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Review Article

### FAST DISSOLVING TABLETS: REVIEW

Sudarshan B. Aher\*, Kajal S. Gahide.

1. Department of Pharmaceutics, R. G. Sapkal, College of Pharmacy, Anjaneri, Nashik.

**Abstract:**

*Fast Dissolving Tablet accommodation the organization and enhanced patient consistence are vital in the outline of oral drug delivery framework. which remains the perfect course of drug delivery inspite of different burden of Oral course having the most noteworthy patient consistence is viewed as the most suitable, most secure furthermore the most efficient system for drug delivery. Quick dissolving tablets is one such most beneficial sample of the oral drug delivery. These tablets promptly break up or crumble in the salivation i.e.within 60 sec without the requirement for water. They have been defined for pediatric, geriatric and out of commission patients. These kind of dose structures are likewise perfect for dynamic patients who are occupied and voyaging and might not have entry to water. FDTs have increased generous consideration for those patients who experience issues in gulping on account of dysphagia, hand tremors issues have supplementary playing point for oblivious, youthful patients with immature solid and sensory system. This article endeavors to present a complete survey with respect to innovative advances made so far in the zone of assessment of quick dissolving tablets as for unique qualities of these special measurements structures.*

**Keywords:** *Fast Dissolving Tablet, Dysphagia, Superdisintegrants, Patented Technology.*

**Corresponding Author:****Sudarshan B. Aher,**

Department of Pharmaceutics ,

R. G. Sapkal, College of Pharmacy,

Anjaneri, Nashik.

Email: [sudarshanaher321@gmail.com](mailto:sudarshanaher321@gmail.com)

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## INTRODUCTION

Oral fast-disintegrating dosage forms, otherwise called 'quick melt', 'fast-deteriorating' or 'quick dissolving' measurements structures, are a moderately novel measurement innovation that includes the fast crumbling or disintegration of the measurements structure, be it a tablet (the most widely recognized structure) or a case, into an answer or suspension in the mouth without the requirement for water [1]. Lately, as per changes in way of life, an interest has emerged for the improvement of dose structures that can be promptly taken care of and taken by numerous patients. Specifically, the advancement of strong measurements structures that can quickly break down or disintegrate actually when taken orally without water is important to support in the treatment of elderly individuals. Regarding different creations and assembling techniques for orally deteriorating or dissolving tablets [2]. One is a molding tablet and others are compressed tablets. A freeze-dried tablet (a molding tablet) made from water-soluble material disintegrates instantly in the saliva, but the structure is so brittle that it cannot be handled easily. In general; compressed tablets can be manufactured at a low price. To give the rapidly disintegrating tablets [3]. Actually RDT tablets are preferred by an increasing number of patients especially children and elderly, but also adult consumers who like to have their medication readily available at any time. Patients appreciate the convenience and the discreteness of these products which can be taken without water and which guarantee a rapid onset of action.

Recently the European Pharmacopoeia adopted the term Orodispersible tablet as a tablet to be placed in the mouth where it disperses rapidly before swallowing and which disintegrates in less than 3 min. There was no specification concerning neither the hardness nor the friability of this kind of tablets. That is why we find certain RDT in the market that disintegrate in less than 1 min or maybe 30 s. but are brittle and require specified peel able blister packaging and thus higher costs. Commercially available RDT are prepared by various techniques, mainly Lyophilization molding and direct compression. The Lyophilization and molding techniques produce RDT which disintegrate within about 30 s, but that have low physical resistance and high friability. On the other hand, tablets obtained by direct compression are less friable but disintegrate in a longer time [4].

Quickly crumbling or dissolving tablets have been further created and some have been connected clinically for instance a suspension or arrangement of a medication and its excipients may be charged in preformed rankle pockets. The suspension is then stop dried or dried by regular system to get

tablets with an extremely permeable structure.

When such tablets are placed in the oral cavity, saliva quickly penetrates into the pore to cause rapid tablet disintegration. Most of these tablets have complicated preparation processes so that the high cost of production will impose a financial burden on patients. Therefore, the production of rapidly disintegrating tablets using a simple and economical method is very necessary [5].

## Biopharmaceutical Consideration

When new drug delivery system put on, it is must that to consider Biopharmaceutical factor like metabolism and excretion.

## Pharmacokinetics:

Study has done on absorption, distribution, metabolism and excretion in this consideration. Drug attains therapeutic level after absorption and therefore elicits pharmacological effect, so both rate and extend of absorption is important. There is delay in disintegration and therefore dissolution in conventional dosage form while FDTs is rapidly disintegrates in oral cavity and dissolution is rapid. Due to disintegration of FDTs in mouth absorption in started from mouth, pharynx and esophagus. Some factors like age, GI pH, and blood flow through GI are taken into consideration, because elders may be considered as separate unique Medicare population. There are many factors on which drug distribution depends like tissue permeability, perfusion rate, binding of drug to tissue, disease state, drug interaction etc. In geriatric patients, decrease in body mass and total body water result in decreased volume of distribution of water-soluble drugs and increased volume of distribution (Vd) of lipid soluble drugs. Duration and intensity of action depends upon rate of drug removal from the body or site of action i.e. biotransformation. Decrease in liver volume, regional blood flow to liver reduces the biotransformation of drug through oxidation, reduction and hydrolysis. Excretion by renal clearance is slowed, thus half-life of renal excreted drugs increase [6].

