

Fluorescence Probing of Sodium Pump Kinetics

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Background

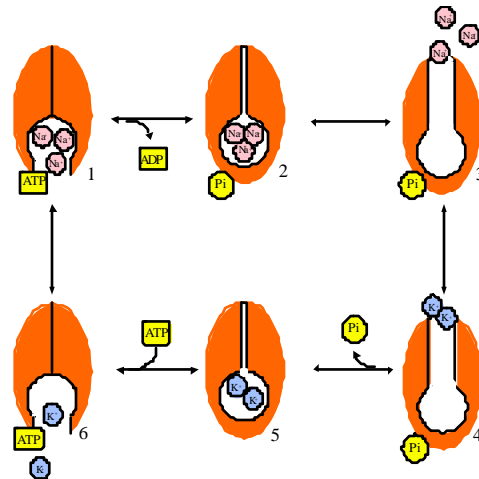
The sodium pump is a crucial enzyme of animal physiology, essential for normal heart, nerve and kidney function. Because it pumps ions across cell membranes, its activity causes changes in the electric field within the membrane, which we detect using voltage-sensitive fluorescent probes. Via rapid kinetic methods we are able to measure rate and equilibrium constants for the enzyme's complex reaction cycle and gain a clearer picture of how it functions, how it could be regulated and how it may be involved in disease.

Outcomes:

- Understanding of how hormones and therapeutic drugs affect the sodium pump
- A more informed basis for the treatment of disease, in particular heart disease

Progress to date.

- Rate constants have been determined for all the major rate-determining steps of the enzyme cycle.
- Equilibrium binding constants have been determined for all the enzyme's substrates, i.e. Na^+ , K^+ and ATP.
- A kinetic model has been developed which enables steady state enzyme activity to be simulated and the effects of hormones and drugs on the sodium pump to be understood at the molecular level.



Reaction mechanism of the sodium pump

Funding is sought to

- extend this study to include the voltage-dependence of the reactions and
- determine the effect of lipid composition on sodium pump activity.

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