Dialysis Encyclopedia Article

Dialysis

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Dialysis

Dialysis is a process by which small molecules in a **solution** are separated from large molecules. The principle behind the process was discovered by the Scottish chemist **Thomas Graham** in about 1861. Graham found that the rate at which some substances, such as inorganic salts, pass through a semipermeable membrane is up to 50 times as great as the rate at which other substances, such as **proteins**, do so. We now know that such rate differences depend on the fact that the openings in semipermeable membranes are very nearly the size of atoms, ions, and small molecules. That makes possible the passage of such small particles while greatly restricting the passage of large particles.

In a typical dialysis experiment, a bag made of a semipermeable membrane is filled with a solution to be dialyzed. The bag is then suspended in a stream of running **water**. Small particles in solution within the bag gradually diffuse across the semipermeable membrane and are carried away by the running water. Larger molecules are essentially retained within the bag. By this process, a highly efficient separation of substances can be achieved.

Electrodialysis is a form of dialysis in which the separation of ions from larger molecules is accelerated by the presence of an electrical field. In one arrangement, the solution to be dialyzed is placed between two other solutions, each of which contains an electrode. Cations within the middle solution are attracted to one electrode and anions to the other. Any large molecules in the middle solution remain where they are.

One possible application of electrodialysis is the **desalination** of water. In this procedure, **sodium** ions from seawater migrate to the cathode and chloride ions to the **anode** of an electrodialysis apparatus. Relatively pure water is left behind in the central compartment.