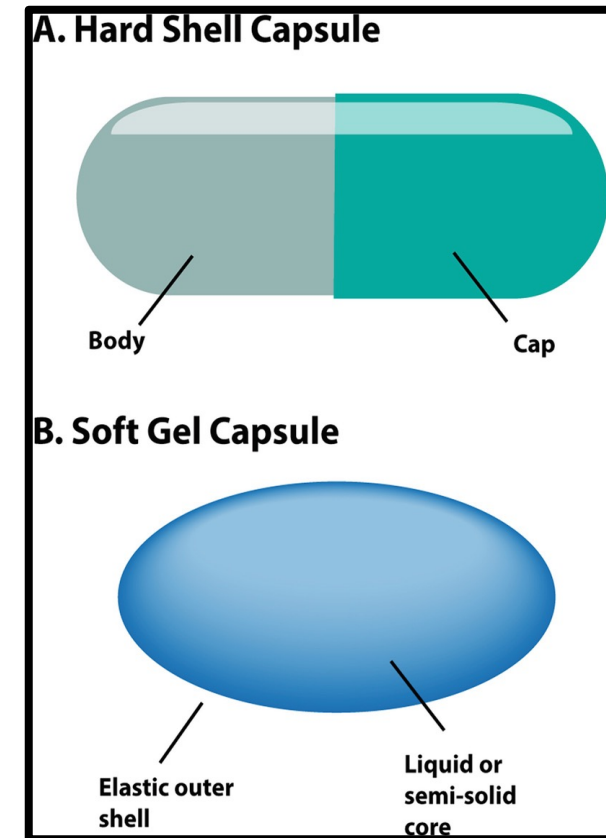




Capsule Dosage Form

Capsules

- Solid dosage form in which the drug substance is enclosed within a hard or soft soluble shell generally formed from **gelatin**.
- **Advantages:**
 1. Easier than tablet to hide the undesirable taste or smell.
 2. Elegant looking and easy to swallow
 3. Minimal amount of excipients and little compression are required during formulation.
- Capsules are classified into **hard and soft** gelatin capsules
- Soft cap. is made of more flexible, plasticized gelatin film than hard gelatin capsules.
- Soft gelatin capsules are made and filled/sealed in one process while the hard gelatin cap. are made and filled in two separate processes

