Active Transport

Primary Active Transport

- molecules are "pumped" against a concentration gradient at the expense of energy (ATP)
  – direct use of energy

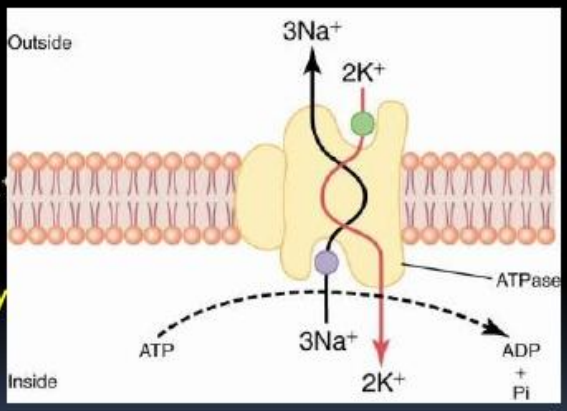
Secondary Active Transport

- transport is driven by the energy stored in the concentration gradient of another molecule (Na^+)
  – indirect use of energy

Primary Active Transport

1. Na^+/K^+ ATPase

- **carrier protein** located on the plasma membrane of all cells
- plays an important role in regulating osmotic balance by maintaining Na^+ and K^+ balance
- requires one to two thirds of cells **energy**



2. Ca^{2+} ATPase

- present on the cell membrane and the sarcoplasmic reticulum
- maintains a low cytosolic Ca^{2+} concentration

3. H^+ ATPase

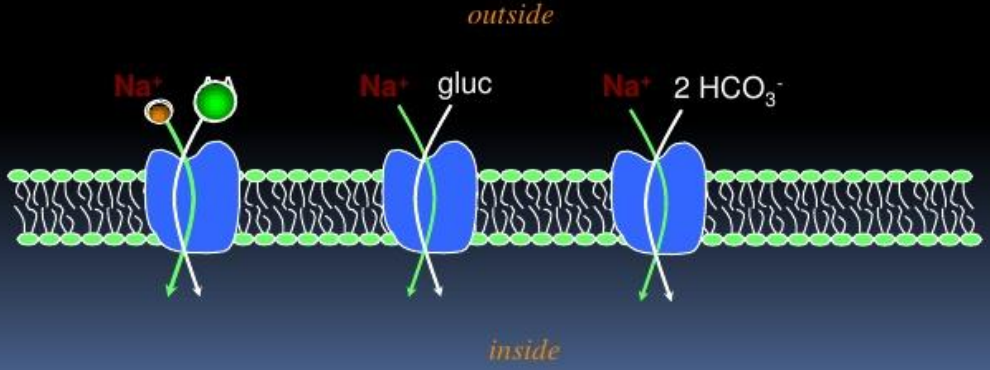
- found in parietal cells of gastric glands (HCl secretion) and intercalated cells of renal tubules (controls blood pH)

Secondary Active Transport

- co-transport and counter-transport -

1. **Co-transport** *(co-porters)*: substance is transported in the same direction as the "driver" ion (Na^+)

Examples:



2. Counter-transport *(anti-porters)*: substance is transported in the opposite direction as the "driver" ion (Na^+)

Examples: