INDUSTRIAL PHARMACY-I

UNIT III-CAPSULES

CLASS:18

TOPIC: a. Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. size of capsules

Definition:

Capsules are solid dosage forms in which the drug or a mixture of drugswith or without excipients is enclosed in Hard Gelatin Capsule Shells, in soft, soluble shells of gelatin, or in hard or soft shellsof any other suitable material, of variousshapes and capacities. They usuallycontain a single dose of active ingredient(s) and are intended for oral administration.

Advantages:

- The drugs having unpleasant odour and taste can be administered by enclosing them in a tasteless shell.
- Theyaresmooth,becomeveryslipperywhenmoistandcanbeeasily swallowed.
- Theyareeconomical
- Theyareeasytohandleandcarry.
- Thecapsulesreleasethemedicamentasandwhendesiredingastro-intestinaltract.
- Capsulesaremadefromgelatinandhencetheyaretherapeuticallyinert.
- Capsulehaveelegantappearancesothatitenhancepatientacceptance.
- Thedrugintheformofsolid,liquid&viscousform canbeencapsulatedincapsuleshell.
- Capsule formulation provide better stability of drug as compare to uncoated tablet & liquid dosage form

Disadvantages:

- Capsule are not usually used for administration ofextremely soluble materials such as potassium chloride, potassium bromide etc. since there is sudden release ofsuch compound in stomach & causes irritation.
- Capsule should not used for highly efflorescent material asmaterial may cause the capsule to soften by losing water molecule to shell ,
- Capsule should not used for highly deliquescent powder as powder have tendency to absorb moisture from capsule shell & make it brittleness.
- The capsule shells can absorb water from the environment and develop problems with drug stability and capsule shell can become tacky
- itunsuitableforusewithliquidformulations

Gelatinasacomponentofcapsuleshell:[1]

As the gelatin is the main source for production of capsule shell,we need to understand its source & process of manufacture .Gelatin is a heterogeneous product derived by irreversible hydrolytic extraction of treated animal collagen as it never occurs naturally.

The physical & chemical properties of gelatinare the function of parent collagen, method of extraction,pH value ,thermal degradation & electrolyte content. The main source of collagen which are required for production of gelatin are animal bones and frozen pork skin.

Generally twotypeofgelatinareusedtomanufacturecapsuleshell.

Type A Gelatin:it is derived from the acid treated precursor and exhibit isoelectric point in region of pH 9.

Type B Gelatin: it is derived from an alkali treated precursor & exhibit isoelectric point in region of pH 4

[The **isoelectric point** is the pH at which a molecule carries no net electrical charge or is electrically neutral]

Drybone → 5%Hcl -------Lime10% ----------Limeremoval -----pHadjustment

10-15days 4-8weeks

Bonemeal Dicalciumphosphate

Calfskin wash Lime10%

----------6-12week ---------- waterwash(10-30hours)

Porkskin wash Acid

----------1-5%Hcl(10-30hrs) ----------Acidremoval

↓

Hotwaterextraction---------filter----------vacuumconc.---------cooltosolidify-------airdry millto size

Fig.1:Theprocessofmanufacturinggelatin

Typeofcapsule(basedontypeofshell)

1. HardGelatincapsule[HGC]
2. SoftGelatincapsule[SGC]

Hard Gelatin capsule:it is the capsule in whichmedicament(s) with or without excipientin the dry powder form are enclosed in a shell which consist ofcap & body.

