

# Dry Granulation

Lab 3

Industrial pharmacy

Lec. Ashti M.H. Saeed

Assist. Lec. Marwa Malik

# Dry granulation

**Granulation** is the process in which the primary powder particles are made to adhere to form large multi-entities called granules.

## Primary reasons for granulation:

To prevent segregation.

To improve flow properties of the mix.

To improve compaction characteristics of the mix.



# Secondary reasons for granulation

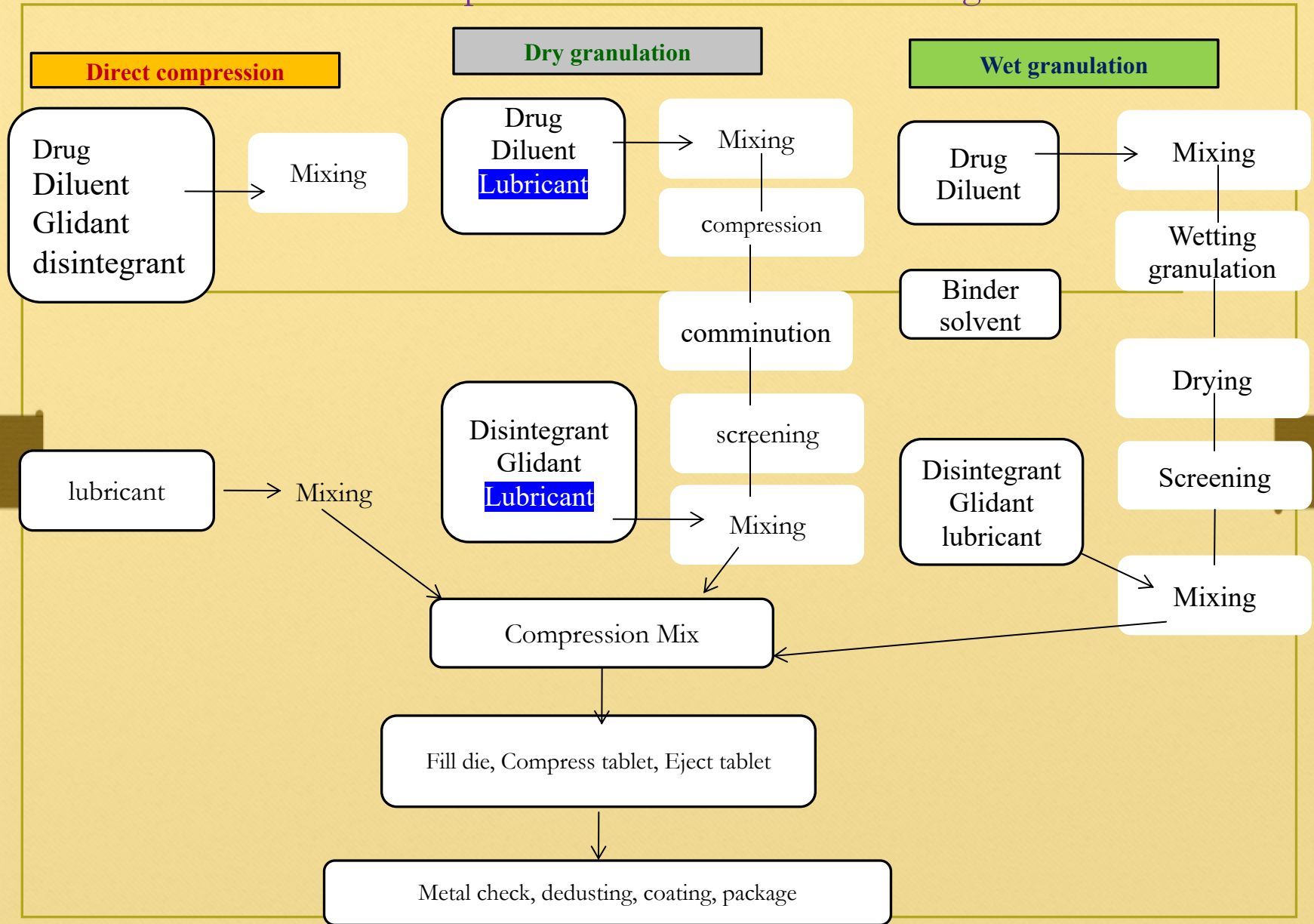
Reduce the hazard associated with the generation of **toxic dust** which may arise when handling powder.

Reduce the hazard associated with the storage of powder that is slightly hygroscopic and may adhere to form a **cake**.

More convenient for **storage and shipment** as it is denser than powder and occupies less volume per unit weight.

- **Dry granulation** → preparation of granules by dry compression [compaction] (**powder particles aggregate at high pressure**)  
Then → milling to random size Then in dry granulator or homogenizer To get certain size.