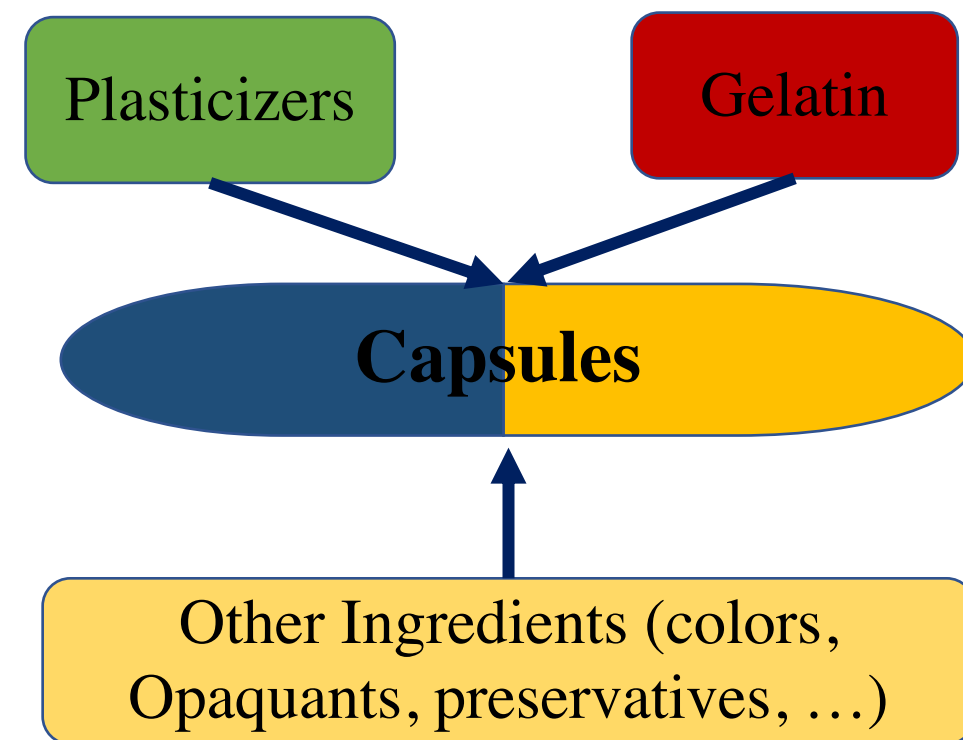


Capsule Shell Compositions



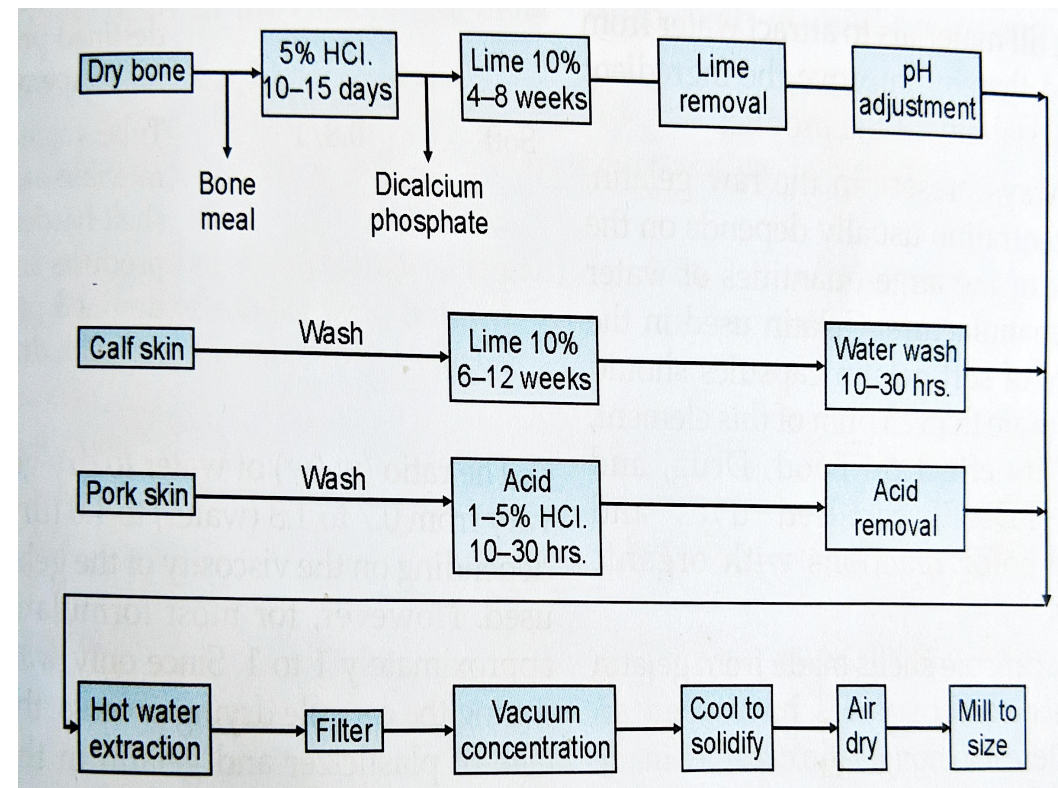
- **Gelatin:**
- Is the main component in the shell of both hard and soft gelatin capsule.
- Gelatin is obtained from hydrolytic extraction of treated animal collagen.
- Its physical and chemical properties depend on the parent collagen, method of extraction and pH value.
- Common sources of collagen are animal **bones**, hide portions, and frozen pork **skin**.
- Collagen from bones and skin are readily available in commercial quantities.

