

Cyclophosphamide  
 Dactinomycin  
 Erythromycin lactobionate  
 Hydrocortisone sodium succinate  
 Mitomycin  
 Nafcillin sodium  
 Penicillin G potassium  
 Vinblastine sulfate

Sometimes, a liquid is packaged along with the dry powder for use at the time of reconstitution (Fig. 15.8). This liquid is sterile and may contain some of the desired pharmaceutical additives, such as the buffering agents. More frequently, the solvent or vehicle is not provided, but the label generally lists suitable



**FIGURE 15.8** The Mix-O-Vial contains dry ingredients in the bottom compartment and a liquid diluent in the top, separated by a specially formulated center seal. The bottom compartment can be filled either with a liquid that is frozen and dried to make a lyophilized product or with a powder. The diluent in the top contains a preservative and sometimes one or more active ingredients. To use the vial, the dust cover is removed; pressure is applied with the thumb to the top plunger, which dislodges the center seal; and the vial is shaken well. The top of the plunger is then swabbed with a disinfectant; the syringe needle inserted through the target circle on the plunger; and the contents of the vial withdrawn into the syringe. The Mix-O-Vial offers stability of the product until it is activated, convenience, fast operation, and safety as regards the right drug with the proper diluent in the correct proportions. (Courtesy originally provided by Upjohn/Pharmacia [Now Pfizer Company].)

solvents. Sodium chloride injection and sterile water for injection are perhaps most frequently employed to reconstitute dry-packaged injections. The dry powders are packaged in containers large enough to permit proper shaking with the liquid component when the latter is aseptically injected through the container's rubber closure during reconstitution. To facilitate dissolution, the dry powder is prevented from caking upon standing by the appropriate means, including lyophilization (Fig. 15.9). Powders so treated form a honeycomb lattice structure that is rapidly penetrated by the liquid, and solution is rapid because of the large surface area of powder exposed.

Pfizer manufactures the Mix-O-Vial, which incorporates the cover as part of the plunger. Once mixed, the small circle of plastic that covers the injection site is removed. This reduces the touch contamination potential.

The Hospira ADD-Vantage system is another example of a ready-to-mix sterile IV product designed for intermittent administration of potent drugs that do not have long-term stability in solution. With this system, antibiotics and other drugs do not have to be mixed until just prior to administration. ADD-Vantage consists of two components (Fig. 15.10): a flexible plastic IV container partially filled with diluent and a glass vial of powdered or liquid drug. The vials containing the medication and the piggybacks (50 to 250 mL of dextrose 5% in water injection, 0.45% sodium chloride solution, or 0.9% sodium chloride injection) are specially designed to be used together. The vial locks into a chamber inside the plastic container, and the drug is released by removing the stopper



**FIGURE 15.9** Antibiotic lyophilizers. (Courtesy of Hospira, Inc.)