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Different types of pharmaceutical tablets used for treatment of diseases

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Abstract

In modern age of revolution and development in drug delivery for better clinical effects conventional dosages form have still a strong grip and most popular in all kinds of medicinal preparation intended for oral use. To satisfy the need of growing market tablets dosages form have incorporated modernization in producing and some advanced tablet types. Modified release tablet formulations including, layered tablets such as In +--lay tablet, Bi-layered tablet, Medicated chewing gum, Tablet tarts, Pastilles, Lollipop, Tablet inserts, Clinicaps, Caplets, Child ecstasy tablet and Tablet in tablet are new entries in pharmaceutical market. This review highlights the current advancements and patents in tablet technology.

Recent advances in novel drug delivery system (NDDS) aims to enhance safety and efficacy of drug molecule by formulating a convenient dosage form for ease of administration and to achieve better patient compliance. In the recent trend one such approach the development of rapid disintegrating tablets formulation is emerging and gaining popularity because it is easy to administer and leads to better patient compliance. These dosage forms are placed in the mouth, allowed to disperse or dissolve in the saliva. They release the drug as soon as they come in contact with the saliva, thus obviating the need for water during administration. The aim of this article is to review the progress of the evolving technologies and super disintegrating agents in the formulation, manufacturing and evaluation of these tablets. This article also discusses the new evaluation methodologies for these rapid disintegrating tablets. Various modifications in the conventional evaluation and use of specialized instruments are found to be essential in the testing of these dosage forms. In the present review the formulation techniques and different technologies are discussed.

Keywords: Wowtab Technology; Flashtab technology; Rapid disintegrating tablet; Conventional techniques; Patented Technology; Food and Drug Administration

1. Introduction

In this era of science, different pharmaceutical research has been conducted to develop new dosage forms which aim to enhance safety and efficacy and convenient dosage to achieve better patient compliance. Oral route of drug delivery is the most widely utilized route of administration among all the routes for the systemic delivery of drugs. The main goal drug delivery system is to provide the therapeutic amount of the drug at the site of action as an effective throughout the whole period of therapy and then maintain the desired drug concentration. The conventional dosage form produces a wide range of variation in drug concentration in the blood stream and body tissues which leads to reduction of drug effectiveness or increased incidence of side effects with subsequent undesirable toxicity and poor efficiency. The recent advancements in tablet formulations include immediate release tablets such as orally dispersible mini tablets, mouth dissolving/fast dissolving tablets, conventional effervescent, non coated and film coated tablets etc. modified release tablet formulations including layered tablets such as inlay tablets, tablet in tablet, bi-layered tablet, medicated chewing gum, tablet tarts, pastilles, lollipop, tablet inserts, clinicaps, caplets and child ecstasy tablets[1].

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In recent decades, a variety of pharmaceutical research has been conducted to develop new dosage forms. Considering quality of life, most of these efforts have been focused on ease of medication. Among the various dosage forms developed to improve the ease of administration, the Rapid Disintegrating tablet (RDT) is the most widely preferred commercial products. The oral cavity is an attractive site for the administration of drugs because of ease of administration. Various dosage forms like Tablets, Capsules, Liquid preparations are administered by oral route. During the last decade, Rapid Disintegrating tablet (RDT) technologies that make tablets disintegrate in the mouth without chewing and additional water intake have drawn a great deal of attention. The RDT is also known as fast melting, fast dispersing, rapid dissolve, rapid melt, and or quick disintegrating tablet. All RDTs approved by the Food and Drug Administration (FDA) are classified as orally disintegrating.

2. Bilayer tablet

There is various application of the bi-layer tablet it consist of monolithic partially coated or multilayered matrices. In the case of bi-layered tablets drug release can be rendered almost unidirectional if the drug can be incorporated in the upper non-adhesive layer its delivery occurs into the whole oral cavity. Bilayer tablet is a new era for successful development of controlled release formulations that have various features to provide successful drug delivery .In the last decade, interest in developing a combination of two or more than two active pharmaceutical ingredients (API) in a single dosage form (Bi-layer tablet) has increased in the pharmaceuticalindustry, endorsing patient convenience and compliance. Bi-layer tablet can be a primary option to avoid the chemical incompatibilities occurs between APIS by physical separation, and to allow the development of different drug release profiles that are immediate release with extendedrelease[1].The primary objective of sustained release drug delivery is to provide the safety and to improve efficacy of drugs. Bi-layer tablet is suitable for the sequential release in combination of two drugs, for separation two incompatible substances and also for sustained release tablet having one layer is immediate release as an initial dose and second layer is maintenance dose as sustained release[3].

