

Dispensing of powders (Lect. 7)

(Bulk and divided powders)

- ❑ **Medicated powders may be provided to the patient in bulk or may be divided into unit-of-use packages.**
- ❑ **Some powders are packaged by manufacturers, whereas others are prepared and packaged by the pharmacist.**

Bulk Powders

- Among the bulk powders available in **prepackaged amounts** are
- **(a) antacids** (e.g., sodium bicarbonate) and **laxatives** (e.g., psyllium [Metamucil]), which the patient takes by mixing with water or another beverages before swallowing;
- **(b) douche powders** (e.g., Massengill powder), dissolved in warm water by the patient for vaginal use;
- **(c) medicated powders for external application to the skin**, usually topical **anti-infectives** (e.g., bacitracin zinc and polymyxin B sulfate) or **antifungals** (e.g., tolnaftate); and
- **(d) brewer's yeast powder** containing B-complex vitamins and other nutritional supplements.

In some cases, a small measuring scoop, spoon, or other device is dispensed with the powder for measuring the dose of the drug

Bulk powder

1. Dispensing powder medication in bulk quantities is limited to **non-potent** substances.
2. Patients should be **educated** about appropriate **handling, storage, measurement, and preparation** of bulk powder prescription and nonprescription products in addition to the customary counseling at the time of dispensing or purchase. Generally, these products are **stored at room temperature in a clean, dry place.** These products should be kept out of the reach of children.
3. Patients should be instructed how to **measure the appropriate amount of the powder** and be told **the type and volume of liquid or vehicle** to use to deliver the medication consistent with package and/or physician instructions.



Divided Powders

- After a powder has been properly blended (using the geometric dilution method for **potent** substances), it may be divided into individual dosing units **based on the amount to be taken or used at a single time.**
- Each divided portion of powder may be placed on a **small piece of paper** (Latin chartula; abbrev. chart.; powder paper) that is folded to enclose the medication.
- Powders containing substances that should be administered in **controlled dosage** are supplied to the patient in divided amounts in folded papers or packets.

Divided powder

- A number of **commercially** prepared premeasured products are available in **folded papers or packets**, including
- **headache powders** (e.g., Aspegic powders),
- powdered **laxatives** (e.g., psyllium mucilloid, Fybrogel),
- **douche powders** (e.g., Massengill powder packets).



Divided powders may be prepared by the pharmacist

- Depending on the **potency of the drug** substance, the pharmacist decides whether to
- **Weighting method**: weigh each portion of powder separately before enfolding in a paper (**for potent drugs**) (The smallest amount of powders in a packet is **100mg**).
- **block-and-divide method**: approximate each portion by using the block-and-divide method, used only for **non-potent** 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 the powder having a **uniform depth**. Then, using the spatula, the pharmacist cuts into the powder lengthwise and crosswise 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**.

Powder paper

The powder papers may be of any size convenient to hold the amount of powder required, but the most popular commercially available sizes are 2.75 × 3.75 in., 3 × 4.5 in., 3.75 × 5 in., and 4.5 × 6 in..

The papers may be

(a) **simple bond paper**;

(b) **vegetable parchment**, a thin, semi-opaque paper with limited moisture resistance;

(c) **glassine**, a glazed, transparent paper, also with limited moisture resistance; and

(d) **waxed paper**, a transparent waterproof paper.

The selection of the type of paper is **based** primarily on the **nature** of the powder. If the powder contains **hygroscopic or deliquescent** materials, **waterproof or waxed paper** should be used.

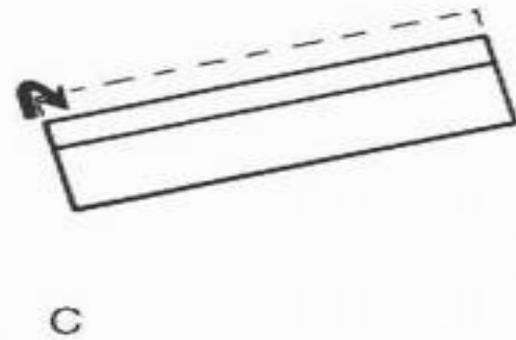
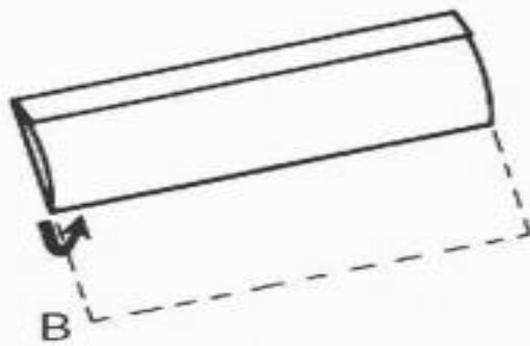
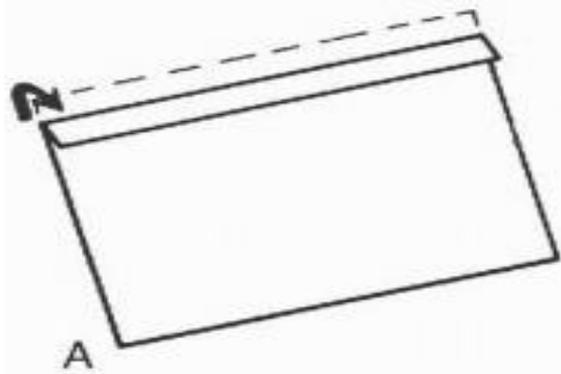
In practice, such powders are **double wrapped** in **waxed paper**, and then for aesthetic appeal they are wrapped in **bond paper**.

