ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 15, Issue 11, 2022

Online - 2455-3891
Print - 0974-2441

Review Article

AN OVERVIEW ON MOUTH DISSOLVING TABLET: FROM MANUFACTURING AND PATENTED TECHNIQUE TO QUALITY CONTROL TEST

PREETI*, VIJAY AGARWAL, ABHINAV AGARWAL

Department of Pharmaceutics, Raj Kumar Goel Institute of Technology (Pharmacy), Ghaziabad Uttar Pradesh, India. Email: Preetichy23@gmail.com

Received: 20 September 2022, Revised and Accepted: 30 October 2022

ABSTRACT

Due to the oral route's comfort, convenience, and patient compliance, it is the most important and advised method for administering medications. The typical oral unit dosage form that is most frequently employed is the tablet. The patients experience problems swallowing during pill administration. Tablets called mouth dissolving tablets (MDTs) that quickly dissolve in the mouth without the need of water can lessen this issue. As a new drug delivery system, MDTs have begun to acquire recognition and appeal. By developing a simple-to-use dosage form that will increase compliance, they hope to increase the safety and efficiency of therapeutic molecules. For individuals with dysphasia, such as children, the elderly, and those who are mentally ill, mouth dispersing medications are becoming more reliable. The introduction, benefits, drawbacks, excipients employed, different formulation procedures, and evaluation factors are all covered in this review.

Keywords: Mouth dissolving tablets, Excipients, Superdisintegrant, Disintegration, Dissolution, Bioavailability.

 DOI: http://dx.doi.org/10.22159/ajpcr.2022v15i11.46555. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

Despite the significant advances in drug delivery, the oral route is still the most effective approach to provide therapeutic agents because it is convenient to administer and has a cheap cost of therapy, which enhances patient compliance. Because of its firmness, self-administration accessibility, and convenience of production, tablets are a frequently prescribed dose type [1]. The mouth dissolving tablet is regarded as one of the most cutting-edge approaches to oral medication delivery. These melt-in-your-mouth pills are crucial for individuals who struggle to swallow oral dosage forms, particularly geriatric and pediatric patients [2]. Mouth dissolving tablets (MDTs) are a good dissolving phenomenon and supportive route for life-threatening diseases such as nervous illness, radioactivity therapy, Parkinson's disease, and AIDS that face the dysphasia condition. MDT is also acceptable for the mentally ill, bedridden, developmentally disabled patients, and in patients with underlying diseases that disrupt swallowing ability, such as migraine, throat cancer, mouth ulcers, and throat infections. It is particularly appropriate for individuals who are travelling, have difficulty accessing water, and have chronic nausea and vomiting. Tablets that dissolve in the mouth have good stability, are simple to manufacture, and are simple for patients to handle [3,4]. A mouth dissolving tablet must be able to dissolve in saliva in the oral cavity in 15–60 s without the aid of water and must have a satisfying mouth feel to meet the primary requirements.

Ideal properties of MDT

1. It should not require water to dissolve or disintegrate in the mouth in a couple of seconds
2. It ought to permit heavy drug loading
3. It ought to work well with other excipients and flavor masking
4. It ought to feel good in the mouth
5. There should be little to no residual in the mouth after oral administration
6. It ought to be strong enough to endure the strains of manufacture
7. It need to be somewhat insensitive to external factors such as humidity and temperature
8. It ought to be versatile and compatible with current processing and packaging equipment
9. It ought to make it possible to produce tablets at a reasonable cost using standard packaging and processing machinery [5].

Mouth dissolving phenomenon

Superdisintegrants are given far greater consideration when creating mouth dispersing pills. By inducing swelling and water absorption in the pill, they offer quick disintegration. The swelling mechanism of the superdisintegrants wets the carrier's surface, which enhances tablet disintegration and causes increased dissolution to occur. The swelling capacity in the dissolving liquid and matrix density both affect how well superdisintegrants act. A greater degree of disintegration is caused by a matrix with a higher swelling capacity and density [2]. Mouth dissolving phenomena are shown in Fig. 1.

Advantages of MDT

- Simple distribution for patients who are unable to swallow, such as the elderly, those who are bedridden, those who have renal illness, and people with mental conditions
- Rapid intervention in drug treatment
- By enabling drugs to be absorbed from the mouth, throat, and esophagus before they enter the stomach, it is possible to achieve increased bioavailability/rapid absorption
- Convenient for busy persons on the go as well as bedridden and handicapped patients in terms of administration and patient compliance
- A nice tongue feel quality, in especially for small children, helps to change the perception of medication as a bitter pill
- The danger of choking or suffocating is decreased, increasing safety, when physical obstacles are avoided during oral administration of standard formulations [6].

