Journal of Bioenergetics and Biomembranes, Vol. 33, No. 5, October 2001 (© 2001)

INTRODUCTORY OVERVIEW

Introduction: A Close Look at an Ion Pump

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The Na,K-ATPase or sodium pump is a vital player in the efficient functioning of all of the organs of the human body. This assertion helps explain why since its discovery in 1957 (for which J.C. Skou, in 1998, shared the Nobel Prize in Chemistry), the Na,K-ATPase has been the object of study for several generations of biochemists, physiologists, biophysicists, and clinical scientists. Its relationship to other transport proteins has become clearer and its place in a superfamily of P-type ATPases has been revealed through the analysis of continually increasing genomic data bases.

The recent demonstrations of the exquisite operation of the F_0F_1-ATPase, at a mechanistic and structural level (for which Paul Boyer and John Walker shared the same Nobel Prize) revealed a biological nanomachine, which seemed familiar from our knowledge of how other rotary motors work at an everyday macro level. From what we already know about how P-type ATPases work, and from what is revealed by the high-resolution structure of the Ca pump, such aesthetically pleasing analogies will be less obvious for these active transport proteins. The important structural changes that occur during the working cycle of these pumps are not yet apparent and seem likely to involve combinations of interdomain motions and subtle realignments of intramembrane structures.

The eight minireviews on the Na,K-ATPase appearing in this issue describe current ideas on how the sodium pump works and how it is regulated. They bring together the views of an international group of active contributors to this area and provide an up-to-date snapshot of what is known about this protein from a variety of viewpoints. I hope that this compendium will provide a useful source of information, but, more importantly, serve as a catalyst for new ideas and experiments.

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0145-479X/01/1000-0365$19.50/0 © 2001 Plenum Publishing Corporation