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ACID–BASE REACTION-BASED ORALLY DISINTEGRATING TABLETS: FORMULATION STRATEGIES, MECHANISMS, EVALUATION, AND RECENT ADVANCES

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1. INTRODUCTION

Oral administration of drugs is preferred due to its ease of swallowing, distress avoidance, versatility and most significantly, patient compliance. The large number of patients find it difficult to swallow tablets and capsules, and do not take their medicines as prescribed. The most evident drawback of the commonly used oral dosage forms like tablets and capsules is difficulty in swallowing leading to patient's incompliance particularly in case of Pediatric and geriatric patients.

Pediatric patients may suffer from ingestion problems as a result of underdeveloped muscular and nervous control. Those who are travelling or have little access to water are similarly affected.[1] The concept of Fast Dissolving Drug Delivery System emerged from the desire to provide patient with more conventional means of taking their medication. It is estimated that 50% of the population affected by this problem, which finally results in a higher chance of noncompliance and ineffective therapy.[2]

Pharmaceutical technologists have developed a novel oral dosage form known as Orally Disintegrating Tablets (ODTs) which disintegrate rapidly in saliva, usually in a matter of seconds, without the need to take it water. Drug dissolution and absorption as well as onset of clinical effect and drug bioavailability may be significantly greater than those observedfrom conventional dosage forms. A wide variety of pharmaceutical research is directed at developing new dosage forms.

Most of these efforts have focused on either formulating novel drug delivery systems or increasing the patient compliance. Fast Dissolving Tablet (FDT) is the most widely preferred commercial products.[3] Fast Dissolving Tablet have major advantages that is there is no need of water for administration, rapid onset of action, reduce risk of suffocation, avoid hepatic first pass metabolism.[4]

Orally disintegrating tablets are also called as orodispersible tablets, quick disintegrating tablets, mouth dissolving tablets, fast disintegrating tablets, fast dissolving tablets, porous tablets, and rapid melts. United States Pharmacopoeia has used the term oro dispersible tablets that disperses readily and within 3 min in mouth before swallowing.[5]

Fast dissolving drug delivery system (FDDDS) is a newer concept which combinesthe advantages of both liquid and solid formulation and at the same time, offer advantages over the traditional dosage forms. The benefits of Fast dissolving tablets are to improve patients' compliance, rapid onset of action, increased bioavailability and good stability which make these tablets popular as a in the dosage form of choice in the current market.[6]

This review presented the concise information about the Fast-Dissolving Tablet (FDT). The ultimate aim of this article is to review the properties, advantages, limitations, challenges in formulation, manufacturing techniques, newer technologies and evaluation tests of ODTs. Ideal properties of ODTs.

The ideal characteristics of a drug for oral dispersible tablet include.[7]

Ability to permeate the oral mucosa.
At least partially non- ionized at the oral cavity Ph
Have the ability to diffuse and partition into the epithelium of the upper GIT.
Small to moderate molecular weight.
Low dose drugs preferably less than 50mg.
Short halflife and frequent dosing drugs are unsuitable for ODT.
Drug should have good stability in saliva and water.
Very bitter or unacceptable taste and odor drugs are unsuitable for ODT.
Advantages of FDTs[8]
Improved compliance.
No water needed.
Better taste.
Improved stability.
Have acceptable taste and pleasant mouth feeling.
Limitations[9,10]
The tablets commonly have insufficient mechanical strength.
The tablets may leave an unpalatable taste and grittiness in the oral cavity if not formulated properly.
Drugs which have large doses, can cause problems to formulate them into ODTs.
Patients who simultaneously take anti- cholinergic drugs are not suitable candidates for ODTs.
Criteria for ODTS[11, 12]
• ODT should leave minimal or no residue in mouth after oral administration, compatible with pleasing mouth feel.
• Effective taste masking technologies should be adopted for bitter taste drugs.
• Exhibit low sensitivity to environment condition such as humidity and temperature.
• ODTs should dissolve / disintegrate in the mouth in matter of seconds without water.
• Have sufficient mechanical strength and good package design.
• The drug and excipient property should not affect the orally disintegrating tablets.
• Be portable and without fragility concern
Challenges in formulating ODTS[24 -29]

Fast disintegration
ODTs should disintegrate in the mouth without the aid of water or with a very small amount of water. The “Fast disintegration” usually means disintegration of tablets in less than 1 minute, but it is preferred to have disintegration as soon as possible. The disintegration fluid is provided by the saliva of the patient.

