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REVIEW ARTICLE

An Approach Based on Advantages over Conventional System

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ABSTRACT

The convenience of administration and improved patient compliance are important in the design of oral drug delivery system which remains the preferred route of drug delivery inspite of various disadvantages. Oral delivery is at this time the gold standard in the drug manufacturing where it is considered as the safest, most convenient and greatest economical method of drug delivery. This is seen to affect about 35% of the general population and associated with a number of circumstances like Parkinsonism, mental disability, motion sickness, unconsciousness, unavailability of the water etc. To overcome such difficulties, mouth dissolving tablets have been developed. Some tablets are designed to dissolve in saliva remarkably fast, within a few seconds, and are true fast-dissolving tablets. One such problem can be solved in the novel drug delivery system by formulating "mouth dissolving tablets" [MDTs] which disintegrates or dissolves rapidly without water within few seconds in the mouth due to the action of superdisintegrant or maximizing pore structure in the formulation. FDT technologies based on lyophilization, molding, sublimation, and compaction, as well as approaches to enhancing the FDT properties, such as spray drying, moisture treatment, sintering, and use of sugar-based disintegrants are applicable. The aim of this review article is to give an overview of advantages of Fast-disintegrating tablets over conventional system.

KEYWORDS: FDT, Patients compliance, super disintigrants, Technology, Evaluation.

INTRODUCTION:

Oral route remains the preferred route for administration of therapeutic agents because of accurate dosage, low cost therapy, self-medication, noninvasive method and ease of administration leading to high level of patient compliance [1]. For the past one decade, there has been an enhanced demand for more patient- friendly and compliant dosage forms [2]. Many patients have difficulty swallowing tablets and hard gelatin capsules and consequently do not take medications as prescribed. It is estimated that50% of the population is affected by this problem, which results in a high incidence of noncompliance and ineffective therapy. [3] To overcome these difficulties, pharmaceutical technologists have devoted considerable efforts for developing a novel type of dosage form for oral administration known as orally disintegrating tablets [ODTs] [4].

These are novel types of tablets that dissolve/ disintegrate/ disperse in saliva within few seconds without water. [5] These dosage forms disintegrate/dissolve in oral cavity within a minute without need of water or chewing, anywhere, anytime. This leads to their appropriateness to geriatric, pediatric and dysphasic patients. [6] The technology is also referred to as fast disintegrating tablet, fast dispersing tablet, rapid dissolve tablet, rapid melt tablet, quick disintegrating tablet, and orally disintegrating tablet.[7] If the drug is hydrophilic, the dosage form is known as fast dissolving tablets otherwise if drug is hydrophobic it is known as fast disintegrating tablets [8]. There are two different types of dispersible tablets which have to be distinguished: One dosage form disintegrates instantaneously in the mouth, to be swallowed without the need for drinking water, while the other tablet formulation can readily be dispersed in water, to form dispersion, easy to ingest by the patient [9]. FDDS include tablets and films [10]. FDTs also have the advantages of liquid formulations, such as easy administration and no risk of suffocation resulting from physical obstruction by a dosage form [11]. The bioavailability of some drugs may be increased due to absorption of drug in oral cavity and also due to pregastric absorption of saliva containing dispersed drugs that pass down into the stomach [12]. Most fast-dissolving delivery system films must include substances to mask the taste of the active ingredient [13]. This masked active ingredient is then swallowed by the patient's saliva along with the soluble and insoluble exicpients [14]. The FDT is also known as fast melting, fast dispersing, rapid dissolve, rapid melt, and/or quick disintegrating tablet [15]. These dosage forms are also used to attain instant a higher concentration of drug in body for immediate actions[16].

Higher drug loading as well as pleasant feeling to the mouth are other advantages offered by the FDT's [17].

