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A Review on Mouth Dissolving Tablet

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Abstract

Nowadays, dysphagia is an issue with traditional dosage forms like tablets and capsules, which leads to a high prevalence of non-compliance and renders therapy ineffective. Mouth dissolving tablets, which have good hardness, dose homogeneity, and ease of administration and serve as the preferred option of dosage form for paediatrics, geriatrics, and travelling patients, have been designed to eliminate the issues associated with conventional dosage forms. In order to have enough hardness, integrity, and speed up disintegration without water, the MDTs were invented. rapid dissolution Without the use of water, tablets easily dissolve or disintegrate in saliva. Some tablets are truly fast-dissolving tablets because they are made to dissolve in saliva amazingly quickly—within a few seconds. Others have additives that speed up the process of Tablet disintegration in the oral cavity is more properly referred to as fast-disintegrating tablets because it can take them up to a minute to do so. This tablet shape was created to make it possible to administer an oral solid dose form without drinking any liquids. These tablets easily dissolve or break down in the saliva, usually in under 60 seconds.

Keywords: Disintegration, marketed MDTs, patented technology, and mouth dissolving tablets

Introduction

The oral route is still favoured for administering therapeutic agents due to correct dosage, low cost therapy, self-medication, non-invasive technique, and convenience of administration, which leads to a high level of patient compliance despite significant advancements in drug delivery[1]. The idea of MDDDS was developed with the intention of increasing patient compliance. These dosage forms are very appealing to paediatric and geriatric patients since they quickly degrade and/or dissolve to release the medication as soon as they come into contact with saliva, eliminating the requirement for water during administration[2]. It is typical for people of all ages to have trouble swallowing traditional tablets and capsules, especially the elderly and those who have dysphagia. Orodispersible pills, fast disintegrating tablets, orally disintegrating tablets, quick disintegrating tablets, fast dissolving tablets, rapid dissolving tablets, porous tablets, quick melt tablets, and rapid melt tablets are other names for mouth-dissolving tablets[3-9].However,the USP recognised these dose forms as ODTs notwithstanding all the aforementioned terms. ODTs are "A solid dosage form containing medicinal substances or active ingredients which disintegrates rapidly with in a few seconds when placed up on tongue," according to the United States Food and Drug Administration (FDA). In comparison to alternative dose forms, such as effervescent tablets, dry syrups, and chewing gums/tablets, which are frequently used to improve patient compliance, MDTs have a number of advantages. Effervescent tablets/granules and dry syrups require mandatory preparation, which includes water consumption. Elderly patients sometimes

experience the bitter or unpleasant taste of the medication in the dose form if the taste masking coat ruptures during mastication. Elderly patients are unable to chew big chunks of tablets or gum.[10]

Advantages of mouth dissolving tablet-

- Due to the enhanced taste of bitter medications, the good mouth feel feature of MDDDS helps to transform the common perception of treatment as "bitter pill," especially for paediatric patients.[11]
- Compared to liquid preparations, ease of administration and precise dosing.
- The advantages of taking liquid medicine instead of a solid formulation.
- Faster drug absorption through the mouth, throat, and oesophagus, which may result in a quick commencement of action.[12-14]
- By minimising adverse effects, pre-gastric absorption can increase bioavailability, lower doses, and clinical performance.
- Ease of administration for patients who cannot swallow, such as the elderly, those who have had strokes, and those who are bedridden, as well as for patients who shouldn't swallow, such as those who have renal failure, as well as for patients who refuse to swallow, such as children, the elderly, and those who are psychiatric patients.[14-16]

Technique of MDTs Formulation

The quick infiltration of water into the tablet matrix, which causes rapid disintegration, is thought to be the cause of the MDTs' speedy dissolving ability. Consequently, the fundamental methods for creating MDTs are:[17]

- Making the most of the tablet matrix's porous structure.
- Using the right disintegrating agent or agents.
- Using excipients in the formulation that are extremely water soluble.

Challenges in formulating the fast dissolving Tablet

Palatability-

FDTs typically contain the medication in a taste-masked form because most medications are unpleasant to consume. After being administered, it dissolves or disintegrates in the patient's mouth, releasing the active components that contact the taste buds Therefore, concealing the taste of the medications is essential to ensuring patient compliance.[18-19]

Hygroscopicity-

Several hygroscopic orally disintegrating dosage formulations are incapable of maintaining physical integrity in the presence of typical temperature and humidity levels. As a result, they require humidity protection, which necessitates the use of speciality product packaging.[20]

Aqueous Solubility-

Because they produce eutectic mixtures, which lower the freezing point and lead to the production of a glassy solid that may collapse upon drying due to the loss of supporting structure during the sublimation process, water-soluble pharmaceuticals present a variety of formulation issues. Utilising a variety of matrix-forming excipients, such as mannitol, which induces crystallinity and hence gives the amorphous composite stiffness, can occasionally prevent such collapse.[21]

Size of the Tablet-

The size of a tablet affects how easily it may be administered.

