''बेटी बचाओ, बेटी पढ़ाओ''

JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY, JAIPUR

Faculty of Pharmaceutical Science

Faculty Name - JV'n Devendra Joshi

Course - B.Pharm (3rd sem)

Session - Physical Pharmaceutics – I (Solubility of drugs)

Academic Day starts with–

- Greeting with saying **'Namaste'** by joining Hands together following by 2-3 MinutesHappy session, Celebrating birthday of any student of respective class and **National Anthem**

SOLUBILITY OF DRUGS

Introduction

A material's solubility refers to its capacity to completely dissolve in another substance under particular circumstances. A solution's concentration is often expressed in terms of the mass of solute dissolved in a specific volume of solvent. In most cases, the solubility is stated in grams per liter. As a result, the amount of a solute required to saturate 100 grams or mL of a solvent at a certain temperature is the measure of a solute's solubility in a solvent at that temperature.

Solids that have been dissolved in liquids are the most typical types of solutions. The solute is a solid that dissolves in a liquid, while the solvent is the liquid that the solute dissolves in. a solute is a dissolved component that is typically less

plentiful in solution than solvent.

The solute is a solid that dissolves in a liquid, while the solvent is the liquid that the solute dissolves in. The dissolved ingredient, or solute, is often a less abundant component of a solution, whereas the solvent is a more plentiful component. A solid is considered to be soluble in a liquid if it can dissolve in it; otherwise, it is said to be insoluble in that liquid. A liquid solution gets increasingly concentrated as we add additional solids to it.

A substance can be made into a solution that is more concentrated the more soluble it is. After the solute of interest has had enough contact time (or however long it takes) with the solvent, solubility is assessed. Intrinsic solubility is one of two different types of solubility.

There are two different types of solubility: apparent solubility and intrinsic solubility. The highest concentration at which a solution can be made using a particular solute and solvent is known as intrinsic solubility. The apparent solubility is determined by experimental measurements and depends on environmental factors like pH and ionic strength.

SOLUBILITY EXPRESSIONS

Quantitative words for expressing the solubility of a medication or other molecule in a solvent include percent by mass, percent by volume, molality (m), molarity (M), mole fraction (x), parts per million (ppm), etc. The specific vocabulary we employ primarily relies on the purpose for which it will be used.

The quantity of a chemical that can dissolve in a given volume of solvent at a given temperature is known as its solubility. The expression parts per parts of solvent (for instance, parts per million, ppm) is widely used in the British Pharmacopoeia and other official chemical and pharmaceutical compendia.

The terms "insoluble," "very highly soluble," and "soluble" can also be used to represent a solute's degree of solubility, but because they are imprecise, they are

frequently not found to be useful. Specific concentration terminology must be used for quantitative work. While they may appear to be "insoluble" by a qualitative test, most substances have at least some degree of solubility UN water, and their solubility may be measured and reported exactly. The solubility of chlorpromazine base in aqueous medium at pH 10 is 8 106 mol/dm3. Due to the lack of solid disappearance, it appears to be 'insoluble' even though it is just very little soluble.

Term	Parts of solvent required per part of solute
Very soluble	Less than 1 part
Freely soluble	1 - 10
Soluble	10 - 30
Sparingly soluble	30 - 100
Slightly soluble	100 - 1000
Very insoluble	1000 - 10,000
Insoluble	More than 10,000

Saturated Solution

A saturated solution is one in which the dissolved solute and the undissolved solute, or solid phase, are in equilibrium. When the solid stops dissolving into the solvent, something occurs. Once a certain amount of solute has been added to a solvent, no additional solute can dissolve under the given conditions. The mixture is fully saturated. The solubility of the solute in that solvent at that temperature determines the concentration of the solute in a saturated solution. The point at which the solution is in equilibrium with an undissolved solute is another way to define the term "saturation of solution." The rate at which the molecules or ions leave the solid surface in a saturated solution containing an

undissolved solid solute is equal to the rate at which the solvated solids dissolve**.**

Unsaturated Solution:

A solution that has the dissolved solute present at a concentration lower than that of a saturated solution is said to be an unsaturated solution. The solution is referred to as unsaturated if less solute is added to the solvent. It is generally accepted that medicinal solutions are unsaturated.

Supersaturated Solution:

A saturated potassium chloride solution at 10o C will have 31 grams of this substance dissolved in 100 grams of water. If there are 40 grams of potassium chloride in the container, then there will be 9 grams of undissolved potassium chloride remaining in the solution. Raising the temperature of the mixture to 30o C will increase the amount of dissolved potassium chloride to 37 grams and there will be only 3 grams of solid undissolved. The entire 40 grams can be dissolved if the temperature is raised above 40o C. Cooling the hot solution (40o C) will reverse the process. When the temperature decreased to 20o C the solubility will eventually be decreased to 34 grams. There is a time delay before the extra 6 grams of dissolved potassiumchloride crystallizes. This solution is "supersaturated" and is a temporary condition. The "extra" solute will come out of solution when the randomly moving solute particles can form the crystal pattern of the solid. A "seed" crystal is sometimes needed to provide the surface for solute particles to crystallize on and establish equilibrium.

MECHANISMS OF SOLUTE SOLVENT INTERACTIONS

When a solute and a solvent interact favorably, the solute dissolves in the solvent. The entire dissolving process is reliant on the solute and solvent's free energy changes. A number of variables combine to form the solvation free energy. There are three phases to the process:

(I) one mole of the solute is detached from the bulk form of the solute in this step, and it is then utilized in the solute-solvent interaction.

(II) The creation of an empty space in a solvent.

In this stage, one solvent molecule breaks loose from the solvent and creates an empty space. The interaction between a solute and a solvent also makes use of this empty spot.

(III) Placing a detached solute molecule in the open space of the solution.

IDEAL SOLUBILITY PARAMETERS

To estimate solubility as a result of solute –solvent interaction, some ideal solubility are required which are very well explained by regular solution theory.

This theory suggests a numerical estimation about solubility

$$S = (\Delta U / V)^{1/2} = [(\Delta H - RT)/ V]^{1/2}$$

Where S = solubility parameter

ΔU = molar energy

V =molar volume of solvent

ΔH = molar heat of vaporization

R = Rydberg constant

T = Temperature

Application of solubility parameters

1 Selection of solvent

2 Preparation of polarity scales

3 Co-solvency power

4 Chemical kinetics

5 Determination of mechanism involved in drug

6 Structural activity relationship

7 Drugs transport through model membrane

- **NextTopic-**

➢ Physical Pharmaceutics I – (Solvation and Association Unit-I)

- **AcademicDayendswith-**

Nationalsong'VandeMataram'

Reference

1 Dr. Hajare A. Ashok A text book of physical pharmaceutics nirali prakashan first edition, july 2018