ISSN:0975-1459
Journal of Pharmaceutical Sciences and Research
www.jpsr.pharmainfo.in

A Review on Orodispersible tablets

Thamarai Selvi. P[1], Dr. R.Pushpalatha[2]

[1]*Mayor Radhakrishnan College of Pharmacy, Cuddalore, Tamilnadu.*
[2]*Professor, Department of Pharmaceutics, Mayor Radhakrishnan College of Pharmacy, Cuddalore, Tamilnadu.*

Abstract:

ODTs are gaining significant importance in the pharmaceutical industry due to their ability to improve patient compliance, enhance drug bioavailability, and provide accurate dosing compared to conventional formulations. They disintegrate rapidly in the oral cavity, typically within less than one minute, resulting in easy-to-swallow residue that benefits pediatric and geriatric patients. Advanced methods like freeze-drying, spray-drying, effervescent techniques, and patented technologies like microencapsulation and nanocrystals have been employed to mask the bitter taste of drugs, ensuring better patient acceptance. Challenges such as reducing manufacturing costs, improving packaging, enhancing mechanical strength, and effective taste masking are being addressed through ongoing research.

Keywords: Orodispersible tablets, fast dissolving tablets, disintegrating tablets,ODTs

1. INTRODUCTION

Solid dosage forms are widely used due to their affordability, simplicity of usage, precise dosage, self-medication and most importantly to ensure patient compliance. Tablets and capsules are the most widely used solid dose forms. Dysphagia or difficulty swallowing is a significant disadvantage of solid dosage forms that affect people of all ages. The size, surface, and flavour of tablets are common reasons for trouble swallowing. Geriatric and paediatric patients, as well as travellers who may not have easy access to water, require the most easily swallowable dosage forms. Pharmaceutical technologists have created a novel oral dose form called ODTs to meet these medical needs. ODTs dissolve quickly in saliva and don't require water, typically dissolving in a matter of seconds. In comparison to conventional dosage forms, there may be a significant increase in medication solubility and absorption, as well as the onset of clinical action and drug bioavailability. ODTs release the drug into the oral cavity where it is absorbed by the local oromucosal tissue as well as the gastrointestinal tract's (GIT), pre-gastric (the stomach), post-gastric (the small and large intestine) segments. Orodispersible tablets (ODTs) are also known as mouth dissolving tablets, rapid dissolving tablets, fast disintegrating tablets, rapid dissolving tablets, porous tablets, and rapid melts.

The European Pharmacopoeia defines orodispersible tablets as those that disperse easily in the mouth within 3 minutes of ingesting. The United States Food and Drug Administration define ODT as "A solid dosage form containing a medicinal substance or active ingredient which disintegrates rapidly, usually within a matter of seconds, when placed upon the tongue." The disintegration time for ODTs typically ranges from several seconds to a minute.

The United States Pharmacopoeia, the British Pharmacopoeia, and the Center for Drug Evaluation and Research (CDER) have recently authorized ODT terminology. The US Food and Drug Administration described ODT tablets as "A Specific type of medication that quickly dissolves in the mouth, requiring no water to swallow".

1.1 Ideal properties of Orodispersible tablets

- It does not require water for swallowing and dissolves quickly in the mouth.
- Increased drug loading
- Compatible with flavor masking and other excipients.
- Be flexible to existing processing and packaging equipment.
- Oral administration leaves minimal or no residue in the mouth.
- Low susceptibility to external variables, such as humidity and temperature .

1.2 Advantages of Orodispersible tablets

- Administer to patients who cannot swallow (e.g. old, stroke victims, bedridden), should not swallow (e.g. renal failure), or refuse to swallow (e.g. paediatrics, geriatrics, and psychiatric patients).
- Ensuring patient compliance for disabled, bedridden, traveling, and busy individuals without easy access to water.
- Improved mouth feel can transform the perception of medication as a "bitter pill," especially for pediatric patients.
- More convenient and accurate dosing compared to liquid formulations.
- Benefits of liquid medication versus solid preparation.
- Drugs are more quickly absorbed from the mouth, pharynx, and esophagus, leading to a rapid onset of action.
- Pre-gastric absorption improves bioavailability, dose reduction, and clinical performance by decreasing adverse effects.
- New business potential includes product diversification, line extension, life-cycle management, product promotion exclusivity, and patent extension.

1.3 Disadvantages of Orodispersible tablets

- Orodispersible is hygroscopic in nature, must be kept in dry place.
- Sometimes it possesses mouth feeling
- ODT requires special packaging for properly stabilization and safety of stable product.
- Dose uniformity is a technical challenge.