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Most commonly used methods to prepare these tablets include; Freeze drying / Lyophilization, Tablet molding and Direct-compression methods [18]. Such a tablet disintegrates into smaller granules or melts in the mouth from a hard solid to a gel-like structure, allowing easy swallowing by patients [19]. These dosage forms are also applicable when local action in mouth is desirable such as local anaesthetic for toothaches and oral ulcers etc [20]. Recently, the European Pharmacopeia adopted the term oro dispersible tablet for a tablet that disperses or disintegrates in less than 3 minutes in the mouth before swallowing [21]. Patients with persistent nausea, who are traveling, or who have little or no access to water are also good candidates for FDDTs [22]. Many patients feel difficulty in swallowing conventional tablets (It is estimated that 50% of the population is affected by this problem) when water is not available, in the case of the motion sickness [kinetosis] and sudden episodes of coughing during the common cold, allergic condition and bronchitis[23,24]. It is also easy to dose the aged, bed-ridden patients, or infants who have problems swallowing tablets and capsules [25]. Thus the development of Met-In-Mouth tablet, which disintegrate rapidly without the need of drinking water providing convenience of administration, patient compliance and quick onset of action [26]. Fast disintegrating tablets [FDT] are also help to encountered phagophobia, odynophagia types problem [27,28]. Most of the FDT technologies use unique forms of taste masking as well. The primary method of taste-masking include adsorption onto or complexation with carriers and spray coating of drug particles [29]. Recent advances in Novel Drug Delivery System [NDDS] aims to enhance safety and efficacy of drug molecule by formulating a convenient dosage form for administration and to achieve better patient compliance. One such approach is "Fast Dissolving Tablet" [30]. ODTs with good taste and flavor increase the acceptability of bitter drugs by various groups of population [31]. United States Food and Drug Administration [FDA] defined ODT as "A solid dosage forms containing medicinal substances which disintegrate rapidly, usually in a matter of seconds, when placed on the tongue" [32]. The major advantage of the ODT formulation is that it combines the advantages of both liquid and conventional tablet formulations [33]. They provide the convenience of a tablet formulation and also allow the ease of swallowing provided by a liquid formulation [34]. There are number of dosage forms available like effervescent tablets, dry syrups and chewing gum tablets, which are commonly used to enhance the patient's compliance but MD tablets that can dissolve or disintegrate in oral cavity have attracted a great deal of attention[35,38,39]. US Food and Drug Administration Center for Drug Evaluation and Research [CDER] defines, in the "Orange Book" an ODT as "a solid dosage form containing medicinal substances, which disintegrates rapidly, usually with a matter of seconds, when placed upon the tongue" [36,40]. Researchers have formulated ODT for various categories of drugs, which are used for therapy in which rapid peak plasma concentration is required to achieve desired pharmacological response [37,41].

ADVANTAGES OF ODTS:

Advantages of ODTs include:

- ❖ Ease of administration to geriatric, pediatric, mentally disabled, and bed-ridden patients, who have difficulty in swallowing the tablet.
- ❖ The ODTs do not need water for swallowing unlike conventional dosage forms. This is very convenient for patients who are travelling or do not have immediate access to water, and thus, provide improved patient compliance.

DIFFICULTIES WITH EXISTING ORAL DOSAGE FORM:

- ➢ Patient may suffer from tremors therefore they have difficulty to take powder and liquids. In dysphasia physical obstacles and adherence to an esophagus may cause gastrointestinal ulceration.
- ➢ Swallowing of solid dosage forms like tablet and capsules and produce difficulty for young adult of incomplete development of muscular and nervous system and elderly patients suffer from dysphasia.
- ➢ Liquid medicaments [suspension and emulsion] are packed in multidose container; therefore achievement of uniformity in the content of each dose may be difficult
- ➢ Buccal and sublingual formation may cause irritation to oral mucosa, so patients refused to use such medications.
- ➢ Cost of products is main factor as parenteral formulations are most costly and discomfort.

Being unit solid dosage forms, provide luxury of accurate dosing, easy portability and manufacturing, good physical and chemical stability and an ideal alternative for pediatric and geriatric patients.

- ❖ Bioavailability of drugs is enhanced due to absorption from mouth, pharynx, and oesophagus.
- ❖ Pregastric absorption can result in improved bioavailability and because of reduced dosage,

improved clinical performance through a reduction of unwanted effects. Rapid onset of therapeutic action as

tablet is disintegrated rapidly along with quick dissolution and absorption in oral cavity.

❖ Good mouth feels, especially for pediatric patients as taste-masking technique is used to avoid the bitter taste of drugs.

❖ Minimum risk of suffocation in airways due to physical obstruction, when ODTs are swallowed, thus they provide improved safety and compliance with their administrations.

❖ Rapid drug therapy intervention is possible.

❖ Conventional processing and packaging equipments allow the manufacturing of tablets at low cost.

❖ No specific packaging is required. It can be packaged in push through blisters.

❖ Provide new business opportunities in the form of product differentiation, patent-life extension, uniqueness, line extension, and life-cycle management, and exclusivity of product promotion.

Factors to be considered for Selection of Superdisintegrants:

➢ **Disintegration**: The disintegrant must quickly wick saliva into the tablet to generate the volume expantion and hydrostatic pressure necessary to provide rapid disintegration in the mouth.

➢ **Compactability:** It is desirable to have ODT with acceptable hardness and less friability at a given compression force to produce robust tablets that avoid the need to use specialized packaging while maximizing production speed.

