

# *Hard capsules*

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The Theory  
and Practice of Industrial  
Pharmacy

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THIRD EDITION  
INDIAN EDITION

# Capsules

latin – capsulae (caps.)

The drug is contained in a gelatin shell   
that breaks open after the capsule has  
been swallowed, releasing the drug.

The hard-shell gelatin   
capsules contain solid drugs



The soft-shell gelatin   
capsules contain oils



**Slow-release capsules contain pellets  that dissolve in the gastrointestinal tract, releasing the drug slowly.**

**Gastro-resistant capsules contain  pellets that dissolve in the intestine.**

# Capsule shell

**These capsules are made up of gelatine blends, small amount of certified dyes, opaquants, plasticizers and preservatives.**

# Gelatin

it is heterogeneous product derived by hydrolytic extraction of animal collagen. the source of gelatins including animal bones, hide portions and frozen pork skin

# Gelatin

Its physical and chemical properties are mainly functions of the parent collagen, method of extraction, pH value, thermal degradation, and electrolyte content.

## Type A

Derived from acidic treated precursor that exhibits an isoelectric point at pH at 9. It is manufactured mainly from pork skin.



## **Type B**

**Derived from alkali treated precursor that exhibits an isoelectric point at pH at 4-7. It is manufactured mainly from animal bones.**

Blends of bone and pork skin gelatins of relatively high gel strength are normally used for hard capsule production. The bone gelatin produces a tough, firm film, but tends to be hazy and brittle. The pork skin gelatin contributes plasticity and clarity to the blend, thereby reducing haze or cloudiness in the finished capsule.

# Parts of capsules



# Manufacture of empty gelatin capsules

Steps involved are:

Dipping

Spinning

Drying

Sipinning

Trimming and joining

Polishing

# Dipping:

Pairs of the stainless steel pins are dipped into the dipping solution to simultaneously form the caps and bodies.

The dipping solution is maintained at a temp. of about 50 °C in a heated, jacketed dipping pan.

# Spinning:

The pins are rotated to distribute the gelatin over the pins uniformly and to avoid the formation of a bead at the capsule ends.

# Drying:

The gelatine is dried by a blast of cool air to form a hard shell.

The pins are moved through a series of air drying kilns to remove water.

# Stripping:

A series of bronze jaws strip the cap and body portions of the capsules from the pins.



# :Trimming and joining

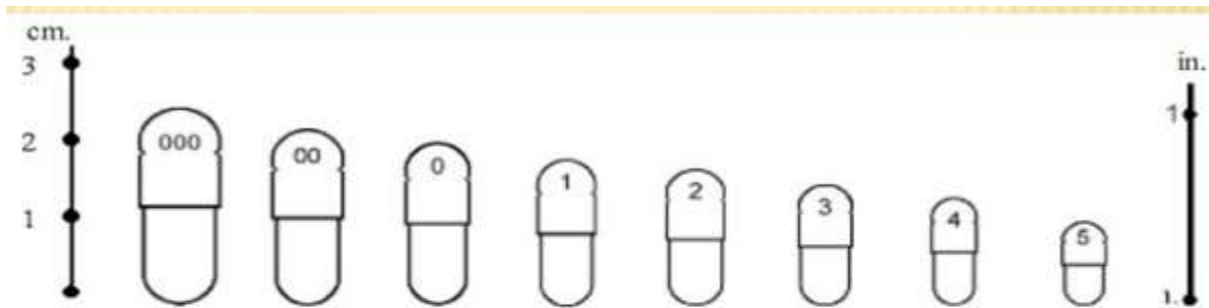
The stripped cap and body portions are trimmed to the required length by stationary knives.

After trimming to the right length, the cap and body portion are joined and ejected from the machine.

# Size of capsules

Size	Volume in ml	Size in mm
000	1.37	26.3
00	0.95	23.7
0	0.68	21.8
1	0.50	19.2
2	0.37	18.3
3	0.30	15.3
4	0.21	14.7
5	0.15	11.9

# Shapes of capsules



- \*The largest size of the capsule is No: 000.
- \*The smallest size is No: 5.
- \*The standard shape of capsules is traditional, symmetrical bullet shape.

# Filling of hard gelatin capsules

## Various Filling Machine Available...

- ✗ Eli-lily and Co
  - ✗ Farmatic
  - ✗ Hofliger and Karg
  - ✗ Zanasi
  - ✗ Parke-Davis.
- ✗ These machine differ in there design and output

# Polishing

**Pan polishing:** Acela-cota pan is used to dust and polish.

**Cloth dusting:** capsules are rubbed with cloth.

**Brushing:** capsules are feed under soft rotating brush

# Storage

Finished capsules normally contain an equilibrium moisture content of 12-15% .

To maintain a relative humidity of 40-60% when handling and storing capsules.

# Hard gelatin capsules machine

Bench-scale filling: for small scale filling of capsules

Manual filling machine



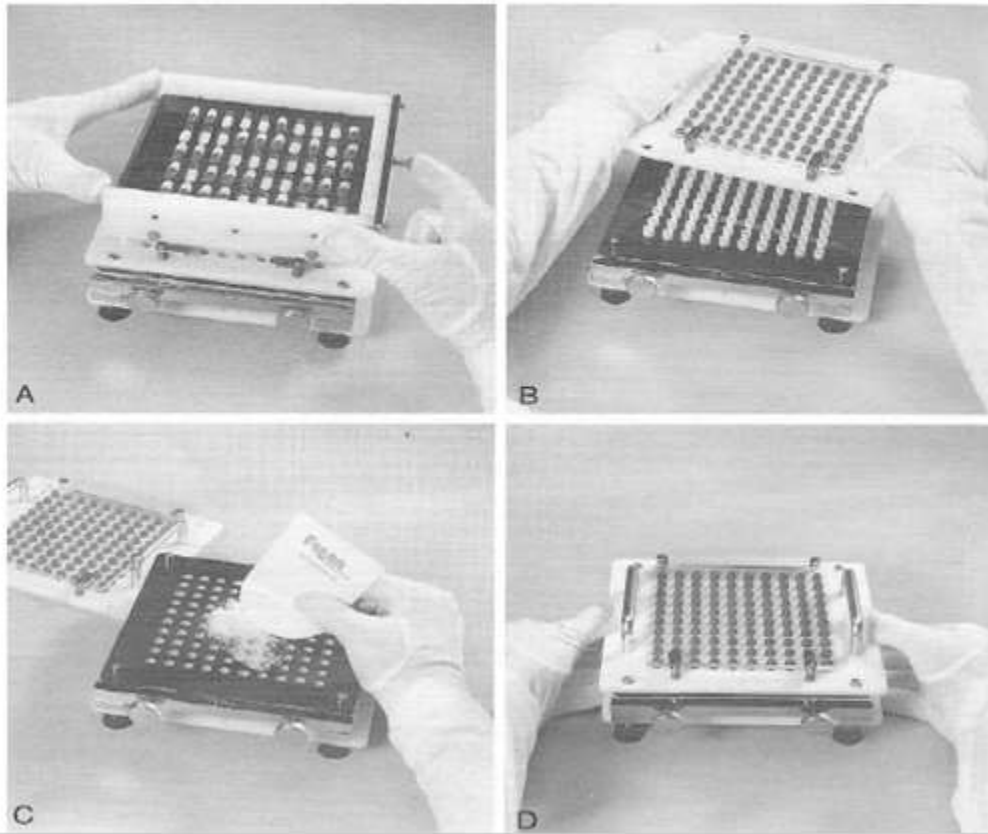
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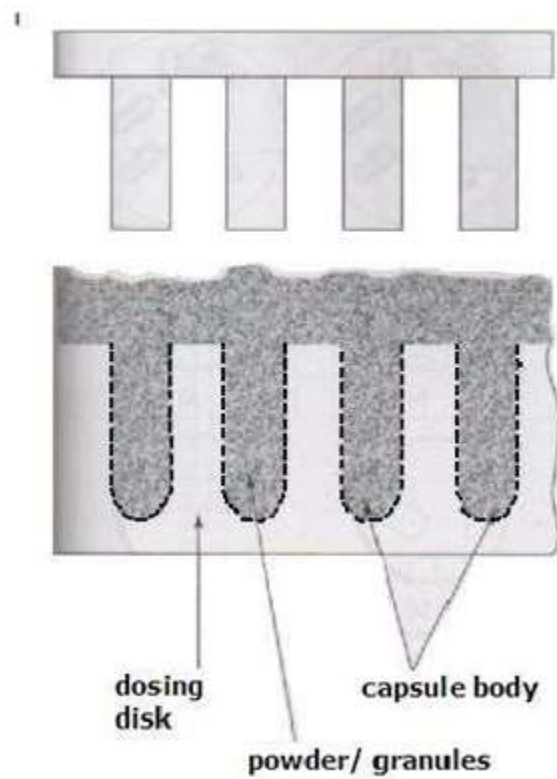


