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A review on: Tablets

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Abstract

The study of medicine is both a science and an art. It doesn't involve mixing up drugs and bandages; instead, it deals with life's fundamental processes, which must be comprehended before they can be directed. Pharmaceutical oral solid dosage forms have been utilized extensively for decades, mostly due to their ease of administration and suitability for systemic drug delivery. The tablets may be produced directly from powders, granule pellets, or multiple units covered in film. Nowadays, tablets are the most widely used dosage form, making up over 70% of all manufactured ethical pharmaceutical formulations. Tablets are solid pharmaceutical dosage forms that can be manufactured by compression or baking and contain medicinal ingredients with or without appropriate diluents.

Introduction

A drug is outline as associate agent meant to be used within the diagnosing mitigation, treatment, cure of prevention of malady in humans or within the different animals. One in every of the foremost astounding qualities of medication is that the diversity of their action and effects on the body. Some medication by selection stimulate the heart muscle, the central systema nervous, or the channel, whereas different medication have the other result. Medication will render blood additional thick or less coagulate, they will increase the hemoprotein content of the erythrocytes, scale back humor cholesterin or expand blood volume. Drug termed emetics induce emesis. Diuretic drug medication increase the flow the urine, expectorator medication increase tract fluid, cathartics or laxatives evacutes the gut.

Drug is also use the cut back pain, fever, thyroid activity, rhinitis, insomnia, gastric, acidity, complaint, pressure or mental depression. Drug are accustomed treat common infections, AIDS, benign proststics dysplasia, cancer, vessel disease, asthma, glaucoma, Alzheimer disease and male importance. **[1]**

Tablets are solid dose forms sometimes ready with the help of appropriate pharmaceutical excipient. They will terribly in size, shape, weight, hardness, thickness, disintegration, and dissociate characteristics and in different aspects, depending on their meant use and methodology of manufacture. Most tablets are utilized in the oral administration of medication. Several of those are ready with colorants and coating of varied sorts. Other tablets like those administrated sublingually, buccally or vaginally are ready to possess feature most application to their explicit rout of administration. Tablets are preapared primarily by compression, with a restricted range ready by molding. Compressed tablets are manufactured with tablets machines capable of exerting nice pressure in compaction the battery-powered or coarse material. Their form and dimension are determined by the utilization of varied formed punches and dies. **[1]**

Types of Tablets :-

1) Bi-layer tablets [2]

We have projected a bilayer tablet, during which the one layer is develiped to get immediate unleash of the drug, with the aim of reaching a high humor concentration in a very short amount of time. The second layer is an controlled unleash deliquescent matrix, that is meant to take care of a good plasma level for a protected amount of time. Bilayer tablets have some key advantages compared to conventional monolayer tablets. In additionally, bilayer tablets have enabled the development of controlled delivery of active pharmaceutical ingredients with predetermined release profiles by combining layers with numerous release patterns, or by combining slow-release with immediate-release layers.

Fig 1: Bilayer Tablet.

Applications

¬ Bi-layer tablet is suitable for sequential release of two drugs in combination.
¬ Separate Two Incompatible Substances.
¬ Sustained release tablet in which one Layer is immediate release as initial dose and second layer is maintenance dose.
¬ Promoting Patient Convenience and Compliance.
¬ Bilayer tablet is improved beneficial technology to overcome the shortcoming of the single layered tablet
¬ Bilayer tablets are used to deliver the loading dose and sustained dose of the same or different drugs.
¬ Bilayer tablets are used for bilayer floating tablets in which one layer is floating layer another one is immediate release layer of the drug.
¬ Bilayer tablets are used to deliver the two different drugs having different release profiles.