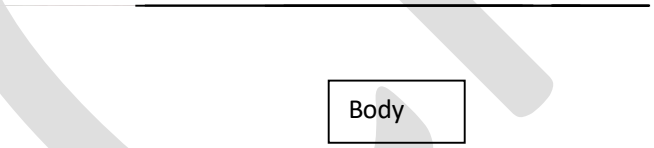

Fig.2: Part of hard Gelatin capsule

Production of Hard gelatin capsule shell:[1]

Themechanisminvolvedforproductionofhardgelatincapsuleshellare

- Dipping
- Spinning
- Drying
- Stripping&Trimming
- Joining

Preparation of the gelatin solution (dipping solution): A concentrated solution of gelatin (35-40%) is prepared by dissolving the gelatin in demineralized water which has been heated to 60– 70°C in jacketed pressure vessels.This is stirred until the gelatin has dissolved and vacuum is applied to removed entrappedair bubbles.At this stage, other processing aids may be added like plasticizer, colourant, opaquing agent etc.The viscosity of gelatin preparation has to be controlled as it may affect downstream manufacturing process & very importantly thickness of shell.

Dipping: Capsule shellsare manufactured under strict climatic conditions by dipping pairs(body and cap) of standardized steel pins arranged in rows on metal bars into an aqueous gelatin solution (25 – 30% w/w) maintained at about 50 ° C in a jacketed heating pan.

Spinningof the dip-coated pins: afteradsorption of the gelatin solution on to the surface of the pins, the bar containing the pins isrotated more times to evenly distribute the gelatin solution around the pins,as uniform gelatin distribution being critical for correct and precise capsule wall thickness.

Drying of the gelatin-coated pins: Once the gelatin is evenly distributed on the mould, a blast of cool air is used to set the gelatin on the mould. At this point, the gelatin is dried, and the pins are then passed through several drying stages to achieve the target moisture content.

Stripping & Trimming : After the gelatin is dried, the capsule is stripped off the mould and trimmed to the proper length

Joining of the trimmed capsule shell: Once trimmed, the two halves (the cap and body) are joined to the pre-closed position using a pre lock mechanism. At this point, printing is done if needed before packing in cartons for shipping.

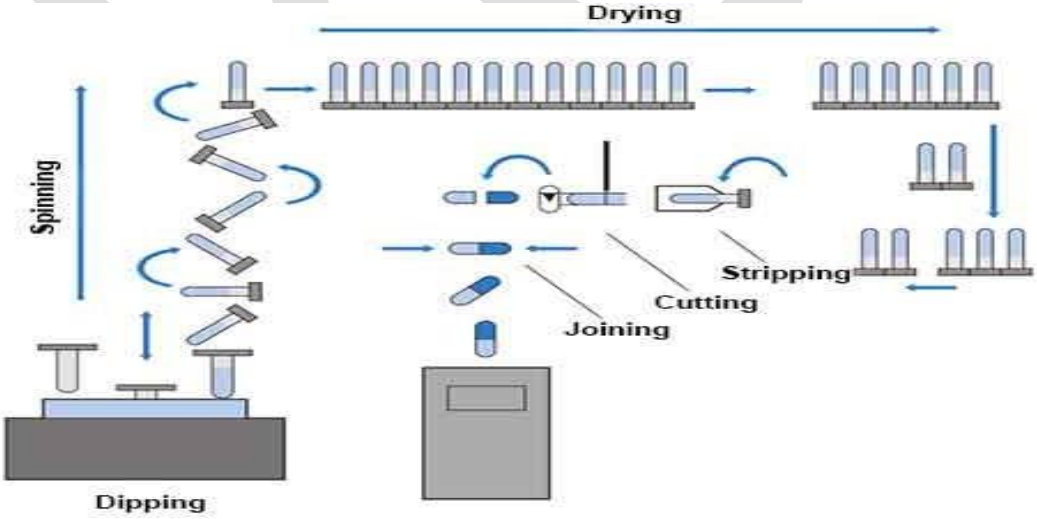

Fig.3 Sequenceoftwopiecehardgelatincapsuleshellmanufacture

Sizeofcapsule:

Size	Volume (mL)	Fillweight(g)atpowder density of0.8/cm^3
000	1.37	1.096
00	0.95	0.760
0	0.68	0.544
1	0.50	0.400
2	0.37	0.296
3	0.30	0.240
4	0.21	0.168
5	0.13	0.104