**ProFill 100 - The ProFill 100 Capsule Filling Machine utilizes an advanced design for fool-proof manual filling of two-piece capsules. With the ProFill 100 machine, there is no need for expensive capsule filling equipment and electrical/vacuum connections.**



## Manually Operated Bench-top Equipment





Capsule caps and bodies are rejoined and the capsules are closed.

# Industrial-scale filling

These machines come in great variety  
from---

**Semi-automatic**

**Automatic machines**

# Quality control of capsules

- 1- Length of capsules
- 2- Shape, size and color.
- 3- Thickness of capsules shell.
- 4- Weight variation test.
- 5- Uniformity of content
- 6- Disintegration test
- 7- Dissolution test
- 8- Stability test

# Advantages of hard gelatin capsules

Masking capacity.

Production of medicament.

Therapeutic inert and easy to digest.

Easy to swallow.

Easy to handle and carry.

Different sizes are available.

# advantages

No need of complicated machinery.

Filling of incompatible substance in the same shell.

Product identification.

Provide enteric & sustained release effects

# Formulation

the general problems, two major ones can be listed.

1. After the powder ingredients have been homogeneously blended by any suitable technique, the flow of the resultant mixture must be adequate to ensure delivery of sufficient powder to the capsules at the time of filling. De-mixing must not occur during the powder handling in the filling equipment itself.

2. Physical incompatibilities between active ingredients, between diluents, or between active ingredients and/or diluents and the capsule shell may create problems.

# General consideration in cap. formulation

1. The powder mix must provide the type of flow characteristics required by the equipment.

2. Potential incompatibilities

3. The choice of excipients



# Special techniques

- Imprinting
- Special purpose capsules
  - a. Formalin treatment has been employed to modify the solubility of gelatin capsules.
  - b. Various coatings have been used in an effort to provide similarly modified solubility characteristics.

3. Separation of incompatible materials (a technique used for some commercial products) is carried out by the use of a two-phase fill in the capsule. One phase consists of either a soft capsule, a smaller hard capsule, a pill, or a suitably coated tablet that is filled into each capsule. Following this as a second phase, a powder fill is added in the usual manner.

4. Recently, there has been a revival of interest in the filling of conventional two-piece gelatin capsules with liquids and semisolids.

## *Filling of Solids in Capsule*

*Homogeneous mixture*

- Adequate flow properties*
- Physical incompatibilities*
- Choice of excipients:*

*Diluents, lubricants & glidants, wetting agents, disintegrants.*

## *DIFFICULTIES IN CAPSULE FILLING*

*Deliquescent / Hygroscopic powders.*

*Remedy: Adsorbent [magnesium carbonate, heavy / light magnesium oxide]*

*Eutectic mixture*

*Remedy: Use of adsorbent [magnesium carbonate, kaolin]*

*Small dose of drug*

*Remedy: Addition of inert powder.*

*Incompatibilities of materials*

*Remedy: Use of two capsules – small in large*

*Lack of adhesiveness difficult to fill by punch method*

*Remedy: moistened with alcohol, granules reduced to powders*

## *Capsule Processing*

- *Empty Capsule*
- *Filling [Formulation]*
- *Finishing*
  - # *Dusting [Cloth Dusting]*
  - # *Polishing [Pan Polishing]*
  - # *Brushing*
- *Inspection*
- *Bottling*
- *Labeling*

## *Special Techniques of Processing*

➤ *Imprinting*

➤ *Special purpose Capsules*

*[To retard solubility of gelatin to delay absorption of drug]*

★ *Formalin treatment*

★ *Various coatings*

➤ *Separation of Incompatible materials*

## In-process Quality And Quality Control Parameters

- Choice of suitable control procedure for filling operation:  
[should desirable to provide 100% weight checking after filling]
- Capsule Appearance
- Weight variation
- Content uniformity
- Solubility
- Disintegration test



*Thank you*