Advantages

¬ They are used as an extension of a conventional technology.
¬ Potential use of single entity feed granules.
¬ Separation of incompatible components.
¬ Patient compliance is enhanced leading to improved drug regimen efficacy.
¬ Patient convenience is improved because fewer daily doses are required compared to traditional delivery system.
¬ Maintain physical and chemical stability.
¬ Retain potency and ensure dose accuracy

Disadvantages

¬ Adds complexity and bilayer rotary presses are expensive.
¬ Insufficient hardness, layer separation, reduced yield.
¬ Inaccurate individual layer weight control.
¬ Cross contamination between the layers.

2) Orally Disintegrating Tablet (ODTs)[3]

Introduction

Orally dispersible tablets are dosage for that disintegrate or dissolve rapidly on contact with saliva. US FDA has defined an ODT as a solid dosage form containing medicinal substances which disintegrates rapidly, usually within a matter of seconds, when placed upon the tongue.

ODTs also are completely different from tender tablets therein they eliminate the requirement for chew or dinking liquids. physical change of the ODT happens on the tongue, followed by the patient swallowing the liquid. ODTs, by virtue of their distinctive characteristics, result in higher patient compliance, particularly for medicine and geriatric patients World Health Organization usually expertise problem swallowing.

Limitations of ODTs

- Most of time soluble diluents used for formulating ODT`s might render hygroscopoc dosage which may lead to stability issues.
- The tablets may leave unpleasant taste and grittiness in mouth if not formulated properly.
- Specialized packing might be required for hygroscopic and light sensitive drug.
- Precautions to be taken while administering immediately after removing from pack.
- Light sensitive drugs, ODT`s may not be suitable as no option for film coating.
- High drug loading should be allowed.
- The mouth feel should be pleasant.

Advantages of ODT

❖ Ease of administration to patients who refuse to swallow a tablet, such as pediatric, geriatric mentally ill, disable and and uncooperative patients.
❖ No need of water to swallow the dosage form, which is highly convenient feature for patients who are travelling and do not have immediate access to water.
❖ Some drugs are absorbed from the mouth, pharynx and oesophagus as the saliva passes down into the stomach; in such cases bioavailability of drugs is increases.
❖ Ability to provide advantages of liquid medication in the form of solid preparation.
❖ Convenience of administration and accurate dose as compared to liquids.
❖ New business opportunities: product differentiation, line extension and lifecycle management, exclusivity of the product promotion and patent-life extension

3) Dispersible Tablet [4]

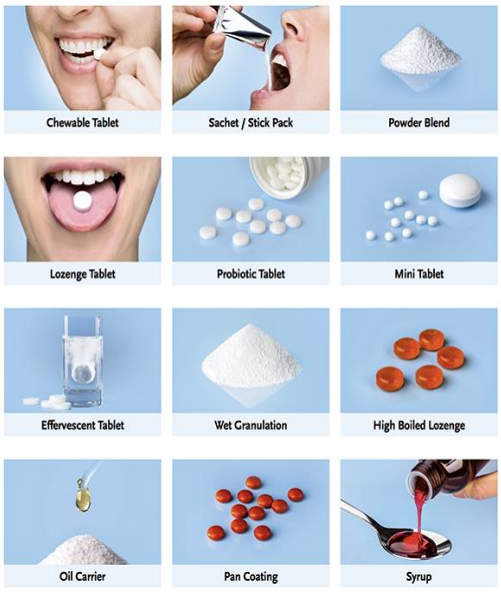
Dispersible tablets as defined in European Pharmacopoeia are uncoated or film coated tablets intended to be dispersed in water before administration giving a homogeneous dispersion. Fast dispersible tablets are categorized into two types, such are dispersible tablets and Mouth dissolving tablets. Dispersible tablets are required to disintegrate within 3 min in water at 15 to 25oC. The dispersion properties of dispersible tablets can be facilitated by the inclusion of an acid/base couple in which the base liberates carbon dioxide when the components of the couple are dissolve in water. To improve the efficacy and safety of a therapeutic substance, the pharmaceutical industry ahs been increasingly pursuing personalized drug delivery systems, and 3D printing technology has attracted much attention as a novel pharmaceutical manufacturing technique for fabricating patient-tailored medicines.

