Traditional Vials

Traditional vials for lyophilization range in size from 2 to 100 mL and may be made from tubular or molded glass. However, tubular glass is usually preferred due to better contact with the lyophilizer shelf and, hence, better heat transfer. The elastomeric closures used for a standard freeze-dried vial have openings to allow the passage of water vapor during lyophilization. The elastomeric closures used for lyophilized drug products are generally 13 or 20 mm in diameter. The closure formulation should preferably have a low propensity to absorb moisture during sterilization/storage and exhibit a low-extractability/leachability profile. Additionally, the elastomers may be coated or laminated with a fluorinated polymer to minimize leachables. At the conclusion of the lyophilization cycle, the elastomeric closures are fully seated and a crimp cap is placed over the closure.

Dosing a lyophilized drug product in a vial to a patient requires many steps prior to dosing the patient. These steps include determination of the diluent amount, disinfection of the diluent stopper, loading the diluent into a syringe, disinfection of the lyophilization stopper, adding the diluent into the lyophilization vial, reconstitution of the lyophilized cake, determination of the amount of reconstituted drug product to withdraw, disinfection of the lyophilization stopper, and loading of the dosing syringe. Additional steps may be required if the drug is to be administered via intravenous injection. These multiple steps are not only cumbersome for the health professional or patient but also increase the opportunity for error in dosing or aseptic technique.

Dual Chamber Vials

A DCV is a two-compartment vial where the lyophilized drug product is in the lower compartment and diluent is in the upper compartment. The two compartments are separated by a middle elastomeric closure. An illustration of this package system is shown in Figure 2. The user simply presses a plastic activator to force the middle stopper and diluent to drop into the lower compartment to reconstitute the lyophilized powder. The user is now free to aseptically withdraw the appropriate dose from the vial with a separate syringe. Thus, at time of use, there are six steps prior to dosing the patient. These include activation of the DCV, reconstitution of the lyophilized cake, removal of the cap on the upper chamber, disinfection of the lyophilization stopper, determination of the amount of drug to withdraw, and loading the dosing syringe. Additional steps may be

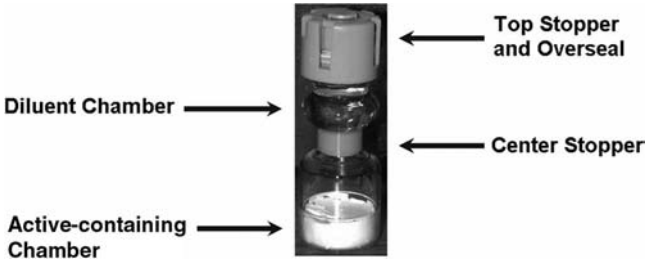

FIGURE 2 Lyophilized cake in dual chamber vial (Act-O-Vial).