Main Ingredients in Capsule Shell



Gelatin Synthesis

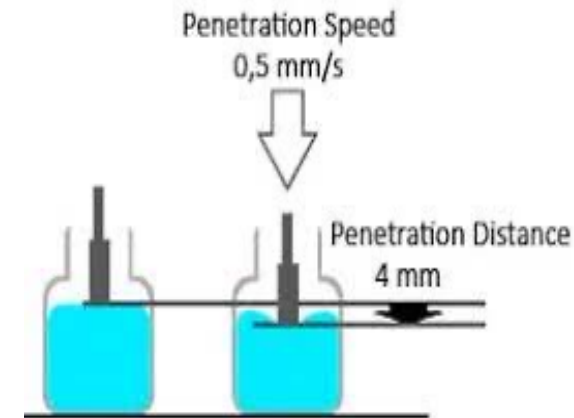
- **Type A** gelatin is derived from an acid-treated precursors.
- Type B gelatin is from an alkali-treated precursor.
- Capsule shell can be made from either one. However, the **best shell** is the one that made from mixture of both.
- Mixture of bone and skin gelatin are used for production of cap. shell.
- Bones gelatin produce tough, firm film, but tends to be hazy and brittle.
- **Skin** gelatin contributes plasticity and clarity to the blend and thereby reducing haze or cloudiness in the finished capsules.



Not for save

Gelatin

- Main Specification required for gelatin is the **Bloom strength**.
- The *bloom* or gel strength of gelatin is a **measure** of the cohesive strength of the cross linking that occurs between gelatin molecules and is proportional to the molecular weight of the gelatin.
- Bloom test is determined by measuring the weight in grams required to move a plastic plunger 4 mm deep into a 6.6% gelatin gel that has been gelled at 10 °C for 17 hrs. bloom range from 150 to 250 g.
- The **higher** the bloom strength of the gelatin used, the more physically stable is the resulting capsule shell.
- The cost of gelatin is directly proportional to its bloom value.



Capsule compositions



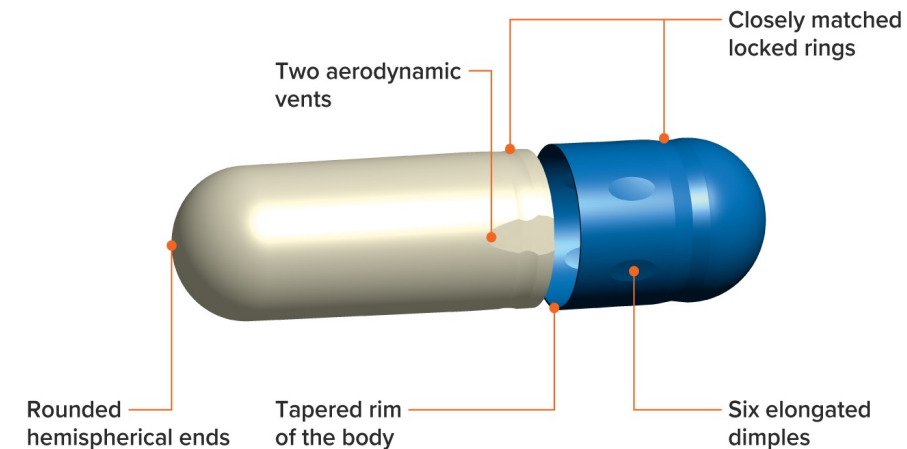
- **Plasticizers:**
- More common for **soft** gelatin capsules.
- The ratio of plasticizers to gelatin determines the hardness of the shell.
- Example of materials used as a plasticizer are: **glycerin, sorbitol** and combination of both.

- **Additional components:**
- Color, Opaquants, or materials such as **methyl cellulose** and polyvinyl alcohols have been used to **modify the solubility** of gelatin or to produce an enteric capsule.