◊ Special features of dispersible tablets.

Dispersible are not intended to be chewed or swallowed whole. They should not be dispersed in carbonated drinks or milk due to foaming or slow dispersion. The purpose of dispersible tablets is to provide a unit dosage form of medication which can be easily administered to infants and children or to elderly, who may have difficulty in swallowing an intact tablet.

◊ Limitation of dispersible tablets.

One common limitation of these formulations is settling of the insoluble solid at the bottom or sides of the container of the prepared dispersion, which may lead to a loss of part of the drug during administration, resulting in siboptimal dosing.



◊ Recommendations for use of dispersible tablets

- To be dispensed in a small amount of liquid.
- The liquid can be gently stirred to aid dispersion before swallowing.
- A proportion of the medicine may remain in container after swallowing. Therefore, it is advisable to einse with a small amount of water or milk and swallow again.
- Careful handing of these tablets is necessary as they are much more fragile than the regular tablets.
- Once removed from the blister packaging, they should be used immediately as their stability outside the blister cannot be guaranteed.

4) Oral Dispersible Tablets[5]

The oral route of drug administration is speculated mutually of the foremost acceptable route for drug delivery. Recently the orally dispersible tablets became the foremost fascinating dose forms particularly for a special class of patient`s i.e. pediatric, geriatric, bedridden, unsound, and uncooperative patients.

Ideal Properties of ODTS

- Water is must for their administration
- Modifications in dosing schedule are possible easily.
- Their drug loading capacity is very high.
- Better aftertaste then other dosage forms.
- They offer quite great stability.
- Involves simple method of processing so the manufacturing cost is very low.

Limitations of ODTS

- Their mechanical strength is quite low so proper handling is must.
- Anti-cholinergic drugs cannot be easily formulated as dispersible tablet.
- High drug loading is not possible for dispersible tablets.
- If not formulated properly these may leave an unpleasant aftertaste.
- Taste masking is quite a big challenge in the formulation of dispersible tablets.

ODT Drug release technology/mechanism of releasing drugs

The main action of dispersible tablets depends on the discharge pattern of superdisintegrants employed in it. The superdisintegrants might unleash the drug through following mechanisms.

1) Deformation once the tablets is developed the disintegrant particles area unit ill-shapen throughout compression stage however whereas administration after they came in reality with water, the disintegrants return to their traditional precompression size through swelling and also the pill breaks..
2) Porosity and capillarity throughout administration the tablets area unit initial dissolved in touch of liquid ,so that the water will simply pentrate within the pills and tablet and it breaks it into minutes particles..
3) Swelling some disintegrants show their action through swelling .i.e. as before long as they came in reality with water they ultimately swell inflicting the pill to interrupt apart

ODTS formulation development of preparation

The formulation of medicament a very crucial step. The formulator has to be very careful during bulk manufacturing because if a product is not formulated properly then it will for sure will not show its therapeutic action properly.

Different techniques are available for the manufacturing of ODT`s.

1. Freeze drying
2. Moulding
3. Spray drying
4. Sublimation
5. Mass extrusion

Characterization of ODT`S

1. Weight variation test
2. Tablet thickness
3. Tablet haedness
4. Tablet friability test
5. Wetting time
6. In vitro disintegration test

5) Fast dissolving tablets[6]

The basic approach utilized in development of FDT is that the use of superdisintegrants like Cross joined carboxymelhylcellulose, atomic number 11 starch glycolate, Polyvinylpyrrolidone etc. which offer instant disintegration of pill when putt on tongue, thereby emotional the drug in secretion.

Salient Features of Fast Dissolving Drug Delivery System

1. Ease of administration for patients who are mentally ill, disabled and non co- operative.

2. Quick disintegration and dissolution of the dosage form.

3. Overcomes unacceptable taste of the drugs.

4. Can be designed to leave minimal or no residue in the mouth after administration and also to provide a pleasant mouth feel.