Disadvantages

1. The tablets often do not have enough mechanical strength. Careful handling is required as a result
2. If the pills are not prepared correctly, they may have a poor taste and feel gritty in the mouth
3. Patients using anticholinergic medications simultaneously as well as those with Sjogren's syndrome or dry mouth brought on by reduced saliva production may not be the best candidates for these tablet formulations
4. Because they are hygroscopic, MDTs must be kept in a dry environment
5. To maintain maximum stability and product security, mouthwash pills require special packaging [7].

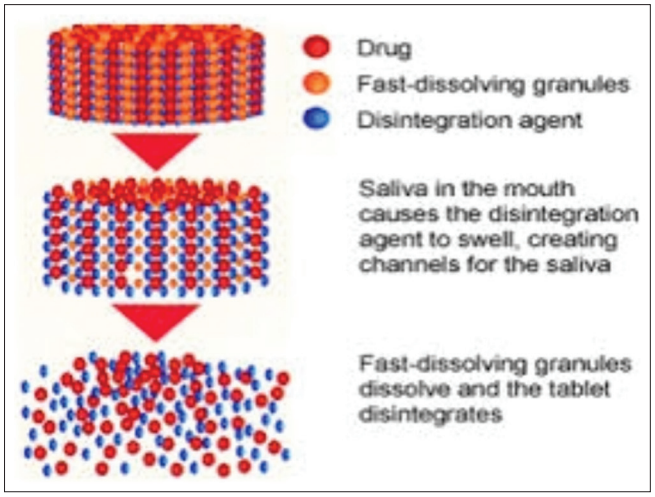

Fig. 1: Mechanism of mouth dissolving

VARIOUS TECHNIQUES USED IN MOUTH DISSOLVING TABLET FORMULATION

Freeze drying technology

Lyophilization is another term for it. To allow saliva to readily move through it and dissolve the lyophilized mass after it is placed in the mouth, it can be utilized to create tablets with an exceptionally porous open matrix network. The medicine is combined with a matrix that is water soluble and freeze-dried to create a unit that dissolves quickly in the mouth. Low dosage, chemical stability, microscopic particle size, and tastelessness are the optimal pharmacological characteristics for freeze-drying formulations. The manufacturing process is fairly expensive and time consuming [8]. Freeze dryer is shown in Fig. 2.

Tablet molding technology

Molded tablets are made with water-soluble ingredients to improve rapid medication absorption through the mucosal lining of the mouth. This technology has the advantage of having a porous structure, which improves solubility and increases bioavailability while reducing first-pass metabolism of some medicines. Typically, soluble additives like saccharides are used in the molding process to improve the mouth feel and tablet breakdown. However, the low mechanical strength of molded tablets causes handling erosion and breakage [9]. The following are various molding methods that may be used to create MDT:

Compression molding

The powder combination is pressed onto mold plates to create a wetted mass after it has previously been soaked with a solvent like ethanol/water.

Heat molding

An instantaneous tablet that dissolves in the mouth can be made from a molten matrix that contains a drug that has been dissolved or dispersed.

Spray-drying technology

To produce extremely porous powders, the pharmaceutical sector uses spray-drying technology. The processing solvent quickly evaporates as a result of spray-drying, leaving behind a highly porous product that can be used to make delectable tablets. It has been observed that tablets made from the spray-dried powder dissolve in aqueous solution in <20 s [10]. Fig. 5 depicts the use of a spray-drying process.

Direct compression method

It is a method that allows tablets to be crushed straight from medication and excipient mixes, without any prior processing. It delivers excellent efficiency and has advantages over other tablet production methods like wet granulation. The mixture that is to be compressed needs

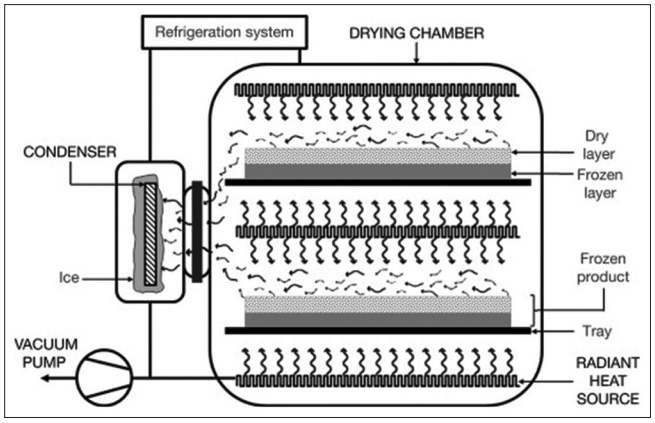

Fig. 2: Freeze dryer technique

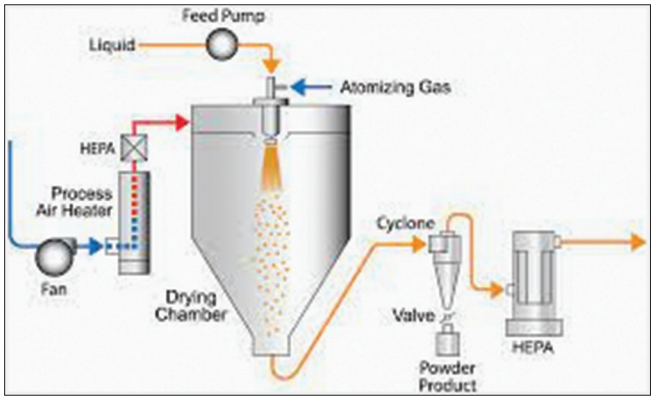

Fig. 3: Spray-drying technique

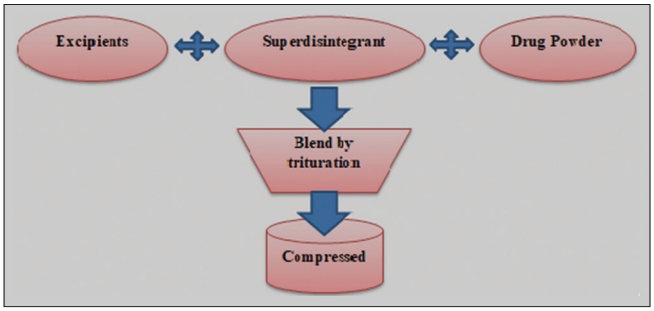

Fig. 4: Direct compression technique

to flow properly and cohere under pressure. The method by which mouth dissolving pills disintegrate and dissolve heavily relies on superdisintegrants. A high disintegration rate must be ensured by selecting the right kind and quantity of disintegrants. Other formulation elements such as effervescent agents or water-soluble excipients can be added to improve the dissolution or disintegration qualities even more. The disintegrant addition technology is the most popular method for making tablets because it has a number of benefits, including the ability to accommodate high doses, cost-effectiveness, the simplest method for making tablets, and the use of conventional equipment and excipients that are widely accessible. Small, very soft tablets have minimal mechanical strength, while hard, massive tablets display longer disintegration times. To achieve quick disintegration and high dissolving rates, employ the right kind and amount of disintegrant [11].

Sublimation technology

The tablet matrix's porosity design is crucial for the rapid breakdown of mouth dissolved tablets. Conventional compressed tablets with

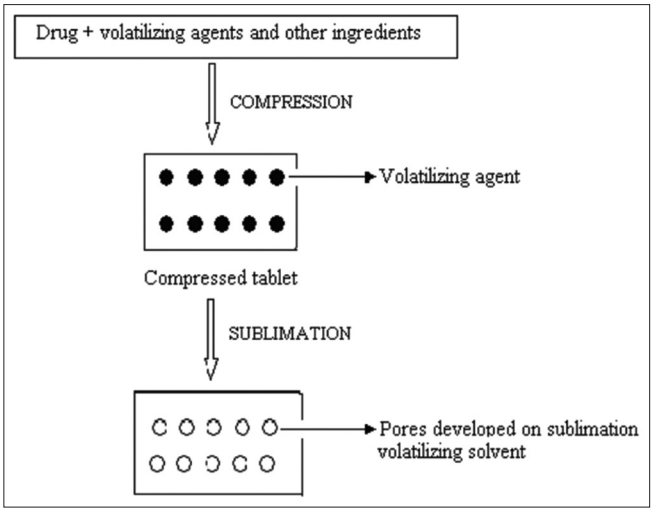

Fig. 5: Sublimation technique

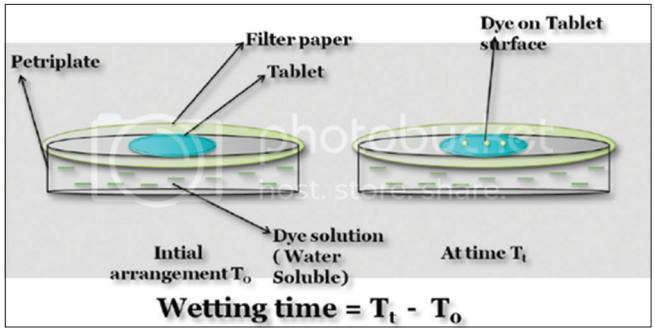

Fig. 6: Wetting time of mouth dissolving tablet

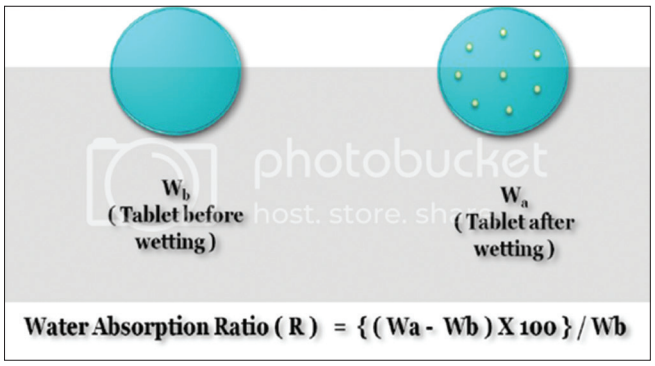

Fig. 7: Water absorption ratio of MDT

highly water-soluble components can fail to dissolve fast because of the inadequate porosity of the matrix. As a result, porous matrix is produced using volatile components that are then exposed to sublimation. Water can transition directly from the solid to the liquid state through a process called sublimation. In this procedure, the excipients are combined with inert volatile chemicals such as urea, urethane, naphthalene, and camphor before the combination is compacted and turned into tablets. As a result of holes in the tablet's structure created by the sublimation of volatile substances, tablets dissolve when they come into contact with saliva. Furthermore, a variety of solvents, including as benzene and cyclohexane, may be used as pore-forming agents [12]. Fig. 5 displays a schematic illustration of the sublimation process.

Mass extrusion technology

The active blend is softened in this way using a solvent solution made of methanol and polyethylene glycol that is water soluble. To generate tablets, the softened material is then pushed via an extruder or syringe and divided into uniform pieces by a heated blade. A bitter flavor might be added to the dried cylinder to disguise the flavor of pharmaceutical grains [13].

Melt granulation technology

Pharmaceutical powders are efficiently agglomerated using a meltable binder in this method. The lack of water and organic solvents makes this approach superior to conventional granulation. There is no drying stage, therefore, the process is quicker and consumes less energy than wet granulation. It is advantageous to increase the rate at which drugs like griseofulvin dissolve in the body's water supply. This technique produces MDT with sufficient mechanical integrity using a hydrophilic waxy binder, such as superpolystate or PEG-6-stearate [14].

Cotton candy process

It is frequently called the "sugar floss" approach. The mouth dissolving tablet's matrix is either candy floss or shear shape. The matrix is created from saccharides or polysaccharides that have undergone simultaneous flash melting and centrifugal force processing to create amorphous floss. Following either partial or complete recrystallization of the matrix, a material with good flow and compressibility properties is created. After the candy floss has been pulverized, mixed, and blended with active ingredients and other excipients, it may then be compressed into MDT. However, only heat stable materials can be used with this approach due to the high processing temperature [15].

Nanonization

A recently created nanomelt technology decreases drug particle size to nano size with the use of a unique wet milling process. The drug's nanocrystals are kept from clumping together by surface adsorption on certain stabilizers, which are subsequently added to MDTs. For drugs that are just marginally soluble in water, this technique is very helpful. Fast nanoparticle dissolution, which increases absorption and, in turn, increases bioavailability and lowers dose requirements, are two further benefits of this technique [16].

PATENTED TECHNOLOGIES FOR FAST DISSOLVING TABLETS FORMULATION

Zydis technology

The most well-known mouth dissolving drug, Zydis, was the first new technology to be made available. The pill dissolves in the mouth after a little length of time spent on the tongue. The medicine is lyophilized or freeze dried to create Zydis tablets, which are typically made of gelatin. The main benefit of this method is its quick melting effect, which is demonstrated by its rapid disintegration and satisfying mouth feel. However, it is relatively time and money consuming, and because the product is unstable and fragile, traditional packaging is not appropriate. The 13 commercially available medications with varied active pharmaceutical components that were created utilizing this method are ondansetron, loperamide, piroxicam, rizatriptan, lorazepam, domperidone, oxazepam, olanzapine, and famotidine [17].

DuraSolv technology

This method creates tablets with a medication, fillers, and lubrication. The technology used to make tablets is typical, and they are well-rigid. A technique like DuraSolv is suitable for goods that only need small amounts of active chemicals. The unique technique of CIMA Labs is called DuraSolv [18].

OraSolv technology

The effervescent disintegration pair used in this technique emits gas when it comes into touch with water. The regularly utilized effervescent disintegration pairings frequently include acid sources such as citric acid, tartaric acid, malic acid, fumaric acid, and adipic acid as well as carbonate supplies such as sodium bicarbonate, potassium bicarbonate, and sodium carbonate. Typically, the effervescent agent makes around 20–25% of the overall weight of the pill [19].

FlashTab technology
It is yet another formulation of a mouth dissolving or disintegrating tablet. The FlashTab technology has a patent from Prographarm Laboratories. The majority of the excipients used are the same as those in typical compressed tablets. This formulation produces a tablet that dissolves in the mouth in under a minute by combining coated drug particles with a dissolving agent and a swelling agent. With this method, a tablet that dissolves fast and includes an active ingredient in the form of a microcrystal is created [20].

AdvaTab technology
It is possible to deliver drugs orally without the use of water thanks to AdvaTab tablets, which typically dissolve in the mouth in <30 s. Patients who have difficulty swallowing capsules and tablets can easily dissolve AdvaTab pills in their mouths, making these pills, especially suitable for them. The ability to combine AdvaTab with Eurand's complementary particle technologies, such as its Diffucaps®, controlled release technology and the industry-leading Microcaps® flavor masking technology, sets it apart from competing MDTs solutions [2].

Wowtab technology
The mouth dissolving tablet formulation known as Wowtab has been on the Japanese market for a while. AdvaTab tablets break down fast when used orally. Using sugar and sugar-like mannitol, both of which have high water solubility and sweetness, the Wowtab technology helps conceal flavors and provide a pleasing tongue feel. According to how easily they can be molded and how quickly they dissolve, sugar-based excipients are categorized. Both traditional bottles and blister packs can be used to package Wowtab products [21].

Flash dose technology
This method creates a crystalline structure that resembles floss using a special spinning motor, just like cotton candy. This crystalline sugar can then be mixed with the active drug before being compressed into a tablet. This procedure, known as Shearform, has been patented by Fuisz. The medicine can be carried by tiny saccharide spheres rather than floss-like material. This technology entails the creation of a tablet that dissolves quickly and contains an active substance in the form of a microcrystal [22].

QuickSolv technology
On this technique, Janssen Pharmaceuticals holds a patent. It produces a matrix made of two liquids that dissolves quickly. The procedure entails dissolving the matrix's constituent parts in water and then freezing the resultant solution or dispersion. The water is subsequently removed from the matrix using excessive alcohol. The finished item has a uniform porosity and enough handling strength [23].

Lyoc technology
Pharma Lyoc holds the patent for the Lyoc technology. This method involves making an oil-in-water emulsion, applying it directly to blister cavities, and then freezing-drying the mixture. By adding inert filler to improve viscosity and ultimately start the sedimentation process, homogeneity during freeze-drying is prevented. A high filler content can diminish the porosity of tablets, which lowers the rate of disintegration [24].

Ziplets technology
The Ziplets technology was recently created by Eurand and can be applied to both bulk actives and coated microparticle forms of water insoluble substances. When the soluble components dissolve on the tablet's outer layer, the rate of water diffusion into the core slows because concentrated viscous solutions form [15].

OraQuick technology
A proprietary taste-masking technique is used in the composition of the OraQuick mouth dissolving pill. Since no solvents are used during the flavor masking process, production is sped up and made more effective. OraQuick is suited for heat-sensitive medications since it generates less heat during manufacture than alternative fast dissolving methods. OraQuick claims to dissolve quickly in a couple of seconds while disguising the taste [25].

Frosta technology
Akina has a patent on this concept. It employs the concept of manufacturing plastic granules, compressing them under low pressure, and producing strong tablets with a lot of porosity. Plastic granules contain a binder, a porous plastic material, and a water penetration booster. Before being pulverized into granules with a binder, the porous plastic component is combined with a water penetration enhancer. The resulting tablets disintegrate quickly (15–30 s depending on tablet size) and have outstanding hardness [26].

Ceform technology
This method creates microspheres that contain the active component. The core of the manufacturing process for Ceform microspheres entails adding a dry powder containing a pharmaceutical compound that is either essentially pure or specially blended with another pharmaceutical compound, excipients, and a pharmaceutical compound machine. The centrifugal force of the Ceform machine's rotating head propels the dry medication combination through tiny, heated holes. The microspheres are then combined and compacted into the oral distribution dose type that was previously chosen. The capacity to process both the drug and the excipient simultaneously creates a special microenvironment where items can be added to the microsphere that can change the properties of the drug ingredient [27].

Pharmaburst technology
SPI Pharma has patented a "Quick Dissolve" delivery technique. Pharmaburst, a coprocessed excipient technique, allows for fast disintegration and little adhesion to punch faces and molds. Saccharine is used in this technique to make a strong, swiftly melting tablet. The active component is coupled with saccharides that have a limited moldability [28].

Quick-Dis technology
An optimal intraoral mouth dissolving drug delivery system has been developed by Lavipharm Laboratories Inc. to meet the market's unmet needs. Lavipharm has invented the thin, flexible, and swiftly dissolving Quick-Dis film, a revolutionary intraoral drug delivery device. The film is applied on the top of the tongue. While remaining at the application site, it rapidly releases the active component for local and systemic absorption. The Quick-Dis medication delivery system has a variety of packaging choices, from single-dose pouches to multidose blister packages. The 2 mm thick Quick-Dis film frequently deteriorates in 5–10 s after coming into touch with water. The disintegration time is at this point. A 2 mm thick Quick-Dis film dissolves in around 30 s, where the dissolving time is the amount of time it takes for at least 80% of the tested film to dissolve in water. When using a Quick-Dis drug delivery mechanism, an active component generally releases 50% in 30 s and 95% in 1 min [29].

EXCIPIENTS USED IN PREPARATION OF MDT

Table 1 below provides a summary of the excipients utilized in the production of MDT.

SUPERDISINTEGRANTS

Because of its simplicity and affordability, disintegrant addition is a common method for creating MDTs. The fundamental ideas include adding superdisintegrants in the right amount to achieve oral dissolving of tablets and pleasant mouth sensations.

Factors to be considered for the selection of superdisintegrants
1 The pill should dissolve in the mouth as it comes into touch with saliva
2 It should be able to be compressed to create less fragile tablets
3 It can provide the patient a satisfying mouth feel. Therefore, small particle sizes are used to guarantee patient compliance

Table 1 : Excipients used in mouth dissolving tablets

Excipient used	Examples
Superdisintegrants	Crospovidone, croscarmellose, microcrystalline cellulose, sodium starch glycolate, sodium carboxy methyl cellulose, calcium carboxy methyl cellulose, modified corn starch
Flavors	Peppermint, cooling flavor, flavoring aromatic oil, peppermint oil, clove oil, bay oil, anise oil, eucalyptus oil, thyme oil
Sweeteners	Aspartame, sugars derivatives
Filers	Mannitol, sorbitol, xylitol, calcium carbonate, magnesium carbonate, calcium phosphate, calcium sulfate, pre-gelatinized starch, mg trisilicate, aluminum hydroxide
Surface active agents	Sodium dodecyl sulfate, sodium lauryl sulfate, tweens, spans
Binders	PVP, PVA, HPMC
Lubricants	Stearic acid, mg stearate, polyethylene glycol, liquid paraffin, colloidal silicon dioxide

PVP: Polyvinylpyrrolidone, HPMC: Hydroxypropyl methylcellulose, PVA: Polyvinyl alcohol

Table 2: Flow property based on angle of repose

Flow property	Angle of repose (degrees)
Excellent	25–30
Good	31–35
Fair-aid not needed	36–40
Passable-may hang up	41–45
Poor-must agitate, vibrate	46–55
Very poor	56–65