Hard Gelatin Capsules

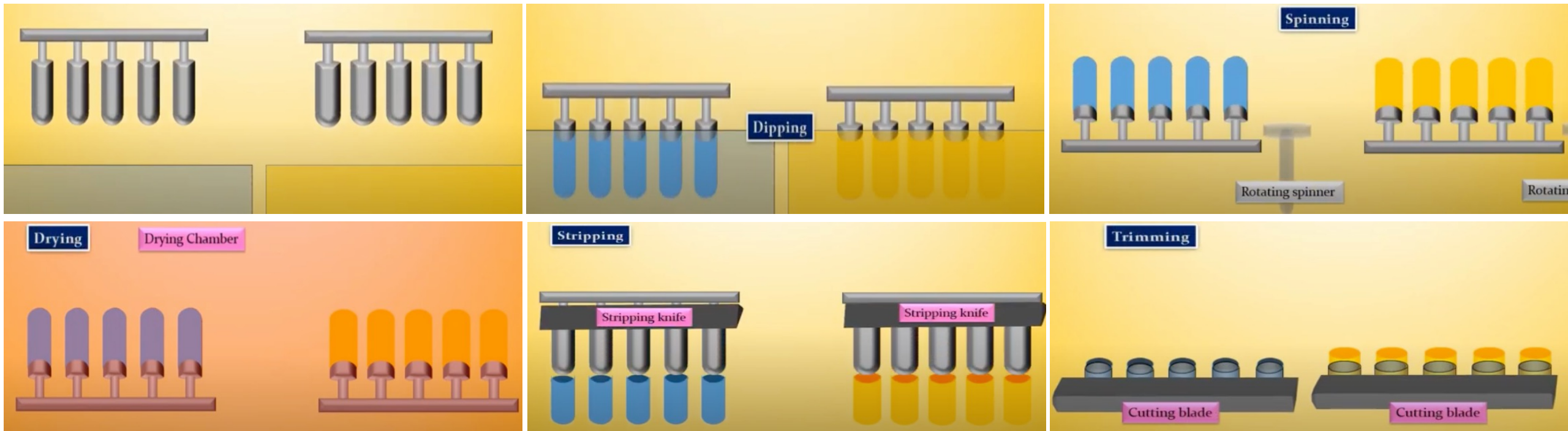


- **Hard capsules are preferred over tablet due to:**
- Easier to formulate because there is no requirement that the powders be formed into a coherent compact that will stand up to handling.
- Capsule filling process is easy and requires minimal strength.
- Preferred to hide undesirable taste, odor.
- Easier to modify release profile due to limited factor involved.
- **Disadvantage:**
- Capsule filling is much slower than tablet press process.
- Some drugs may cause irritation when suddenly release in stomach (specially for extremely soluble compounds)



Hard Capsule Shell Synthesis

- Include different steps:
- Dipping → Spinning → Drying → Stripping → Trimming → Joining



- <https://youtu.be/IDtNhL7z06M>

Hard Capsule Shell Synthesis

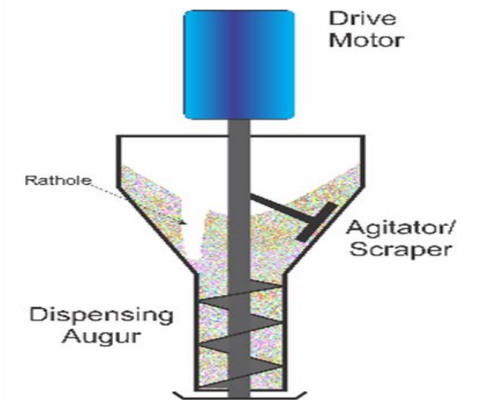


- **Dipping:** Cold pins of a **specified size** are dipped into a hot gelatin solution of a controlled viscosity. Solution **viscosity, rate and time** of dipping will determine the shell **thickness**. Both cap and body are dipped in the same time into a solution of similar viscosity.
- **Spinning:** Pins are rotated to distribute the gelatin uniformly during which the time the gelatin may be set or gelled by a blast of **cool air**.
- **Drying:** The pins are moved through a series of controlled air drying kilns (oven) for the gradual and precisely controlled removal of water.
- **Stripping:** The capsules are stripped from the pins.
- **Trimming:** Capsules halves are trimmed to exact length.
- Finally the capsules halves are **joined** to each other and ejected from the machine.

Capsule Filling Machine



- Capsules can be filled with a wide range of pharmaceutical materials including: powders, granules, tablet, capsule, paste, **non-aqueous** and oily liquids.
- Capsule filling machines work based on **two** feeding mechanisms:
- **Auger** type (dependent): capsules are filled with **loose powder**.
- In this type powder is transferred directly to capsule body and flow of powder is aided by either revolving auger or by vibrating plate.
- <https://youtu.be/r22IKhI3g9M>

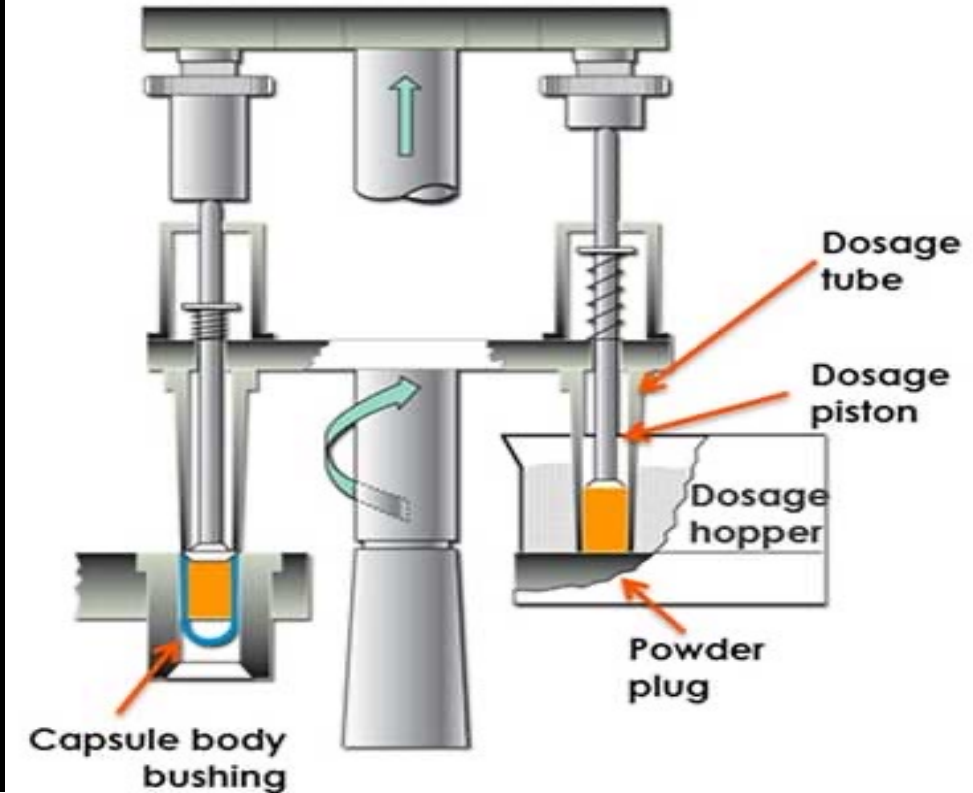
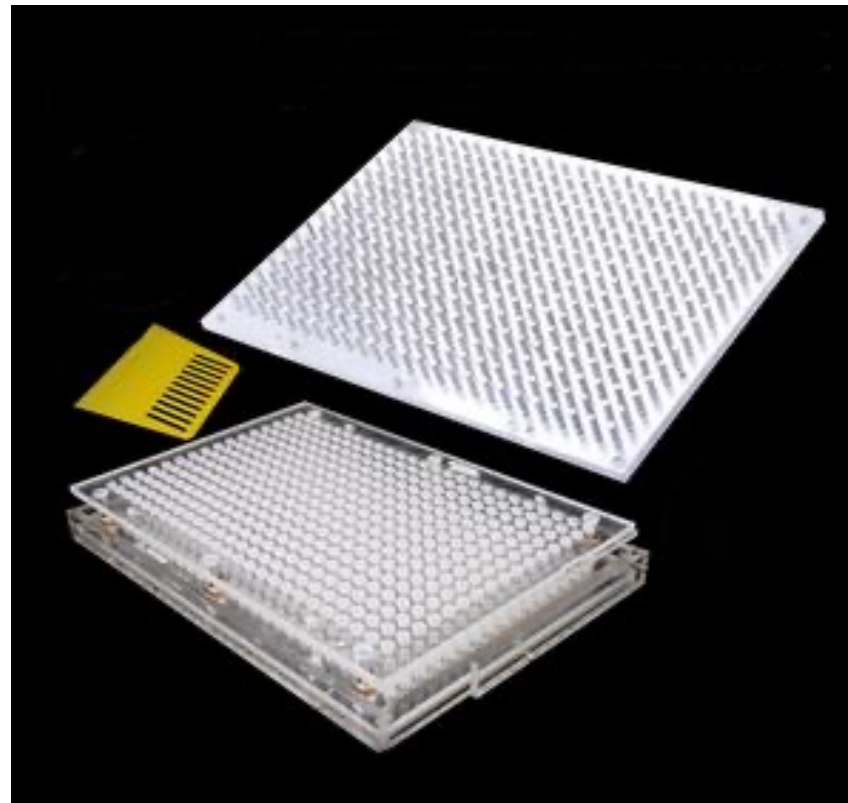


