New insights on the regulation of the yeast V e P H⁺-ATPases.


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VH⁺-ATPase has an important role in a cell biology. It is activated/partly inactivated by the addition/exhaustion of extracellular glucose. The current model of its regulation assumes the reversible disassembly/reassembly of ~60-70% of the \( \text{V}_1/\text{V}_0 \) complexes, responsible for ATP hydrolysis and \( \text{H}^+ \) conductance, respectively. Model predicts the identical properties for the activated/semi-active enzymes molecules and the protein content increase of the \( \text{V}_1 \) subunits by 2.5-3.3 folds. The total membranes(TM) were isolated from yeast spheroplasts pre-incubated with or without glucose. Nitrate inhibited \( \text{H}^+ \) transport more than the ATPase activities, indicating its uncoupling action, which was significantly higher for the non-activated enzyme. This finding suggests that the structure of the non-activated enzyme is less stable than that of the activated enzyme. Similar results were obtained for the isolated organelles of secretory pathway. The glucose activation of the pump increases its coupling capacity, its \( K_M \) for ATP hydrolysis and ATP affinity for \( \text{H}^+ \) transport, the \( V_{\text{max}} \) for \( \text{H}^+ \) transport in comparison with the \( V_{\text{max}} \) for ATP hydrolysis, the immune reactivity of catalytic subunit A and regulatory subunit B by 9.3 and 2.4 times, respectively. The protein content of subunits A/B was not changed by extracellular glucose. We conclude that instead of the dissociation/re-association of complexes \( \text{V}_1/\text{V}_0 \) changes in the extracellular glucose concentration cause reversible and asymmetrical modulations in the immune reactivity of subunits A and B by their putative biochemical modifications. This response asymmetrically modulates \( \text{H}^+ \) transport and ATP hydrolysis, exhibiting distinct properties for the activated versus non-activated enzymes. We show that \( \square \text{pH} \) across plasma membrane is a key factor in the regulation of V and P H⁺-ATPases of yeast, since the extracellular \( \text{pH} \) increase has stimulated both pumps while \( \text{NH}_4\text{Cl} \) and ionophores destroying \( \square \text{pH} \) prevented this stimulation in absence or presence of glucose.

Word Keys: V H⁺-ATPase, regulation