

containing 3 g of drug? Whenever possible, it is preferable for ratio strengths to be expressed as 1. In this example, if 3 g of drug is in 6,000 mL of solution, 1 g of drug is contained in 2,000 mL, and thus, the ratio strength is 1:2,000 w/v. Sometimes, the answers do not come out as evenly, for example, what is the ratio strength of 0.3 mL of a liquid in 1 L of solution? In this instance, there is 0.3 mL in 1,000 mL, equivalent to 3 mL in 10,000 mL, or a ratio strength of 3:10,000 v/v, or 1:3,333.3 v/v.

Another ratio strength calculation: In grams, how much drug is needed to make 5 L of a 1:400 w/v solution? By definition (of 1:400 w/v), 1 g of drug is needed for each 400 mL of the solution. Since 5 L, or 5,000 mL, of solution is to be prepared, the amount of drug required is found by solving $1 \text{ g}/400 \text{ mL} = (x) \text{ g}/5,000 \text{ mL}$, or 12.5 g.

Rather than being expressed in terms of percentage strength or ratio strength, the strength of some pharmaceutical preparations, particularly injections and sometimes oral liquids, is based on drug content per unit of volume, as milligrams per milliliter. Thus, flexibility in dosing can be achieved by administering the volume of preparation that contains the desired dose.

Reducing and Enlarging Formulas

In the course of pharmaceutical manufacturing and in professional practice activities, it is often necessary to reduce or enlarge a pharmaceutical formulation to prepare the desired amount of product. A standard manufacturing formulation, or *master formula*, contains the quantitative amounts of each ingredient needed to prepare a specified quantity of product. When preparing other quantities, larger or smaller, the *quantitative relationship* of each component to the other in the formula must be maintained. For example, if there is 2 g of ingredient A and 10 mL of ingredient B (among other ingredients) in a formula for 1,000 mL, one must use 0.2 g of ingredient A and 1 mL of ingredient B to make 100 mL, or one-tenth of the formula. If, on the other hand, a formula is to be enlarged—for example, from 1 L (1,000 mL) of product to a gallon (3,785 mL)—the amount of each ingredient required is 3.785 times that needed to prepare 1 L of product.

In these examples, the quantity of product prepared is reduced or enlarged, but the quantitative relationship between each ingredient and the product strength remains unchanged.

Dosage Units

Drug dosage is selected by the prescriber based upon clinical considerations and the characteristics of the pharmacologic agent. Dosage forms (e.g., tablets, injections, transdermal patches) are used to administer the drug to the patient. Solid dosage forms, such as tablets and capsules, are generally prepared in various strengths to allow flexibility in dosing. The desired dose for a drug prepared in a liquid form may be provided by the volume administered. For example, if a liquid dosage form contains 5 mg of drug per milliliter and if a dose of 25 mg of drug is desired, 5 mL of the liquid may be administered. Commercially manufactured products are formulated to provide the drug in dosage forms and amounts convenient for administration. When the desired dosage or dosage form is commercially unavailable, the pharmacist may be called upon to compound the desired preparation.

Common Household Measure

Liquid and powder medications not packaged in unit-dose systems are usually measured at home by the patient with common household measuring devices, such as the teaspoon or tablespoon. Although the household teaspoon may vary in volume capacity from approximately 3 to 8 mL, the American Standard Teaspoon has been established as having a volume of 4.93 ± 0.24 mL by the American National Standards Institute. For practical purposes, most pharmacy practitioners and pharmacy references use 5 mL as the capacity of the teaspoon. This is approximately equivalent to 1.33 $\bar{3}$, although physicians commonly use the drachm symbol to indicate a teaspoonful in their prescription directions to be transcribed by the pharmacist to the patient. The tablespoon is considered to have a capacity of 15 mL, equivalent to three teaspoonfuls or approximately 0.5 $\bar{3}$.

Occasionally, the pharmacist will provide a special medicinal spoon for the patient to use