Auger Filler

Changeover.com
We change downtime to uptime

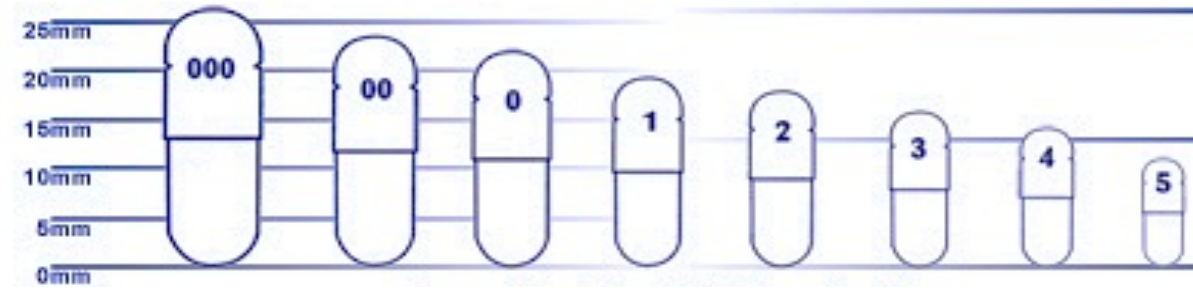
Dosator Type filling machine

- **Dosator** type (independent): compressed the measured amount of powder to form a **plug**.
- <https://youtu.be/XrZgRCWH3No>



Capsule Capacity

- The empty capsules are sold by size.
- The once most commonly employed for human use range from **size 0** (the largest) to size 5 (the smallest).
- **Size 00** capsules may occasionally be used if the amount to be filled is large (capacity ~ 960 mg).
- Powder weights listed are approximate and vary with the amount of pressure employed in hand filling, or with the type of equipment utilized in machine filling.