3. Mini-tablets

The main goal of any drug delivery system is to provide a therapeutic amount of drug to the target site in the body to achieve and maintain the desired concentration of drug at thatparticular site. Usually conventional dosage form results in wide range of fluctuation in drug concentration in the blood stream and body tissues with consequent undesirable toxicity which results in poor efficiency. Due to factors such as repetitive dosing, unpredictable absorption and undesirable toxicity lead to the concept of controlled drug delivery system. The main aim of designing controlled drug delivery systems is to reduce the dosing frequency and to increase the effectiveness of the drug by localization at the specific site of action in body[23-25]. Mini-tablets are small tablets having diameter ranging between 1.0-3.0 mm. They are typically filled into a capsule or compressed into larger tablets and sometimes placed in sachets for easy administration.

3.1. Advantages

Administration to the patients who can not swallow, such as the elderly, bedridden patients, patients affected by renal failure & patients who refuse to swallow such as pediatric, geriatric& psychiatric patients. Rapid drug therapy intervention. Achieve increased bioavailability/rapid absorption through pre-gastric absorption of drugs from mouth, pharynx & esophagus as saliva passes down. Convenient for administration and patient compliant for disabled, bedridden patients and for travelers and busy people, who do not always have access to water. Good mouth feel property helps to change the perception of medication as bitter pill particularly in pediatric patients. The risk of chocking or suffocation during oral administration of conventional formulations due to physical obstruction is avoided, thus providing improved safety. New business opportunity like product differentiation. Salient Features Ease of administration to patients who refuse to swallow a tablet, such as pediatric and geriatric patients and, psychiatric patients. Convenience of administration and accurate dosing as compared to liquids. Rapid dissolution of drug and absorption which may produce rapid, onset of action. Some drugs are absorbed from the pharynx and esophagus as the saliva passes down into the stomach, in such cases bioavailability of drugs is increased. Ability to provide advantages of liquid medication in the form of solid preparation. Pre-gastric absorption can result in improved bioavailability and as a result of reduced dosage, improved clinical performance through a reduction of unwanted effects.

3.2. Disadvantages

Rapid Disintegrating tablet is hygroscopic in nature so must be keep in dry place. Some time it possesses mouth feeling RDT requires special packaging for properly stabilization & safety of stable product.

4. Mouth dissolving tablet

Oral Disintegrating Tablets (ODT) are defined as "A solid dosage form that contain medicinal substances and which disintegrates quickly within a matter of seconds, when placed upon the tongue. Oral route of administration is the most popular route for the systemic effects due to its ease of ingestion of accurate dosage with pain avoidance, self-medication, and most important patient compliance. Fast disintegrating tablets are also named as Fast dissolving tablet, Mouth-dissolving, Melt-in-mouth, Quick-dissolving, Rapid dissolve, Quick-disintegration, Orally disintegrating, Fast-melt, Oro dispersible, and Effervescent drug absorption system. Fast dissolving tablet can be administered to the patients who cannot swallow tablet/capsule such as elderly, stroke victim, bedridden patients etc. FDT can be administered without water, anywhere, any time. Beneficial in cases of motion sickness, coughing, suede episodes of allergic attack where rapid onset of action required.31-33 Mouth dissolving tablets that are available in market along with their activity are Piroxicam (NSAIDs), Olanzapine (Psychotropic), Ondansetron (Antiemetic), Rofecoxib (NSAIDs), Donepezil (Anti-Alzheimer's), Zolmitriptan (Anti-migrain) etc. Some of the patented inventions in this field include "Fast dissolving tablet" , "Fast dissolving tablet and its production" contains active ingredient such as NSAIDS, Vitamine, Anti-Hypertensive Drug Etc. Mouth dissolving tablets are well established dosage forms available in the market. The numerous advantages that they offer to the patients in terms of compliance as well as to the manufacturers in terms of huge revenues by line extension of products are well known. In spite of such popularity, there seems to be lack of a standardized system to characterize these dosage forms. Enormous work has been done in this field, wherein some of the researchers have developed their own methods of evaluation. This article attempts to present a detailed review regarding technological advances made so far in the area of evaluation of mouth dissolving tablets with respect to special characteristics of these unique dosage forms. In the absence of any available standardized method, the author's recommendation on critical issues in the field may be considered.

4.1. Technology for mouth dissolving tablets

4.1.1. Conventional Techniques

Conventional techniques determine long-term heat stability of polymer articles at temperatures below melting, for example during accelerated aging in circulating air ovens until degradation effects such as discoloration and embrittlement are visible. A more precise failure criterion is the combined use of spectroscopic methods, e.g., monitoring the increasing concentration of carbonyl groups by IR spectroscopy.

4.1.2. Disintegrates addition

Disintegrate addition technique is one popular techniques for formulating Fast-dissolving tablets because of its easy implementation and cost effectiveness. The basic principle involved in formulating Fast-dissolving tablets by disintegrates addition technique is addition of superdisintegrants in optimum concentration so as to achieve mouth dissolving along with the good mouth feel.

4.1.3. Molding

In this method, molded tablets are prepared by using water-soluble ingredients so that the tablets dissolve completely and rapidly. The powder blend is moistened with a hydroalcoholic solvent and is molded into tablets under pressure lower than that used in conventional tablet compression. The solvent is then removed by air-drying. Molded tablets are very less compact than compressed tablets. These possess porous structure that enhances dissolution.

4.1.4. Freeze drying

A process in which water is sublimated from the product after freezing. Lyophilization is a pharmaceutical technology which allows drying of heat sensitive drugs and biological at low temperature under conditions that allow removal of water by sublimation. Lyophilization results in preparations, which are highly porous, with a very high specific surface area, which dissolve rapidly and show improved absorption and bioavailability.

4.1.5. Sublimation

The slow dissolution of the compressed tablet containing even highly water-soluble ingredients is due to the low porosity of the tablets. Inert solid ingredients that volatilize readily (e.g. urea, ammonium carbonate, ammonium bicarbonate, hexamethelene

tetramine, camphor etc.) were added to the other tablet ingredients and the mixture is compressed into tablets. The volatile materials were then removed via sublimation, which generates porous structures. Additionally, several solvents (e.g. cyclohexane, benzene) can be also used as pore forming agents.

4.1.6. Spray-drying

Spray drying can produce highly porous and fine powders that dissolve rapidly. The formulations are incorporated by hydrolyzed and non hydrolyzed gelatins as supporting agents, mannitol as bulking agent, sodium starch glycolate or cross carmellose sodium as disintegrating and an acidic material (e.g. citric acid) and or alkali material (e.g. I sodium bicarbonate) to enhance disintegration and dissolution. Tablet compressed from the spray dried powder disintegrated within 20 seconds when immersed in an aqueous medium.

4.1.7. Mass-extrusion

This technology involves softening the active blend using the solvent mixture of water soluble polyethylene glycol, using methanol and expulsion of softened mass through the extruder or syringe to get a cylinder of the product into even segments using heated blade to form tablets. The dried cylinder can also be used to coat granules of bitter tasting drugs and thereby masking their bitter taste

4.1.8. Direct compression

Direct compression method is the easiest way to manufacture tablets. Conventional equipment, commonly available excipients and a limited number of processing steps are involved in direct compression. Also high doses can be accommodated and final weight of tablet can easily exceed that of other production methods. Directly compressed tablet's disintegration and solubilization depends on single or combined action of disintegrates, water soluble excipients and effervescent agent.

Patented Technology ,Flashtab technology Prographarm laboratories have patented the Flashtab technology. Tablets prepared by this system consist of an active ingredient in the form of micro crystals. Drug micro granules may be prepared by using the conventional techniques like coacervation, micro encapsulation, and extrusion spheronisation. All the processing utilized conventional tabletting technology.

4.1.9. Wow tab technology

Wowtab Technology is patented by "Yamanouchi Pharmaceutical Co." WOW means "Without Water ". In this process, combination of low mouldability saccharides and high mouldability saccharides is used to obtain a rapidly melting strong tablet. The active ingredient is mixed with a low mouldability saccharide and granulated with a high mouldability saccharide and compressed into tablet.

4.1.10. Flash dose technology

Flash dose technology has been patented by "Fuisz". Nurofenmeltlet, a new form of ibuprofen as melt-in-mouth tablets, prepared using flash dose technology is the first commercial product launched by" Biovail Corporation". Flash dose tablets consist of self bindingshearform matrix termed as "floss". Shearform matrices are prepared by flash heatprocessing

4.1.11. Orasolv technology

Orasolv technology has been developed by "CIMA" labs. In this system active medicament is taste masked. It also contains effervescent disintegrating agent. Tablets are made by direct compression technique at low compression force in order to minimize oral dissolution time. Conventional blenders and tablet machine is used to produce the tablets. The tablets produced are soft and friable and packaged in specially designed pick and place system.

4.1.12. Durasolv technology

Durasolv is the patented technology of "CIMA" labs. The tablets made by this technology consist of a drug, fillers and a lubricant. Tablets are prepared by using conventional tableting equipment and have good rigidity. These can be packed into conventional packaging system like blisters. Durasolv is an appropriate technology for products requiring low amounts of active ingredients.

4.1.13. Zydis technology

This technology involves softening the active blend using the solvent mixture of water soluble polyethylene glycol, using methanol and expulsion of softened mass through the extruder or syringe to get a cylinder of the product into even segments using heated blade to form tablets. The dried cylinder can also be used to coat granules of bitter tasting drugs and thereby masking their bitter taste.

5. In-lay tablets

Inlay tablet is a type of layered tablet in which instead the core tablet being completely surrounded by coating and the top surface is completely exposed. Tablet compression was done with core rod tooling in which drug is incorporated in cup portion and the other surface of the core is exposed to the outside. While preparing, only the bottom portion of the die cavity is filled with coating material and core is placed upon it. During the compression, some coating material is displaced to form sides and compresses the whole tablet. The main body portion may consist of uncoated granules which are compressed around the enteric coated inlay portion. In this modification of tablet the main body portion is first released and assimilated in the gastrointestinal tract while other the enteric coating protects the inlay portion of tablet for a predetermined period of time so as to provide time delayed or sustained medication.[39- 41]

The present invention of inlay tablet also teaches the use of dual retard technique to effectively control the release rate of active ingredient by using small quantity of release controlling agents. Due to this dual retard technique the size of dosage form sufficiently reduces, which is convenient for swallowing[39-41].

5.1. Formulation of inlay tablet as listed below[40]

Atoz Inlay tablets with combinations like Metformin 500 mg sustained release and Pioglitazone 15 mg.Ursinos is the marketed inlay tablets containing aspirin. Rosiglitazone IR + Metformin SR Tablet (TORRENT PHARMACEUTICALS). Isoniazid And Salbutamol Sulphate Inlay Tablet [39]

5.2. Patented Inlay Tablet

Pravastatin Sodium (10 mg) + Niacin (500 mg)[40].

6. Caplet

Dosage form of a drug is that which enters reaches the site of action and exerts its action. forms of the drug is to be the most appropriate each route of administration. It should be by various aspects according to the need of pleasant odor and bad taste. The caplets shape. Caplet is a tablet like any other tablet, be differs only is being a smoothly-coated like an ordinary capsule. Caplets are the oblong-shaped tablet, and to alternative to the capsule, and can be easy to sage form. So that it is used as alternative to let. It could be considered as mostconvenientmonly used dosage forms which is taken per route), tablets and capsules.

Caplet Products Available In Market: Calci-D film coated caplets, used for calcium deficiency. It is presented as caplets[42].

Paracetamol (Acetaminophen) Caplets, known NSAID and used mainly inflammatory, antipyretic, analgesic, to moderate pains accompanied with cold Imodium caplets help to restore balance digestive system. The Imodium caplet the symptoms of diarrhea, including arrhea. Nurofen caplets (ibuprofen), they are geted relief for pain. Excedrin migraine caplets, contain acetaminophen, aspirin, and Therapeutically Active Caffeine and are used for pain reliever

7. Clinicaps

Clinicaps capsules are the two-piece gelatin capsules which are specially designed for studies of 'double blind' during clinical trials. After closure (locking), caps are closes tightly on the body and keeping only the dome of the body visible. After locking it is difficult to open the capsule that prevents tampering and effectively hides the sample.Clinicaps capsules are useful to encapsulate the tablet or capsule dosage form in the body and mask the placebo. This will ensures the integrity of the blind study of clinicaps and improves patient compliance. As wide is the diameter of clinicaps capsules that help to contain large diameter or unequally shaped tablets which help of eliminates the need of split or grind tablets. These capsules are shorter in length so as to enhance ease of swallowing them and are made for ease of use (are filled by mostly automatic, semi chines, and manual capsule filling machines.[43]

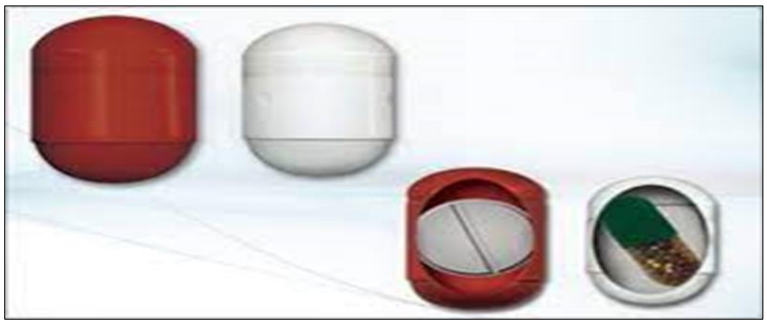

Figure 1 Clinicaps capsules

8. Pastilles

A pastille is a form of sweet or medicinal solidified thick liquid that meant to be consumed by light chewing and is allowing it to dissolve in the mouth. tilles are also used to define certain forms of tille is also known as“Troche” and medicated lozenge that dissolve rapidly like candy.[44]

Figure 2 Pastiilles Tablet

9. Child ecstasy tablet

3,4-methylenedioxy-methamphetamine a psychoactive drug of the substituted methylenedioxphenethylamine and amphetamine is consumed mainly for its euphoric ie effects. Pharmacologically, MDMA can acts as a serotonin-norepinephrine-dopamine agent and re-uptake inhibitor. MDMA is widely known as "Ecstasy form, although this term may also hold the possible adulterants. MDMA in a crystalline powder form free of adulterants such as “mandy” as termed in the UK and “molly”as termed in the US. In most countries Possession of MDMA is illegal. Some limited exceptions are exist for the scientific and medical research. MDMA may have health beneficial effects certain mental disorders, but also ha effects that include neurotoxicity andcognitive impairment [45]

Figure 3 Child Ecstasy Tablets

10. Lollipop

Lollipops are sugar-based lozenges on a stick. children. Also ideal for patients requiring breakthrough cancer pain medication who cannot swallow tablets or 427 eliminates the need of split or grind tablets. These capsules are shorter in length so as to enhance ease of swallowing them and are made for ease of use (Fig. 1). These are filled by mostly automatic, semi-automatic filling ma capsules; provides almost immediate relief

11. Gummy bears

Gummy bears contain medication in a flavored gummy candy. Good for children

11.1. Criteria for drug selection

The ideal characteristics of a drug for in vivo dissolution from an RDT include:-

- No bitter taste.
- Dose lower than 20mg.
- Small to moderate molecular weight.
- Good stability in water and saliva
- Partially non-ionized at the oral cavities pH.
- Ability to diffuse and partition into the epithelium of the upper GIT.
- Ability to permeate oral mucosal tissue.
- Unsuitable drug characteristic for RDT:- Short half-life and frequent dosing.
- Very bitter or otherwise unacceptable taste because taste masking cannot be achieved.
- Required controlled or sustained release.

12. Super Disintegration Used in RDTS

As day's passes, demand for faster disintegrating formulation is increased. So, pharmacist needs to formulate disintegrants i.e. Superdisintegrants which are effective at low concentration and have greater disintegrating efficiency and they are more effective intragranularly. This superdisintegrants act by swelling and due to swelling pressure exerted in the outer direction or radial direction, it causes tablet to burst or the accelerated absorption of water leading to an enormous increase in the volume of granules to promote disintegration.

12.1. Various types of Super disintegrates used are as follows

- Crosspovidone
- Microcrystalline cellulose
- Sodium starch glycollate
- Sodium carboxy methyl cellulose or cross carmelose sodium
- Pregelatinzed starch
- Calcium carboxy methyl cellulose
- Modified corn starch. Sodium starch glycollate has good flowability than cross carmellose sodium.

12.1.1. Factors to be considered for selection of super disintegrants

- It should produce mouth dissolving when tablet meets saliva in the mouth
- It should be compactable enough to produce less-friable tablets.
- It can able to produce good mouth feel to the patient. Thus, small particle size are preferred to achieve patient compliance.
- It should has good flow since it improve the flowability of the total blend.

12.2. Evaluation

Uniformity of weight I.P. procedure for uniformity of weight was followed, twenty tablets were taken and their weight was determined individually and collectively on a digital weighing balance. The average weight of one tablet was determined from the collective weight. The weight variation test would be a satisfactory method of determining the drug content uniformity.

12.2.1. Thickness

Tablet thickness can be measured using a simple procedure. 5 tablets were taken and their thickness was measured using Varnier calipers.

12.2.2. Hardness

It is the force required to break a tablet by compression in the radial direction, it is an important parameter in formulation of RDTs because excessive crushing strength significantly reduces the disintegration time. In the present study the crushing strength of the tablet was measured using Pfizer hardness testers. An average of three observations is reported.

12.2.3. Disintegration time

The test was carried out on 6 tablets using the apparatus specified in I.P.-1996 distilled water at 37ºC ± 2ºC was used as a disintegration media and the time in second taken for complete disintegration of the tablet with no palatable mass remaining in the apparatus was measured in seconds.

12.2.4. In-vitro drug release

The development of dissolution methods for RDTs 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 RDT. Other media such as 0.1N HCl and buffers (pH - 4.5 and 6.8) should be evaluated for RDT much in the same way as their ordinary tablet counter parts. The USP 2 Paddle apparatus is used for this purpose which is the most suitable and common choice for orally disintegrating tablets, with a paddle speed of 50 rpm commonly used. Typically the dissolution of RDT is very fast when using USP monograph conditions; hence slowerpaddle speeds may be utilized to obtain a profile. The USP 1 Basket apparatus may have certain applications but sometimes tablet fragments or disintegrated tablet masses may become trapped on the inside top of the basket at the spindle where little or no effective stirring occurs, yielding irreproducible dissolution profiles.

12.2.5. Friability test

Friability of the tablets was determined using Roche friability (Electrolab, Mumbai). This device subjects the tablets to the combined effect of abrasions and shock in a plastic chamber revolving at 25 rpm and dropping the tablets at a height of 6 inches in each revolution. Preweighed sample of tablets was placed in the friabilator and were subjected to 100 revolutions. Tablets were de dusted using a soft muslin cloth and reweighed. The friability (f) is given by the formula. f = (1- W0 / W) × 100 Where, W0 is weight of the tablets before the test and W is the weight of the tablet after the test. In-vitro dispersion time test To determine dispersion time 10 ml measuring cylinder was taken in which 6 ml distilled water was added and tablet was dropped in it. Time required for complete dispersion was determined.

12.2.6. Wetting time

Five circular tissue papers of 10 cm diameter are placed in a petri dish with a 10 cm diameter. Ten millimeters of water-containing Eosin, a water-soluble dye, is added to petri dish. A tablet is carefully placed on the surface of the tissue paper. The time required for water to reach upper surface of the tablet is noted as a wetting time.

12.2.7. 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 & 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) Where- Wb is weight of tablet before water absorption &Wa is weight of tablet after water absorption.

12.2.8. Accelerated Stability study

The Orally disintegrating tablets are packed in suitable packaging and stored under the following conditions for a period as prescribed by ICH guidelines for accelerated studies.40 1 °C,50 1°c,37 1 ° C and Relative Humidity= 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.

12.2.9. Packaging

Packaging special care is required during manufacturing and storage to protect the dosage of other fast-dissolving dosage forms. Quick-dispersing and/or dissolving oraldrug delivery systems, the system can be packaged using various options, such as single pouch, blister card with multiple units, multipleunit dispenser, and continuous roll dispenser, depending on the application and marketing objectives.

13. Conclusion

Rapid dissolving Tablets is the general form of nomenclature for tablets that disintegrate rapidly or instantly in the oral cavity. RDTs have better patient acceptance and compliance and may offer improved biopharmaceutical properties, improved efficacy, and better safety compared with conventional oral dosage forms. RDTs can be prepared in different ways and product performance depends upon the drug suitability and excipients selections in the delivery system. In combination with other technologies such as modified release and microencapsulation, RDTs will continue to provide enhanced commercial and therapeutic benefits. RDT is a growing technology, offering considerable benefits for lifecycle management16, development timelines, patient convenience and market share. By paying close attention to advances in technologies, pharmaceutical companies can take advantage of RDTs 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 RDTs in the days to come. The successful marketed RDTs have good taste and rapid release properties. With rapid acceptance of RDTs by patients and pharmaceutical companies, the market for this dosage form is promising, and the product pipeline continues to grow rapidly.

Compliance with ethical standards

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Disclosure of conflict of interest

The author has no conflicts of interests to declare.

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