Table 3: Flow of property based on Hausner's ratio

Flow property	Hausner's ratio
Excellent	1.00–1.11
Good	1.12–1.18
Fair	1.19–1.25
Passable	1.26–1.34
Poor	1.35–1.45
Very poor	1.46–1.59
Very, very poor	>1.60

Table 4: Weight variation of mouth dissolving tablets

Average weight of tablets	Percentage deviation
80 mg or less	±10
80 mg or 250 mg	±7.5
250 mg or more	±5

4 Since it increases the flowability of the entire mix, it should have good flow.

Pre-formulation studies of drug and excipients

Pre-formulation is started when a newly created drug has demonstrated enough pharmacologic commitment in animal models to warrant testing in humans. It is essential to determine the precise basic physical and chemical characteristics of the drug molecule as well as any additional qualities that may be deduced from the drug powder. This knowledge serves as a guide for many of the upcoming events and ways for describing progress. The term for this first stage of learning is pre-formulation. Pre-formulation studies are crucial to preventing formulation-related problems at a later stage of formulation development, reducing product launch times, and lowering the cost of the prescription item [30].

Angle of repose

To determine the angle of repose, one can measure the friction forces in a loose powder θ. It is defined as the largest possible angle that may be created between the surface of the powder pile and the horizontal. The angle of repose is calculated using Newman's funnel technique. The measured amount is put into the funnel. The funnel is positioned such that the tip barely scrapes the blend heap at the top. The mixture is allowed to flow freely through the funnel on the outside [31]. The formula below may be used to calculate the powder cone's diameter and angle of repose (Table 2):-

$$\text{Tan}(\theta) = h/r$$

Where, θ = angle of repose
r = radius of the cone base
h = height of the cone

Bulk density (Db)

Bulk density (Db), represented by the unit g/cm^3, is the mass of the powder divided by the bulk volume. The final step is to compute the bulk density by dividing the sample weight in grams by the finished volume in cubic centimeters [32].

$$Db = M/Vb$$

Where, M = mass of powder in gram
Vb = bulk volume of the powder.

Tapped density (Dt)

By dividing the powder's entire mass by its tapped volume, one may calculate its tapped density. It may be estimated by including a graduated cylinder with a known mass of the drug-excipient combination. The cylinder is allowed to naturally fall from a height of 10 cm onto a hard surface at intervals of 2 s. The tapping is kept up until the difference between successive volumes is under 2%. It is expressed in g/ml [33].

$$Dt = M/Vt$$

Where, M = mass of powder

Vt = volume of the tapped packing.

Hausner's ratio

As an indirect measure of how easily powder flows, Hausner's ratio is defined as:

$$\text{Hausner's ratio} = Dt/Db$$

Where, Dt = tapped density
Db = bulk density.

Porosity

The ratio of the void volume (Vp) to the bulk volume (Vb) of the package is used to define the porosity € of powder [34] (Table 3).

The powder's porosity is determined by:

$$€=Vb - Vp/Vp = 1 - Vp/Vb$$

The following are common percentages used to represent porosity:

$$\% € = (1 - Vp/Vb) \times 100.$$

Carr's index

Powder flow characteristics are shown by Carr's index, which is provided by -

$$C.I. = Dt - Db/Dt \times 100$$

Where, Dt = tapped density of the powder;
Db = bulk density of the powder.

QUALITY CONTROL TEST OF MDT

Tablets produced from all of the formulas underwent the following quality control tests:

General appearance
Customers' perceptions of a tablet's overall appearance, visual identity, and level of "elegance" are influenced by its dimensions, shape, color, taste, texture of the surface, physical flaws, consistency, and readability of any identifying markings.

Size and shape
The size and form of the tablet may be managed and tracked in terms of its dimensions [35].

Tablet thickness
Some filling equipment uses the consistent thickness of the tablets as a counting mechanism. As with normal tablets, the thickness of the tablet can be measured using a micrometer or a Vernier caliper. Ten tablets may be taken, and a micrometer may be used to measure their thickness [36].

Weight variation
Twenty pills are randomly selected from the batch and weighed separately to check for weight variation. The Indian Pharmacopoeia 5 weight variation standard is shown in the (Table 4).

Hardness
The hardness of a tablet is defined as the amount of force required to shatter it across its diameter. When handled before use and during storage transition, the tablet's hardness influences how resistant it is to breaking, chipping, or abrasion. Hardness can be assessed using a Monsanto, Erweka, Pfizer, or Schleuniger hardness tester [37].