Table 1: List of Orodispersible tablets available in Marketed Products

Name of drug	Brand name	Manufacturer	Therapeutic uses
Acyclovir	Acivir DJ	Cipla	Anti-viral Agent
Cefixime	Cefinar DJ	Zydus Alidac	Anti-bacterial agent
Mirtazapine	Rameron Soltab	Organon	Anti-depressant
Piroxicam	Feldene Fast Melt	Pizer,NY,USA	NSAID
Ondansetron	Zofran ODI	Glaxo wellcome	Anti-emetic
Nimesulide	Esulide MD	Doff Biotech	NSAID
Mosapride	Mosid MD	Torrent pharma	Migraine treatment
Valdecoxib	Valus	Glenmark	NSAID
Loratadine	Alavert	Wyeth	Anti-allergic
Olanzapine	Zyprexia	Eli lilly, Indianapolis	Anti-psychotic
Famotidine	Pepcid RPD	Merck and co.,NJ	Anti-ulcer
Selegilline	Zepler TM	Amarine Corp London	Anti-parkinsonism

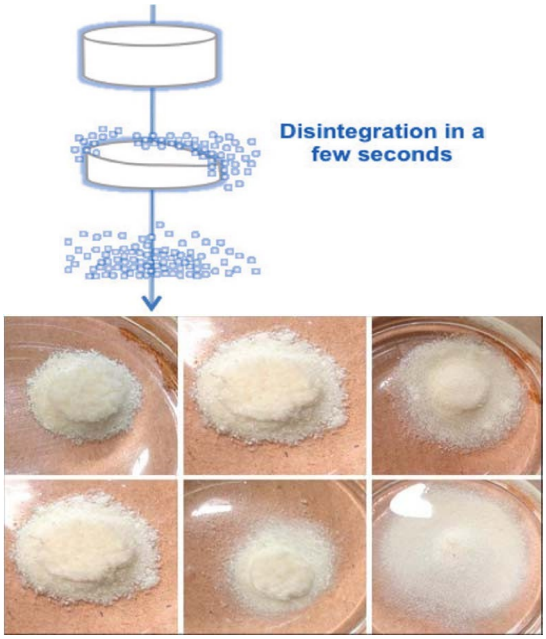

Figure 1: Orodispersible tablets

2. PREPARATION OF ORODISPERSIBLE TABLET

2.1 Method of Preparation

2.1.1 Freeze drying or lyophilisation

In the process of freeze drying, also known as lyophilisation, a frozen medication solution or suspension containing excipients that form structures has its solvent extracted. This method produces tablets that dissolve quickly since they are often very light and porous in nature. The drug material created by freeze drying, along with the glassy amorphous porous structure of the excipients, lead to improved solubility. Typically, the freeze drying procedure has three steps,

- Material is frozen to bring it below the eutectic point
- Primary drying, which removes around 4% of the moisture from the dry product weight.
- Secondary drying to bring the bound moisture down to the desired end volume.

The entire process of freeze drying is done at low temperature, reducing any negative thermal effects that can have an impact on the stability of the drug throughout processing.

2.1.2 Tablet molding

Water-soluble chemicals are usually the main constituents of molded tablets. After moistening the powder mixture with a solvent (often ethanol or water), it is molded into tablets at a pressure lower than that of conventional tablet compression. The solvent can then be eliminated by air drying. In order to improve the dissolution, molded tablets often have a higher porous structure since they are compressed at a lower pressure than conventional compressed tablets. The powder blend typically needs to be run through an extremely fine screen in order to increase the dissolution rate. No vacuum lyophilisation, which involves removing the solvent from a drug solution or suspension at ambient pressure, is one method of preparing the molded forms that has been used recently. Another method involves creating the molded forms directly from a molten matrix in which the drug is dissolved or distributed.

2.1.3 Spray drying

The technique of spray drying allows for the production of extremely porous, fine powders. In the pharmaceutical sector, spray dryers are a standard tool for creating extremely porous powders. According to Allen et al., this method has been used to produce tablets that dissolve quickly.

Getting dried particles with the right qualities is the major goal of drying. The components of oral disintegrating tablets are mannitol, which acts as a bulk agent, hydrolyzed or unhydrolyzed gelatin, sodium starch glycolate, and croscarmellose sodium, which act as disintegrating agents. Citric acid and sodium bicarbonate are occasionally used to enhance their dissolution and disintegration. Lastly in a spray drier, the formulation is spray-dried. The ODTs made with this technique break down in less than 20 seconds. When kollidon CL excipient base was used instead of direct compression to manufacture tablets, maximum drug release and lowest disintegration time were observed. This indicates that the spray dried excipient based technique is preferable to the direct compression technique.

2.1.4 Sublimation

The limited porosity of the tablets is the reason behind the delayed breakdown of the compressed tablet, even with highly water-soluble components. The remaining tablet ingredients were combined with inert solids that volatilize easily, such as urea, ammonium carbonate, ammonium bicarbonate, hexamethelene tetramine, camphor, etc., and the mixture was compacted into tablets. Sublimation was then used to eliminate the volatile components, creating

porous structures in the process. Moreover, a variety of solvents, including as benzene and cyclohexane, can be employed as pore-forming agents.

It is said that tablets made using this method often disintegrate in 10–20 seconds. The tablet matrix and sublimation substance utilized were mannitol and camphor, respectively. To create pores in the tablets, camphor was evaporated by sublimating it in a vacuum at 80°C for 30 minutes.

2.1.5 Melt granulation

Pharmaceutical powders can be effectively agglomerated by a meltable binder using the melt granulation technique. Unlike traditional granulation, this method has the benefit of not requiring the use of organic solvents or water. High shear mixers are used to achieve this method of operation, these mixers use a heating jacket or the heat produced by impeller blade friction to elevate the temperature of the product to the melting point of the binder. Superpolystate©, PEG-6-stearate, a hydrophilic waxy binder, is used in this method to make FDT with enough mechanical integrity. The waxy substance Superpolystate© has an HLB value of 9 and a melting point between 33°C-37°C. As a result, it will serve as a binder, strengthen the tablet's physical resistance, and aid in their dissolution as they melt in the mouth and quickly dissolve away, leaving no residue.

2.1.6 Cotton candy process

This method is so named because it employs an exclusive spinning mechanism to create floss-like crystalline structures that resemble cotton candy. It is sometimes referred to as the candy floss procedure.

The cotton candy procedure includes forming a matrix of polysaccharides or saccharides through the simultaneous action of flash melting and spinning. The matrix is partially recrystallized to increase flow and compressibility. This candy floss matrix is then ground, combined with active ingredients and excipients, then compressed to ODT. This method can handle large amounts of medication and has better mechanical strength. However, this process is limited due to its high temperature.

2.1.7 Mass extrusion

It entails softening the active blend using a solvent mixture of water soluble polyethylene glycol and methanol, followed by ejection of the softened bulk through an extruder or syringe to shape a cylinder of the product into even segments using a heated blade to form tablets.

2.1.8 Phase transition

A unique method for producing suitably hard ODTs using the phase transition of sugar alcohol. To produce ODTs, tablets containing two sugar alcohols, one with a high melting point and the other with a low melting point, are crushed and then heated. Because of the limited or minimal compatibility, the heating process promotes particle bonding, providing tablets with sufficient hardness.

2.1.9 Nanonization

Employing a patented wet-milling method, a drug's particle size can be reduced to nanosize through the use of the recently developed Nanomelt technology. The drug nanocrystals are surface-adsorbed on certain stabilizers to prevent agglomeration, and these stabilizers are subsequently added to ODTs. Particularly for medications that solubility is low, this method is beneficial. Additional benefits of this technology include a wide range of doses (up to 200 mg of drug per unit), a cost-effective manufacturing process, regular packaging because of its exceptional durability, and fast disintegration/dissolution of nanoparticles leading to increased absorption and hence higher bioavailability and dose reduction.

2.1.10 Fast dissolving films

It is an entirely novel field of ODTs that offers a very practical way to take supplements and drugs. Using this method, a non-aqueous solution containing medication and additional taste-masking ingredients is produced. The solvent is allowed to evaporate, allowing the water-soluble film-forming polymer (such as carboxymethylcellulose, hydroxypropyl methylcellulose, hydroxyl ethylcellulose, hydroxyl propylcellulose, polyvinyl pyrrolidone, sodium alginate, etc.) to form a film.

If the medication is bitter, coated microparticles of the drug or resin adsorbate can be added to the film. When this film is put to the mouth, it quickly melts or dissolves, releasing the medication in a suspension or solution. This system's characteristics include fast drug delivery, a size of less than 2x2 inches, paper thin films that dissolve in 5 seconds, and flavoring after taste.

2.1.11 Direct compression

For ODTs, direct compression is the easiest and economical method of producing tablets because it can be produced with standard tablet and packaging equipment and with tableting excipients having better flow, compressibility, and disintegration qualities. These include sugar-based excipients, effervescent agents, and tablet disintegrants.

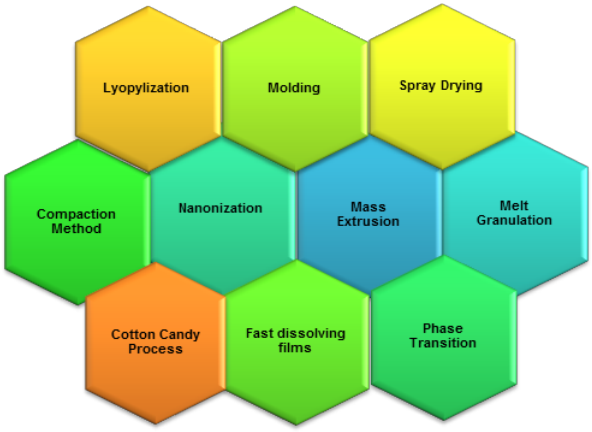

Figure 2: Different methods used for preparation of Orodispersible tablets

2.2 Latest Patented Technologies

Table represents the patented technologies and the technique used in the preparation of Orodispersible tablets.

Table 2: Patented technologies and techniques used in ODT's

S.No	Name of the Technology	Technique used
1.	Zydis	Freeze drying process
2.	Quick-dis	Thin, flexible & quick flim
3.	Oraquick	Microencapsulation
4.	Durasolv	High compaction pressure
5.	OT	Low compression force
6.	Shearform	Heat flash process
7.	Flashdose	Self-binding shear form matrix
8.	Flashtab	Microgranulation of microcrystals
9.	Wowtab	Two different types of Saccharides
10.	Nanocrystal	Nanocrystal technique
11.	Lyoc	Freeze dried emulsion
12.	Ziplet	Water soluble inorganic excipients
13.	Pharmaburst	Co-processed excipients
14.	Frosta	Plastic granules having high porosity

Figure 3: Pharmaceutical technologies and techniques used in ODT's

3. Excipients Used In Formulation Of Orodispersible Tablets

Excipients utilized in FDTs include a super disintegrant, a diluent/bulking agent, a lubricant and, if necessary, a swelling agent, a permeabilizing agent (depending on the drugs nature), sweeteners, and flavorings. Excipients play an important part in the formulation of the fast-dissolving tablet.

3.1 Super Disintegrants

In several direct compression-based ODT technologies, the inclusion of superdisintegrants has a primary effect on the rate of disintegration and thereby dissolution. The presence of other formulation elements, such as water-soluble excipients and effervescent agents, accelerates the process of disintegration.

These agents are blended to make the formulation, which increases compatibility, ²compressibility, and reduces the possibility of affecting mechanical strength. As a result, these super disintegrants improve the applications of fast dissolving tablets, capsules, mouth dissolving tablets, orodispersible tablets, and so on. There are two types of super disintegrants used, one is natural super disintegrants and the other is synthetic super disintegrants.

Natural Super disintegrants are derived from natural sources and are non- irritating or non-toxic in nature. Natural compounds are employed as superdisintegrants: such as Soy polysaccharide, Isapghula Husk Mucilage (Plantago ovata), Chitosan, Guar Gums, and Agar.

Synthetic Super disintegrants comprises of Croscarmellose sodium, sodium starch glycolate and crospovidone.

3.2 Emulsifying agents

These compounds are used to quickly dissolve and release the medication without requiring the user to swallow, drink water, or chew the tablet. When the final formulation is developed, they can be added in amounts ranging from 0.05% to 15% by weight. A variety of emulsifying agents are employed including lecithin, propylene glycol esters, and sucrose esters.

3.3 Bulking Substances

These ingredients are crucial in improving the formulation's bulkiness, texture, and oral dissolving time. Mannitol, fructose, sorbitol, and lactose derivatives were a few of the agents.

3.4 Effervescent agents

The patented Orasolv technology (OT), which is widely utilized to create over-the-counter medications, is based on the evolution of CO_2 as a disintegrating mechanism. The product contains microparticles and is slightly effervescent in nature. The tablet dissolves when the effervescent agent is activated by saliva.

3.5 Sugar based excipients

This is another direct compression approach for creating ODT. Sugar-based excipients include bulking agents like dextrose, fructose, lactitol, maltitol, maltose, mannitol, sorbitol, starch hydrolysate, polydextrose, and xylitol, especially those with high water solubility and sweetness. These substances also offer a pleasant mouthfeel and taste-masking abilities. Based on the dissolution rate and molding, Mizumito et al. classified sugar-based excipients into two groups.

Type 1: Lactose and mannitol are saccharides with a limited moldability and a high dissolving rate.

Type 2: Maltose and maltilol, two saccharides, have a low dissolution rate and a high moldability.

3.6 Diluents

Magnesium tri silicate, Mannitol, Magnesium carbonate, Sorbitol, Calcium carbonate, Xylitol etc. Percentage used in formulation is 0-85 %.

3.7 Binders

Polyvinyl pyrrolidone, Polyvinyl alcohol Hydroxy propyl, methylcellulose. Percentage used in formulation is 5-10%.

3.8 Antistatic agent

Sodium lauryl sulfate, sodium dodecyl sulfate, polyoxyethylene sorbitan fatty acid esters, polyoxyethylene stearates etc. Percentage used in formulation is 0-10 %.

Figure 4: Excipients used in Orodispersible Tablet

4. Evaluation Of Orodispersible Tablet

4.1 Pre-compression parameters

4.1.1 Angle of repose

Using a fixed funnel approach, the angle of repose of powder was measured. A funnel was used to hold the precisely weighed amount of powder mixture. The funnel was kept at a height where the tip of the funnel just touched the top of the powder pile. The powder was allowed to flow through the funnel without any resistance on to the surface. Measurements were taken for the powder cone's height and diameter. The following formula was used to find the angle of repose:

Tan ɵ = h/r

Where h is the powder cone's height and r is its radius.

4.1.2 Bulk density and tapped density

A 25-mL measuring cylinder was filled with 5 g of powder .To break up any agglomerates that might have developed, it was first given a gentle shake. After recording the initial volume, the cylinder was let to tall on a hard surface by itself at intervals of two seconds, at a height of 2.5 cm. Until a constant volume was noticed, tapping was continued. Using the following formulas, the loose bulk density (LBD) and the taped bulk density (TBD) were determined:

LBD = Weight of the powder / volume of the packing

TBD =Weight of the powder / tapped volume of packing

4.1.3 Compressibility index

The following formula was used to determine the compressibility index of granules: Carr's Compressibility index = [(TBD –LBD) x 100]/ TBD

4.1.4 Hausner's ratio

Hausner's ratio was calculated by the following formula:

Hausner's ratio = Tapped density / Bulk density.

4.1.5 Texture analysis

The CT3 Texture Analyzer (Brookfield Engineering, USA) was used to evaluate ODTs using a 4500 g load cell. Water is used instead of stimulated salivary fluid for better reproducibility. A small thin layer of glue is used to attach the ODT to the acrylic probe. In order to produce a continuous liquid layer at the mesh's surface, a Petri dish with a diameter of 34.78 mm and 4.5 ml of distilled water were placed underneath the probe. The dish was lined with a stainless steel mesh measuring 26.8 mm in diameter, 2.26 mm in height, and 1.5 mm in aperture.

Two different probe speeds were used; 0.02 mm/s and 0.01 mm/s. The measurement began when the probe containing the attached sample reached a trigger load of 10 g. The test terminated when the tablet completely disintegrate and the probe made contact with the flat surface. TexturePro software (Brookfield Engineering, USA) was used to record the load (g) versus time (s) plots for test conducted on minimum of three tablet formulation. The experimental setup for ODTs analysis is depicted in the diagram below.

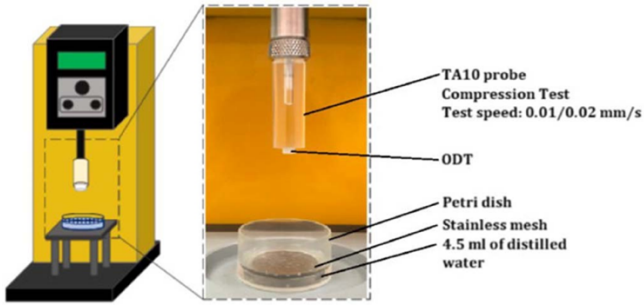

Figure 5: Texture analyzer

4.2 Post-compression parameters

4.2.1 Content uniformity

To ascertain if the individual content is within the limit, the assay of the drug substance(s) in several individual dosage units serves as the basis for the uniformity of content test. Tablets containing less than 25 mg or less than 25 percent of a single tablet must undergo the content uniformity test. Using the assay-described procedure, the active component content is ascertained in each of the ten dosage units that are consumed at random. If every component contains 85–115% of the average content, the preparation passes the test.

4.2.2 Hardness

A tablet's hardness is determined by the force applied across its diameter that would cause it to break. The harder the tablet is, the more resistant it is to fracture, chipping, and abrasion when it is stored and handled improperly before use. A Monsanto Hardness Tester was used to measure each tablet hardness. The hardness of ODT is generally kept lower than conventional tablets as increased hardness delays the disintegration of the tablet. Force is expressed in kilograms, and for uncoated tablets, a hardness of 3-5 kg/cm^2 is acceptable.

4.2.3 Weight variation test

A digital balance was used to weigh each of the twenty tablets that were randomly selected. To calculate weight

variation, the average weight and each individual weight were recorded and compared.

4.2.4 Friability test

Friability is the loss of weight of tablet in the container due to removal of fine particles from the surface. Friability test is carried out to access the ability of the tablet to withstand abrasion in packaging, handling and transport. Friabilator apparatus is employed for finding the friability of the tablets. Friabilator consist of a plastic chamber that revolves at 25 rpm and dropping the tablets at a height of 6 inches in each revolution. Pre-weighed sample of tablets was placed in the friabilator and were subjected to 100 revolutions. Tablets were de-dusted utilizing a soft muslin cloth and reweighed, the loss in the weight of tablet is the measure of friability and is expressed in percentage as,

% Friability = Loss in weight \ Initialweight x 100

4.2.5 Wetting time

Wetting time is the indication of the inner structure of the tablets and to the hydrophilicity of the excipients. Thus, wetting time of a dosage form is related with the contact angle. The lower the wetting time the quicker is the disintegration of the tablets. The wetting time can be measured by using five circular tissue papers of 10 cm in diameter, which are placed in a petridish of 10 cm diameter. Ten millilitres of water-soluble dye like eosin solution is added to the petridish. A tablet is carefully placed on the surface of the tissue paper. The time required for water to reach upper surface of the tablet is noted as the wetting time. For measuring water-absorption ratio, the weight of the tablet before keeping in the petridish is noted (Wb).The wetted tablet from the petridish is taken and reweighted (Wa). The water-absorption ratio, R can be determined according to the following equation:

$R = 100 (Wa – Wb)/Wb.$

4.2.6 Disintegration test

The in-vitro disintegration time was determined by disintegration test apparatus. The time for disintegration of orodispersible tablets is generally <1 min and actual disintegration time that patient can experience ranges from 5 to 30 seconds. A tablet is placed in each of the six tubes of the apparatus, and one disc is added to each tube. The standard procedure of performing disintegration test for these dosage forms has several limitations. It is expected that disintegration test for orodispersible tablets should mimic disintegration in mouth within salivary contents. Sunada et al. performed disintegration test by using modified United States Pharmacopoeia Apparatus II by taking 900 ml of medium maintaining 37°C with rotation/minute of 100. It was carried out by taking a 1 litre cylindrical vessel. Orodispersible tablets were placed in basket sinker in the middle of the vessel with a distance of 6-8.5 cm. The apparatus consisted of stainless steel wire gauze on which orodispersible tablets were placed and slightly immersed in medium. Here, the rotary shaft is used to provide rotation and mechanical stress.

4.2.7 Dissolution test

It is an important test as the drug-release profile can be obtained by performing this test. Both the USP dissolution test apparatus can be used. Dissolution of orodispersible tablets is very fast. Therefore, USP 2 Paddle-type apparatus at 50-100 rotations/min is used for dissolution testing. Swammy et al. carried out in vitro dissolution study of pheniramine maleate orodispersible tablets in type II apparatus with 550 r/min using 900 ml phosphate buffer of pH 6.8 at 37±0.5°C as a dissolution medium. USP type I basket apparatus have certain application in the case of orodispersible tablets, but tablet fragments or disintegrated tablet masses may become trapped on the inside top of the basket at the spindle. An erroneous-dissolution profile is obtained, where little or no effective stirring occurs. Thus, type II is more preferred due to reproducible dissolution profile.

4.2.8 Moisture-uptake studies

It is an important study in the case of orodispersible tablets. This study is carried out in order to assess the stability of the tablets. Ten tablets were kept in the desiccators over calcium chloride at 37°C for 24 h. The tablets were then weighted and exposed to 75% relative humidity at room temperature for 2 weeks. Required humidity was achieved by keeping saturated sodium chloride solution at the bottom of the desiccators for 3 days. One tablet as control (without super disintegrant) was kept to assess the moisture uptake due to other excipients. Tablets are weighed and the percentage increase in weight is recorded

4.2.9 Water absorption ratio

A piece of tissue paper folded twice was placed in a small petri dish containing 6 ml of water. A tablet was put on the paper and the time required for complete wetting was measured. The wetted tablet was then weighed. Water absorption ratio (R), was determined using following equation, $R=10 \times Wa / Wb$

Where, Wb is weight of tablet before water absorption and Wa is weight of tablet after water absorption.

5. Challenges In Formulation Of Odt

Mechanical strength and disintegration time

ODTs are formulated to obtain disintegration time usually less than a minute. While doing so, maintaining a good mechanical strength is a prime challenge. Many ODTs are fragile, and there are many chances that such fragile tablet will break during packing, transport or handling by the patients. It is very natural that increasing the mechanical strength will delay the disintegration time. Hence, a good compromise between these two parameters is always essential.

Tastes masking

Many drugs are bitter in taste. A tablet of bitter drug dissolving/ disintegration in the mouth will seriously affect patient compliance and acceptance for the dosage form. In order to prevent the bitter medication from being detected in the mouth, it is necessary to effectively mask its bitter taste.

Aqueous solubility

Water-soluble drugs pose various formulation challenges because they form eutectic mixtures, which result in freezing-point depression and the formation of a glassy solid that may collapse upon drying because of loss of

supporting structure during the sublimation process. Matrix-forming excipients, such as mannitol, which can induce crystallinity and gives rigidity to the amorphous composite are used to prevent collapse or breakdown.

Size of tablets

Depending on their size, tablets might vary in ease of use. It has been shown that tablets in the sizes of 7-8 mm are the easiest to swallow, whereas tablets larger than 8 mm are the easiest to handle. As a result, it is challenging to optimize the tablet size which are easy to handle as well as easy to take.

Amount of drug

The amount of drug incorporated to each unit dose limits the application of technologies used for ODTs. The ODT tablet's weight should not be more than 500 mg, as per USP guidelines. For lyophilized dosage form, the drug dose should be lower than 400 mg for insoluble drug and <60 mg for soluble drug. This parameter is particularly challenging when formulating a fast-dissolving oral films or wafers.

Hygroscopicity

Under normal storage conditions of temperature and humidity, most of the orally disintegrating dosage forms cannot maintain their physical integrity due to their hygroscopic nature. As a result, they require humidity protection, necessitating the use of specific product packaging.

Mouth feel

In the oral cavity, ODTs should not disintegrate into larger particles. The particles generated after the disintegration of the ODTs should be as small as possible. Improved mouth feel is also achieved by adding tastes and cooling substances, such as menthol.

Good packaging design

For the protection of ODTs from moisture and other environmental hazards, the package design should be considered early in the development stages.

6. Conclusion

Orally Disintegrating Tablets (ODTs) present a significant advancement in drug delivery, offering a convenient and effective solution for patients with difficulty swallowing conventional tablets and capsules, such as those with dysphagia. ODTs improve medication adherence, especially in pediatric and geriatric populations, by eliminating the need for water and making administration easier and more acceptable.

Despite their advantages, the formulation of ODTs involves several challenges that must be carefully addressed to ensure product efficacy and patient compliance. Key challenges include balancing mechanical strength and disintegration time, ensuring effective taste masking, managing the aqueous solubility of the drug, controlling tablet size, and dealing with the drug load limitations. Additional concerns such as hygroscopicity, mouthfeel, and the need for robust packaging design further complicate the development process. Successful ODT formulations require a delicate balance of these factors to provide a product that is not only effective and easy to take but also stable and manufacturable on a large scale.

Future Prospective

Future challenges for many ODT manufacturers include reducing costs by finding ways to manufacture with conventional equipment, using versatile packaging, improving mechanical strength and taste-masking capabilities. ODTs may be suitable for the oral delivery of drugs such as protein and peptide-based therapeutics that have limited bioavailability when administered by conventional tablets because these products usually degrade rapidly in the stomach. Furthermore, there is a scope to develop controlled release ODTs prepared using different drug carriers.

References

1. Debjit B, Chiranjib B, Krishna K, Chandira RM. Fast dissolving tablet: An overview. J Chem Pharm Res 2009;1(1):163-77.
2. Sastry VS, Ram NJ, Joseph AF. Recent technological advances in oral drug delivery – A review. PSTT 2000;3:139-44.
3. Fu Y, Yang S, Jeong SH, Kimura S, Park K. Orally fast disintegrating tablets: Developments, technologies, taste-masking and clinical studies. Crit Rev Ther Drug Carrier Syst 2004;21(6):433-76.
4. Sreenivas SA, Dandagi PM, Gadad AP, Godbloe AM, Hiremath SP, Mastiholimath VS. Orodispersible tablets: New-fangled drug delivery systems – A review. Indian J Pharm Educ Res 2005;39(4):177-81.
5. Seager H. Drug-delivery products and the Zydis fast-dissolving dosage form. J Pharm Pharmacol 1998;50(4):375-82.
6. Bradoo R, Shahani S, Deewan B, Sudarshan S. Fast dissolving drug delivery system. J Am Med Assoc India 2001;4(10):27-31.
7. Bangale GS, Shinde GV, Stephen Rathinaraj B. New generation of orodispersible tablets: Recent advances and future propects. Int J Adv Pharm Sci 2011;2:17-28
8. Brown D. Orally disintegrating tablets - Taste over speed. Drug Deliv Technol 2003;3:58-61
9. Chiman B, Isha S. Development of fast disintegration tablets as oral drug delivery system - A review. Indian J Pharm Biol Res 2013;1(3):80-99.
10. Gupta A, Mishra AK, Gupta V, Bansal P, Singh R, Singh AK. Recent trends of fast dissolving tablet - An overview of formulation technology. Int J Pharm Biol Arch 2010;1(1):1-10.
11. Ashish P, Harsoliya MS, Pathan JK, Shruti S. A review-Formulation of mouth dissolving tablet. Int J Pha
12. Rakesh P, Mona P, Prabodh SC, Dhirender K, Sanju N. Orally disintegrating tablets - Friendly to pediatrics and geriatrics. Arch Appl Sci Res 2010;2(2):35-48.
13. Patil MR, Gujarathi Nayan A, Rane Bhushan R. Formulation and evaluation of mouth dissolving tablet: Review article. Pharm Sci Monit 2014;5(2):7-20.
14. Deepak H, Geeta A, Hari Kumar SL. Recent trends of fast dissolving drug delivery system - An overview of formulation technology. Pharmacophore 2013;4(1):1-9.rm Clin Sci 2011;1(1):1-8.
15. Prateek S, Ramdayal G, Kumar SU, Ashwani C, Ashwini G, Mansi S. Fast dissolving tablets: A new venture in drug delivery. Am J PharmTech Res 2012;2(4):252-79.
16. Velmurugan S, Vinushitha S. Oral disintegrating tablets: An overview. Int J Chem Pharm Sci 2010;1(2):1-12.

17. Kumar NP, Nayyar P, Kumar SP. Fast dissolving tablets - A review. Middle East J Sci Res 2015;23(1):142-8.
18. Kumar E, Bhagyashree J. Mouth dissolving tablets – A comprehensive review. Int J Pharm Res Rev 2013;2(7):25-41.
19. Sagar N, Goswami L, Kothiyal P. Orally disintegrating tablets: A review. Int J Adv Pharm Res 2012;3(10):1222-8.
20. Badgujar BP, Mundada AS. The technologies used for developing orally disintegrating tablets: A review. Acta Pharm 2011;61(2):117-39.
21. Fady A. Malaak, Khalid Abu Zeid , Shahinaze A. Fouad, Mohamed A. El-Nabarawi, Review Article Orodispersible Tablets: Novel Strategies and future challenges in Drug Delivery, Research J. Pharm. and Tech. 12(11): November 2019,5575-5582.
22. Mizumoto T, Masuda Y, Kajiyama A, Yanagisawa M, Nyshadham JR. Tablets quickly disintegrating in the oral cavity and process for producing the same. US Patent 6,589,554; 2003.
23. KV Pharmaceutical Company. Drug Delivery Technologies (technical bulletin) found in part at KV Pharmaceutical Company. Ora Quick. 27 May 2001.
24. Pandey P, Dahiya M., 2016. Oral Disintegrating Tablets: A Review. Int. J. Pharma Res. Rev. 5, 50-62.
25. Kumar SS, Ravendra V, Vikash C, Prakash SS. Orally disintegrating tablets: A dosage form that extends the market exclusivity and patent protection. World J Pharm Pharm Sci 2014;3(7):526-46
26. Pooja A, Arora SV. Orodispersible tablets: A comprehensive review. Int J Res Dev Pharm Life Sci 2013;2(2):270-84
27. Radke RS, Jadhav JK, Chajeed MR. Formulation and evaluation of orodispersible tablets of baclofen. Int J Chem Tech Res. 2009;1(3):517–21.
28. Shubhra S, Kumar YS. Fast dissolving tablets: A strategy to improve solubility of poorly soluble compounds. Glob J Pharmacol 2014;8(4):584-91.
29. Puneet M, Kumar SP, Rishabha M. A review on recent advances of oral mouth dissolving tablet. J Drug Discov Ther 2014;2(18):17-22.
30. Alam MD, Nayyar P, Kumar SP. Novel technology for formulation and evaluation of mouth dissolving tablet - A review. Adv Biol Res 2014;8(5):180-6.
31. Bandari S, Mittapalli RK, Gannu R, Rao YM. Orodispersible tablets: An overview. Asian J of Pham. 2008;2:2–11.
32. Gohel M, Patel M, Amin A, Agarwal R, Dave R, Bariya N. Formulation design and optimization of mouth dissolving tablets of nimesulide using vacuum drying technique. AAPS Pharm Sci Tech. 2005;5:36–4
33. Radke RS, Jadhav JK, Chajeed MR. Formulation and evaluation of orodispersible tablets of baclofen. Int J Chem Tech Res. 2009;1:517–21.
34. Sunada H, Bi Y. Preparation, evaluation and optimization of rapidly disintegrating tablets. Powder Technol. 2002;122:188–98.
35. Narazaki R, Harada T, Takami N, Kato Y, Ohwaki T. A new method for disintegration studies of rapid disintegrating tablet. Chem Pharm Bull (Tokyo) 2004;52:704–7
36. Swamy PV, Divate SP, Shirsand SB, Rajendra P. Preparation and evaluation of orodispersible tablets of pheniramine maleate by effervescent method. Indian J Pharm Sci. 2009;71:151–4.
37. Leon L, Herbert AL, Joseph LK. 3rd ed. Varghese Publishing House; Bombay: 2008. The theory and practices of industrial pharmacy. p. 296–303, 430–56.
38. United States Pharmacopoeia 30/NF25. Asian edition, The official compendia of standard United States Pharmacopoeia. Rockville, MD: Convection Inc.; 2007, 277:644–45.
39. Deshpande KB, Ganesh NS. Orodispersible tablets: An overview of formulation and technology. Int J Pharm Biol Sci 2011;2(1):726-34.