## Pharmacodynamics:

Drug receptor interaction impaired in elderly as well as in young adult due to undue development of organ. Decreased ability of the body to respond baro reflexive stimuli, cardiac output, and orthostatic hypotension may see in taking antihypertensive like prazosin. Decrease sensitivity of the CVS to  $\beta$ -adrenergic agonist and antagonist. Immunity is less and taken into consideration while administered antibiotics. Altered response to drug therapy-elderly show diminished bronchodilator effect of theophylline shows increased sensitivity to barbiturates. Concomitant illnesses are often present in elderly, which is also taken into consideration, while multiple drug therapy prescribed. Research workers have clinically evaluated drug combination for various classes"

cardiovascular agents, diuretics, anti-hypertensive in geriatrics. The combination choice depends on disease state of the patient [7].

#### Criteria for Fast dissolving Drug Delivery System

- The tablets should Not require water to swallow, but it should dissolve or disintegrate in the mouth in matter of seconds.
- Be compatible with taste masking.
- Be portable without fragility concern.
- Have a pleasant mouth feel.
- Leave minimum or no residue in the mouth after oral administration.
- Exhibit low sensitive to environmental condition as temperature and humidity.
- Allow the manufacture of the tablet using conventional processing and packaging equipments at low cost [8].

#### Advantages of Fast Dissolving Tablet

- No need of water to swallow the tablet. Can be easily administered to pediatric, elderly and mentally disabled patients.
- Accurate dosing as compared to liquids.
- Dissolution and absorption of drug is fast, offering rapid onset of action.
- Bioavailability of drugs is increased as some drugs are absorbed from mouth, pharynx and esophagus through saliva passing down into the stomach
- Advantageous over liquid medication in terms of administration as well as transportation
- First pass metabolism is reduced, thus offering improved bioavailability and thus reduced dose and side effects.
- Free of risk of suffocation due to physical obstruction when swallowed, thus offering improved safety [9].

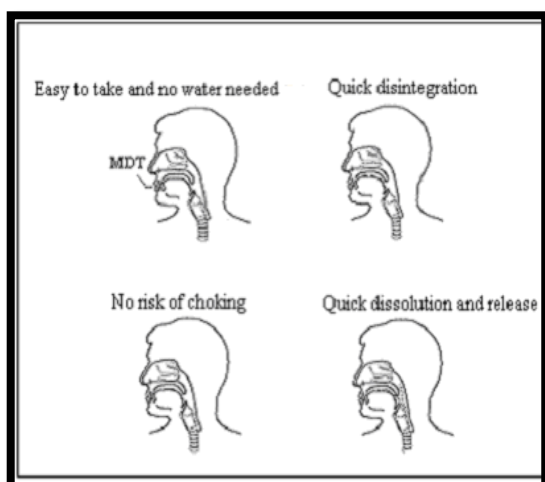


Fig 1.1: Advantages of fast dissolving tablet

#### Limitations of Fast Dissolving Tablet

1. Careful handling is required because tablets usually have insufficient mechanical strength.
2. If tablets are not formulated properly they may leave unpleasant taste or grittiness in the mouth.
3. Drugs difficult to formulate into FDT with relatively larger doses.
4. Drugs with short half-life and frequent dosing and those whom require controlled or sustained release are unsuitable candidates of FDTs [10].

#### Challenges in Formulating Fast Dissolving Tablet:

##### Palatability

Most of the drugs are unpalatable. Fast dissolving tablet usually contain medicament in taste mask form which upon administration, disintegrates or dissolves in patient's oral cavity, thus releasing the active ingredients which come in contact with the taste buds; hence, taste-masking of the drugs becomes critical to patient compliance.

##### Mechanical strength

In order to allow fast dissolving tablets to disintegrate in the oral cavity, they are made of either very porous and soft-molded matrices or compressed into tablets with very low compression force, which makes the tablets friable and/or brittle, difficult to handle, and often requiring specialized peel-off blister packing that may add to the cost. Only few technologies can produce tablets that are sufficiently hard and durable to allow them to be packaged in multi dose bottles.

##### Hygroscopicity

Several orally disintegrating dosage forms are hygroscopic and cannot maintain physical integrity under normal conditions of temperature and humidity. Hence, they need protection from humidity which calls for specialized product packaging.

