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Extended Abstract

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Pharma Sci 2020- Universal pharmaceutical calculations: An overview- Antoine Al-Achi - Campbell University

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Abstract

The purpose of pharmaceutical calculations is to allow the pharmacist to prepare pharmaceutical dosage forms for their patients accurately. There exists a need for every pharmacist to be competent in these calculations for patient's care and safety. Some of the necessary calculations are shown below.

Aliquot method: HLs method permits the pharmacist to make measurements for powders or liquids within acceptable errors (usually 5%). The method relies on knowledge of the sensitivity requirement of the balance (for powders) or the deviation value of the measuring device (for liquids). HLs in turn, allows calculation of the minimum allowable quantity within a predetermined error rate.

Density Factor (DF): The density factor determination is necessary for accurately preparing suppositories in pharmacy. It is defined as the weight of the drug in grams which occupies the same volume as that of 1 g of the base (usually cocoa butter). The Paddock Laboratory method is used for such determination of the DF value.

Milliequivalent (mEq): The notion of mill equivalent applies to ions in solution. When ions interact with each other in solution, they do so, 1 equivalent weight to 1 equivalent weight. For example, 1 equivalent weight of calcium always reacts with 1 equivalent weight of chloride in solution. Stated otherwise, 20 g of calcium react with 35.5 g of chloride to form $CaCl_2$. Note that calcium chloride has 2 equivalent weights of each calcium and chloride (it contains 40 g of calcium and 71 g of chloride).

Milligrams percent (mg %): HLs concentration unit is similar to % w/v, except for the fact that it expresses the number of milligrams of the drug in 100 mL preparation. For a solution which is labelled as 0.12% (% w/v), the concentration may be expressed in mg % (120 mg/100 mL).

Molality (m): When a drug solution is labelled as 1 m, it means that the solution contains 1 mole of the drug per kilogram of solvent. For example, a pharmacist added 3 g of sucrose (342.3 g/mole) to 100 g of water. The resulting solution may be labeled as 0.09 molal. [(3 g)×(1000 g/kg)/(342.3 g/mole)×(100 g)]

Molarity (M): It is defined as the number of moles of the drug in a one-litre solution. For a hydrochloric acid solution with a concentration of 1 M means there is one mole of HCl in every litre solution. Since the molecular weight of HCl is 36.5 g/mole, thus a 1 M solution contains 36.5 g HCl in one-litre preparation. HLs translates into 3.65% (%w/v) from the proportionality. [(100 Ml) × (36.5 g)/(1000 mL)=3.65 g]

Normality (N): The number of gram equivalents of the drug in one liter solution is the basis of this concentration unit. Normality is related to molarity by the following equation.

[Molarity=(Valence) x Normality]. For example, the valence of sulphuric acid is 2 equivalents/mole. Thus a 1 M solution of sulphuric acid is 2 N (or 2 Equivalents/L). Since one equivalent weight of sulphuric acid is [(98 g/mole)/(2

Equivalents/mole)=49 g), then a 2 N solution contains (2×49 g=98 g of sulphuric acid/L).

Part per Million (ppm): HLs concentration unit is reserved for solutions that include ions in a much diluted form. It is defined as the number of parts of the solute present in one million parts of the solution. When water is the solvent (density=1 g/mL), part per million refers to the number of grams of the solute in one million milli liters of solution. Suppose that a solution containing 5 ppm of fluoride ions (19 g/mole) is needed for a patient. The pharmacist may use sodium fluoride (42 g/mole) in preparing this solution. The quantity of NaF needed to make 1 liter of solution is 11 mg (containing 5 mg/L of fluoride ions).

Percent by volume (%v/v): HLs concentration unit defines the number of milli liters of the drug found in 100 mL of solution. If a pharmaceutical solution is labelled as 4% (%v/v) for its glycerine content, thus it contains 4 mL of glycerine in every 100 mL preparation. If the pharmacist measures 20 mL of this solution using a graduated cylinder, he should expect to have 0.8 mL of glycerine in this volume. HLs calculation is also done by proportion [(20 mL) × (4 mL)/ (100 mL)=0.8 mL].

References:

1. Al-Achi A, Gupta MR, Stagner WC (2013) Integrated pharmaceutics: applied preformulation, product design, and regulatory science. Wiley, NJ, USA.
2. Allen LV (2016) The art, science, and technology of pharmaceutical compounding. American Pharmacists Association, DC, USA.
3. Amiji, MM, Cook TJ, Mobley WC (2014) Applied physical pharmacy. McGraw-Hill Education/Medical.
4. Shrewsbury RP (2015) Applied pharmaceutics in contemporary compounding. Morton Publishing, CO, USA.

Biography

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