Palatability
Oral dispersible tablets dissolve or disintegrate near the taste buds. A pleasant taste inside the mouth becomes critical for patient acceptance. Unless the drug is tasteless or does not have an undesirable taste, taste-making techniques should be used. An ideal taste-masking techniques should provide good mouth feel and should be compatible with ODT formulations. The amount of taste masking material should be as low as possible to reduce the tablet size.

Tablet strength and porosity
In order to disintegrate the oral dispersible tablet in oral cavity, the tablet structure should have a highly porous network and should use low compression force, which makes the tablets friable or brittle, which is difficult to handle. Because the strength of a tablet is related to compression pressure, it is important to find the porosity that allows fast water absorption while containing high mechanical strength.

Hygroscopicity
Generally oral dispersible tablets are hygroscopic and cannot maintain physical integrity under normal conditions of temperature and humidity. This problem can be especially challenging because many highly water-soluble excipients are used in the formulation to enhance fast dissolving properties as well as to create good mouth feel. Those highly water-soluble excipients are susceptible to moisture. Hence, they need protection from various environmental conditions.

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

Amount of drug
ODTs are limited by the amount of drug that can be incorporated into each unit dose. For lyophilized dosage forms, the drug dose must be lower than 400 mg for insoluble drugs and less than 60mg for soluble drugs. This parameter is particularly challenging when formulating a fast-dissolving films.

Mouth feel
The ODT should not disintegrate into larger particles in the oral cavity. The particles generated after disintegration of the ODT should be as small as possible. ODT should leave minimal or no residue in mouth after oral administration. Moreover, addition of flavours andcooling agents like menthol improve the mouth feel.

Sensitivity to environmental conditions
ODT generally should exhibit low sensitivity to environment conditions such as humidity and temperature as most of the materials used in an ODT are meant to dissolve in minimum quantity of water.
The following characteristics may render a drug unsuitable for delivery as an ODT
These should be the characters not formulated to mouth dissolving tablets.

Short half life
Very bitter taste (difficult to mask)
Required controlled or sustained release.

Development challenges of ODTS[29-31]

Because administration of MDTS is different from administration of Conventional tablets. The MDTS should maintain several unique properties.

- Fast disintegration
- Taste of active ingredients.
- Drug properties
- Solubility
- Crystal morphology
- Solubility
- Particle size
- Hygroscopicity
- Compressibility
- Bulk density
- Tablet strength and porosity
- Moisture sensitivity, MDTS should be moisture resistant.
- These water-soluble excipients are susceptible to moisture so a good package design to protect MDTS is needed.

Technologies used for manufacturing of orally disintegrating tablets

Various processes employed in formulating ODTs including conventional technologies and patented technologies. It includes.

Spray drying

Spray drying is a process by which highly porous, fine powders can be produced. Spray- dryers are invariably used in the pharmaceutical industry to produce highly porous powders. Spray drying provides a rapid and economically efficient way to eliminate solvents and produces highly porous and fine powders. The formulations are compounded by hydrolysed and non-hydrolysed gelatine as supporting agents, mannitol as bulking agent, croscarmellose sodium or sodium starch glycolate as disintegrating agent. To enhance disintegration and dissolution by adding appropriate acidic or alkaline material. Allen et al. have reported applying this process to the production of Fast dissolving tablets.[13] The formulation was spray dried to yield a porous powder.

