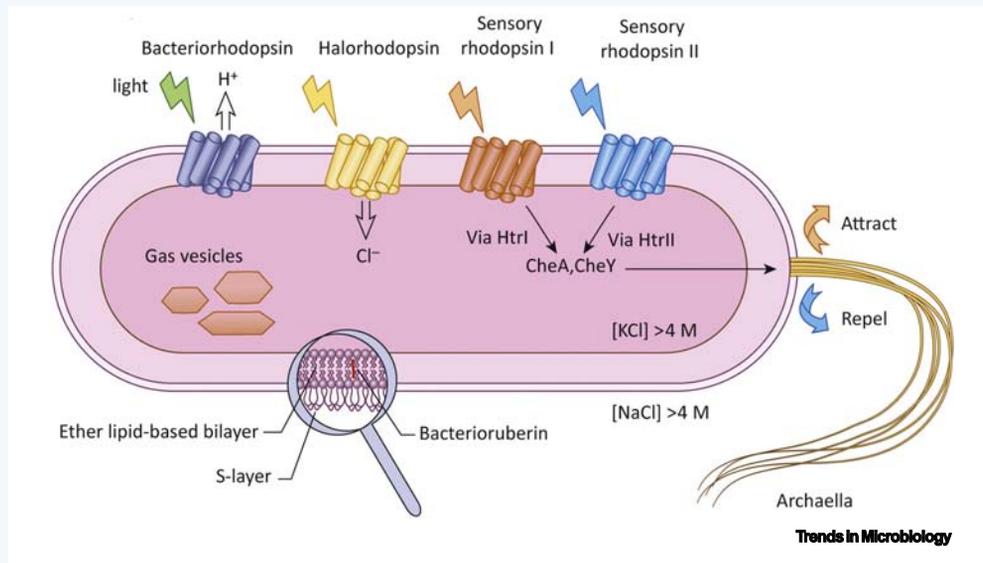


*Halobacterium salinarum*Jerry Eichler^{1,*}¹Department of Life Sciences, Ben Gurion University of the Negev, Beersheva, Israel

Halobacterium salinarum is a halophilic (salt-loving) member of the Archaea that grows in concentrations of sodium chloride (NaCl) near or at saturation. Initially isolated from salted fish a century ago, *Hbt. salinarum* first drew general attention with the 1971 discovery of bacteriorhodopsin, the light-driven proton pump isolated from the purple membrane of this organism. Since then, studies of *Hbt. salinarum* have led to numerous ground-breaking and paradigm-shifting discoveries, such as the first insight into membrane protein structure and the first demonstration that such proteins can be crystallized from bilayers, as well as the first example of a noneukaryal glycoprotein. Work on *Hbt. salinarum*, one of the species originally used to describe the Archaea, has also advanced understanding of molecular workings in the third domain; the first transformation and gene-deletion systems for Archaea were developed in *Hbt. salinarum*. Finally, *Hbt. salinarum* presents creative solutions to challenges associated with life in high salt concentrations.



Trends in Microbiology

TAXONOMY AND CLASSIFICATION:**DOMAIN:** Archaea**PHYLUM:** Euryarchaeota**CLASS:** Halobacteria**ORDER:** Halobacteriales**FAMILY:** Halobacteriaceae**GENUS:** *Halobacterium***SPECIES:** *salinarum*

Gram-negative aerobe, but can grow anaerobically.

KEY FACTS:

The genome of *Hbt. salinarum*, strain NRC-1, comprises a 2.57 Mb chromosome (68% GC content) and two megaplasms (58% GC content).

A polyploid, *Hbt. salinarum* withstands high UV radiation partly due to robust DNA repair.

The cytoplasm of *Hbt. salinarum* contains >4 M potassium chloride (KCl). Adaptations that allow proteins to fold and function in such high salt concentrations include increased acidic residue content; the median pI of the *Hbt. salinarum* proteome is 4.9.

The C₅₀ carotenoid α -bacterioruberin embedded in the lipid bilayer contributes to the red-pink color of the organism.

The N- and O-glycosylated S-layer glycoprotein that forms the S-layer surrounding *Hbt. salinarum* cells was the first noneukaryal glycoprotein described.

Hbt. salinarum generates ATP aerobically or anaerobically via arginine fermentation or light-driven generation of a proton gradient by bacteriorhodopsin. Photon absorption by bacteriorhodopsin causes retinal isomerization and proton expulsion.

Clusters of bacteriorhodopsin trimers form the purple membrane.

In yellow light, halorhodopsin drives Cl⁻ uptake.

Responding to orange and blue light, sensory rhodopsins I and II, complexed with the transducers HtrI and HtrII, elicit photophilic and photophobic responses, respectively. A two-component regulatory system mediates archaeellar rotation in the appropriate direction.

Gas vesicles, first described in *Hbt. salinarum*, are thought to increase buoyancy in low oxygen content hyper-saline environments.

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