

Table 13.5 EXAMPLES OF ORAL SOLUTIONS BY CATEGORY (Continued)

ORAL SOLUTION	REPRESENTATIVE COMMERCIAL PRODUCTS	CONCENTRATION OF COMMERCIAL PRODUCT	COMMENTS
Opioid Agonist Analgesic			
Methadone HCl	Methadone HCl (Roxane)	1 or 2 mg/mL	For relief of severe pain; detoxification, maintenance treatment of opioid addiction
Vitamin D			
Ergocalciferol	Calciferol Drops (Schwartz)	8,000 U/mL	Water-insoluble ergocalciferol (vitamin D ₂) in propylene glycol. Usual prophylactic dose is about 400 U; therapeutic dose may be as high as 200,000–500,000 U daily in treating rickets.

pharmaceutical interest are described later in this chapter.

Oral Rehydration Solutions

Rapid fluid loss associated with diarrhea can lead to dehydration and ultimately death in some patients, particularly infants. More than 5 million children younger than 4 years of age die of diarrhea each year worldwide (4). Diarrhea is characterized by an increased frequency of loose, watery stools, and because of the rapid fluid loss, dehydration can be an outcome. During diarrhea, the small intestine secretes far more than the normal amount of fluid and electrolytes, and this simply exceeds the ability of the large intestine to reabsorb it. This fluid loss, which occurs mostly from the body's extracellular fluid compartment, can lead to a progressive loss of blood volume culminating in hypovolemic shock.

Diarrhea is a normal physiologic body response to rid itself of a noxious or toxic substance, such as rotavirus or *Escherichia coli*. Thus, the treatment approach is to allow the diarrhea to proceed and not to terminate it too quickly but promptly replace the lost fluid and electrolytes to prevent dehydration. The loss of fluid during diarrhea is accompanied by depletion of sodium, potassium, and bicarbonate ions; if severe, the loss can result in acidosis, hyperpnea, and vomiting as well as hypovolemic shock. If continuous, bouts of vomiting and diarrhea can cause malnutrition as well. Consequently, the goal is to replace lost fecal water with an

oral rehydration solution and use nutritional foods, such as soybean formula and bran.

Oral rehydration solutions are usually effective in treatment of patients with mild volume depletion, 5% to 10% of body weight. These are available OTC and are relatively inexpensive, and their use has diminished the incidence of complications associated with parenterally administered electrolyte solutions. Therapy with these solutions is based on the observation that glucose is actively absorbed from the small intestine, even during bouts of diarrhea. This active transport of glucose is advantageous because it is coupled with sodium absorption. Almost in domino fashion, sodium absorption promotes anion absorption, which in turn promotes water absorption to short-circuit dehydration. To produce maximal absorption of sodium and water, studies have demonstrated that the optimal concentrations of glucose and sodium in an isotonic solution are 110 mM (2%) glucose and 60 mEq/L of sodium ion, respectively. Bicarbonate and/or citrate ions are also included in these solutions to help correct the metabolic acidosis caused by diarrhea and dehydration.

A liter of typical oral rehydration solution contains 45 mEq Na⁺, 20 mEq K⁺, 35 mEq Cl⁻, 30 mEq citrate, and 25 g dextrose. These formulations are available in liquid or powder packet form for reconstitution. It is important that the user add the specific amount of water needed to prepare the powder forms. Furthermore, these products should not be mixed with or given with other electrolyte-containing liquids, such as milk or fruit juices.