Friability
Friability may be assessed using the Roche Friabilator. This device subjects the tablet to the combined effects of abrasion and stress in a plastic container that rotates at a speed of 25 revolutions per minute and drops a tablet from a height of 6 inches with each revolution. The friabilator rotates a sample of tablets that have been pre-weighed 100 times [38]. The following formula provides the friability (F):

$$F = \frac{W\,int. - W\,fin}{W\,int.} \times 100$$

Where, Wint = Initial weight of tablets before friability;
Wfin = Final weight of tablets after friability.

Wetting time
The dosage form's wetting time and contact angle are related. It has to be assessed to provide light on the tablet disintegration properties; a shorter wetting time means a tablet will disintegrate more quickly. This is accomplished by placing a tablet in a tiny Petri dish with an internal diameter of 6.5 cm, 6 ml of water, and measuring how long it takes for the tablet to get totally wet [39].

Disintegration test
Fast dissolving pills need to have their disintegration times adjusted since they must dissolve without water for the test to be accurate. A 10 ml of water are placed inside a 10 cm diameter Petri dish for this purpose. The tablet is placed gently in the center of Petri dish, and the duration till it totally crumbles into tiny pieces can be noticed [40].

Water absorption ratio
A piece of tissue paper can be folded twice and placed in a small Petri dish with 6 cc of water. You may calculate how long it will take for a tablet to be completely wet by laying it out on paper. After that, the moist pill is weighed [41]. The following equation may be used to calculate the water absorption ratio, R:

$$R = 10\,(wa/wb)$$

Where, wa = weight of tablet before water absorption;
wb = weight of tablet after water absorption.

***In vitro* dispersion time**
The *in vitro* dispersion time is calculated by dropping a tablet into a beaker with 50 ml of liquid. We randomly choose three pills from each formulation so that we can perform an *in vitro* dispersion test. It is possible to measure how long it takes for a pill to completely disperse [42].

***In vitro* dissolution test**
To perform *in vitro* dissolution studies, the USP paddle technique at 50 rpm in 900 ml of dissolving fluid kept at a temperature of 37±0.5 may be employed. You can select a dissolution medium based on a monograph. After staining the sample through Whatman filter paper and performing a spectrophotometric analysis at a specific wavelength, the sample should be taken out at the designated intervals. To maintain the same volume throughout the test, an equal amount of freshly heated medium heated to 37°C is added back into the dissolution media after each sampling. With n=6, dissolution studies are conducted [43].

Stability testing of drug (temperature dependent stability studies)
The mouth disintegrating tablets should be put in the proper packaging and stored under the following conditions for a period of time in accordance with ICH guidelines for stability studies [44].

Long-term testing conditions: 25.2°C/60.5% RH

Accelerated testing requirements: 40.2°C/75.5% RH

The pills are taken out after 15 days and checked for physical faults such esthetic problems, hardness, friability, disintegrations, and drug content. The acquired data are fitted into first order equations to ascertain the kinetics of deterioration. The Arrhenius equation may be used to calculate the shelf life at 25°C given stability data.

PACKAGING

Packaging is one of the essential elements in the production of MDT, in accordance with ICH criteria for stability study. The products made using various techniques differ significantly in a few areas, most notably mechanical strength. The end products of the lyophilization process, which makes use of a number of technologies, such as Zydis, Lyoc, Quicksolv, and Nanocrystals, are porous by nature, have a low physical resistance to moisture, and may degrade in situations with higher humidity levels. The aforementioned factors necessitate appropriate packaging for purchased products. Zydis units are often packaged with peelable backing foil. Packsolve offers a special packaging unit for OraSolv tablets with a dome-shaped blister that stops the tablet from moving vertically within the depression and protects it from breaking during storage and shipping. A number of the DuraSolv products that were bought. Technologies such as WOW Tab, Pharmaburst, OraQuick, and Ziplets, among others, are frequently packed in push-through blisters or bottles because they have the mechanical strength to endure handling and transportation jolts [45].

CONCLUSION

This review covers a variety of patented and unpatented methods for creating MDT, along with their benefits, drawbacks, pre-formulation, formulation, and quality control requirements. The overview came to the conclusion that MDT might help patients with their dysphasia, improving their bioavailability. In the modern era of pharmaceuticals, MDTs are largely preferred as compared to more conventional dose forms such as tablets and capsules.

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