5. Allows high drug loading.

6. Ability to provide advantages of liquid medication in the form of solid preparation.

7. Cost-effective.

Challenges in the formulation of FDTs

- Rapid disintegration of tablets.
- Avoid increase in tablet size.
- Have sufficients mechanical strength.
- Minimum or no residue in mouth.
- Protection from moisture.
- Compaitable with taste masking technology.
- Not affected by by drug properties.

Drug candidate for fast dissolving tablets

- Antibacterial agents.
- Anthelmintics
- Antidepressants
- Antidiabetics
- Analgesics agents
- Antiarrhythmics
- Antihistamines
- Anxiolytics, sedatives hypnotics and neuroleptics
- Diuretics
- Gastro intestinal agents
- Corticosteroids
- Antoprozoal agents

6)CHEWABLE TABLETS [7]

Chewable tablets that ar needed to be broken and chewed the letter before uptake. These tablets ar given to the kids United Nations agency have issue in swallowing and to the adults United Nations agency dislike swallowing .these tablets ar supposed to disintegration, ar pleasant tasting and leave no bitter or unpleasant style. Sweeteners, each present and artificial ar one variety of practical excipient normally employed in tender pill formulations to mask the unpleasant tastes and facilitate medicine dosing.

tender pill ar typically used once the active ingredient is meant to act during a localized manner instead of systemically. tender pill is one that's palatable and should be chewed and eaten with very little or no water.

Advantages of Chewable Tablets

- Better bioavailability through bypassing disintegration.
- Improved patient acceptance through pleasant taste.
- Patient convenience; need no water for swallowing.
- Possible to use as a substitute for liquid dosage forms where rapid onset of action is needed.
- Absorption of drug is faster.
- Product distinctiveness through marketing prospective

Disadvantages of Chewable Tablets

- It contains sorbitol which causes diarrhoea and flatulence.
- They are hygroscopic in nature, so must kept in dry place
- They show the fragile, effervescence granules property
- They require proper packaging for safety and stabilization of stable drug

Need for the Development of Chewable Tablets

- Patient Related Factors
- Effectiveness Factors
- Manufacturing and Marketing Related Factors

Formulation and Evaluation[8]

Tablet Manufacturing Techniques

- Direct compression :-

The direct compression method is by far the most effective technique of tablet manufacturing. Direct compression is the simplest and most economical method for the manufacturing of tablets because it requires less processing steps than other techniques such as wet granulation and roller compaction.

- Wet granulation :-

Wet granulation is a process of using a liquid binder to lightly agglomerate the powder mixture. The amount of liquid required to be properly adjusted, as over wetting will cause the granules to be too hard and under-wetting will cause them to be too soft and friable.

- Dry granulation :-

Dry granulation requires drugs or excipients with cohesive properties. Dry granulation is similar than wet granulation, therefore the cost is reduced. This process is often used when the product to be granulated is sensitive to moisture and heat.

Evaluation Parameters

The evaluation parameters are being discussed and utilized by various researchers to evaluate various tablets formulations.

Pre-formulation Parameters

Angle of repose

The angle repose or more precisely, the critical angle of repose of a granular material is the steepest angle of descent or dip of the slop relative to the horizontal plane when material on the slop face is on the verge of sliding.

Bulk density and Taped density

Bulk density is not an intrinsic property of a material, it can change depending on how the material is handled. The bulk density of a powder simply expresses the amount, usually weight or mass, of a powder in a specified volume. The packing of particles depends on their shape, cohesiveness, short-range motion and external forces. On practical basis bulk density of a powder tends to increase when subjected to tapping, vibration and other mechanical action which causes particles to move relative to one another in a way that allows smaller particles to occupy the voids between large particles.

Carr`s index

The carr index is frequently used in pharmaceutics as an indication of the flowbility of a powder. A carr index greater that 25 is considered to be an indication of poor flowability and below 15 of good flowability. The Carr index is an indication of the compressibility of a powder.

Hausner ratio

The Hausner ratio is also used in industries as an indication of the flowability of a powder.

