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FAST DISSOLVING TABLETS: REVIEW

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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.*

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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 compressedtablets. A freeze-dried tablet (a molding tablet) madeFromwater-soluble material disintegrates instantly in the saliva, but the structure is so brittle that it cannot be handled easilyIn general; compressedtablets can be manufactured at a low price. To give the rapidly disintegrating tablets [3]. Actually RDT tablets are preferred by an increasingnumber of patients especially children and elderly, butalso adult consumers who like to have their medicationreadily available at any time. Patients appreciatethe convenience and the discreteness of these productswhich can be taken without water and which guarantya rapid onset of action.

Recently the European Pharmacopoeia adopted the term Orodispersible tablet as a tablet to be placed in the mouthwhere it disperses rapidly before swallowing andwhich disintegrates in less than 3 min. There was nospecification concerning neither the hardness nor thefriability of this kind of tablets. That is why we findcertain RDT in the market that disintegrate in lessthan 1min or maybe 30 s. but are brittle and requirespecified peel able blister packaging and thus highercosts Commercially available RDT are prepared by various techniques, mainly Lyophilization molding and direct compression. The Lyophilization and molding techniques produceRDT which disintegrate within about 30 s, but thathave low physical resistance and high friability. On the other hand, tablets obtained by direct compression areless 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 complicatedpreparation processes so that the high cost of production will imposes a financial burden on patients. Therefore, theproduction of rapidly disintegrating tablets using a simpleand 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 β-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 inmatter 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 mentallydisabled patients.
- Accurate dosingas compared to liquids.
- Dissolution and absorption of drug is fast, offering rapid onsetof action.
- Bioavailability of drugs is increasedas some drugs areabsorbed from mouth, pharynx and esophagus through salivapassing down into the stomach
- Advantageous over liquid medication in terms ofadministration as well astransportation
- First pass metabolism is reduced, thus offering improvedbioavailability and thus reduced dose and side effects.
- Free of risk of suffocation due to physical obstruction when swallowed, thus offering improved safety [9].

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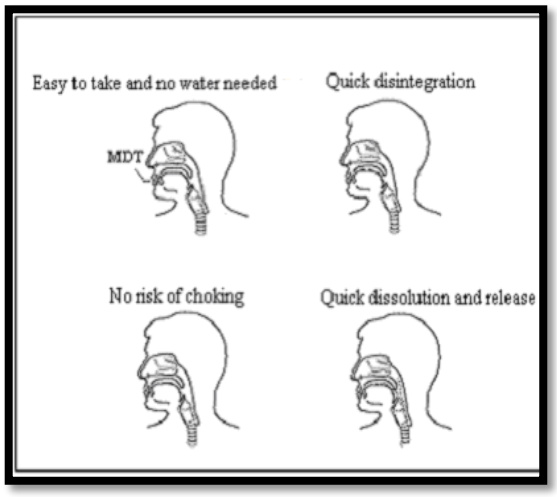

Fig 1.1: Advantages of fast dissolving tablet

Limitations of Fast Dissolving Tablet

1. Careful handling is required because tablets usuallyhave insufficient mechanical strength.
2. If tablets are not formulated properly they may leaveunpleasant taste or grittiness in the mouth.
3. Drugs difficult to formulate into FDT with relativelylarger 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 containmedicament in taste mask form which upon administration, disintegrates ordissolves in patient's oral cavity, thus releasing the active ingredients whichcome in contact with the taste buds; hence, taste-masking of the drugsbecomes 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 compressedinto tablets with very low compression force, which makes thetablets friable and/or brittle, difficult to handle, and often requiring specializedpeel-off blister packing that may add to the cost. Only few technologiescan produce tablets that are sufficiently hard and durable to allow themto be packaged in multi dose bottles.

Hygroscopicity

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

Amount of drug

The application of technologies used for orally disintegrating tablets islimited 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 forinsoluble drugs and less than 60 mg for soluble drugs. This parameter isparticularly challenging when formulating a fast-dissolving oral films orwafers.

Aqueous solubility

Water-soluble drugs pose various formulation challenges because they formeutectic mixtures, which result in freezing-point depression and the formationof a glassy solid that may collapse upon drying because of loss ofsupporting structure during the sublimation process. Such collapse sometimescan be prevented by using various matrix-forming excipients such as mannitol than can induce crystallinity and hence, impart rigidity

to theamorphous composite.

Size of tablet

The degree of ease when taking a tablet depends on its size. It has beenreported that the easiest size of tablet to swallow is 7-8 mm while theeasiest size to handle was one larger than 8 mm. Therefore, the tablet sizethat 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 quickuptake of water into the tablet matrix resulting in its rapiddisintegration. Hence, the basic approaches for development offast dissolving tablets include maximizing the porous structure ofthe tablet matrix, incorporating the appropriate disintegratingagent and using highly water soluble excipients in theformulation. Various technologies used for development offast dissolving tablets are given below.

1. Direct Compression Method

This is one of the popular techniques used for preparation offast dissolving dosage forms. In this technique, tablets areprepared directly by compression of mixture of drug andexcipient without any preliminary treatment. The basicprinciple involves addition of super disintegrants and water soluble excipients. This technique involve use of super disintegrants in optimum concentration so as to achieverapid disintegration along with good mouth feel. The mixturewhich is to be compressed must have good flow properties.Few drugs can be directly compressible into tablets ofacceptable quality. Tablet disintegration time can be optimizedby using an effective concentration of super disintegrant. It isconsidered as the best method to prepare orally disintegratingdosage forms since the prepared tablets provides higherdisintegration due to absence of binder and low moisturecontent. 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 andeffervescent 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
Crosslinked cellulose	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.
Crosslinked PVP	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.
Crosslinked starch	Explotab® Primogel®	Swells 7-12 folds in < 30 seconds.	Swells in three dimensions and high level serve as sustain release matrix.
Crosslinkedalginic acid	Alginic acid NF	Rapid swelling in aqueous medium or wicking action	Promote disintegration in both dryn or wet granulation
Soy polysaccharides	Emcosoy®		Does not contain any starch or Sugar. Used in nutritional products
Calcium silicate		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.

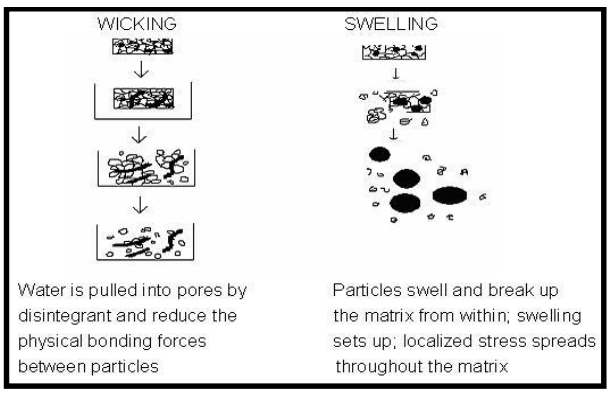

Figure 1.2 Disintegration of tablet by wicking and swelling

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-swellable' 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.

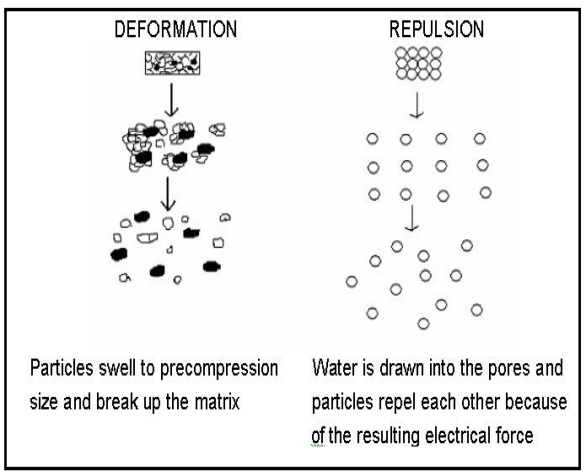

Figure 1.3Disintegration by deformation and repulsion

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 moltenmixture of hydrogenated cottonseed oil, sodium carbonate, lecithin, polyethylene glycol and an active ingredient into a lactose basedtablet 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 thereis no drying step, the process is less time consuming and uses less energy than wet granulation. It is a useful technique to enhance thedissolution rate of poorly water-soluble drugs, such as griseofulvin. This approach to prepare FDT with sufficient mechanicalintegrity, involves the use of a hydrophilic waxy binder. Super polystate is a waxy material with a melting point of 33–37°C and a HLBvalue 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 thetablets 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 themanufacturing 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. Afterheating, the median pore size of the tablets was increased and tablet hardness was also increased. The increase of tablet hardness withheating 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 isachieved due to the formation of many pores where camphor particles previously existed in the compressed tablets prior tosublimation of the camphor. A high porosity was achieved due to the formation of many pores where camphor particles previouslyexisted 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 layersthat uses powder processing and liquid binding materials. A novel fast dissolving drug delivery device (DDD) with loose powders in itwas fabricated using the three dimensional printing (3DP) process. Based on computer-aided design models, the DDD containing thedrug acetaminophen were prepared automatically by 3DP system. It was found that rapidly disintegrating oral tablets with properhardness can be prepared using TAG. The rapid disintegration of the TAG tablets seemed due to the rapid water penetration into thetablet 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 andmethanol and expulsion of softened mass through the extruder or syringe to get a cylindrical shaped extrude which are finally cut intoeven 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 havebeen 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 & croscarmellose sodium and acidic ingredient (citric acid) and alkalineingredients (e.g. sodium bicarbonate). This spray-dried powder, which compressed into tablets showed rapid disintegration andenhanced dissolution. Maximum drug release and minimum disintegration time were observed with Kollidon CL excipient base ascompared to tablets prepared by direct compression, showing the superiority of the spray dried excipient base technique over directcompression technique.

8. Cotton Candy Process

The FLASHDOSE® is a MDDDS manufactured using Shearform™ technology in association with Ceform TI™ technologyto eliminates the bitter

taste of the medicament. The Shear form technology is employed in the preparation of a matrix knownas 'floss', made from a combination of excipients, either alone or with drugs. The floss is a fibrous material similar to cotton-candyfibers, 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 dextrins and poly dextrose can be transformed into fibers at 30–40% lowertemperature than sucrose. This modification permits the safe incorporation of thermo labile drugs into the formulation. The tabletsmanufactured 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. Thesurfactant acts as a crystallization enhancer in maintaining the structural integrity of the floss fibers. It also helps in the conversion ofamorphous sugar into crystalline form from an outer portion of amorphous sugar mass and subsequently converting the remainingportion of the mass to complete crystalline structure. This process helps to retain the dispersed drug in the matrix, thereby minimizingmigration 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. Themachine is similar to that used in 'cotton-candy' formation which consists of a spinning head and heating elements. In the flash heatprocess, 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 innature.

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 bypartial crystallization through an ethanol treatment (1%) which is sprayed onto the floss and subsequently evaporated to impartimproved 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 andcompressed into tablets. In order to improve the mechanical strength of the tablets, a curing step is also carried out which involves theexposure of the dosage forms to elevated temperature and humidity conditions, (40 °C and 85% RH for 15 min). This is expected tocause crystallization of the floss material that results in binding and bridging to improve the structural strength of the dosage form.

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9. Tablet Molding

Molding process is of two type's i.e. solvent method and heat method. Solvent method involves moistening the powder blendwith a hydro alcoholic solvent followed by compression at low pressures in molded plates to form a wetted mass (compressionmolding). The solvent is then removed by air-drying. The tablets manufactured in this manner are less compact than compressed tablets and posses a porous structure that hastens dissolution. The heat molding process involves preparation of a suspension thatcontains a drug, agar and sugar (e.g. mannitol or lactose) and pouring the suspension in the blister packaging wells, solidifying theagar at the room temperature to form a jelly and drying at 30^0C.

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 anamorphous porous structure that can dissolve rapidly. A typical procedure involved in the manufacturing of ODT using this techniqueis mentioned here. The active drug is dissolved or dispersed in an aqueous solution of a carrier/polymer. The mixture is done byweight and poured in the walls of the preformed blister packs. The trays holding the blister packs are passed through liquid nitrogenfreezing tunnel to freeze the drug solution or dispersion. Then the frozen blister packs are placed in refrigerated cabinets to continuethe freeze-drying. After freeze-drying the aluminum foil backing is applied on a blister-sealing machine. Finally the blisters arepackaged 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 packagingunsuitable 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 drugusing a proprietary wet-milling technique. The nano crystals of the drug are stabilized against agglomeration by surface adsorptionon selected stabilizers, which are then incorporated into MDTs. This technique is especially advantageous for poor water solubledrugs. Other advantages of this technology include fast disintegration/dissolution of nanoparticles leading to increased absorption andhence higher bioavailability and reduction in dose, cost effective manufacturing process,

conventional packaging due to exceptionaldurability 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 dosageform that can be swallowed without water as itdissolves instantly on tongue in less than 5seconds. The drug is physically trapped in awater-soluble matrix, and then freeze-dried toproduce a product that rapidly dissolves. Thematrix consists of water-soluble saccharidesand polymer (gelatin, dextran, alginates) toprovide rapid dissolution and to allowsufficient physical strength to withstandhandling. Water is used during the process toproduce porous units for rapid disintegration.Various gums are used to eliminate thesedimentation problem of dispersed drugs.Glycine is used to prevent the shrinkage ofzydis unit during the process and in long-termstorage. As the zydis dosage form is weak inphysical strength, unit is contained in peelable blister pack, which allows removal of productwithout damaging it.

2] Orasolv Technology

CIMA labs have developed Orasolv technology. The system essentially makestablets that contain taste masked activeingredients and effervescent disintegratingagent which on contact with saliva, rapidlydisintegrates and releases the taste mask activeingredient. The tablets made by directcompression at very low compression force inorder to minimize oral dissolution time. Thetablets so produced are soft and friable and arepackaged specially designed pick and placesystem. The taste masking associated with Orasolv formulation is two folds. The unpleasant flavor of a drug is not merelycounteracted by sweeteners or flavours; coating the drug powder and effervescence are meansof taste masking in Orasolv.

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3] Durasolv Technology

Durasolv is CIMA's second generation fastdissolving tablet formulation. Produced in asimilar fashion to that of orasolv, durasolv has much higher mechanical strength than itspredecessor due to the use of higher compaction produced during tabletting. The durasolv product is thus produced in a fasterand more cost effective manner. One disadvantage of durasolv is that the technologyis not compatible with larger doses of activeingredients, because formulation is subjected tohigh pressures on compaction. Durasolv iscurrently available in two products nulev and zorlip.

4] WOWTAB Technology

WOWTAB technology is patented byYamanouchi Wow means "without water".WOWTAB is an intra buccally soluble, compressed tablet consisting of granules madewith saccharides of low and high mouldability. The combination of high and low mouldability is used to obtain a tablet of adequate hardnessand fast dissolution rate. Mould ability is the capacity of the compound to be compressed. Low mouldablity means the compounds show reduced compressibility for tabletting and rapid dissolution rate. But in case of high mouldability compounds this context isreversed. In this the active ingredient is mixed with low mould ability 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 forconventional bottle and blister packaging.

5] Flash Dose Technology

Fuisz has patented the Flash Dose technology. The Flash Dose technology utilizes a uniquespinning mechanism to produce floss likecrystalline structure, much like cotton candy.This crystalline sugar can then incorporate theactive drug and be compressed into a tablet. Flash Dose tablet consists of self-binding shea form matrix termed "floss". The procedurehas been patented by Fuisz and known as "Shearform". Interestingly, by changing thetemperature and other conditions duringproduction, the characteristics of the productcan are altered greatly. Instead of floss- like material, small spheres of saccharide can beproduced to carry the drug. The procedure ofmaking microspheres has been patented by Fuisz and known as "Ceform".

a. Shearform Technology™

The technology is based on the preparation offloss 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 issimultaneously subjected to centrifugal forceand to a temperature gradient, which raises thetemperature of the mass to create an internal, flow condition, which permits part of it tomove with respect of the mass. The floss soproduced is amorphous in nature so it is further chopped and recrystallised by various techniques to provide aciform flow propertiesand this facilitate blending the recrystallised matrix is then blended with other tabletexcipients and an active ingredient. Theresulting mixture is compressed into tablet.

b. Ceformtechnology™

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

otherpharmaceutical compounds, and excipients intoa precision engineered and rapidly spinningmachine. The centrifugal force of the rotating head of the ceform machine throws the drydrug blend at high speed through small heatedopenings. The microspheres are then blendedand/or compressed into the pre-selected oraldelivery dosage format. The ability tosimultaneously process both drug and excipientgenerates a unique microenvironment in whichmaterials can be incorporated into themicrosphere that can alter the characteristics of the drug substance.

6] Flashtab Technology

This technology involves the preparation ofrapidly disintegrating tablet which consists of an active ingredient in the form ofmicrocrystals. 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	ActiveIngredients	Company
Nimulid-MD	Nimesulide	Panacea Biotech
Zyrofmeltab	Rofecoxib	ZydusCadila
MOSID-MD	Mosapride Citrate	TorrentPharmaceuticals
Feledine Melt	Piroxicam	Pfizer
Maxalt ODT	Famotidine	Merck
Remeron Sol Tab	Mirtazapine	Organon
Romilast	Montelukast	Ranbaxy
Manza BDT	Olanzepine	Orchid
Olanexinstab	Olanzepine	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	SuzenPharma
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 allow 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 Θ = 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=(Tappeddensityx100)/(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 with stand mechanical shocks while handling. The hardness of the tablets was determined using Monsanto hardness tester. It is expressed in kg/cm^2. Five tablets were ran-domly selected and hardness of the tablets was deter-mined.

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. 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:

% 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 6.8phosphate buffer at 37 ± 0.5º 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= Wa -Wb / Wb × 100

Where, Wa = weight of tablet after absorption,
Wb = Initial weight of the tablet

In-vitro dispersion time:
Tablet was added to 10 ml of phosphate buffer solution, ph 6.8 at 37+0.5ºc, 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±0.5°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 (0.45µm), 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°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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