Freeze drying or lyophilization

Lyophilization process involves removal of solvents from a frozen drug solution or a suspension containing structureforming excipients. The disintegration and dissolution properties are enhanced by the desired properties of tablets that have very light and highly porous structures. A process in which water is sublimated from the product after freezing. The drying process may give rise to the glassy amorphous structure of excipients and drug substance.[14] Jaccard and Leyder used lyophilization to create an oral pharmaceutical preparation that not only dissolves rapidly but also improved the bioavailability of several drugs such as spironolactone and oleandomycin.[15]

Sublimation

Compressed tablet which contains highly water-soluble components can show slow dissolution behaviour, due to the low porosity of the tablets that reduces water penetration into the matrix. When inert volatile solid ingredients like ammonium bicarbonate, ammonium carbonate, benzoic acid, camphor, hexamethylene tetramine, naphthalene, phthalic anhydride were added to along with other tablet excipients and the blend was compressed in to table, which are finally subjected to a process of sublimation resulting in highly porous structures. Sublimation temperature ranged from 40 °C to 60° C.[16]

Molding

Melded tablets are made up of water-soluble ingredients. The powder mixture is sprinkled with a solvent. The mixture is melded into tablets under pressure. Applied pressure should be lower than those used in conventional tablet compression. Creation of highly porous structure at a low pressure to improve dissolution. This process is also known as Compression Moldings. The tablet produced by meldingare solid dispersion. Melded tablets disintegrate more rapidly and offer improved taste because the dispersion matrix is in general made from water soluble sugars. The active ingredients in most cases are absorbed through the mucosal lining of the mouth. Unfortunately, moulded tablets do not possess higher mechanical strength.[17]

Mass extrusion

The mass extrusion technology involves softening of the active blend using the solvent mixture of water-soluble polyethylene glycol and methanol and expulsion of softened mass through the extruder or syringe to get a 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.[18, 19]

Direct compression

It is cost effective and easiest manufacturing process. This technique is now commonly used to improve the availability of improved tablet excipients, especially disintegrating agents and sugar-based excipients. Tablets obtained by conventional compression method are less friable, but disintegrate very slowly. Usually, wet granulation technique is considered to be convenient and cost-effective way to formulate ODTs.[20, 21]

Patented technologies for preparation of ODTS

Many patented technologies are available for preparing mouth dissolving tablets. They are.

Zydis technology[32-36] Zaydi's formulation is a unique freeze-dried tablet in which drug is physically entrapped or dissolved within the matrix of fast dissolving carrier material. When Zaydis units are put into the mouth, the freeze- dried structure disintegrates instantaneously and does not require water to aid swallowing. The Zaydis matrix is composed of many materials designed to

achieve a number of objectives. To impart strength and resilience during handling, polymers such as gelatine, dextran or alginates are incorporated. These form a glossy amorphous structure, which imparts strength. To Obtain Crystallinity, elegance and hardness, saccharides such as mannitol or sorbitol are incorporated. Water is used in the manufacturing process to ensure production of porous units to achieve rapid disintegration while various gums are used to prevent sedimentation of dispersed drug particles in the manufacturing process. Collapse protectants such as glycine prevent the shrinkage of Zaydis units during freeze drying process or long term- storage. Zaydi'sproducts are packed in blister packs to protect the formulation from moisture in the environment.

Frosta technology[33,45]
Highly plastic granules are compressed at low pressure to produce strong tablets with high porosity.
The highly plastic granules comprise three types of components: a poriferous and plastic material, a water penetration enhancer, and a binder. Tablets can be made by mixing porous, plastic material with a water penetration enhancer at certain ratios. During granulation, the binder secures the porous material and water penetration enhancer. If the binder is in the liquid or semi-solid state, it should not destroy the porous structure of the porous materials. Aqueous binder solutions with very low water activity.

Excipients commonly used for ODTS preparation[12,26,38]
Mainly seen excipients in FDT are as follows at least one disintegrant, diluent, lubricant, and swelling agent, permeabilizing agent, sweeteners, and flavouring.

Super disintegrants
Crosspovidone, Microcyrstalline cellulose, Sodium starch glycollate, sodium carboxy methyl cellulose, Pregelatinzed starch, Calcium carboxy methyl cellulose and modified corn starch. Sodium starch glycollate has good flowability than croscarmellose sodium. Cross povidone is fibrous nature and highly compactable.