# Unit operations in tablet manufacturing





# Methods of dry granulation



**A. Slugging technique  
(double compression)**



**B. Roller compaction  
technique**

## A- Slugging technique:

**Slug:** large flat tablet (large compact) or pellets contains half amount of lubricant, but its not actually tablet because it doesn't obey the method of evaluation or assay of the tab.

1. Prepare the formula
2. Milling
3. Weigh all the substances and 1/2 amount of lubricant. (Because it is needed during slugging by tablet machine to eject the slug from die).
4. Mix well by mixer and compress into large tab. (slug) using large punch and die (diameter  $\frac{3}{4}$  to 1.25 inch).
5. Grinding slug by dry granulator or homogenizer to convert slug into granules.



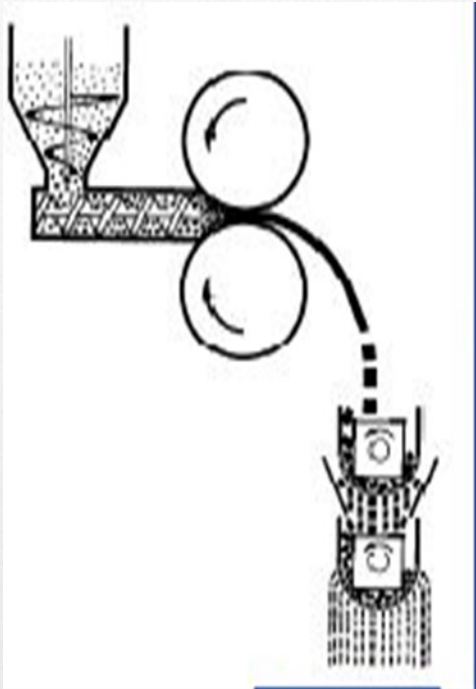
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6. Weigh granules and divide by weight of single tablet to get real no. of tablets

**(Real no. of tablets = total weight of granules before 2<sup>nd</sup> lubrication/wt. single tab. Before 2<sup>nd</sup> lubrication)**

7. Second compression after addition of calculated amount of lubricant, mix and compress by normal machine.



# Rollers or chilsonator roller compactor



Two rolls rotate against each other, to increase the density of powder by pressing it between the rollers and get a thin wide sheet or ribbon equivalent to the slug produced by slugging, then these ribbons or aggregates are screened to produce uniform granules.

# Advantages of dry granulation

**More economic, less space, less equipment than wet granulation.**

— **No need for drying so it is not time consuming.**

— **Used for moisture sensitive materials.**

— **The disintegration time is improved because the binder used in powder form, so the adhesive effect is less so fast disintegration.**

□ **No migration of colors (mottling) that may occur in wet granulation because of presence of moisture.**



# Disadvantages of dry granulation

Slugging required specialized heavy duty machine

Produces more dust which may cause contamination of the product.

Generation of charges of static electricity and lead to reduce flowability (multiple screening that will reduce P.S.).

Decreases the dissolution of insoluble drugs (lipophilic drug) in spite of reducing particle size. Here, sticking of particles that may affect flowability.

## Preparation of sodium phenobarbital tab. by using dry granulation

- **Organoleptic properties** (crystalline powder)
- **Solubility** (freely soluble in water 1:3)
- **Stability** (phenobarbitone is not affected by heat or moisture, but sod. phenobarbital decompose by heat and moisture so it's hygroscopic by absorbing  $\text{CO}_2$  from atmosphere to convert to phenobarbitone).



# Formula

Sod. Phenobarbitone	15 mg	(active ingredient)
Lactose	5 mg	(diluent)
Emcompress	20 mg	(diluent)
Starch	20 mg	(disintegrant)
Acacia	10 mg	(binder)
Sod. Stearate	5 mg	(lubricant)

Prepare 30 tablets.

## Calculations:-

Total wt of each tablet =  $10+5+20+20+10+5 = 75 \text{ mg}$

Since, half amount of lubricant should be added in the 1<sup>st</sup> mixing step; So,

$$5\text{mg}/2 = 2.5 \text{ mg of Sod. stearate per tablet}$$

1.  $2.5 * 30 = 75 \text{ mg}$  of Sod. Stearate should be added in the 1<sup>st</sup> lubrication

2.  $75 - 2.5 = 72.5 \text{ mg}$  wt of single tablet before 2<sup>nd</sup> lubrication

Suppose, the wt of granules mixture before 2<sup>nd</sup> lubrication are 2040 mg

3. (Real no. of tablets = total weight of granules before 2<sup>nd</sup> lubrication/wt. single tab. Before 2<sup>nd</sup> lubrication)

$$= 2040/72.5$$

$$= 28.2 \text{ tablets}$$

So;  $2.5 * 28.2 = 70.5 \text{ mg}$  of sod. Stearate added in the 2<sup>nd</sup> lubrication





Lachman L., Liberman's H.A., editors. The Theory and practice of industrial pharmacy. New Delhi: CBS publishers and Distributors; 2013