Glassine and vegetable parchment papers may be used when only a limited barrier against moisture is necessary.

Powders containing **volatile components** should be wrapped in **waxed or glassine papers**. Powders containing neither volatile components nor ingredients adversely affected by air or moisture are usually wrapped in a **white bond paper**.

Paper folding

- 1. Place the paper flat on a hard surface and fold toward you a uniform flap of about 0.5 in. of the long side of the paper. To ensure uniformity of all of the papers, this step should be performed on all the required papers concurrently, using the first folded paper as the guide (A).**
- 2. With the flap of each paper away and on top, place the weighed or divided powder in the center of each paper.**
- 3. Being careful not to disturb the powder excessively, bring the lower edge of the paper upward and tuck it into the crease of the flap (B)**
- 4. Grasp the flap, press it down upon the tucked-in bottom edge of the paper, and fold again with an amount of paper equal to the size of the original flap (0.5 in.) (C).**
- 5. Pick up the paper with the flap on top, being careful not to disturb the position of the powder, and place the partially folded paper over the open powder box (to serve as the container) so that the ends of the paper extend equally beyond the sides (lengthwise) of the open container. Then, press the sides of the box slightly inward and the ends of the paper gently down along the sides of the box to form a crease on each end of the paper. Lift the paper from the box and fold the ends of the paper along each crease sharply so that the powder cannot escape (D).**
- 6. Place the folded paper in the box so that the double-folded flaps are at the top, facing you, and the ends are folded away from you (E).**



E

Nowadays

- ❑ For **convenience** and **uniformity of appearance**, pharmacists may use **commercially available small cellophane or plastic envelopes** to **enclose individual doses or units** of use rather than folding individual powder papers. These envelopes are usually **moisture resistant**, and **their use results in uniform packaging**.
- ❑ Today, powder papers are **rarely used on an out-patient**, community practice basis and their use is confined to institutional and research practice

Examples

- Drugs that are provided in this drug delivery form include polyethylene glycol 3350 (i.e., MOVICOL),
- ColonClean



Granules

- Granules are prepared **agglomerates of smaller particles** of powder. They are **irregularly shaped** but may be prepared to be **spherical**. They are usually in the 4- to 12-mesh sieve size range, although granules of **various mesh** sizes may be prepared depending upon their **application**.

Advantage of granulation

1. Granules **flow better than powders**. The easy flow characteristics are important in supplying drug materials from the hopper or feeding container into the tableting presses. For this reason powder mixtures are usually granulated if they are intended to be compressed into tablets. Granules also **eliminate or control dust**.
2. Granules **increase compressibility**.
3. Granules have **smaller surface area** than a comparable volume of powders. This makes granules **more stable physically and chemically** than the corresponding powders. Granules are **less likely to cake or harden upon standing than are powders**.
4. Granules are **more easily wetted** by a solvent than are certain powders (which tend to float on the surface), so that granules are also preferred in making solutions. Example: Principen[®] (ampicillin) for Oral Suspension (Squibb). Ampicillin is unstable in aqueous solution, so it is usually prepared as granules and reconstituted by a pharmacist with purified water just prior to dispensing. The granules also contain **colorants, flavorants**, and other pharmaceutical ingredients, so the resulting solution or suspension has all the desired medicinal and pharmaceutical features of a liquid pharmaceutical.
5. Granules produce **particle-size uniformity, thus content uniformity**.