Capsule Size	Typical Volume (ml)	Fill weight = tap density * Capsule volume		
		Light Density = 0.6g/ml	Medium Density = 0.8g/ml	Heavy Density = 1 g/ml
		Fill weight (mg)		
0	0.68	408	544	680
1	0.5	300	400	500
2	0.37	222	296	370
3	0.3	180	240	300
4	0.21	126	168	210
5	0.13	78	104	130

Finishing and Polishing



- Finished capsules from filling equipment require some type of dust removal and/or polishing before the remaining operations of inspection, bottling and labeling are done.
- The following equipment are commonly used for this purpose:
 1. **Pan polishing:** A piece of cloth is placed in the pan, and this cloth is used to trap the removed dust as well as to impart a gloss to the capsules.
 2. **Hand polishing:** the capsules are rubbed with a cloth manually. This procedure imparts somewhat improved gloss to the capsule.
 3. **Brushing:** capsules are fed under rotating soft brushes, which serve to remove the dust from the capsule shell.



Alternate Capsules



- Capsule shell can be made from material other than gelatin for various reasons. That includes religious, vegetarian dietary restrictions.
- **Hydroxypropyl methyl cellulose (HPMC):** odorless, and flexible and their appearance corresponds to that of gelatin capsules, except that surface of HPMC capsules is **matte**. HPMC is plant derived material.
- **Starch Capsules:** capsule shell is made of potato starch and represent direct alternative to hard gelatin capsules.
- **Pullulan capsules**
- Biopolymer material. It is a Polysaccharide produced by the fermentation of carbohydrate (like starch/sugar) by the fungus *Aureobasidium Pullulan*.
- These are 100% natural vegetable capsules which are edible polymer, odorless & have no identifiable taste.



Soft Gelatin Capsules

Soft Gelatin Capsules (SGcaps)



- Solid dosage form containing **liquid** medication.
- They are formulated for oral, suppository, topical, and for cosmetic uses.
- As in hard gelatin capsule, the shell of the capsule is composed of **gelatin**, water and plasticizer. In addition, it may contain compounds such as preservatives, colors and opaquing agent.
- The difference from hard gelatin capsule is the **high amount of water** which may constitute up to 50%.

SHAPES OF SOFT GELATIN CAPSULES:

OBLONGS



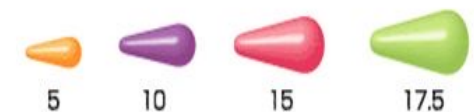
OVALS



ROUNDS



SUPPOSITORIES



SPECIAL SHAPES



Advantages



- It offers the following advantages:
 1. They permit liquid medications to become **easily portable**.
 2. **Uniformity** of dosage because they contain liquid which is more uniform than powder.
 3. The **disintegration** and dissolution rates are faster than that of other solid dosage forms.
 4. The **bioavailability** of drugs is often improved since these capsules contain the drug in liquid form.
 5. Safer handling of **highly potent** or cytotoxic drug compound.

Disadvantage:

- It does require special equipment and skills to formulate.

Capsule Contents



- The content of soft gelatin capsules may be solution or suspension.
- Only those liquids that are both water-miscible and volatile **cannot** be included as major constituents of the capsule content since they can migrate into the hydrophilic gelatin shell and volatilize from the surface. (**Water** and **ethyl alcohol** fall into this category).
- However, up to 5%, water and alcohol can be used as minor constituents (e.g., as cosolvents to aid in the preparation of solution).

Capsule Contents

- Preparations for encapsulation should have a pH between 2.5-7.5 since preparations that are more **acidic can cause hydrolysis** of the gelatin shell while those that are more **alkaline can tan the gelatin** and thus affect the solubility of the shell.
- Solids are incorporated into the soft gelatin capsules as either a solution or suspension.
- The preparation of a suitable solution of a solid medicament should be the first goal of the pharmacist. Usually, a solution is more easily encapsulated and exhibits better uniformity and *physical* stability than does a suspension.

