Is very slow diffusional water movement specific to *Haloarcula marismortui*?

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Haloarcula marismortui is an archeal extreme halophile originally isolated from the Dead Sea, of which the major constituents are 1.68 M NaCL plus 1.5M $MgCl_2$. The cells of this species contain K^+ at concentrations above 4M. At the same time, the outer membrane is highly permeable to small organic molecules and has a high electrical conductance. Thus, a high cell K^+ concentration is maintained despite the high permeability of the outer membrane.

It will be shown that K^+ retention within the cells is not directly coupled to metabolism, but is due to some sort of binding interaction with other cell contents.

When this work was started the only compounds known with very high binding capacities for ions were antibiotics such as nonactin and valinomycin. These owe their specificity to a 'cage' of 6 – 8 carbonyl-oxygen atoms arranged in space according to a definite pattern. If the same principle were to be responsible for K^+-binding in *Ha. marismortui*, 24 – 32 moles of oxygen per liter cell water would be required. Such enormous amounts cannot be supplied by the cells' organic components. It was therefore suggested that the oxygen might be supplied by the ordering of water molecules that would therefore be a component of a tertiary intracellular system of water, K^+, Cl^- and cell proteins.

In order to detect ordered water within *Ha. marismortui* cells, a number of techniques have been employed. These have included NMR, dielectric spectroscopy, calorimetry and neutron scattering. We have concluded that about 59% of the cell water diffuses at a rate 2 - 3 orders of magnitude more slowly than in other cells in which water diffusion has been measured.

As control we have used *Halobacterium salinarum*, whose cells have equally high K^+ concentrations, though the outer membrane has more usual permeability properties. Cell K^+ in this organism is apparently controlled by metabolism.