adverse conditions, the halogenated hydrocarbon will react with water and form a halogen acid that may corrode the can. Coating of cans can slow down the rate of this corrosion but not necessarily eliminate it. The control of moisture is therefore important not only for this reason but often also for the reason of chemical stability of the drug.

6.2 Sprays

These are mentioned here in distinction from aerosols; they are mostly nasal sprays. In testing these, the droplet size is important in metered-dose sprays, since small droplets can reach bronchi and alveoli, which would be undesirable, e.g., for delivery of corticosteroid treatment of rhinal disease. Yu et al. (1984) have described a simple experimental setup used for determining the droplet size of flunisolid nasal spray. It is a glass chamber with an air inlet and a plastic stopper that has a hole matching that of the spray unit. This is connected via a conical cavity to a cascade impactor and an appropriate flow meter. This can be done (more expensively) by laser holography (Yu et al., 1983). Such instrumentation may be used to follow possible changes in droplet size distribution as a function of time.

VanOort et al. (1994) and Byron (1990) emphasize that the size of the particles is one of the most important factors in the efficiency of deposition of solids from inhalation aerosols. The FDA has called for a sampling chamber size of 500 mL (Adams, 1989). VanOort et al. (1994) have modified the Anderson Impactor as shown in Fig. 14 and have shown that the chamber volume greatly affects the percentage respirable dose.

VanOort et al. (1994) also tested the effect of the chamber volume, as shown in Fig. 15. In an Andersen Sampler (Andersen Sampler Inc., Mark II 1 ACFM Nonviable Ambient Sampler), the manufacturer recommends that, at a flow rate of 28.3 L/min, the effective cutoff diameters (ECD) are 9, 5.8, 4.7, 3.3, 2.1, 1.1, 0.7, and 0.4 μm for stages 0 to 7.

7. POWDERS

Pharmaceutical powders are for reconstitution into either suspensions or solutions. A prescription example of the former is chloramphenicol palmitate, where the reconstitution is carried out by the pharmacist prior to dispensing. An example of the latter is Metamucil, where the customer reconstitutes the product (e.g., in orange juice). Examples of solutions are Achromycin IM (which is a parenteral powder, i.e., not a lyophylizate). Over-the-counter examples of oral solutions of this type are older products such as Vi Magna Granules (Lederle^{TM}). Analogies in the food area are fruit drink powders, which are sold in packets and reconstituted by the consumer to a certain volume.

The main physical concerns in this type of product are appearance, organoleptic properties, and ease of reconstitution. Only the latter will be treated here.

There are several reasons a powder may change dissolution time as a function of storage time. The most common reasons are (a) cohesion, (b) crystal growth, and (c) moisture sorption, which causes a *lumping up* of powders. The latter is simply due to the dissolution and bridge-forming that occurs and is akin to what happens in wet granulation.