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# Introduction to Tablet, Capsule and Its Different Evaluation techniques

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***Abstract***

Tablets are the most common solid dosage forms of all pharmacological dosage forms. They are easier to prepare than other dosage forms, but many issues will develop during the manufacturing process. Pre- and post-production procedures for producing a marketable dose form must be considered. Tablets are solid dosage forms containing medicinal substances with or without suitable diluents. Capsules are capsules in which drug is enclosed within either a hard or soft shell. They offer safe and convenient ways of activepharmaceutical ingredients (API) administration. A hard gelatine capsule shell consists of two prefabricated, Capsule shells are fabricated and supplied empty to the pharmaceutical industry by shell suppliers.

***Keywords*** - Caplet, Soft Gelatin, Orally Disintegrating Tablet (ODT), Disintegration Tester Dissolution Tester, Hard Gelatin Capsules, Invariability Tests.

## I. INTRODUCTION

Without question, the compressed tablet is one of the most popular dosage forms today. Tablets account for almost a third of all prescriptions distributed. Typically, a compressed pill is thought of as an oral medication; nevertheless, tablets have a variety of other applications. The organ pill, the pellet, the wafer, the troche, and thus the duct insert is all manufactured in the same way as associate degree oral pill. There are three methods of commercially making compressed tablets: A soft gel or soft gelatine capsule is a solid capsule (outer shell) surrounding a liquid or semi-solid centre (inner fill). An active ingredient is often incorporated into the outer shell, the inner fill, or both. they're oral dose type for drugs almost like capsules. Soft gel shells area unit a mix of gelatine, water, pacifier and a plasticiser like alcohol and/or sorbitol (s). laborious gelatine capsules conjointly called hard-shell gelatine capsules or two-piece capsules area unit solid dose forms during which one or additional healthful agents and/or inert materials area unit surrounded among little shell. they're a well-established dose type that gives solutions to several of today's drug delivery and nutraceutical formulation challenges.

### A. Tablet

Tablets A tablet is a pharmaceutical oral dosage form (OSD) or solid unit dosage form. Test Tablets may be defined as the solid unit dosage form of medicament or medicaments with suitable excipients. Tablets are prepared either by melding or by compression. It comprises a mixture of active substances and excipients, usually in powder form, pressed or compacted from a powder into a solid dose. The excipients will embody diluents, binders or granulating agents, giants (flow aids) Associate in Nursing lubricants to make sure economical pilling; disintegrates to market pill break-up within the biological process tract; sweeteners or flavours to reinforce taste; and pigments to form the tablets visually engaging or aid in visual identification of an unknown tablet. A polymer coating is often applied to make the tablet smoother and easier to swallow, to control the release rate of the active ingredient, to make it more resistant to the environment (extending its shelf life), or to enhance the tablet's appearance. The compressed tablet is the most popular dosage form in use today. About two thirds of all prescriptions are dispensed as solid dosage forms, and half of these are compressed tablets. A pill will be developed to deliver Associate in Nursing correct dose to a selected site; it's typically taken orally, however will be administered sublingually, buccal, rectally or intravaginal. The pill is

simply one in every of the various forms that Associate in Nursing oral drug will take like syrups, elixirs, suspensions, and emulsions. Medicinal tablets were originally made in the shape of a disk of whatever colour their components determined, but are now made in many shapes and colours to help distinguish different medicines. Tablets square measure usually sealed with symbols, letters, and numbers, that modify them to be known. Sizes of tablets to be enclosed vary from some millimetres to a few cm. Pills square measure thought up to now back to around 1500 B.C. [1] Earlier medical recipes, like those from 4000 B.C., were for liquid preparations instead of solids. [1] the primary references to pills were found on papyruses in ancient Egypt, and contained dough, honey or grease. healthful ingredients, like plant powders or spices, were mixed in and fashioned by hand to form very little balls, or pills. In ancient Greece, such medicines were known as katapotia ("something to be swallowed"), and the Roman scholar Pliny, who lived from 23-79 AD, first gave a name to what we now call pills, calling them pillar. [1] Pills have always been difficult to swallow and efforts long have been made to make them go down easier. In medieval times, people coated pills with slippery plant substances. Another approach, used as recently because the nineteenth century, was to gild them in gold and silver, though this usually meant that they'd meet up with the duct with no impact. [1] Within the 1800s sugar-coating and gelatine-coating was made-up, as were gelatine capsules. [1] In 1843, British painter and discoverer William Brocken was granted a patent for a machine capable of "Shaping Pills, Lozenges and graphite by Pressure in Dies". ". The device was capable of compressing powder into a tablet without use of an adhesive. (2)


**Fig.1: Introduction of Tablet**

**Types of Tablet:**

**a. Pill**

A pill was originally defined as a small, round, solid pharmaceutical oral dosage form of medication. Today, pills include tablets, capsules, and variants thereof like caplets — essentially; any solid form of medication colloquially falls into the pill category. An early example of "pills" came from Ancient Rome. They were made from the Zn carbonates hydro incite and smithsonite. The pills were used for sore eyes, and were found aboard a Roman ship RelittodelPozzino that destroyed in a hundred and forty B.C. However, these tablets were meant to be ironed on the eyes, not enveloped. [3][4]

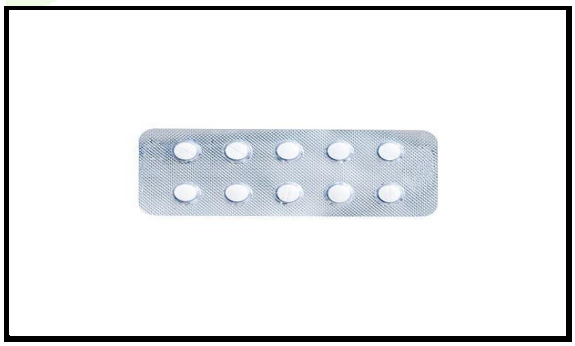

**Fig. 2:-Introduction of Pill**

**b. Caplet**

A caplet could be a swish, coated, oval-shaped healthful pill within the general form of a capsule. several caplets have AN indentation running down the centre in order that they could also be split in 0.5 a lot of simply. [5] Since their beginning, capsules are viewed by customers because the best technique of taking medication. For this reason, producers of medicine like over-the-counter analgesics eager to emphasize the strength of their product developed the ―caplet‖, a portmanteau [6] of ―capsule formed, [7][8] so as to tie this positive association to more efficiently produced tablet pills, as well as being an easier-to-swallow shape than the usual disk-shaped tablet.

**Fig.3:- Introduction of Caplet**

**c. Orally disintegrating tablet (ODT)**

A medicine dosage form known as an orally disintegrating tablet (ODT) is available for a limited number of over-the-counter (OTC) and prescription pharmaceuticals.

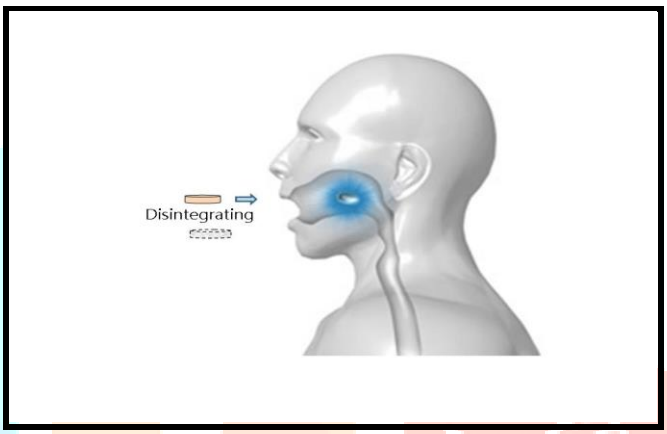


**Fig.4:- Orally disintegrating tablet**

## II. TABLETTING FORMULATIONS: MANUFACTURING OF TABLET

In the tablet-pressing method, it's necessary that each one ingredient be fairly dry, small-grained or granular, somewhat uniform in particle size, and freely flowing. Mixed particle sized powders segregate throughout producing operations thanks to totally different densities, which might lead to tablets with poor drug or active pharmaceutical ingredient (API) content uniformity, however granulation ought to forestall this. Content uniformity ensures that an equivalent API dose is delivered with every pill. Some arthropod genus could also be tableted as pure substances, however this can be seldom the case; most formulations embrace excipients. Normally, a pharmacologically inactive ingredient (excipient) termed a binder is accessorial to assist hold the pill along and provides it strength. A wide variety of binders may be used, some common ones including lactose, dibasic calcium phosphate, sucrose, corn (maize) starch, microcrystalline cellulose, povidonepolyvinylpyrrolidone and modified cellulose (for example hydroxypropyl methylcellulose and hydroxyethylcellulose). Often, a disintegrant is required to aid tablet dispersion after swallowing, allowing the API to be released for absorption. Some binders, including starch and cellulose, are also good disintegrants.

**Advantages of tablets:**

- They are easy to carry.
- They are easy to swallow.
- They are attractive in appearance.
- Unpleasant odor or taste of the drug can be masked by suger coating or film coating.
- They do not require any measurement of dose.
- Sealed covering protects the tablet from atmospheric conditions e.g., light, air etc.
- An accurate amount of medicament even in very small can be incorporated.
- Tablets have a longer shelf life than other dosage forms, indicating that they are more stable.
- The incompatibility of medicaments is less in tablet dosage form.
- Easy to self administration.
- Economically their cost of production is relatively low.
- Easy to handling.
- Tablet is the lightest and most compact dosage form.

**Disadvantage of tablet:**

Some medication resist compression into dense compacts because of their amorphous nature or rarity character. Drugs with poor wetting and slow dissolution properties is also tough or not possible to formulate and manufacture as a pill which will offer adequate of full drug bioavailability. Bitter tasting medication with AN objectionable odor or medication that is sensitive to O could need encapsulation defence before compression or the tablets could need coating. In such cases, the capsule could provide the most effective and lowest value approach. Tables aren't appropriate for youngsters or recent man as a result of they cannot take it simply. Patients with expulsion and symptom cannot take it or absorb it. Some medication cause stomachal irritation once they are given within the pill type.

Tablet is not suitable for Unconscious patients.

**III. Process in Tablet Manufacturing**

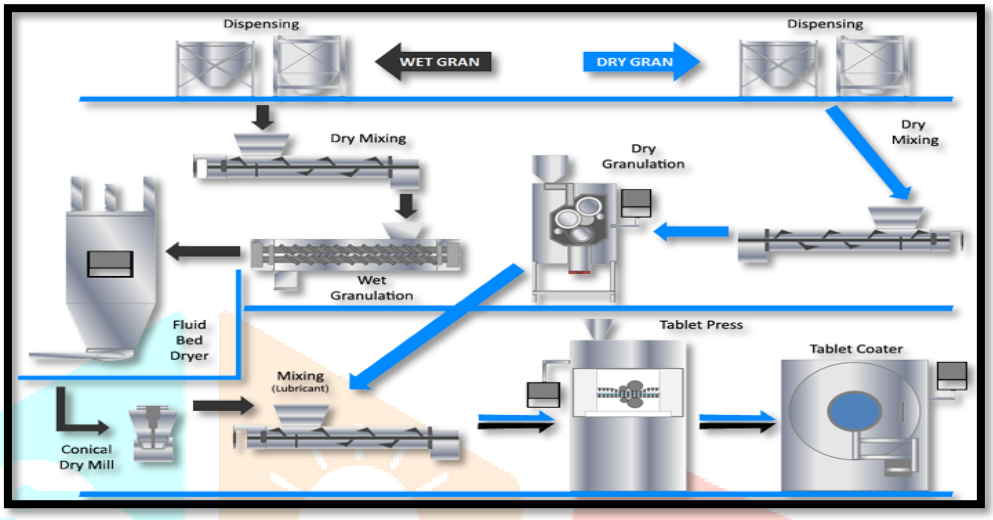


**Fig5:- Process in Tablet Manufacturing**

**1.Dispensing:** Each ingredient in the tablet formula is weighed and accurately dispensed as per dose. Whenever formulating any type of product, this is an extremely important step, and it should be carried out under technical supervision.

**2. Sizing:** Formulation ingredients must be in finely divided form, otherwise, size reduction should be carried out for better flow property and easy mixing.