Post Formulation Parameters

Content uniformity testing

Content uniformity testing involves using a content assay to determine the content of active material contained in multiple different samples collected throughout the batch.

Tablets monographs with a content uniformity requirement do not have weight variation requirements.

Dissolution testing

Dissolution testing is used to measure the release rate of an active component form a solid dosage form under controlled conditions. This technique is used to assess the performance of tablets, capsules, films and other solids. Application of dissolution testing is assessing the quality of a sample by determining the release of active pharmaceutical ingredient from the formulation is within acceptable limits.

Disintegration test

The disintegration test is a measure of the time required under a given set of conditions for a group of tablets to disintegrate into particles which will pass through a 10 mesh screen. The IP has specified the range for disintegration of different types of tablets based on the conditions.

Moisture uptake studies

Moisture uptake studies for fast dissolving tablets should be conducted to have an insight into the stability of the formulation. Humidity was achieved by keeping saturated sodium chloride solution at bottom of the desiccators for three days. Tablets were weighed and the percentage increase in weight was recorded daily.

Manufacturing Process[9]

The manufacturing process was created for companies and individuals to gain aa complete understanding of the basic requirements needed to make tablets and capsules.

The focus will be a step by step explanation of each unit dose operation, common equipment, and practical knowledge of each operation

Three Principle methods of developing powders for tablet making

Tablets made by blending the dry powdered ingredients together, and then compressing into tablets is called **A directly compressible formula.** We are saying that the characteristics of these powders will blend together with the other ingredients will flow, compress and eject from the tablet press.

When the binder is put into water or solvent solution and is sprayed or metered into the powders this process is called **The wet granulation process.** The solids within the liquid solution from bonds between particles which are maintained even after the liquid is dried and milled.

Some granulators have the ability to dry the excess moisture. Many granulators do not have the ability to dry the wet massed granulation; therefore the wet granulation must be moved to the next unit operation which is called drying. If the blended powders will not work with the addition of the dry binder and liquid, or heat cannot be used, then we must **Dry Granulate.** The dry granulation method uses mechanical force to density and compact powders together which forms dry granules.

Tablet Compression

While an experienced operator can take a marginal granulation and make a good quality tablet, an inexperienced operator will be unable to produce a quality tablet.

While tablet presses are used for many applications, the basis of formula development is the same for each application. The final granulation to be compressed must have three basic characteristics, all of which are critical.

COMMON TABLETS DEFECTS

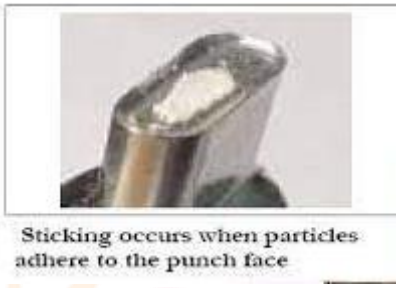
Making tablets batch after batch without an occasional defect would be unusual tablet to tablet weight variation create tablet defects. Consistent tablet weight is essential to making a good tablets.

Some of the most common tablet defects are:

- Weight variation
- Friability variation
- Picking & sticking
- Capping
- Laminating
- Chipping
- Mottled
- Double pressing

Picking and Sticking

Picking and sticking occurs when granules stick to the punch faces during compression. During compression these granules break open and the wet product sticks to the punch faces. To overcome sticking on the press, increase hardness by making the tablet thinner and increase dwell time to make the wet granules adhere to other granules rather than the punch face.



Sticking occurs when particles adhere to the punch face

Also, if a blend is incomplete this could mean that the lubricant in the formula is not protecting the granule from sticking to the punch cup surface. If all else fails polish the punch cup surface.

Capping and Lamination

Capping is often referred to as air entrapment. During compression ,air is evacuated from between the granules to lock to one another If the air does not escape during the compression process the top of the tablets .The tooling are designed to allow air to escape during compression along the upper punch tip and die well. This is why capping occurs on the top cap of the tablet.

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