➢ **Mouthfeel:** Large particals can result in a gritty feeling in mouth. Thus, small particales are preffered. If the tablet forms a gel-like consistency on contact with water. However, it produces a gummy texture that many consumer find objectionable.

➢ **Flow:** In typical tablet formulation, suprdisintegrants are used at 2-5 wt % of the tablet formulation. With ODT formulation, disintegrant level can be significantly higher.

Important Criteria for Excipients used in Formulation of ODTs:

➢ It must be able to disintegrate quickly.

➢ Their individual properties should not affect the ODTs.

➢ It should not have any interaction with drug and other excipieints.

➢ It should not interfere in the efficacy and organoleptic properties of the product.

➢ When selecting binder [a single or combination of binders] care must be taken in the final integrity and stability of the product.

➢ The metlting point of the excipients used should be in the range of 30-35ºC34.

➢ The binder may be in liquid, semi solid, solid or polymeric in nature.

Desired characteristics and development challenges:

- **Fast Disintegration:**

FDT dosage forms, also commonly known as fast melt, quick melt, orally disintegrating tablets, and orodispersible systems, have the unique property of disintegrating the tablet in the mouth in seconds.

- **Taste of Active Ingredients:**

Taste-masking technologies are increasingly focused on aggressively bitter-tasting drugs like the macrolide antibiotics, non-steroidal anti-inflammatory drugs, and penicillins.

- **Drug Properties:**

The drugs belonging to Biopharmaceutical Classification System Class II, i.e., the drugs with poor solubility and high permeability are best suitable moieties for FDTs in a dose of 125 and 250 mg. Tizanidine HCl, Oxybutynin HCl, Rofecoxib, Ibuprofen, Promethazine Theoclate, prednisone, Indomethacin, Glyburide, Fentanyl citrate, Griseofulvin Hydrochlorothiazide, Crystallized Paracetamol, and Nimesulide are few examples of drugs that has been formulated as fast-dissolving drug delivery system.

- **Tablet Strength and Porosity:**

The FDTs comprise of two component frameworks of lyophilized matrix system that work together to ensure the development of a successful formulation. The first component is water-soluble polymers such as gelatin, dextran, alginate, and maltodextrin. This component maintains the shape and provides mechanical strength to the tablets [binder]. The second constituent is matrix-supporting/disintegration-enhancing agents such as sucrose and mannitol, which acts by cementing the porous frame work, provided by the water-soluble polymer and accelerates the disintegration of the FDT.

- **Moisture Sensitivity:**

FDTs should have low sensitivity to humidity. This problem can be especially challenging because many highly water-soluble excipients are used in formulation to enhance fast-dissolving properties as well as to create good mouth feel.

THE NEED FOR DEVELOPMENT OF FAST DISINTEGRATING TABLETS [5]

- **Patient factors:**

❖ Geriatric patients mainly suffering from conditions like hand tremors and dysphasia.

❖ Pediatric patients who are unable to swallow easily because their central nervous system and internal muscles are not developed completely.

❖ Traveling patients suffering from motion sickness and diarrhea that do not have easy access to water.

❖ Patients with persistent nausea for a long period of time are unable to swallow. Especially cancer patients after taking their chemotherapy are too nauseous to swallow the H2 blockers, which are prescribed in order to avoid gastric ulceration.

❖ Mentally challenged patients, bedridden patients and psychiatric patients.

- **Effectiveness factor:**

Any pre-gastric absorption avoids first pass metabolism and can be a great advantage in drugs that undergo hepatic metabolism. Furthermore, safety profiles may be improved for drugs that produce significant amounts of toxic metabolites mediated by first-pass liver metabolism and gastric metabolism, and for drugs that have a substantial fraction of absorption in the oral cavity and pre-gastric segments of GIT.

EXCIPIENTS COMMONLY USED FOR FDT PREPARATION:

Mainly seen excipients in FDT are as per Table no.-1 at least one disintegrant, a diluent, a lubricant and optionally swelling agent, a permeablizing agent, sweeteners and flavoring agents.

❖ **Superdisintegrants**

Super disintegrant provide quick disintegration due to combined effect of swelling and water absorption by the formulation.

Swelling Index = [[Final volume - Initial volume]/initial volume]] X 100

Example: croscarmellose sodium, crospovidone, carmellose, carmellose calcium, sodium starch glycolate ion exchange resins [e.g. Indion 414]. Sodium starch glycollate has good flowability than crosscarmellose sodium. Cross povidone is fibrous nature and highly compactable.

❖ **Binders**

Main role of Binders is to keep the composition of these fast melting tablets together during the compression stage.

Example: Binders commonly used are cellulosic polymers, povidones, polyvinyl alcohols, and acrylic polymers.

❖ **Antistatic agent**

An **antistatic agent** is a compound used for treatment of materials or their surfaces in order to reduce or eliminate buildup of static electricity generally caused by the triboelectric effect.

Example**:** colloidal silica [Aerosil], precipitated silica [Sylod.FP244], talc, maltodextrins, .beta-cyclodextrin etc.

❖ **Lubricants**

Lubricants remove grittiness and assist in the drug transport mechanism from the mouth down into the stomach.

Example: Magnesium stearate, stearic acid, leucine, sodium benzoate, talc, magnesium lauryl sulphate, liquid paraffin etc.

❖ **Flavours**

Example**:** Peppermint flavour, clove oil, anise oil, eucalyptus oil. Flavoring agents include, vanilla, citrus oils, fruit essences etc.

❖ **Sweeteners**

Example: Sorbitol, Mannitol, Maltitol solution, Maltitol, Xylitol, Erythritol, Sucrose, Fructose, Maltose, aspartame, sugars derivatives etc.

❖ **Fillers**

Example: Directly compressible spray dried Mannitol, Sorbitol, xylitol, calcium carbonate, magnesium carbonate, calcium phosphate, pregelatinized starch, magnesium trisilicate, aluminium hydroxide etc.

❖ **Surface active agents**

Example**:** sodiumdoecylsulfate, sodiumlaurylsulfate, Tweens, Spans, polyoxyethylene stearate.

MAIN MECHANISM OF TABLET DISINTEGRATION:

Disintegrants are substances routinely included in tablet and in some hard shell capsule formulations to promote moisture penetration and dispersion of the matrix of dosage form in dissolution fluids. In recent years, several newer agents have been developed known as “Superdisintegrants”. These newer substances are more effective at lower concentrations with greater disintegrating efficiency and mechanical strength. Various mechanisms [see table no.- 2] proposed in this concern include water wicking, swelling, deformation recovery and repulsion. It seems likely that no single mechanism can explain the complex behaviour of the disintegrants. However, each of these proposed mechanisms provides some understanding of different aspects of disintegrant action.

❖ **SWELLING**

Although water penetration is a necessary first step for disintegration, swelling is probably the most widely accepted mechanism of action for tablet disintegrants. For

swelling to be effective as a mechanism of disintegration, there must be a superstructure against which disintegrant swells.

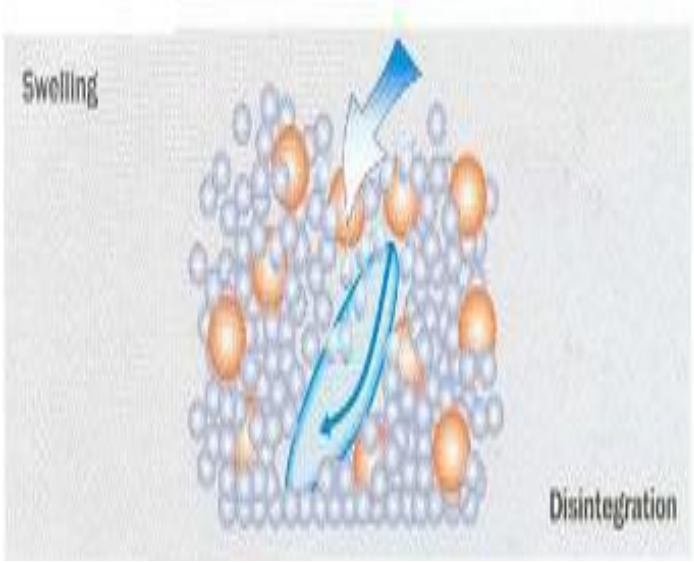

Figure1 Swelling [Particles swell and break up the matrix form within; swelling sets up; localized stress spread throughout the matrix]

❖ **WATER WICKING**

When we put the tablet into suitable dissolution medium, the medium penetrates into tablet and replaces air adsorbed on the particles, which weakens intermolecular bond and break the tablet into particles. Water uptake by tablet depends upon hydrophilicity of drug, excipients and on manufacturing conditions.

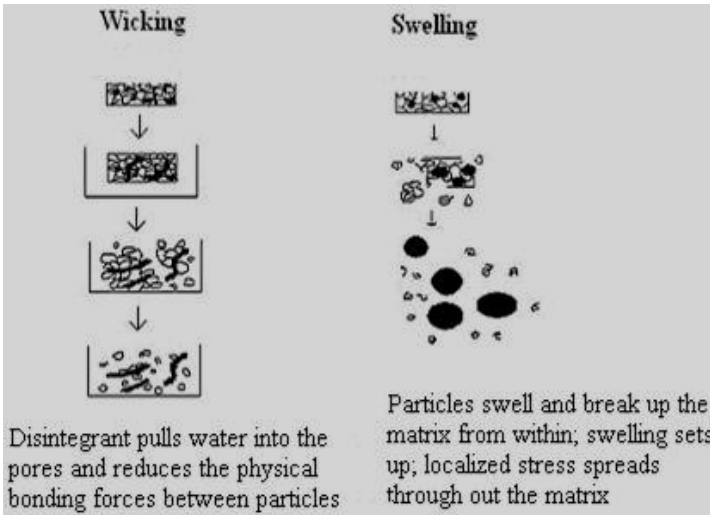

Figure 2 Disintegration of Tablet by Wicking and Swelling

❖ **PARTICLE REPULSIVE FORCES**

According to this theory, water penetrates into tablet through hydrophilic pores and a continuous starch network is created that can convey water from one particle to the next, imparting a significant hydrostatic pressure. The water then penetrates between starch grains because of its affinity for starch surfaces, thereby breaking hydrogen bonds and other forces holding the tablet together.

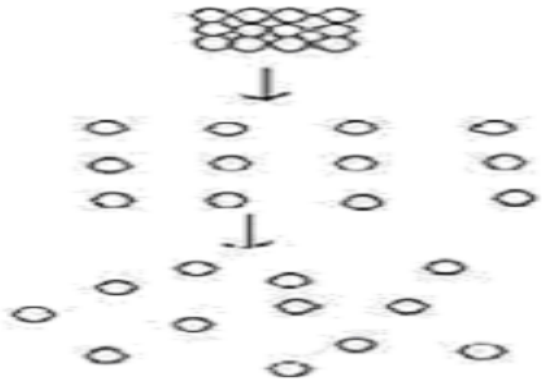

Figure 3 Repulsion Theory [Water is drawn into the pores and particles repel each other due to the resulting electrical force]

❖ **DEFORMATION [ELASTIC RECOVERY]:**

During tablet compression, disintegrated particles get deformed and these deformed particles get into their normal structure when they come in contact with aqueous media.

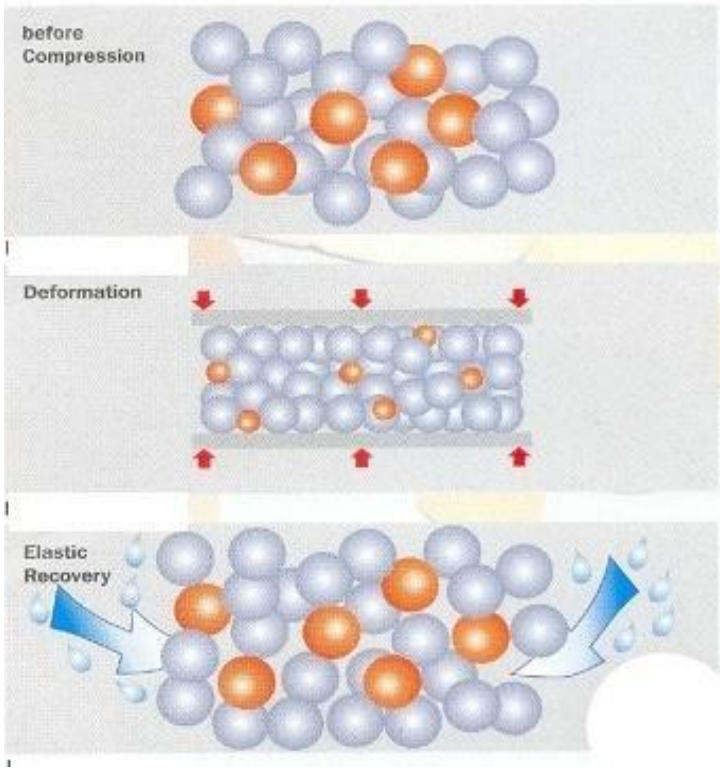

Figure 4 Elastic recovery

Technologies used to manufacture mouth dissolving tablets:

❖ **Conventional technologies for odts**

1. Freeze drying

ZYDIS® [R.P. Scherer, Swindon, UK], using freeze drying processes, is one of the first generations of fast disintegrating dosage forms. This method involves of drug in water soluble matrix, which is then transferred to the preformed blister with peelable foil, as the zydis units are not strong enough to withstand being pushed through the lidding foil of a conventional blister. Freeze drying is then done to remove water by sublimation.

.2. Moulding

In this method, molded tablets are prepared by using water-soluble ingredients so that the tablets dissolve completely and rapidly.

i. Compression molding:

The manufacturing process involves moistening the powder blend with a hydroalcoholic solvent followed by compressing into mold plates to form a wetted mass, which is, then air dried to remove the solvent.

ii. Heat molding:

A molten matrix in which drug is dissolved or dispersed can be directly molded into ODTs. The tablets prepared using heat molding process involves settling of molten mass that contain a dispersed or dissolved drug.

iii. Molding by vacuum evaporation without lyophilization:

This process involves evaporation of solvent from a drug solution or suspension at a standard pressure.

3. Spray Drying

The formulations contained hydrolyzed and unhydrolyzed gelatin as a supporting agent for the matrix, mannitol as a bulking agent and sodium starch glycolate/croscaramellose as a disintegrant. Disintegration and dissolution were further enhanced by adding an acid [e.g. citric acid] or an alkali [e.g., sodium bicarbonate]. The suspension of above excipients was spray-dried to yield a porous powder which was compressed into tablets. Tablets manufactured by this method disintegrated in < 20sec. in an aqueous medium.

4. Direct Compression Method [Disintegrant Addition]

In this method, tablets are compressed directly from the mixture of the drug and excipients without any preliminary treatment.The evolution of carbon dioxide as a disintegration mechanism called OROSOLV and DURASOLV have been described in two US Patents assigned to CIMA Lab.

5. Sublimation

Sublimation has been used to produce MDTs with high porosity. A porous matrix is formed by compressing the volatile ingredients along with other excipients into tablets, which are finally subjected to a process of sublimation. Inert solid ingredients with high volatility [e.g. ammonium bicarbonate, ammonium carbonate, benzoic acid, camphor, naphthalene, phthalic anhydride, urea and urethene] have been used for this purpose. Solvents such as cyclohexane and benzene were also suggested for generating the porosity in the matrix.

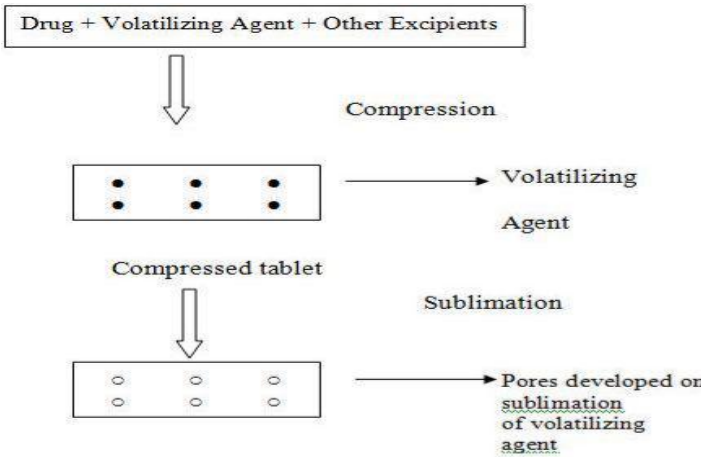

Figure 5 Steps Involved in Sublimation.

6. Phase transition process:

In this technique, ODTs are produced by compressing and subsequently heating tablets that contain two sugar alcohols, one with high and other with a low melting point. The combination of low and high melting point sugar alcohols, as well as a phase transition in the manufacturing process, is important for making ODTs without any special apparatus.

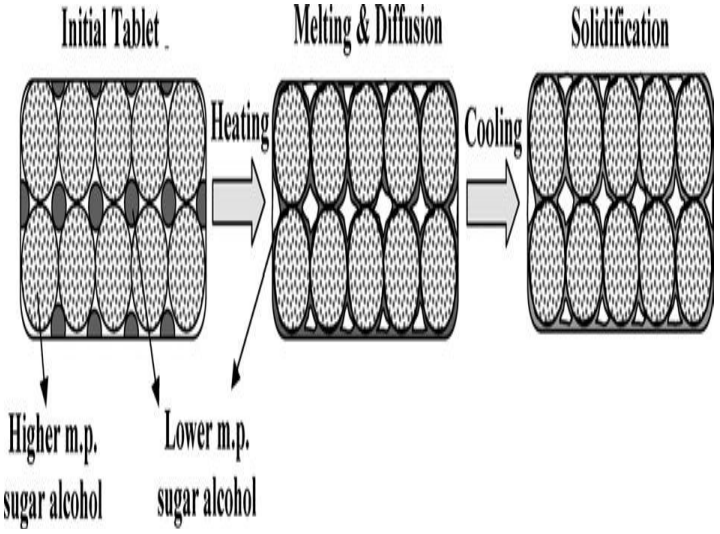

Figure 6 Schematic illustration of a fast disintegration tablet prepared by the phase transition method using a higher melting [erythritol] and a lower melting [xylitol] sugar alcohol

7. Melt granulation:

Melt granulation is a process in which pharmaceutical powders are efficiently agglomerated by the use of binder that can be a molten liquid, a solid, or a solid that melts during the process.

8. Mass Extrusion:

This technology consists of softening the active blend using a solvent mixture of watersoluble polyethylene glycol with methanol and expulsion of softened mass through the extruder or syringe to obtain cylinder of the product into even segments employing heated blade to form tablet.

9.Oral Disintegrating Thin Films:

In this technique, water soluble film forming polymer [pullulan, carboxy methylcellulose, hydroxypropyl methylcellulose, hydroxyl ethylcellulose, hydroxyl propylcellulose, polyvinyl pyrrolidone, polyvinyl alcohol or sodium alginate, etc.] drug and other taste masking ingredients are dissolved in nonaqueous solvent to prepare non-aqueous solution, which forms a film after evaporation of solvent.

EVALUATION OF FAST DISINTEGRATING TABLETS:

Tablets from all the formulation were subjected to following quality control test.

- **General Appearance:**

The general appearance of a tablet, its visual identity and over all "elegance" is essential for consumer acceptance and tablet's size, shape, colour, presence or absence of an odour, taste, surface texture, physical flaws and consistency and legibility of any identifying marking.

- **Size and Shape:**

The size and shape of the tablet can be dimensionally described, monitored and controlled.

- **Tablet thickness:**

Tablet thickness is an important characteristic in reproducing appearance and also in counting by using filling equipment. Some filling equipment utilizes the uniform thickness of the tablets as a counting mechanism. Ten tablets were taken and their thickness was recorded using micrometer.

- **Weight variation:**

20 tablets were selected randomly from the lot and weighted individually to check for weight variation. Weight variation specification as per I.P. is shown in following table- 5.

- **Hardness:**

Hardness of tablet is defined as the force applied across the diameter of the tablet in the order to break the tablet. The resistance of the tablet to chipping, abrasion or breakage under condition of storage transformation and handling before usage depends on its hardness. Hardness of the tablet of each formulation was determined using Monsanto Hardness tester.

- **Friability [F]:**

Friability of the tablet determined using Roche friabilator. This device subjects the tablet to the combined effect of abrasion and shock in a plastic chamber revolving at 25 rpm and dropping a tablet at height of 6 inches in each revolution. Pre -weighted sample of tablets was placed in the friabilator and were subjected to the 100 revolutions. The friability [F] is given by the formula.

F = [**W int. -W fin] / W int.**

Wint - Weight of tablets before friability.

Wfin - Weight of tablets after friability.

- **Wetting Time:**

Wetting time of dosage form is related to the contact angle. It needs to be assessed to give an insight into the disintegration properties of the tablets; a lower wetting time implies a quicker disintegration of the tablet. For this purpose, a tablet is placed on a piece of tissue paper folded twice and kept in a small Petri dish [ID = 6.5 cm] containing 6 ml of water, and the time for complete wetting is measured.

- **Water absorption Ratio:**

A piece of tissue paper folded twice was placed in a small Petridish containing 6 ml of water. A tablet was put on the paper & 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 [wa/wb]

wa is weight of tablet before water absorption &

wb is weight of tablet after water absorption.

- **In vitro dispersion time:**

In vitro dispersion time was measured by dropping a tablet in a beaker containing 50 ml of Sorenson's buffer pH 6.8. Three tablets from each formulation were randomly selected and in vitro dispersion time was performed.

- **In vitro Dissolution test:**

The development of dissolution methods for FDTs is comparable to the approach taken for conventional tablets and is practically identical. Dissolution conditions for drugs listed in a pharmacopoeia monograph, is a good place to start with scouting runs for a bioequivalent FDT. Other media such as 0.1 M HCl and buffer [pH 4.5 and 6.8] should be evaluated for FDT much in the same way as their

ordinary tablet counterparts. It has been suggested that choice for orally disintegrating tablets, with a paddle speed of 50 rpm commonly used.

➢ **Stability testing of drug [temperature dependent stability studies]:**

The fast disintegrating tablets are packed in suitable packaging and stored under the following conditions for a period as prescribed by ICH guidelines for accelerated studies.

[1] 40 ± 1 °C
[2] 50 ± 1°c
[3] 37 ±1 ° C and RH 75% ± 5%

The tablets were withdrawn after a period of 15 days and analyzed for physical characterization [Visual defects, Hardness, Friability, Disintegrations and Dissolution etc.] and drug content. The data obtained is fitted into first order equations to determine the kinetics of degradation. Accelerated stability data are plotting according Arrhenius equation to determine the shelf life at 25°C.

USP 2 paddle apparatus is the most suitable and common

➢ **Packaging:**

The products obtained by lyophilization process including various technologies such has Zydis, Lyoc, Quicksolv, and Nanocrystal are porous in nature, have less physical resistance, sensitive to moisture, and may degrade at higher humidity conditions. For the above reasons products obtained require special packing. Zydis units are generally packed with peelable backing foil. Paksolv is a special packaging unit, which has a dome-shaped blister, which prevents vertical movement of tablet within the depression and protect tablets from breaking during storage and transport, which is used for Orasolv tablet. Some of the products obtained from Durasolv. WOW Tab, Pharmaburst oraquick, Ziplets, etc. technologies have sufficient mechanical strength to withstand transport and handling shock so they are generally packed in push through blisters or in bottles.

Table No. 1: Name and Weight Percentage of Various Excipients

Name of the excipients	Percentage used
Disintegrant	1-15%
Binder	5-10%
Anti-static agent	0-10%
Diluents	0-85%

Table 2: Mechanism of superdisintegrants

Mechanism of disintegration	Example of super disintegrant
Wicking	Cross linked cellulose, cross linked PVP, calcium silicate
Swelling	Cross linked starch
Both wicking and swelling	Cross linked PVP, Cross linked aliginic acid

Table 3: Angle of Repose as an Indication of Powder Flow Properties

Sr. No.	Angle of Repose [θ]	Type of Flow
1	< 20	Excellent
2	20 – 30	Good
3	30 – 34	Passable
4	> 34	Very Poor

Table-4: Relationship between % compressibility and flow ability

% Compressibility	Flow ability
5 – 12	Excellent
12 – 16	Good
18 – 21	Fair Passable
23 – 35	Poor
33 – 38	Very Poor
< 40	Very Very Poor

Table-5: Weight variation specification as per I.P

Average Weight of Tablet	% Deviation
80 mg or less	±10
80 mg to 250 mg	±7.5
250 mg or more	±5

Table 6: Name and Weight Percentage of Various Excipients

Name of the excipients	Percentage used
Disintegrant	1-15%
Binder	5-10%
Anti static agent	0-10%
Diluents	0-85%

Table 7: Various ingredients for FDTs

Component	Example
Water-soluble excipients	Compressible sugars, binders, surfactants, flavouring agents
Water-insoluble excipients	Microcrystalline cellulose, di- or tri-basic calcium phosphate
Disintegrants	Modified celluloses [such as cross-linked sodium carboxy methyl cellulose], cross-linked polyvinyl pyrrolidone [PVP], microcrystalline cellulose, starch and modified starch [including potato starch, maize starch, starch 1500, sodium starch glycolate and starch derivatives], alginic acid and sodium alginate.

Table No. 8: Technologies Used for Masking the Taste of Active Ingredients

Technology	Excipients	Active Ingredient	Method
Fluidized bed coating	Methyl cellulose [MC], Acesulfame[AS], HPMC	Northindrone, tamoxifen, caffeine, acetaminophen, rilmazafone HCl	-MC and AS solution charged to fluidized bed drier containing sieved northindrone. -Internal temperature maintained at 115°F - Coating completed in 3,min.
Agglomeration process	Sweetener:- Sodium saccharin; acesulfeme Dry blend;- HPMC Silica dioxide Polythiazide	Polythiazide	-Sweetener solution sprayed on dry blend to form agglomerated granules - Wet mixture was dried in a convection oven at 103°F for 17 hrs. -Dried product size reduced, sieved [#100
Pelletization process	Dry Blend:- Aspartame, HPC and Gum arabic	Loratidine	Crushed ice was mixed with dry blend mixture to form spherical particles. - Wet spherical particles were dried in a tray drier at 55°C
Infusion method	Dry blend:- Sucralose, Fluoxetine and Polyvinyl pyrrolidone	Fluoxetine	-Propylene glycol: water [40:60] was used to mix dry blend, HPMC was added. Mixing was continued at high speed for 3 min. The particles obtained were screened [#100]

CONCLUSION:

The clinical studies show FDTs can improve patient compliance, provide a rapid onset time of action, and increase bioavailability. Considering the many benefits of FDTs, it is only a matter of time until a majority of oral formulations are prepared in FDT forms. By paying close attention to advances in technologies, pharmaceutical companies can take advantage of FDTs for product line extensions or for first-to-market products. With continued development of new pharmaceutical excipients, one can expect the emergence of more novel technologies for FDTs in the days to come. The successful marketed FDTs have good taste and rapid release properties. With rapid acceptance of FDTs by patients and pharmaceutical companies, the market for this dosage form is promising, and the product pipeline continues to grow.

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