Examples

- A number of commercial products containing **antibiotic drugs that are unstable in aqueous solution are prepared as small granules for constitution** by the pharmacist with purified water just prior to dispensing.
- Examples include
- **KLACID granules** for oral suspension (**clarithromycin**, Abbot),
- **Augmentin ES-600** (**amoxicillin/ clavulanate** potassium, GSK
- **Uricol** granules.
- The granules are prepared to contain not only the medicinal agent but also **colorants, flavorants, and other pharmaceutical ingredients**.
- The granules are measured and **mixed with water** or other beverages, **sprinkled on food**, or **eaten plain**.
- Granulations of effervescent products may be **compressed into tablet** form, as **Zantac EFFER dose** tablets (Glaxo Wellcome). Also (**Multivitamins**) **effervescent granules** and tablets are dissolved in water before use.

preparation of granules:

Wet method

- **wet method** is to **moisten** the powder or powder mixture and then **pass the resulting paste through a screen** of the mesh size to produce the desired size of granules.
- The granules are placed on **drying** trays and are dried by air or under heat. The granules are periodically moved about on the drying trays to prevent adhesion into a large mass.
- Another type of **wet** method is **fluid bed processing**, in which particles are placed in a conical piece of equipment and are **vigorously dispersed and suspended** while a liquid excipient is sprayed on the particles and the product dried, forming granules or pellets of defined particle size

Dry method for granulation

- **The dry granulation method** may be performed in a couple of ways. By one method, the dry powder is passed through a **roll compactor** and **then through a granulating machine**.
- An alternative dry method, termed **slugging**, is the compression of a powder or powder mixture into large tablets or slugs on a compressing machine under 8,000 to 12,000 lb of pressure, depending on the physical characteristics of the powder. The slugs are generally **flat-faced and are about 2.5 cm (1 in.) in diameter**. The slugs are granulated into the desired particle size, generally for use in the production of tablets.
- The dry process often results in the **production of fines, that is, powder that has not agglomerated into granules**. These fines are separated, collected, and reprocessed

Effervescent granulated salts

- Effervescent salts are granules or coarse to very coarse powders containing **a medicinal agent in a dry mixture usually composed of sodium bicarbonate, citric acid, and tartaric acid**. When added to water, the acids and the base react to liberate carbon dioxide, resulting in effervescence.
- **The resulting carbonated solution masks undesirable taste of any medicinal agent.**
- Using **granules or coarse particles** of the mixed powders rather than small powder particles **decreases the rate of solution** and **prevents violent and uncontrollable effervescence**. Sudden and rapid effervescence could overflow the glass and leave little residual carbonation in the solution.
- Using a combination of citric and tartaric acids rather than either acid alone avoids certain difficulties. When **tartaric acid is used as the sole acid, the resulting granules readily lose their firmness and crumble**. **Citric acid alone results in a sticky mixture difficult to granulate.**

Effervescence

- A good effervescent blend consists of both citric acid and tartaric acid (1:2 ratio).



- (Mwt = 84) Citric acid (Mwt = 210)



- Tartaric acid (Mwt = 150)

- The ratio of the effervescent ingredients is **1:2:3.4** for the citric acid: tartaric acid: sodium bicarbonate.
- Effervescent granules are prepared by two general methods: **(a) the dry or fusion method and (b) the wet method**

Fusion or dry method

- In the fusion method, the one molecule of water present in each molecule of citric acid acts as the binding agent for the powder mixture. **Before mixing** the powders, the **citric acid crystals are powdered and then mixed with the other powders of the same sieve size to ensure uniformity of the mixture.**
- The sieves and the mixing equipment should be made of stainless steel or other material resistant to the effect of the acids.
- The mixing of the powders is performed as rapidly as is practical, preferably in an **environment of low humidity** to avoid absorption of moisture and a **premature chemical reaction.**
- After mixing, the powder is placed on a suitable dish in an **oven** at 34°C to 40°C. During the heating process, **an acid-resistant spatula** is used to turn the powder. **The heat releases the water of crystallization from the citric acid,** which in turn **dissolves a portion of the powder** mixture, setting the chemical reaction and consequently **releasing some carbon dioxide.**

- This causes the **softened mass of powder to become somewhat spongy**, and when it has reached the proper consistency (as bread dough), it is removed from the oven and rubbed through a sieve to produce granules of the desired size (**Screening**).
- **a No. 4 sieve** produces large granules,
- **a No. 8 sieve** prepares medium size granules, and
- **a No. 10 sieve** prepares small granules.
- The granules are dried at a temperature not exceeding 54°C and are immediately placed in containers and tightly sealed

Wet Method

- The wet method differs from the fusion method in that the source of **binding agent is** not the water of crystallization from the citric acid but the **water added to alcohol as the moistening agent**, forming the pliable mass for granulation.
- In this method, all of the powders may be **anhydrous** as long as water is added to the moistening liquid. **Just enough liquid is added (in portions) to prepare a mass of proper consistency;** then the granules are prepared and dried in the same manner as described.

THANK YOU