Structural comparisons of P-type ATPases
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P-type ATPase cation pumps form steep electrochemical gradients and energise biomembranes. As a prominent example Na⁺,K⁺-ATPase accounts for about 2/3 of the ATP turnover in brain, maintaining sodium and potassium gradients. We have determined crystal structures and assessed the activity of several P-type ATPases, in particular Ca²⁺-ATPase, H⁺-ATPase and Na⁺,K⁺-ATPase. From comparisons we describe general aspects of function based on conformational changes associated with the E1-E2 transitions via phosphoenzyme intermediates. Recently we have revealed a C-terminal ion pathway a total of four ion binding sites which explain how the Na⁺,K⁺-ATPase manages to perform an uneven transport of three sodium ions out and two potassiums in. The model is in excellent agreement with a HNa₃E₁/H₂K₂E₂ model proposed 30 years ago by Esmann and Skou and is further underscored by a large cluster of mutations associated with neurological diseases.