Flavours
Peppermint flavour, cooling flavour oils and flavouring aromatic oil, peppermint oil, clove oil, bay oil, anise oil, eucalyptus oil, thyme oil, oil of bitter almonds.

Flavouring agents include,
Vanilla, citrus oils, fruit essences.

Sweeteners
Aspartame, Sugars derivatives.

Fillers
Directly compressible spray dried Mannitol, Sorbitol, Xylitol, Calcium carbonate, Magnesium carbonate, Calcium phosphate, Calcium sulphate, Pregelatinized starch, Magnesium trisilicate, aluminium hydroxide.

Lubricants
Stearic acid, Magnesium stearate, Zinc state, Calcium state, talc, polyethylene glycol, liquid paraffin, magnesium lauryl sulphate, colloidal silicone dioxide.

Betahistine
This drug is broadly used worldwide, except for the USA, since it has not been approved by the US Food and Drug Administration. Betahistine is a structural analog of histamine that acts as a weak partial postsynaptic histamine H_1 receptor agonist and presynaptic H_3 receptor antagonist, with no effect on postsynaptic H_2 receptors. The mechanism of action of the drug appears to depend mainly on its action on H_3 receptors mediated by two metabolites, aminoethylpyridine and hydroxyethylpyridine.

Experimental studies in animals demonstrate that betahistine improves labyrinthine microcirculation by vasodilation of the arterioles of the stria vascularis, and also in the posterior semicircular canal ampulla. Thus, betahistine would reduce endolymphatic pressure by achieving a reduction in the production of, and an increment in the re-absorption of, endolymph.

Furthermore, experimental data regarding betahistine also suggest a decrease in the sensory input from the vestibular receptors On the other hand, there is growing evidence that betahistine acts also at various levels of the central nervous system. Animal and human studies indicate betahistine blocks the presynaptic histamine H_3 receptors on the histaminergic nerve terminals originating from the tuberomammillary nuclei of the posterior hypothalamus, thus increasing histamine turnover and release in the vestibular nuclei Likewise, betahistine may participate in the mechanisms of histaminergic modulation of glycine and gamma-aminobutyric acid (GABA) release in the vestibular nuclei that may contribute to rebalancing neural activity after a unilateral vestibular loss (Bergquist et al., 2006). These actions on the histaminergic system may promote and facilitate central vestibular compensation Finally, experimental data suggest that the upregulation of the histamine caused by the betahistine would induce excitatory effects on the neuronal activity of cortical and subcortical structures. This arousal effect would facilitate sensorimotor and cognitive activity, necessary for recovery after vestibular function loss.

The effect of betahistine is dose- and duration-dependent
The standard dosage is 48–96 mg/day, although a higher dosage between 288 and 480 mg/day is sometimes used .Adverse effects are rare, mild, and self-limiting. A cutaneous hypersensitivity reaction is the most frequently reported complaint. Nausea, vomiting, epigastric pain, and headache are occasionally reported, especially with higher doses.

The clinical efficacy of betahistine
Betahistine has been evaluated in several trials and there is conflicting evidence. A Cochrane review concluded that there was not enough evidence to say whether betahistine has any effect on the frequency or duration of the episodes of vertigo MD Subsequently, a meta-analysis has been performed supporting the therapeutic benefit of betahistine for both MD and vestibular vertigo .Betahistine 144 mg/day yields similar vertigo control rate as intratympanic dexamethasone .However, a recent long-term, double-blind, randomized placebo-controlled clinical trial (BEMED study), using 48 or 114 mg/day betahistine, has shown that betahistine has no beneficial effect in MD .Further long-term randomized, placebo-controlled clinical trials with higher dosages of betahistine are warranted to confirm the findings of the BEMED trial. Clinical research should also focus on identifying biologic markers or clinical predictors for betahistine response in MD.

2.Acid–Base Reaction-Based Orally Disintegrating Tablets: Formulation Strategies, Mechanisms, Evaluation,

1. Formulation and Quality Control of Orally Disintegrating Tablets (ODTs): Recent Advances and Perspectives
Orally disintegrating tablets (ODTs) rapidly disintegrate or dissolve in the oral cavity without using water. Demand for ODTs has increased, and the field has overgrown in the pharmaceutical industry and academia. It is reported that ODTs have several advantages over other conventional tablets. Since some of them are absorbed from the mouth, pharynx, and esophagus as the saliva passes down into the stomach, in such cases, the bioavailability of the drug improves meaningfully. Furthermore, the immediate release property of ODTs makes them a popular oral dosage form in patients with swallowing challenges, children, and for cases with a need for rapid onset of action. The current review article explains the features of active ingredients and excipients used in the formulation of ODTs, discusses multiple ODT formulation and preparation techniques with their merits and demerits, and also, offers remedies for problems associated with ODTs. Moreover, quality control steps and required considerations are presented.

2.Advancement in the Formulation and development of orally disintegrating tablets: innovation, challenges, and future perspective
In recent decades, orally disintegrating tablets (ODTs) have revolutionized drug delivery by addressing challenges in patient compliance and therapeutic efficacy. This review provides a comprehensive and critical analysis of the evolution, current advancements, and future prospects of ODTs. The origins of ODT formulations are reviewed in general, including pioneering techniques such as lyophilization, sublimation, and direct compression, along with early attempts to achieve rapid disintegration and acceptable mouthfeel. Advances in excipient and formulation technologies are also discussed, highlighting their role in the early development of ODTs. The review then turns to contemporary developments, emphasizing innovative technologies such as advanced taste masking, bioavailability enhancement strategies, and the integration of regulatory and quality control measures. In addition, it looks at emerging trends shaping the future of ODTs, including the use of 3D printing, artificial intelligence, and deep neural networks in formulation design and optimization. By bridging the current science and future of ODT development, this review underscores the potential of these dosage forms to meet evolving therapeutic and patient-centric needs.

3.Recent advances in the technology of effervescent tablets: lessons learned and future perspectives
Effervescent tablets are solid pharmaceutical dosage forms that are widely accepted due to their advantages. The improvement in patient compliance results from a combination of factors related to both the extrinsic characteristics of the tablet and the effects it produces. An important reason is the possibility of avoiding swallowing whole tablets, as a large part of the population, such as the elderly, children, and dysphagic patients, find it difficult to swallow them. The aim of this investigation is to review the recent literature on the technology and application of effervescent tablets and investigate their added value towards upgrading of such dosage forms and in general of pharmaceutical technology. Special attention is given to the excipients that are used for the design and development of efficacious systems, as well as their added value for the drug release studies having in mind the patients' unmet needs

4. Effervescent Tablets: Comprehensive Review on Formulation Strategies, Manufacturing Technologies, and Quality Evaluation
Effervescent tablets are specialized oral dosage forms that have gained significant popularity in both pharmaceutical preparations and dietary supplement formulations due to their rapid disintegration and enhanced patient acceptability. These tablets contain a combination of acidic components such as citric or tartaric acid and alkaline components like sodium bicarbonate, which react in the presence of water to release carbon dioxide. The liberation of CO2 improves the solubility and palatability of the formulation, resulting in a clear, flavoured solution that is easy to administer, particularly for geriatric, paediatric, and dysphagic patients who have difficulty swallowing conventional tablets. Despite the advantages, effervescent tablets require careful selection and balance of excipients including binders, fillers, sweeteners, polymers, and water-soluble lubricants to maintain stability and prevent premature effervescent reactions. They are highly sensitive to moisture; therefore, manufacturing must be carried out under controlled environmental conditions, typically below 25°C and low

humidity, with moisture-protective packaging to ensure product integrity. Various manufacturing methods such as wet granulation, dry granulation, direct compression, and advanced granulation technologies are utilized to produce tablets with suitable mechanical strength and dissolution properties. Quality evaluation parameters including hardness, friability, effervescence time, pH, moisture content, and uniformity of content are essential for ensuring therapeutic performance. Although effervescent tablets provide rapid onset of action, improved taste, and patient compliance, challenges such as higher production cost and specialized equipment requirements remain. Continued advancements in formulation and process technologies are supporting the growing application and commercial importance of effervescent tablet systems.

5.Recent Advances in Orally Disintegrating Tablet: Properties, Formulation and Production

Healthcare practitioners, patients, and consumers widely recognize the convenience associated with administering oral tablets. The emergence of orally disintegrating tablets (ODTs) represents a significant advancement in solid dosage forms, facilitating more convenient oral delivery while maintaining medication safety, effectiveness, and quality. The ODTs market is expected to experience continuous growth in the coming years despite the internal challenges faced by commercial manufacturers. This paper initiates a comprehensive discussion of the properties of ODTs, including palatability and taste, drug content, disintegration, mechanical strength, moisture content, safety, and efficacy. The formulation factors that affect each of these qualities are also discussed. Additionally, this review delves into the processes of the production of ODTs, encompassing the approaches and technologies from the mixing of active ingredients and recipients to the formation and packaging of ODTs. This review provides valuable insights into the advancement in ODTs technology, aiming to equip researchers with the knowledge necessary to improve quality and optimize efficiency, ultimately receiving high acceptance from patients or consumers.

6. Fast disintegrating tablets: An updated review on formulation and evaluation

Fast Disintegrating Tablets (FDTs), also referred to as Orally Disintegrating Tablets (ODTs) or Mouth-Dissolving Tablets (MDTs), are solid dosage forms designed to disintegrate rapidly in the oral cavity without the need for water. These tablets offer significant advantages in patient compliance, especially for pediatric, geriatric, and dysphagic populations, and provide faster onset of action compared to conventional tablets. This review presents an updated overview of the formulation strategies, technological approaches, evaluation parameters, and recent advancements in FDT development.Different formulation techniques—including direct compression, freeze-drying, sublimation, spray drying, molding, mass extrusion, and patented processes—have enabled the production of robust, fast-acting tablets with superior organoleptic properties. The selection and mechanism of superdisintegrants, such as Crospovidone, Croscarmellose Sodium, Sodium Starch Glycolate, Kyron T-314, and β-Cyclodextrin, play a critical role in achieving rapid disintegration and optimal mechanical strength. Taste-masking approaches, encompassing polymer coating, drug–resin complexes, microencapsulation, and cyclodextrin inclusion complexes, further enhance patient acceptability.

Key evaluation parameters—including hardness, friability, drug content, wetting time, disintegration time, and dissolution profile—are essential to assess product quality and performance. Recent innovations such as 3D-printed FDTs, nanoparticle-loaded systems, and QbD-driven optimization have advanced the field significantly. This review consolidates current knowledge and provides insights into emerging trends, highlighting the potential of FDTs as a versatile and patient-friendly dosage form in modern pharmaceutical therapy.

7. Orally Disintegrating Tablets: A Comprehensive Review of Formulation Strategies, Excipient Technology and Quality Evaluation

Orally disintegrating tablets (ODTs) have emerged as a highly patient-centric solid dosage form, offering significant advantages over conventional oral tablets, particularly for pediatric, geriatric, dysphagic, and critically ill patients. These solid dosage forms are specifically designed to disintegrate or dissolve rapidly in the oral cavity within 30 seconds or less without the need for water, thereby facilitating ease of administration and improving medication adherence. The global ODT market has witnessed considerable growth driven by rising demand for convenient drug delivery and technological innovations in excipient science. This review comprehensively examines the scientific principles underlying ODT design, including the role of superdisintegrants, diluents, taste-masking agents, and lubricants. Manufacturing methodologies—namely direct compression, freeze-drying, sublimation, spray drying, and molding—are critically appraised with respect to their advantages, limitations, and industrial applicability. The review further addresses quality evaluation parameters encompassing pre-compression characterization, post-compression testing, wetting behavior, disintegration kinetics, dissolution profiling, drug content uniformity, and accelerated stability assessment per ICH guidelines. Regulatory frameworks governing ODT approval, including guidance from the US FDA and European Medicines Agency, are also discussed. Emerging trends such as nanotechnology-based ODTs, 3D-printed oral films, and co-processed excipients are highlighted as frontiers shaping the future of this dosage form. This review aims to serve as a consolidated reference for pharmaceutical scientists engaged in the rational development and optimization of ODT formulations.

8. Advancing the understanding of the tablet disintegration phenomenon - An update on recent studies
Disintegration is the de-aggregation of particles within tablets upon exposure to aqueous fluids. Being an essential step in the bioavailability cascade, disintegration is a fundamental quality attribute of immediate release tablets. Although the disintegration phenomenon has been studied for over six decades, some gaps of knowledge and research questions still exist. Three reviews, published in 2015, 2016 and 2017, have discussed the literature relative to tablet disintegration and summarised the understanding of this topic. Yet, since then more studies have been published, adding to the established body of knowledge. This article guides a step forward towards the comprehension of disintegration by reviewing, concisely, the most recent scientific updates on this topic. Initially, we revisit the mechanisms of disintegration with relation to the three most used superdisintegrants, namely sodium starch glycolate, croscarmellose sodium and crospovidone. Then, the influence of formulation, storage, manufacturing and media conditions on disintegration is analysed. This is followed by an excursus on novel disintegrants. Finally, we highlight unanswered research questions and envision future research venues in the field.

9. Orally disintegrating tablets.
Orally Disintegrating Tablet (ODT) is such type of an innovative and unique drug delivery system which is gaining more attention and attraction in the research field of rapidly dissolving technology. ODTs are solid dosage forms containing active ingredients which dissolve or disintegrate quickly within a second, when placed on tongue. ODT technologies address the need of geriatric, pediatric and psychiatric patients who may feel difficulty in swallowing, thus ODTs are preferred alternative to conventional tablet and capsules due to better patient compliance. In the design of drug delivery system, comforts of drug administration and patient conformity have considerable prominence. They are several methods employed for preparing ODTs conventionally are spray drying, freeze drying, direct compression, melding, and sublimation while new technologies have been developed for the formulation of orodispersible tablets. This article emphasis the various aspects of ODT formulation and to review the development of ODTs, new ODT technologies and evaluation methodologies, mechanism of super disintegration, challenges faced during formulation and its limitations.

3. CONCLUSION

Acid–base reaction-based orally disintegrating tablets (ODTs) represent a promising approach in modern pharmaceutical drug delivery, offering improved patient compliance, ease of administration, and rapid disintegration in the oral cavity. The formulation of ODTs involves the careful selection of active pharmaceutical ingredients, superdisintegrants, diluents, sweeteners, flavouring agents, and other suitable excipients to achieve desirable disintegration, dissolution, palatability, and mechanical strength. Acid–base reaction technology, particularly through the interaction of acidic and alkaline components in the presence of moisture, can generate carbon dioxide, which may enhance tablet disintegration and facilitate drug release when appropriately incorporated into the formulation.

Various manufacturing techniques, including direct compression, spray drying, freeze-drying, sublimation, and molding, provide opportunities to develop ODTs with suitable physicochemical properties and therapeutic performance. However, challenges such as moisture sensitivity, inadequate mechanical strength, unpleasant drug taste, stability issues, and the need for optimized packaging must be addressed during formulation development. Evaluation parameters such as hardness, friability, wetting time, disintegration time, dissolution profile, drug content uniformity, and stability studies are essential to ensure the quality and performance of the final product.

Recent advances in excipient technology, taste-masking approaches, quality-by-design principles, and innovative manufacturing techniques offer considerable potential for improving ODT formulation and development. In particular, further research on acid–base reaction-based systems is required to optimize the ratio of acidic and alkaline components, minimize premature reactions during storage, and establish their influence on disintegration, drug release, and stability. Overall, acid–base reaction-based ODTs have significant potential to provide convenient and patient-friendly dosage forms, provided that their formulation, manufacturing, and quality attributes are systematically optimized and validated.

4. REFERENCE

1. Sastry SV, Stidham JR, Fix JA. Recent technological advances in oral drug delivery: A Review. Pharmaceutical Science and Technology Today. 2000; 3: 138-145.
2. Hirani J, Rathod D, Vakala K. