**POWDERS**

**LAB. SIX**

**POWDERS**

A powder can be defined as subdivided solids (drug and /or chemicals) intended for internal or external use.

* Powder present in various dosage forms as: vials, suspension, and dusting powder.
* The term powder is used to describe a formulation in which a drug has been mixed with other powder excipient to produce the final product .The function of the added excipients depends upon the intended use of the product :diluting ,coloring ,flavoring and sweetening agent for example may be added to the powder for oral use.

**Particle size of powders:**

The particles of pharmaceutical powders may range from extremely coarse (about 10mm in diameter) to extremely fine (approaching colloidal dimensions of 1µm or less).

**Notes:**

* The **USP** classifies the particle size of powders into the following terms: very coarse, coarse, moderately coarse, fine and very fine.
* The particle size of the powder can influence a variety of important factors, such as:

1. Dissolution rate of particles intended to dissolve; drug micronization can increase the rate of drug dissolution and its bioavailability.
2. Suspendability of particles intended to remain undissolved but uniformly dispersed in liquid vehicle.
3. Uniform distribution of a drug substance in a powder mixture or solid dosage form to ensure dose –to-dose content uniformity.
4. Penetrability of particles intended to be inhaled for deposition deep in the respiratory tract.
5. Non-grittiness of solid particle in dermal ointments, creams, and ophthalmic preparations.

**Methods for determination of particles size**:

1. Sieving: in which particles are passed by mechanical shaking through a series of known size sieves.
2. Microscopy: in which the particles are sized through the use of calibrated grid back ground or other measuring device.
3. Sedimentation: in which the particles size is determined by measuring the terminal settling velocity of particles through a liquid medium in gravitational or centrifugal environment.
4. Light energy diffraction or light scattering in which particle size is determined by reduction in light reaching the sensor as the particle (dispersed in liquid or gas) passes through the sensing zone.
5. Laser holography: in which pulsed laser is fired through an aerosolized particle spray and photographed in three dimensions with holographic camera.
6. Cascade impaction: is based on the principle that a particle, driven by an air stream will impact on a surface in its path, provided that its inertia is sufficient to overcome the drag force that tends to keep it in the airstream.

**Advantages of powders**:

1. Improve the stability of the drugs such as antibiotics.
2. Easily taken by children or infant.
3. Convenient for dispensing drugs with large dose.
4. Oral powder capsules have a faster dissolution rate than tablets and capsules.
5. Economical (do not need a solvent).

**Disadvantages of powders:**

1. It is not suitable for administration of unpleasant taste drugs.
2. Unsuitable for drugs that deteriorate by oxygen or atmosphere.
3. It is not suitable for administration of potent drug.
4. Unsuitable for administration of drugs inactivated in the stomach.

**Methods of mixing powders:**

Depending upon the nature of the ingredient, the amount of powder to prepare, and the equipment available, powders may be blended by:

1. Spatulation.
2. Trituration.
3. Sifting.
4. Tumbling.
5. **Spatulation:**

Is a method by which a small amount of powder may be blended by the movement of a spatula through the powders on a sheet of paper or an ointment tile.

**Note:**

* Spatulation is not suitable for large quantities of powders containing potent substance ,because homogenous blending is not as certain as through other methods .
* Very little compression or compacting of the powder results from spatulation.
* Spatulation is especially suited to the mixing of solid substances that form eutectic mixtures (or liquefy) when in close and prolonged contact with one another (ex: phenol ,camphor, menthol, aspirin……)

**2. Trituration:**

This method employed both to decrease the particle size and to mix the powder.

**Notes:**

* In trituration method if simple admixture is desired without special need to decrease particle size, the glass mortar is usually preferred.
* In trituration method when a small amount of potent substance, dilution method is used to ensure the uniform distribution of potent drug.

**3. Sifting:**

In this method powders mixing by passing them through sifters like those used in kitchen to sift flour.

**Notes:**

* Sifting result in light fluffy product.
* Sifting is not acceptable for the incorporation potent drugs into diluent powder.

**4.Tumbling:**

By this method the powders are mixed by tumbling in rotating container.

**Dispensing of powders:**

Medicated powder may be provided to the patient as

a. Bulk powder: for non-potent drug as antacid laxative, douche powders.

b. Divided powder: for potent drug as antibiotics.

**Methods of Preparing Divided Powders:**

Depending on the potency of the drug substance, the pharmacist decides to prepare by either method 1 or 2.

1. Weighing Method: By this method each portion of powder is weighed separately before enfolding in a paper.
2. Block and divide method: It is used only for nonpotent drugs, the pharmacist places the entire amount of the prepared powder on a flat surface such as a porcelain or glass plate, pill tile or large sheet of paper and with a large spatula forms a rectangular or square block of powder having a uniform depth. Then, using the spatula, the pharmacist cuts into the powder vertically and horizontally to delineate the appropriate number of smaller, uniform blocks, each representing a dose or unit of medication. Each of the smaller blocks is separated from the main block with the spatula, transferred to a powder paper, and wrapped.

**Rules of mixing and preparation of powders:**

1. Calculate one packet more than the prescribed amount because of the loss of weight.
2. Particle size of the powder should be reduced by the mortar if any crystalline substance is present.
3. Mix the powder by geometrical dilution method.
4. Divide and package.

**Notes:**

* The weight of powder mixture in ***EACH PACKET*** should be at least ***0.1 g or 2 gr.***
* **Remember:**

*When weighing any pharmaceutical ingredient, it is imperative to give due consideration to the accuracy of the instrument being used. However, every balance has its own range and tolerance .*

In preparation of powders, if the ***total amount of an active ingredient is less than the minimum weighable quantity of the balance (0.05 g or 1 gr)***, dilution will be necessary.

* Avoid any fraction present in grain.
* Lactose is usually used as a diluent, because it is colorless, odorless, soluble and generally harmless.

**Types of Paper used to Enclose the Powder:**

1. Simple bond paper.
2. Vegetable parchment, a thin, semi opaque paper having limited moisture resistance qualities.
3. Glassine, glazed, transparent paper, having limited moisture – resistant qualities.
4. Waxed paper, a transparent, waterproof paper.

**Method for wrapping divided powders:**



**Experimental Work:**

**Rx1**

Aspirin gr iv

Phenacetine gr iv

Codeine phosphate 1/8 gr

Ft. pulv

M.Ft. 12 packets

Calculations:

Calculate for 13 packets:

Aspirin : 4 gr \*13 = 52 gr \* 0.065 = 3.38 g

Phenacetine: 4 gr \*13 = 52 gr \* 0.065 = 3.38 g

Codeine phosphate : 1/8 \* 13gr = 1.625 gr \* 0.065 =0.105 g

The total weight of powder mixture = 6.86 g

The weight of each packet = 0.528 g

**Rx2**

Phenacetine gr iv

Caffeine gr i

Ft. pulv

M.Ft. 10 packets

Calculations :

Calculate for 11 packets :

Phenacetine : 4 gr \* 11 = 44 gr \* 0.065= 2.86 g

Caffeine : 1 gr \* 11 = 11 gr \*0.065 =0.715 g

The total weight of powder mixture = 3.575 g

The weight of each packet = 0.325 g

**Rx3**

Bismuth carbonate grv

Sodium bicarbonate gr iii

Magnesium gr vii

Ft. pulv

M.Ft. 4 packets

Calculations :

Calculate for 5 packets :

Bismuth carbonate : 5 gr \*5=25 gr\*0.065 = 1.625 g

Sodium bicarbonate : 3 gr \*5=15 gr \*0.065= 0.975 g

Magnesium :7 gr \*5=35gr \*0.065= 2.275 g

The total weight of powder mixture = 4.875 g

The weight of each packet = 0.975 g

**Dilution of Powders:**

**Rx1**

Codeine phosphate 1/6 gr

Ft.pulv.

M.Ft. 11 packets

Calculations :

Calculate for 12 packets

Codeine phosphate :1/6 gr \*12 = 2 gr

* The weight of powder mixture in EACH PACKET should be at least 0.1 g or 2 gr.

12 packet \*2 gr = 24 gr The total weight of powder mix

24 gr- 2 gr = 22 gr The amount of lactose needed.

**Rx 2**

Phenobarbitone 1/8 gr

Caffeine 1/4 gr

Ft.pulv.

M.Ft. 9 packets

Calculations :

Calculate for 10 packets

Phenobarbitone : 1/8 gr\*10 = 1.25 gr

Caffeine : 1/4 gr\*10 = 2.5 gr

* The weight of powder mixture in EACH PACKET should be at least 0.1 g or 2 gr.

2gr \*10 = 20 gr The total weight

20gr – (1.25+2.5) gr = 16.25 gr the amount of lactose needed

The above described technique is what we commonly refer to as a ‘single dilution’. Potent substances in small amounts require a ‘***double dilution***’ (also known as ‘***serial dilution’***).The latter technique, as its name implies involves more than one dilution step.

**Rx3**

Hyoscine hydrobromide 1/150 gr

Ft. pulv.

M.Ft.12 packets

Calculations:

Calculate for 15 packets

1/150 gr\*15 = 1/10 gr

The total amount of an active ingredient is less than the minimum weighable quantity of the balance (0.05 g or 1 gr) ; dilution is required .

1 gr hyoscine + 9 gr lactose = 10 gr powder mixture ( 1st dilution )

The weight of powder mixture in EACH PACKET should be at least 0.1 g or 2 gr.

15 packets \* 2 gr = 30 gr

30 gr – 10 gr = 20 gr lactose ( 2nd dilution)

Amount of lactose added = 9 gr + 20 gr = 29 gr

**Rx4**

Phenobarbitone 10 mg

Ft. pulv .

M.Ft.5 packets

Calculations:

Calculate for 6 packets . Phenobarbitone is available in 15 mg tablet.

10 mg \*6= 60 mg

60mg/15= 4 tablets

The weight of powder mixture in EACH PACKET should be at least 0.1 g or 2 gr.

6 packets \* 0.1 g= 0.6 g The total weight

Crush the tablets by mortar and pestle , then weigh the powder and calculate the amount of lactose if needed to complete the weight to 0.6 g.

**Rx5**

Sodium bicarbonate bulk powder

Sodium bicarbonate gr x

Compound powder of Rhubab gr iii

Oil of peppermint ɱ ss

Lactose q.s. gr xiv

Ft.pulv

M.ft. One powder

**Rx 6**

Compound magnesium trisilicate oral powder BP

Magnesium trisilicate 50g

Chalk 50g

Heavy magnesium carbonate 50g

Sodium bicarbonate 50g

Ft. pulv.

M.ft

**Rx7**

Zinc ,Starch and talc dusting powder BP

Zinc oxide 25 g

Starch 25g

Sterilized purified talc 25 g

Ft. pulv.

M.Ft.