7-8 mm tablets are reportedly the simplest to swallow, while tablets larger than 8 mm were said to be the easiest to handle. Consequently, it is challenging to create tablets that are both convenient to use and easy to manage.[22]

Formulation of MLDs Tablets

Bulking Materials

Bulking components play a crucial role in the creation of fast-melting tablets. The substance provides diluent, filler, and cost-cutting properties. Additionally, the addition of bulk also lowers the concentration of the active ingredient in the composition. Bulking agents enhance the textural qualities, which in turn promote the disintegration in the mouth.[23-25]

For increased aqueous solubility and good sensory perception, more sugar-based bulking agents are advised for this delivery system, such as mannitol, polydextrose, lactitol, DCL (direct compressible lactose), and starch hydrolystate. Bulking agents are applied in amounts between 10% and 20%.[26]

Emulsifying Agents

Emulsifying agents are crucial excipients for creating tablets that dissolve quickly since they speed up the release of the medicine without the need for chewing, swallowing, or water. Additionally, adding emulsifying agents helps to stabilise immiscible mixes and improve bioavailability. For the creation of fast-acting tablets, a variety of emulsifiers are advised, including alkyl sulphates, propylene glycol esters, lecithin, sucrose esters, and others. These substances can be included in the final composition in amounts varying from 0.05 to 15 percent by weight.[27-29]

Lubricants:

Although they are not necessary excipients, lubricants can help make these tablets taste better once they dissolve in the mouth. Lubricants take away stickiness and help transfer drugs from the lips down into the stomach.[30]

Superdisintegrant

An excipient called a disintegrant is added to a tablet or capsule mixture to help break apart the compacted mass when it is placed in a fluid environment.[31-34]

Name of disintegant	Brand name	concentration	Mechanism action
Sodium Starch Glycolate	Explotab,Primogel	2-8%	Swelling
Micro crystalline cellulose	Avicel, Celex	2-15%	Eater wicking
Cross linked povidone	Cross povidone	2-5%	Swelling,water-wiking
Low substutedhydroxy propyl cellulose	LH-11, LH-12 (Grades)	1-5%	Swelling
Crosscarmellose sodium	Ac-Di-Sol	1-3%	Wicking
Pregelatinized starch	Starch 1500	1-20%	swelling

Various manufacturing technique of MDDDS-

Lyophilization
Moulding
Direct Compression
Cotton Candy Process
Spray Drying
Sublimation
Mass Extrusion

Lyophilization

After the product has been frozen during the freeze-drying process, the water is sublimed from it. Drugs like famotidine, loperamide, piroxicam, oxazepam, lorazepam, domeperidone, brompheniramine, olanzepine, ondansetron, and rizatriptan have all been manufactured using the patented Zydis technology (ZT) method[35]. There are currently thirteen goods on the market that were produced utilising this technology. Claritin Reditab, Dimetapp Quick Dissolve, Feldene Melt, Maxalt- MLT, Pepcid RPD, Zofran ODT, and Zyprexa Zydis are among the MDT products that are offered in the United States. Zydis formulations for oxazepam, lorazepam, loperamide, and enalapril are also offered on the global market. ZT uses an original freeze-drying procedure.

Stage 1 involves preparing an aqueous medication solution or suspension in large quantities and precisely dosing it into blisters that have already been made. Since the blister is the one that really shapes the tablet, it plays a crucial role in the whole product package.[36-40]

Stage 2 involves putting the filled blisters through a particularly crafted cryogenic freezing procedure to regulate the ice crystals' final sizes and make sure the tablets have a porous matrix to aid in their quick disintegration property. The majority of the remaining moisture is removed from the tablets during the sublimation process, which is where these frozen units are transferred after being frozen.[42]

Stage 3: Using a heat-seal method to close open blisters, the product is stabilised and protected from a range of external factors.

Tablet Moulding

Moulded tablets always contain water-soluble components, which causes the tablets todissolve quickly and fully. The following are the various tablet moulding methods:[43]

Compression Moulding Process

In this manufacturing technique, the powder mixture is moistened with a hydroalcoholic solvent before being compressed (compression moulded) into mould plates to create a wetted mass. After that, the solvent is eliminated by air drying, a procedure used in the production of tablet triturates. These tablets are not as small as compressed tablets, and possess a porous structure that hastens dissolution.[44]

Heat Moulding process

During the heat-moulding process, the molten mass holding the medication is set. In this method, the tablet is made using a mould, agar solution as a binder, blister packaging, and so on. A suspension containing the medication, agar, and sugar is created, then the suspension is poured into the blister

packing well, the agar solution is allowed to cool to become a jelly, and finally the suspension is dried under vacuum at a temperature of around 30 °C.[45]

Direct Compression

Due to their ability to be produced using standard tablet manufacturing and packaging equipment as well as the availability of tabletting excipients with improved flow, compressibility, and disintegration properties, particularly tablet disintegrants, effervescent agents, and sugar-based excipients, DC is the most straightforward and economical tablet manufacturing technique for MDTs.[46-48]

Sublimation

High porosity MDTs have been created by the sublimation process. Compressing the excipients and volatile components into tablets creates a porous matrix, which is then transformed through sublimation.[49]

This has been accomplished by using inert solid substances with high volatility, such as ammonium bicarbonate, ammonium carbonate, benzoic acid, camphor, hexamethylenetetramine, naphthalene, phthalic anhydride, urea, and urethene. The creation of the matrix's porosity was also suggested using solvents like cyclohexane and benzene. Water is used as a pore-forming substance in a process described by Makino et al.[50]

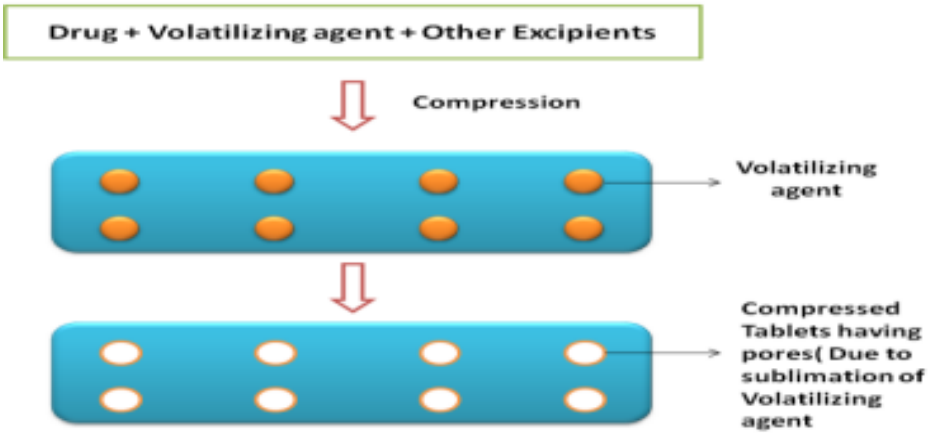

Fig 1-Sublimation technique. Evaporation of volatile agent results in formation of porous tablets thereby causing fast disintegration[51]

Spray Drying process

Spray-drying has been employed by Allen et al. to create MDTs. The formulations included sodium starch glycolate/croscarmellose as a disintegrant, mannitol as a bulking agent, and hydrolyzed and unhydrolyzedgelatin as a supportive ingredient for the matrix. With the addition of an acid (like citric acid) or an alkali (like sodium bicarbonate), disintegration and dissolution were further accelerated.[52-53] Spray-drying the excipient suspension produced a porous powder that was then crushed into tablets.

Evaluation parameters

Weight variation test:

Twenty tablets were chosen at random, and the weights of each tablet as well as the total weight of the twenty tablets were calculated. Calculated deviations from average weights for each individual tablet were then compared to the Pharmacopoeia's standard values.[54]

The following formula determines the percentage of each tablet's weight that deviates from the average.

% WeightVariation = Average of 20 pills Individual weight of each tablet

Twenty tablets, on average, weigh 100.

Test for hardness:

Monsanto and Pfizer hardness testers, among others, were used to measure the hardness of the tablets. The amount of force needed to break the tablets is proportional to how hard they are (kg/cm2). The measured values must match the reference value.[55]

Friability Test

The degree of tablet fracture under physical stress conditions, such as during transit or packing, is referred to as friability. A sample of six randomly selected tablets was tested for friability using a Roche friabilator set at 25 rotations per minute for 4 minutes. The percentage of weight reduction is calculated by comparing the combined weight of six tablets before and after operation.[56]

Formula for calculating the % weight loss is given below: % $Weigh\ tloss$ = Totalweight of tablet before

− Total weight of tablets after Total weight of tablets × 100

Wetting time:

For mouth-dissolving tablets, wetting time and water absorption ratio are key factors. With the next technique, you may determine how long the pill needs to wet. In a tiny petri dish filled with a water-soluble dye solution, a piece of filter paper that had been cut in a circular shape was put. The time needed to completely moisten the tablet was calculated when it was placed on the paper (Figure 7).Tissue paper that had been folded twice was utilised by Bi Y. et al. and placed in a little culture dish (i.d. = 6.5 cm) with 6 ml of water.

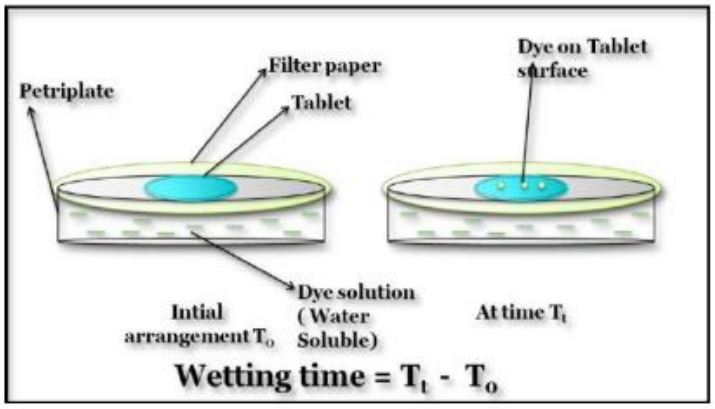

Fig 2- Wetting time of Mouth dissolving tablet. The time taken for appearance of dye colour on tablet is wetting time[57]

Water absorption ratio:

The method used to determine wetting time is similar (Figures 8). However, in this case, the tablet's initial weight and final weight (after thorough soaking) were assessed, and the water absorption ratio was determined using the following formula:[58]

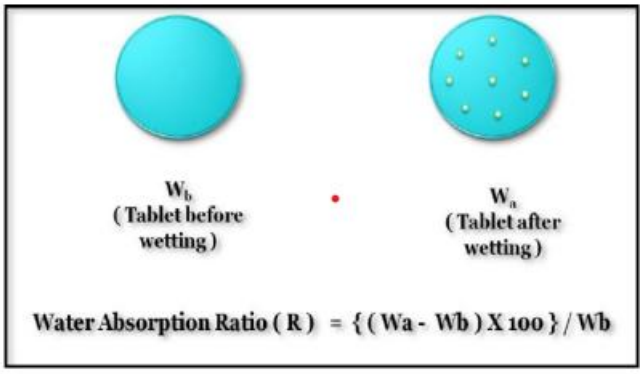

Fig 3- Calculation of water absorption ratio for MDTs. Difference between intial and final weights of tablet is noted Water absorption[59]

In vitro dissolving studies:

Six tablets were chosen at random and submitted to drug release tests using a USP dissolution apparatus. A volume of 900 ml of dissolution media was employed, and a temperature of 37 0.5 oC was maintained. Up to 30 minutes, 5 ml of the sample was taken at 5-minute intervals and replaced with 5 ml of new buffer solution. The samples were filtered and appropriately diluted, then an HPLC or UV spectrophotometer was used to perform the drug assay.[60-63]

Conclusion

Given its potential benefits over conventional dose forms—improved patient compliance, ease, bioavailability, and quick commencement of action—many manufacturers have been paying close attention to FDTs for more than a decade. The FDT formulations made possible by several of these technologies are sufficiently strong mechanically and dissolve quickly in the mouth without liquid. Within this market category, there is a significant possibility for new enhanced oral products to emerge. A third of the population, mostly elderly and young people, have trouble swallowing, which makes it difficult for them to take their oral tablet medications as prescribed and lowers the effectiveness of their treatment as a whole. These pills are made to dissolve or disintegrate quickly in the saliva, usually in less than 60 seconds (between 5 and 50 seconds). The creation of a fast-dissolving tablet also presents a chance. Numerous medications, including analgesics, antihistamines, cardiovascular medications, neuroleptics, and medications for erectile dysfunction, can be thought of as candidates for this dose type. Pharmaceutical companies frequently create a specific therapeutic entity in a new and enhanced dosage form as a given drug entity approaches the end of its patent life. A novel dosage form enables a firm to maintain market exclusivity while providing a more practical dosage form or dosing schedule to its patient population.

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