Salinity Tolerance Mechanisms in Marine Plants and Genetic Engineering of the Salinity-Tolerance Genes

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Salt-transport systems involving ATPases located in cellular membranes are of the utmost importance for the molecular description of the salinity tolerance of plants. High ATPase activity was detected by cytochemical procedures of lead precipitation on the copiously invaginated cell membranes of mature leaf epidermal cells from Zostera marina, whereas immature leaf cells which were sensitive to salinity did not detect such high activity. The enzymatic reaction was markedly reduced by 10^{-2} mM ouabain, suggesting characterestic presence of potential Na^+-pumps that play a central role in the tolerance of seagrasses to salinity. Cloning of cDNAs for seagrass ATPases is now in progress.

On the other hand, such high enzymatic activity was not found on cell membranes of marine macro-algae but on the membranes of some cytoplasmic vesicles or micro-vacuoles. Thus it appears that marine plant cells currently exploit two main methods by which they excrete excess salts for resisting the high salinity of seawater.