



FIGURE 14.6 Liquid filling. Bottles being conveyed after cleaning. As they pass through an indexing worm, the bottles are spaced accurately for filling and capping. (Courtesy of Paddock Laboratories.)

the resin but is slowly released by the ion exchange process in the gastrointestinal tract. An example of this product type is hydrocodone polistirex (Tussionex Pennkinetic Extended-Release Suspension, CellTech).

Extemporaneous Compounding of Suspensions

Unfortunately, not all medicines are available in a convenient, easy-to-take liquid dosage form. Consequently, patients who are not able to swallow solid medicines, such as infants and the elderly, may present a special need. Thus, the pharmacist may have to use a solid dosage form of the drug and extemporaneously compound a liquid product. A difficulty that confronts the pharmacist is a lack of ready information on stability of a drug in a liquid vehicle. It is known that drugs in liquid form have faster decomposition rates than in solid form and some are affected by the pH of the medium. Leucovorin calcium when compounded from crushed tablets or the injectable form is most stable in milk or antacid and is unstable in acidic solutions.

To overcome this information gap, the pharmacist can attempt to contact the manufacturer of the solid dosage form to attain stability information. A number of extemporaneous formulations have appeared in

the professional literature, such as for prednisone oral suspension (4) and ketoconazole suspension (5), and some manufacturers provide in the package insert a formula for preparation of an oral liquid form, such as Rifadin (rifampin, Aventis). A number of compilations of formulations based upon documented stability data and unpublished data compiled by manufacturers and practitioners are available for pharmacists to use, and hundreds of compounded liquid formulations are available through journals such as the *International Journal of Pharmaceutical Compounding*.

Typically, in formation of an extemporaneous suspension, the contents of a capsule are emptied into a mortar or tablets crushed in a mortar with a pestle. The selected vehicle is slowly added to and mixed with the powder to create a paste and then diluted to the desired volume. The selected vehicle can be a commercial product, such as the Ora family of preparations (Ora-Sweet, Ora-Sweet SF, Ora-Plus, Ora-Blend, Paddock Laboratories).

The extent of the formulation depends upon the patient. For example, a liquid suspension for a neonate should not include preservatives, colorings, flavorings, or alcohol because of the potential for each of these to cause either acute or long-term adverse effects. Because this liquid product will