

BIOCHEMISTRY IN THE LAB

Dialysis

Artificial semipermeable membranes are routinely used in biochemical laboratories to separate small solutes from larger solutes. For example, this technique (referred to as **dialysis**) is used as an important early step in protein purification. A specimen containing an impure protein is placed in a cellophane dialysis bag (Figure 3A), which is suspended in flowing distilled water or in a buffered solution. After a certain time, all the small solutes will have left the bag. The protein solution, which may contain many high-molecular-weight impurities, will then be ready for further purification.

Hemodialysis is a clinical application of dialysis that removes toxic waste from the blood of patients suffering from temporary or permanent renal failure. All constituents of blood except blood cells and the plasma proteins move freely between blood and the dialyzing fluid. Because dialysis tubing allows passage of nutrients (glucose, amino acids) and essential electrolytes (Na^+ , K^+), these and other vital substances are added to the dialyzing fluid. Their inclusion prevents a net loss of these materials from the blood. Because no waste products such as urea and uric acid are in the dialyzing fluid, these substances are lost from the blood in large quantities.

Although hemodialysis is very effective in removing toxic waste from the body, it does not solve all the problems brought on by renal failure. For example, until recently, patients suffering from renal failure often became anemic because they lacked a protein hormone called *erythropoietin*, which is normally

secreted by the kidney. (Erythropoietin stimulates red blood cell synthesis.) Because of DNA technology (Chapter 18), erythropoietin can now be readily administered to dialysis patients.

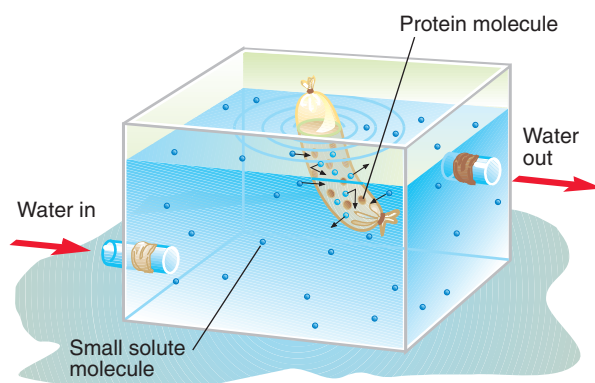


FIGURE 3A

Dialysis

Proteins are routinely separated from low-molecular-weight impurities by dialysis. When a dialysis bag containing a cell extract is suspended in water or a buffered solution, small molecules pass out through the membrane's pores. If the solvent outside the bag is continually renewed, all low-molecular-weight impurities are removed from the inside. ■