



Biophysics

Sixth lecture

Electrical excitability of cell membranes

Second stage

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Electrical excitability of cell membranes

Excitable membranes are the carriers of the electrical signals in living organisms. Nerve impulse and other membrane potential changes result from transient membrane permeability changes to ions, in many cases selectively to Na^+ , K^+ , Ca^{2+} , or Cl^- ions.

Two factors determine the net flow of ions across an open ionic channel:

- 1- The membrane potential
- 2- The differences in ion concentrations between the intracellular and the extracellular spaces.

Because cells have negative intracellular potentials, the electrical force will tend to direct positively charged ions (cations such as sodium, potassium, and calcium) to flow into a cell. Hence, electrical forces will direct an inward flow of sodium, potassium, and calcium ions and an outward flow of chloride ions.

The direction of ion movement produced by the 'concentration force' **depends** on:

- 1- The concentration differences for the ion between the intracellular
- 2- The extracellular compartments.

Sodium, calcium, and chloride ions have higher extracellular concentrations compared with intracellular concentrations. The intracellular concentration of potassium is greater than the extracellular concentration. Concentration forces direct an inward flow of sodium, calcium, and chloride ions and an outward flow of potassium ions.