##### Amount of drug

The application of technologies used for orally disintegrating tablets is limited by the amount of drug that can be incorporated into each unit dose. For lyophilized dosage forms, the drug dose must be lower than 400 mg for insoluble drugs and less than 60 mg for soluble drugs. This parameter is particularly challenging when formulating a fast-dissolving oral films or wafers.

##### 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. Such collapse sometimes can be prevented by using various matrix-forming excipients such as mannitol that can induce crystallinity and hence, impart rigidity

to the amorphous composite.

### Size of tablet

The degree of ease when taking a tablet depends on its size. It has been reported that the easiest size of tablet to swallow is 7-8 mm while the easiest size to handle was one larger than 8 mm. Therefore, the tablet size that is both easy to take and easy to handle is difficult to achieve [11].

### Technologies Available For Preparation of Fast Dissolving Tablets:

The fast dissolving property of the tablet is attributed to a quick uptake of water into the tablet matrix resulting in its rapid disintegration. Hence, the basic approaches for development of fast dissolving tablets include maximizing the porous structure of the tablet matrix, incorporating the appropriate disintegrating agent and using highly water soluble excipients in the formulation. Various technologies used for development of fast dissolving tablets are given below.

#### 1. Direct Compression Method

This is one of the popular techniques used for preparation of fast dissolving dosage forms. In this technique, tablets are prepared directly by compression of mixture of drug and excipient without any preliminary treatment. The basic principle involves addition of super

disintegrants and water soluble excipients. This technique involves use of super disintegrants in optimum concentration so as to achieve rapid disintegration along with good mouth feel. The mixture which is to be compressed must have good flow properties. Few drugs can be directly compressible into tablets of acceptable quality. Tablet disintegration time can be optimized by using an effective concentration of super disintegrant. It is considered as the best method to prepare orally disintegrating dosage forms since the prepared tablets provide higher disintegration due to absence of binder and low moisture content. Various advantages of this method include easy implementation, use of conventional equipments along with commonly available excipients, limited number of processing steps and cost effectiveness [12].

#### A] Super disintegrants

In many orally disintegrating tablet technologies based on direct compression, the addition of super disintegrants principally affects the rate of disintegration and hence the dissolution. The presence of other formulation ingredients such as water-soluble excipients and effervescent agents further hastens the process of disintegration. For the success of fast dissolving tablet, the tablet having quick dissolving property which is achieved by using super disintegrant [13].

**Table 1: List of super disintegrants**

Superdisintegrants	Commercially available grades	Mechanism of action	Special comment
<b>Crosslinked cellulose</b>	Crosscarmellose® Ac-Di-Sol®, Nymce ZSX® Primellose®, Solutab®, Vivasol®, L-HPC.	Swells 4-8 folds in < 10 seconds. Swelling and wicking both	Swells in two dimensions. Direct compression or Granulation Starch free.
<b>Crosslinked PVP</b>	Crosspovidon M® Kollidon® Polyplasdone	Swells very little and returns to original size after compression but act by capillary action.	Water insoluble and spongy in nature so get porous tablet.
<b>Crosslinked starch</b>	Explotab® Primogel®	Swells 7-12 folds in < 30 seconds.	Swells in three dimensions and high level serve as sustain release matrix.
<b>Crosslinked alginic acid</b>	Alginic acid NF	Rapid swelling in aqueous medium or wicking action	Promote disintegration in both dry or wet granulation
<b>Soy polysaccharides</b>	Emcosoy®		Does not contain any starch or Sugar. Used in nutritional products
<b>Calcium silicate</b>		Wicking action.	Highly porous, Light weight,

### Mechanism of Action of Super Disintegrants

The tablet breaks to primary particles by one or more the mechanisms listed below:-

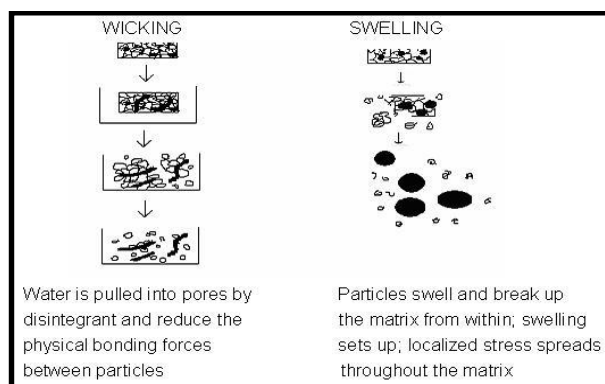
- Capillary action/Water wicking
- Swelling
- Heat of wetting
- Disintegrating particle/particle repulsive forces
- Deformation
- Release of gases
- Enzymatic action

#### Capillary action / Water wicking:

Disintegration by capillary action is always the first step. When we put the tablet into suitable aqueous medium, the medium penetrates into the tablet and replaces the air adsorbed on the particles, which weakens the intermolecular bond and breaks the tablet into fine particles. Water uptake by tablet depends upon hydrophilicity of the drug /excipient and on tableting conditions. For these types of disintegrates maintenance of porous structure and low interfacial tension towards aqueous fluid is necessary which helps in disintegration by creating a hydrophilic network around the drug particles.

#### Swelling:

Perhaps the most widely accepted general mechanism of action for tablet disintegration is swelling. Tablets with high porosity show poor disintegration due to lack of adequate swelling force. Sufficient swelling force is exerted in the tablet with low porosity. It is worthwhile to note that if the packing fraction is very high, fluid is unable to penetrate in the tablet and disintegration is again slows down.



**Figure 1.2 Disintegration of tablet by wicking and swelling**

#### Heat of wetting (air expansion):

When disintegrates with exothermic properties gets wetted, localized stress is generated due to capillary air expansion, which helps in disintegration of tablet. This explanation however, is limited to only a few types of disintegrates and cannot describe the action of most modern disintegrating agents.

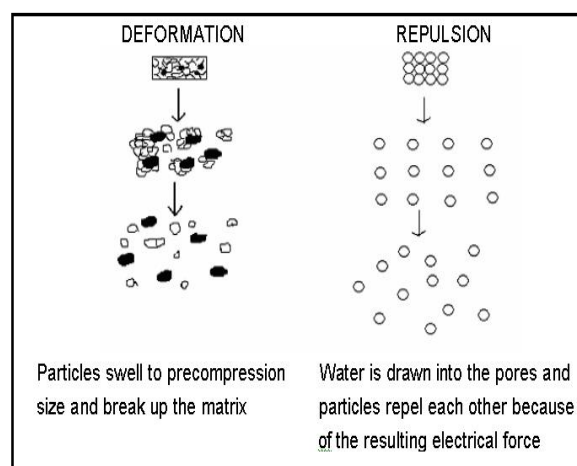
#### Disintegrating particle / Particle repulsive

#### forces:

Another mechanism of disintegration attempts to explain the swelling of tablet made with 'non-swelling' disintegrates. Guyot-Hermann has proposed a particle repulsion theory based on the observation that non-swelling particle also cause disintegration of tablet. The electric repulsive forces between particles are the mechanism of disintegration and water is required for it.

#### Deformation:

Hess had proved that during tablet compression, disintegrated particles get deformed and these deformed particles get into their normal structure when they come in contact with aqueous media or water. Occasionally, the swelling capacity of starch was improved when granules were extensively deformed during compression. This increase in size of the deformed particles produces a breakup of the tablet.



**Figure 1.3 Disintegration by deformation and repulsion**

#### Enzymatic reaction:

Enzymes present in the body also act as disintegrants. These enzymes dearth the binding action of binder and helps in disintegration. Due to swelling, pressure is exerted in the outer direction that causes the tablet to burst or the accelerated absorption of water leads to an enormous increase in the volume of granules to promote disintegration [14, 15].

#### B] Sugar Based Excipients:

This is another approach to manufacture ODT by direct compression. The use of sugar based excipients especially bulking agent's likedextrose, fructose, isomalt, lactilol, maltilol, maltose, mannitol, sorbitol, starch hydrolysate, polydextrose and xylitol, which displayhigh aqueous solubility and sweetness, and hence imparts taste masking property and a pleasing mouth feel. Mizumito et al have classified sugar-based excipients into two types on the basis of molding and dissolution rate. The mechanical strength of moldedtablets is a matter of great concern. Binding agents, which

increase the mechanical strength of the tablets, need to be incorporated. Taste masking is an added problem to this technology. The taste masked drug particles were prepared by spray congealing a molten mixture of hydrogenated cottonseed oil, sodium carbonate, lecithin, polyethylene glycol and an active ingredient into a lactose based tablet triturate form. Compared to the Lyophilization technique, tablets produced by the molding technique are easier to scale up for industrial manufacture.

## 2. Melt granulation

Melt granulation technique is a process by which pharmaceutical powders are efficiently agglomerated by a melt able binder. The advantage of this technique compared to a conventional granulation is that no water or organic solvents is needed. Because there is no drying step, the process is less time consuming and uses less energy than wet granulation. It is a useful technique to enhance the dissolution rate of poorly water-soluble drugs, such as griseofulvin. This approach to prepare FDT with sufficient mechanical integrity, involves the use of a hydrophilic waxy binder. Super polystate is a waxy material with a melting point of 33–37°C and a HLB value of 9. So it will not only act as a binder and increase the physical resistance of tablets but will also help the disintegration of the tablets as it melts in the mouth and solubilizes rapidly leaving no residues.

## 3. Phase transition process

It is concluded that a combination of low and high melting point sugar alcohols, as well as a phase transition in the manufacturing process, are important for making FDTs without any special apparatus. FDT were produced by compressing powder containing erythritol (melting point: 122°C) and xylitol (melting point: 93-95°C), and then heating at about 93°C for 15 min. After heating, the median pore size of the tablets was increased and tablet hardness was also increased. The increase of tablet hardness with heating and storage did not depend on the crystal state of the lower melting point sugar alcohol.

## 4. Sublimation

In this method a subliming material like camphor, is removed by sublimation from compressed tablets and high porosity is achieved due to the formation of many pores where camphor particles previously existed in the compressed tablets prior to sublimation of the camphor. A high porosity was achieved due to the formation of many pores where camphor particles previously existed in the compressed mannitol tablets prior to sublimation of the camphor. These compressed tablets which have high porosity (approximately 30%) rapidly dissolved within 15 seconds in saliva. Granules containing nimusulide, camphor, crospovidone, and

lactose were prepared by wet granulation technique. Camphor was sublimed from the dried granules by vacuum exposure. Conventional methods like dry granulation, wet granulation and direct compression with highly soluble excipients, super disintegrants and effervescent systems can also be used.

## 5. Three-dimensional Printing (3DP)

Three-dimensional printing (3DP) is a rapid prototyping (RP) technology. Prototyping involves constructing specific layers that uses powder processing and liquid binding materials. A novel fast dissolving drug delivery device (DDD) with loose powders in it was fabricated using the three dimensional printing (3DP) process. Based on computer-aided design models, the DDD containing the drug acetaminophen were prepared automatically by 3DP system. It was found that rapidly disintegrating oral tablets with proper hardness can be prepared using TAG. The rapid disintegration of the TAG tablets seemed due to the rapid water penetration into the tablet resulting from the large pore size and large overall pore volume.

## 6. Mass Extrusion

This technology involves softening of the active blend using the solvent mixture of water soluble polyethylene glycol and methanol and expulsion of softened mass through the extruder or syringe to get a cylindrical shaped extrude which are finally cut into even segments using heated blade to form tablets. This process can also be used to coat granules of bitter drugs to mask their taste.

## 7. Spray Drying

In this technique, gelatin can be used as a supporting agent and as a matrix, mannitol as a bulking agent and sodium starch glycolate or cross carmellose or crospovidone are used as super disintegrants. Tablets manufactured from the spray-dried powder have been reported to disintegrate in less than 20 seconds in aqueous medium. The formulation contained bulking agent like mannitol and lactose, a super disintegrant like sodium starch glycolate & cross carmellose sodium and acidic ingredient (citric acid) and alkaline ingredients (e.g. sodium bicarbonate). This spray-dried powder, which compressed into tablets showed rapid disintegration and enhanced dissolution. Maximum drug release and minimum disintegration time were observed with Kollidon CL excipient base as compared to tablets prepared by direct compression, showing the superiority of the spray dried excipient base technique over direct compression technique.

## 8. Cotton Candy Process

The FLASHDOSE® is a MDDS manufactured using Shearform™ technology in association with Ceform TI™ technology to eliminate the bitter

taste of the medicament. The Shear form technology is employed in the preparation of a matrix known as 'floss', made from a combination of excipients, either alone or with drugs. The floss is a fibrous material similar to cotton-candy fibers, commonly made of saccharides such as sucrose, dextrose, lactose and fructose at temperatures ranging between 180–266 °F. However, other polysaccharides such as poly malto dextrans and poly dextrose can be transformed into fibers at 30–40% lower temperature than sucrose. This modification permits the safe incorporation of thermo labile drugs into the formulation. The tablets manufactured by this process are highly porous in nature and offer very pleasant mouth feel due to fast solubilization of sugars in presence of saliva. The manufacturing process can be divided into four steps as detailed below.

#### A) Floss Blend

In this step, 80% sucrose in combination with mannitol/dextrose and 1% surfactant is blended to form the floss mix. The surfactant acts as a crystallization enhancer in maintaining the structural integrity of the floss fibers. It also helps in the conversion of amorphous sugar into crystalline form from an outer portion of amorphous sugar mass and subsequently converting the remaining portion of the mass to complete crystalline structure. This process helps to retain the dispersed drug in the matrix, thereby minimizing migration out of the mixture.

#### B) Floss Processing

The floss formation machine uses flash heat and flash flow processes to produce matrix from the carrier material. The machine is similar to that used in 'cotton-candy' formation which consists of a spinning head and heating elements. In the flash heat process, the heat induces an internal flow condition of the carrier material. This is followed by its exit through the spinning head (2000–3600 rpm) that flings the floss under centrifugal force and draws into long and thin floss fibers, which are usually amorphous in nature.

#### C) Floss Chopping and Conditioning

This step involves the conversion of fibers into smaller particles in a high shear mixer granulator. The conditioning is performed by partial crystallization through an ethanol treatment (1%) which is sprayed onto the floss and subsequently evaporated to impart improved flow and cohesive properties to the floss.

#### D) Blending and Compression

Finally, the chopped and conditioned floss fibers are blended with the drug along with other required excipients and compressed into tablets. In order to improve the mechanical strength of the tablets, a curing step is also carried out which involves the exposure of the dosage forms to elevated

temperature and humidity conditions, (40 °C and 85% RH for 15 min). This is expected because crystallization of the floss material that results in binding and bridging to improve the structural strength of the dosage form.

#### 9. Tablet Molding

Molding process is of two types i.e. solvent method and heat method. Solvent method involves moistening the powder blend with a hydro alcoholic solvent followed by compression at low pressures in molded plates to form a wetted mass (compression molding). The solvent is then removed by air-drying. The tablets manufactured in this manner are less compact than compressed tablets and possess a porous structure that hastens dissolution. The heat molding process involves preparation of a suspension that contains a drug, agar and sugar (e.g. mannitol or lactose) and pouring the suspension in the blister packaging wells, solidifying the agar at the room temperature to form a jelly and drying at 30°C.

#### 10. Lyophilization or Freeze-Drying

Freeze drying is the process in which water is sublimed from the product after it is frozen. This technique creates an amorphous porous structure that can dissolve rapidly. A typical procedure involved in the manufacturing of ODT using this technique is mentioned here. The active drug is dissolved or dispersed in an aqueous solution of a carrier/polymer. The mixture is done by weight and poured in the walls of the preformed blister packs. The trays holding the blister packs are passed through liquid nitrogen freezing tunnel to freeze the drug solution or dispersion. Then the frozen blister packs are placed in refrigerated cabinets to continue the freeze-drying. After freeze-drying the aluminum foil backing is applied on a blister-sealing machine. Finally the blisters are packaged and shipped. The freeze-drying technique has demonstrated improved absorption and increase in bioavailability. The major disadvantages of Lyophilization technique are that it is expensive and time consuming; fragility makes conventional packaging unsuitable for these products and poor stability under stressed conditions.

#### 11. Nanonization

A recently developed Nanomelt technology involves reduction in the particle size of drug to nano size by milling the drug using a proprietary wet-milling technique. The nano crystals of the drug are stabilized against agglomeration by surface adsorption on selected stabilizers, which are then incorporated into MDTs. This technique is especially advantageous for poor water soluble drugs. Other advantages of this technology include fast disintegration/dissolution of nanoparticles leading to increased absorption and hence higher bioavailability and reduction in dose, cost effective manufacturing process,

conventional packaging due to exceptional durability and wide range of doses (up to 200 mg of drug per unit [16-19]).

## PATENTED TECHNOLOGIES FOR FAST DISSOLVING TABLETS

### 1] Zydis Technology

Using the concept of Gregory et al., R.P. Scherer has patented zydis technology. Zydis is a unique freeze-dried oral solid dosage form that can be swallowed without water as it dissolves instantly on tongue in less than 5 seconds. The drug is physically trapped in a water-soluble matrix, and then freeze-dried to produce a product that rapidly dissolves. The matrix consists of water-soluble saccharides and polymer (gelatin, dextran, alginates) to provide rapid dissolution and to allow sufficient physical strength to withstand handling. Water is used during the process to produce porous units for rapid disintegration. Various gums are used to eliminate the sedimentation problem of dispersed drugs. Glycine is used to prevent the shrinkage of zydis unit during the process and in long-term storage. As the zydis dosage form is weak in physical strength, unit is contained in peelable blister pack, which allows removal of product without damaging it.

### 2] Orasolv Technology

CIMA labs have developed Orasolv technology. The system essentially makes tablets that contain taste masked active ingredients and effervescent disintegrating agent which on contact with saliva, rapidly disintegrates and releases the taste mask active ingredient. The tablets made by direct compression at very low compression force in order to minimize oral dissolution time. The tablets so produced are soft and friable and are packaged specially designed pick and place system. The taste masking associated with Orasolv formulation is two folds. The unpleasant flavor of a drug is not merely counteracted by sweeteners or flavours; coating the drug powder and effervescence are means of taste masking in Orasolv.

### 3] Durasolv Technology

Durasolv is CIMA's second generation fast dissolving tablet formulation. Produced in a similar fashion to that of orasolv, durasolv has much higher mechanical strength than its predecessor due to the use of higher compaction produced during tableting. The durasolv product is thus produced in a faster and more cost effective manner. One disadvantage of durasolv is that the technology is not compatible with larger doses of active ingredients, because formulation is subjected to high pressures on compaction. Durasolv is currently available in two products nulev and zorlip.

### 4] WOWTAB Technology

WOWTAB technology is patented by Yamanouchi. Wow means "without water". WOWTAB is an intrabuccally soluble, compressed tablet consisting of granules made with saccharides of low and high mouldability. The combination of high and low mouldability is used to obtain a tablet of adequate hardness and fast dissolution rate. Mould ability is the capacity of the compound to be compressed. Low mouldability means the compounds show reduced compressibility for tableting and rapid dissolution rate. But in case of high mouldability compounds this context is reversed. In this the active ingredient is mixed with low mouldability saccharides and granulated with high mouldability saccharides and then compressed into tablet. The wowtab formulation is stable to environment due to its significant hardness than Zydis or Orasolv. WOWTAB product is suitable both for conventional bottle and blister packaging.

### 5] Flash Dose Technology

Fuisz has patented the Flash Dose technology. The Flash Dose technology utilizes a unique spinning mechanism to produce floss like crystalline structure, much like cotton candy. This crystalline sugar can then incorporate the active drug and be compressed into a tablet. Flash Dose tablet consists of self-binding shea form matrix termed "floss". The procedure has been patented by Fuisz and known as "Shearform". Interestingly, by changing the temperature and other conditions during production, the characteristics of the product can be altered greatly. Instead of floss-like material, small spheres of saccharide can be produced to carry the drug. The procedure of making microspheres has been patented by Fuisz and known as "Ceform".

#### a. Shearform Technology™

The technology is based on the preparation of floss that is also known as 'Shearform Matrix', which is produced by subjecting a feed stock containing a sugar carrier by flash heat processing. In this process, the sugar is simultaneously subjected to centrifugal force and to a temperature gradient, which raises the temperature of the mass to create an internal flow condition, which permits part of it to move with respect of the mass. The floss so produced is amorphous in nature so it is further chopped and recrystallised by various techniques to provide a form flow properties and this facilitates blending the recrystallised matrix is then blended with other tablet excipients and an active ingredient. The resulting mixture is compressed into tablet.

#### b. Ceform technology™

In ceform technology microspheres containing active ingredient are prepared. The essence of ceform microsphere manufacturing process involves placing a dry powder, containing substantially pure drug material or a special blend of drug materials plus



other pharmaceutical compounds, and excipients into a precision engineered and rapidly spinning machine. The centrifugal force of the rotating head of the centrifugal machine throws the dry drug blend at high speed through small heated openings. The microspheres are then blended and/or compressed into the pre-selected oral delivery dosage format. The ability to simultaneously process both drug and excipient generates a unique microenvironment in which materials can be incorporated into the microsphere that can alter the characteristics of the drug substance.

### 6] Flashtab Technology

This technology involves the preparation of a rapidly disintegrating tablet which consists of an active ingredient in the form of microcrystals. Drug microgranules may be prepared by using the conventional techniques like microencapsulation, coacervation and extrusion-spheronization. The microcrystals or microgranules of the active ingredient are added to the granulated mixture of excipients prepared by wet or dry granulation and compressed into tablets [20, 21, 22].

**Table 2: Marketed product of Fast Dissolving Tablet**

Brand Name	Active Ingredients	Company
Nimulid-MD	Nimesulide	Panacea Biotech
Zyromeltab	Rofecoxib	Zydus Cadila
MOSID-MD	Mosapride Citrate	Torrent Pharmaceuticals
Feledine Melt	Piroxicam	Pfizer
Maxalt ODT	Famotidine	Merck
Remeron Sol Tab	Mirtazapine	Organon
Romilast	Montelukast	Ranbaxy
Manza BDT	Olanzapine	Orchid
Olanexinstab	Olanzapine	Ranbaxy
Valus	Valdecoxib	Glenmark
Rofaday MT	Rofecoxib	Lupin
Torrox MT	Rofecoxib	Torrent
Dolib MD	Rofecoxib	Panacea
Zilflam	Rofecoxib	Kapron
Orthoret MD	Rofecoxib	Biochem
Nexus MD	Nimesulide	Lexus
Nimex MD	Nimesulide	Mexon healthcare
Nisure MD	Nimesulide	Suzen Pharma
Olnium MD	Nimesulide	Olcare Lab
Sulbid	Nimesulide	Alpic Remedies

**Pre Compression Parameters of Tablets:**

The various characteristics of blends to be tested before compression are:

**Angle of Repose:**

Angle of repose is determined by using funnel method. The accurately weighed blend is taken in a funnel. The height of the funnel is adjusted in such a way that the tip of the funnel just touches the apex of the heap of blend. The drug (as solid dispersion)-excipient blend is allowed to flow through the funnel freely on to the surface. The diameter of the powder cone is measured and angle of repose is calculated using the following equation.

$$\tan \theta = h/r$$

Where, h and r are the height of cone and radius cone base respectively. Angle of Repose less than 30 ° shows the free flowing of the material.

**Bulk density:**

Apparent bulk density is determined by pouring a weighed quantity of blend into graduated cylinder and measuring the volume and weight. Bulk density can be calculated by using following formula:

Bulk density = Weight of the powder / Volume of the packing

**Tapped Density:**

It is determined by placing a graduated cylinder, containing a known mass of drug-excipients blend. The cylinder is allowed to fall under its own weight onto a hard surface from the height of 10 cm at 2 second intervals. The tapping is continued until no further change in volume is noted. Tapped density can be calculated by using following formula:

Tapped Density = (Weight of the powder / volume of the tapped packing)

**Compressibility Index:**

The Compressibility Index of the blends is determined by compressibility index. Compressibility Index can be calculated by using following formula:

Compressibility Index (%) = [(TD-BD) X 100] / TD]

**Hausner's Ratio:**

A similar index to indicate the flow properties can be defined by Hausner's ratio. Hausner's ratio can be calculated by using following formula:

Hausner's ratio=(Tapped densityx100)/(Poured density) [23, 24].

**Evaluation of Tablets****Weight Variation:**

The weight variation test is carried out in order to ensure uniformity in the weight of tablets in a batch. First the total weight of 20 tablets from each formulation is determined and the average is

calculated. The individual weight of the each tablet is also determined to find out the weight variation.

**Table 3: Weight variation specification as per IP**

Average weight of Tablets(mg)	% Deviation
80 mg or less	10
More than 80 mg but less than 250 mg	7.5
250 mg or more	5

**Thickness:**

Ten tablets were selected and average thicknesses were calculated. The thicknesses of the tablets were determined by using vernier calipers.

**Hardness Test:**

Hardness indicates the ability of a tablet to withstand mechanical shocks while handling. The hardness of the tablets was determined using Monsanto hardness tester. It is expressed in kg/cm<sup>2</sup>. Five tablets were randomly selected and hardness of the tablets was determined.

**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 assess the ability of the tablet to withstand abrasion in packaging, handling and transport. Roche friabilator is employed for finding the friability of the tablets. Weigh the 20 tablets from each batch and place in Roche friabilator that will rotate at 25 rpm for 4 minutes. Dedust the all tablets and weigh again. The percentage of friability can be calculated using the formula:

$$\% \text{ Friability} = [(W1-W2)100]/W1$$

Where, W1= Weight of tablet before test

W2 = Weight of tablet after test

**In vitro disintegration time:**

One tablet from each formulation was placed in USP tablet disintegration apparatus without disk, containing 900 ml of pH 6.8 phosphate buffer at 37 ± 0.5° C, and the time required for complete disintegration was determined.

**Wetting time:**

Five circular tissue papers of 10-cm diameter were placed in a petridish with a 10 cm diameter. Ten mL of water at 37±0.5°C containing eosin, a water-soluble dye, was added to the petri dish. A tablet was carefully placed on the surface of tissue paper. The time required for water to reach the

upper surface of the tablets was noted as the wetting time.

#### 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.

$$R = \frac{W_a - W_b}{W_b} \times 100$$

Where,  $W_a$  = weight of tablet after absorption,  
 $W_b$  = Initial weight of the tablet

#### In-vitro dispersion time:

Tablet was added to 10 ml of phosphate buffer solution, pH 6.8 at  $37 \pm 0.5^\circ\text{C}$ , Time required for Complete dispersion of a Tablet was measured

#### In Vitro release studies:

Drug release studies of the prepared fast dissolving tablets with semi synthetic and natural super disintegrants were performed, in triplicate, in a USP Dissolution Apparatus II (Paddle type) (Electrolab TDT-08L, India). The dissolution test was performed using Phosphate buffer pH 6.8 at  $37 \pm 0.5^\circ\text{C}$ . The speed of rotation of paddle was set at 50 rpm. Aliquots of 1mL were withdrawn from the dissolution apparatus at different time intervals and filtered through a cellulose acetate membrane ( $0.45\mu\text{m}$ ), and fresh dissolution medium was replenished immediately. Absorbance of solution was checked by UV spectrophotometer (Shimadzu-1800, Kyoto, Japan) at a wavelength and drug release was determined from standard curve .

#### Accelerated stability studies:

Stability studies were carried out on optimized formulation. The tablets were stored at  $40^\circ\text{C}$  and 75% RH for duration of three months. After for every one month samples were withdrawn and tested for various parameters like hardness, drug content and *in vitro* drug release [25-29].

#### CONCLUSION

The advancement of a quick dissolving tablet give a decent chance to a line expansion in the commercial center; drugs (e.g. neuroleptics, cardiovascular medications, analgesics, antihistamines and medications for erectile brokenness) can be considered contender for this dose structure. Pharmaceutical promoting is another explanation behind the increment in accessible quick dissolving items. As a medication substance nears the end of its patent life, it is regular for pharmaceutical makers to add to a given medication element in a novel and enhanced measurements structure. Another measurement structure permits a producer to develop market

eliteness, while offering its patient populace a more helpful dose structure or dosing regimen. In such manner, quick dissolving details are like numerous supported discharge plans that are presently usually accessible. An augmentation of business sector selectiveness, which can be given by a quick dissolving, prompts enhanced income, while likewise focusing on underserved patient populaces. Despite the fact that the expense to make these specific dose structures surpasses that of routine tablets, this extra cost is not being gone on to the customer.

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