

probably be administered through a tube threaded through the mouth into the stomach and because taste is usually underdeveloped in the neonate, a flavoring agent is not required.

In the neonate, alcohol can alter liver function, cause gastric irritation, and effect neurologic depression. So unless it is absolutely necessary, it should be omitted from an extemporaneous formulation. Pharmacists must be cautious because some vehicles, such as Aromatic Elixir, NF, contain a significant amount of alcohol, 21% to 23%, and are not suitable for use in these patients. The same problem holds for liquid formulations for the elderly or any patient who may be receiving another medication that depresses the central nervous system or would cause the patient to get violently ill, for example, metronidazole (Flagyl) and disulfiram (Antabuse).

Preservatives have been implicated in adverse effects in preterm infants. Benzyl alcohol should be omitted from neonate formulations because this agent can cause a gasping syndrome characterized by a deterioration of multiple organ systems and eventually death. Propylene glycol has also been implicated in problems such as seizures and stupor in some preterm infants. Thus, formulations for neonates should be kept simple and not compounded to supply more than a few days of medicine.

To minimize stability problems of the extemporaneous product, it should be placed in an airtight, light-resistant container by the pharmacist and stored in the refrigerator by the patient. Because it is a suspension, the patient should be instructed to shake it well prior to use and watch for any color change or consistency change that might indicate a stability problem.

## Packaging and Storage of Suspensions

All suspensions should be packaged in wide-mouth containers having adequate airspace above the liquid to permit thorough mixing by shaking and ease of pouring. Most suspensions should be stored in tight containers protected from freezing, excessive heat,

and light. It is important that suspensions be shaken before each use to ensure a uniform distribution of solid in the vehicle and thereby uniform and proper dosage.

## Examples of Oral Suspensions

Examples of official and commercial oral suspensions are presented in Table 14.1. Antacid and antibacterial suspensions are briefly discussed next as examples of this dosage form. In addition, kaolin mixture with pectin is widely used in the treatment of diarrhea.

### *Antacid Oral Suspensions*

Antacids are intended to counteract the effects of gastric hyperacidity and, as such, are employed by persons, such as peptic ulcer patients, who must reduce the level of acidity in the stomach. They are also widely employed and sold over the counter (OTC) to patients with acid indigestion and heartburn. Many patients belch or otherwise reflux acid from the stomach to the esophagus and take antacids to counter the acid in the esophagus and throat.

Most antacid preparations are composed of water-insoluble materials that act within the gastrointestinal tract to counteract the acid and/or soothe the irritated or inflamed linings of the gastrointestinal tract. A few water-soluble agents are employed, including sodium bicarbonate, but for the most part, water-insoluble salts of aluminum, calcium, and magnesium are employed; these include aluminum hydroxide, aluminum phosphate, dihydroxyaluminum aminoacetate, calcium carbonate, calcium phosphate, magaldrate, magnesium carbonate, magnesium oxide, and magnesium hydroxide. The ability of each of these to neutralize gastric acid varies with the chemical agent. For instance, sodium bicarbonate, calcium carbonate, and magnesium hydroxide neutralize acid effectively, whereas magnesium trisilicate and aluminum hydroxide do so less effectively and much more slowly. In selecting an antacid, it is also important to consider the possible adverse effects of each agent in relation to the individual patient. Each agent has its own peculiar potential for adverse effects.