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# Aquaporin Water Channels: From Atomic Structure to Clinical Medicine

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The high water permeability of certain biological membranes is due to the presence of aquaporin water channel proteins. AQP1 was discovered in human red cells. AQP1 has been thoroughly characterized biophysically, and the atomic structure of AQP1 has been elucidated. Ten homologs have been identified in humans. These are selectively permeated by water (aquaporins) or water plus glycerol (aquaglyceroporins). The sites of expression predict the clinical phenotypes in humans. Individuals lacking Colton blood group antigens have mutations in the AQP1 gene. When deprived of water, AQP1-null individuals exhibit a defect in urine concentration and a marked reduction in fluid exchange between capillary and interstitium in lung. AQP1 is expressed in multiple tissues where physiologically important fluid secretion is known to occur including choroid plexus and anterior chamber of eye. AQP0 is expressed in lens fiber cells and mutations result in familial cataracts. AQP2 is expressed in renal collecting duct principal cells where membrane trafficking is regulated by vasopressin. Mutations in the human AQP2 gene result in nephrogenic diabetes insipidus, but underexpression is found in clinical disorders with reduced urinary concentration (e.g., lithium therapy and nocturnal enuresis) and overexpression is found in disorders with fluid retention (e.g., congestive heart failure and pregnancy). AQP5 is expressed in the apical membranes of salivary and lacrimal gland acini, and mistargetting has been identified in some patients with Sjogren's syndrome. Involvement of aquaporins is expected in other human clinical disorders such as brain edema and muscular dystrophy (AQP4), anhidrosis (AQP5) renal tubular acidosis (AQP6), conversion of glycerol to glucose during starvation (AQP7 and AQP9), and cystic fibrosis (several aquaporins). Aquaporins are known to protect micro-organisms from freezing and osmotic shock. Plant aquaporins are involved in numerous processes including the uptake of water by rootlets and carbon dioxide by leaves. The physiological roles of aquaporin homologs are being pursued by multiple laboratories worldwide.

**August 31, 2005, kl. 11.00 (Coffee starting 10.40)**
**Roskilde Universitetscenter**
**Store Auditorium, Bygning 0**
**Visitors should follow the signs for XVIth Horizons in H-bond Research**

*This meeting is jointly arranged by:*
*Kemisk Forening*
*and*
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