**3. Mixing equipment:** e.g., pneumatic tumbling mixers diffusion/ mixers (e.g., Blender, double cone blender, cubic mixer, drum blender), 8

**4.Granulators:** e.g. , Rotating shape granulators , dry granulator , high shear granulator etc

**5.Drying equipment:** e.g. spray dryer , rotary dryer , fluidized bed dryer etc

**6. Table ting machine:** e.g. single punch tablet press and multi station /rotary tablet press Exp. Fete Press, CardPressetc 9

**7. Evaluation /Quality control (QC) equipment:**

e.g., disintegration equipment , USP Dissolution Tester, Tablet Hardness Tester, Tablet Thickness Tester, Tablet Friability Testers etc.

**8.Coating and polishing machines for coated tablets**:

e.g., standard coating pan, perforated pan, fluidized bed/ Air suspension coating system etc. 8. Packaging machines e.g., blister packing machine, aluminium foil packaging machine, etc.

**C. Tablets/QC test Equipment**

Weighing Balance

Hardness Tester

Disintegration tester

Dissolution tester

**IV. CAPSULE**

Capsules are solid pharmaceutical dosage forms in which the drug or a mixture of drugs is enclosed in a gelatine shell or any other suitable material to form various shapes. Capsules generally contains a single dose of active ingredient and are taken orally.

The two main types of capsules are:

· **Soft Gelatine Capsules**

· **Hard-shelled capsules**

Both of these classes of capsules are made from aqueous solutions of gelling agents, such as animal protein (mainly gelatine) or plant polysaccharides or their derivatives (such as carrageenans and modified forms of starch and cellulose). Other ingredients can be added to the gelling agent solution including plasticizers such as glycerine or sorbitol to decrease the capsule's hardness, colouring agents, preservatives, disintegrate, lubricants and surface

**Soft Gelatine Capsules (Soft gels):**

**Fig6:- Soft Gelatine Capsules**

**Advantages of softgels :**

- Easy to swallow, no taste, unit dose delivery, tamper-proof. · Wide variety of colours, shapes, and sizes.
- Can accommodate a variety of compounds filled as semi-solids, liquids, gels, and pastes.
- By delivering the drug in solution or using other absorption enhancing materials, it can improve bioavailability.

**Disadvantages of soft gels:**

- Requires special manufacturing equipment.
- High-water-solubility compounds and hydrolysable compounds present stability concerns.
- Limited choices of excipients/carriers compatible with the gelatine.

**VI.SOFT GELATINE ENCAPSULATION PROCESSES AND EQUIPMENT**

**Rotary Die process:** Two ribbons of gelatine are fed continuously into a rotating die assembly and are simultaneously formed into the two halves of a capsule. The ribbons converge adjacent to a fill contraption. The fill contraption is motivated by a pump that measures and dispenses the acceptable volume of fill material into the capsules. The crammed capsules square measure afterwards sealed because the die assembly rotates. This method permits correct and duplicable fill uniformity.Pump heads are available for fill weights as low as 100 mg. For oral dosage forms, the fill weight ranges from 100 mg up to about 1 gram.

The following should be monitored/controlled:

· Gelatin temperature
· Fill temperature
· Ribbon thickness
· Seal or seam width
· Fill quantity

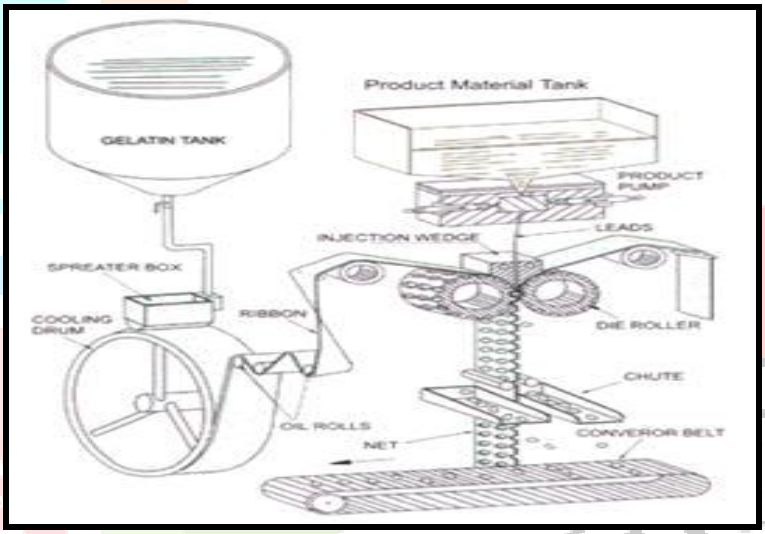


**Fig 6:-Rotary Die process**

**Hard Gelatin Capsules:**

Hard gelatin capsules, sometimes called hard-shell gelatin capsules or two-piece capsules, are solid dosage forms that contain one or more therapeutic substances and/or inert ingredients within a tiny shell. They're a tried-and-true dosage form that can help with a variety of drug delivery and nutraceutical formulation issues.A hard gelatine capsule shell consists of two prefabricated, cylindrical sections (a cap and a body) each of which has one rounded, closed-end and one open end. The body has a slightly lower diameter than the cap and fits inside the cap.Hard gelatine capsule shells are fabricated and supplied empty to the pharmaceutical industry by shell suppliers and are then filled in a separate operation. During the capsule filling unit operation, the body is filled with the drug substances and the shell is closed by bringing the body and the cap together.

**Fig 7:-Hard Gelatin Capsules**

**Components of hard Gelatin capsules:**

Hard gelatin capsule shell consists for the most part of gelatin. apart from gelatin, it's going to contain materials like plasticiser, colourants, opacifying agents, and preservatives that either alter capsule formation or improve their performance. onerous gelatin capsules additionally contain 12–16% water, however the water content will vary, reckoning on the storage conditions

**Capsule sizes and shapes:**

Empty onerous gelatin capsule shells are available a range of sizes starting from associate degree discretionary enumeration of 000 five|to five} with 000 being the most important size and 5 being the littlest. the form has remained nearly unchanged since its invention apart from the event of the automatic capsule throughout the Nineteen Sixties once automatic filling and packaging machines were introduced. The size of onerous gelatin capsule elite to be used is set by needs of the formulation, together with the dose of the active ingredient and therefore the density and compaction characteristics of the drug and alternative parts. The first step to estimating the best capsule size for a given product is to see the density of the formulation mistreatment broached density for powders and bulk density for pellets, minitablets, and granules. the suitable capsule size could then be calculated mistreatment the measured density of the formulation, the target fill weight, and capsule volume. The fill weight for liquids is calculated by multiplying the precise gravity of the liquid by the capsule body volume increased by zero.9

## VII.EVALUATION TEST OF CAPSULE

- Stability tests
- Stability test for capsules are performed to know the integrity of gelatine capsule shell and for determining shelf life of capsule.
- Invariability tests
- The invariability in the medicaments packed in the capsule shells can be determined by performing the following tests.
- Weight variation test
- Content uniformity test
- Disintegration test
- Disintegration test is a method to evaluate the rate of disintegration test of solid dosage form.
- Dissolution test
- Dissolution test is an official method to determine the dissolution rate of solid dosage form.
- Moisture Permeation tests
- Containers for capsule packaging are evaluated using this test in order to ensure their suitability

## VIII. Conclusion

In the current era, multiple unit dosage forms have become popular for several reasons. Multiple unit dosage forms are expensive but they offer a number of advantages. Pellet products not only possess the advantages cited earlier, but 1 T they also appear to have potential in marketability over other solid dosage forms.Apart from the improved stability as compared to the monolithic / single unit dosage forms, they can be successfully used to prepare controlled release dosage forms. Apart from the improved stability as compared to the monolithic / single unit dosage forms, they can be successfully used to prepare controlled release dosage forms. Pellets are formed with the aid of pelletizer. This machine is able to form approximately spherical bodies from a mass of finely divided particles continuously, by a rolling or a tumbling action on a flat or a curved surface with the addition of a liquid, the method referred as extrusion and spheronization. In addition, there are other methods too, such as the methods based on pan coating, rotary fluidized bed granulators, high shear mixer, etc. In all the methods, the spheronization process has proved to be a fertile area for research and should be pursued'^. Although there are various methods to convert the fine powdered material into free flowing spherical agglomerates, they have some limitations. It further emphasizes that a single ideal method cannot be developed to meet all of the desired features. Such limitations motivate research workers to develop a method and technology which is able to overcome major problems such as process time, running cost, etc.

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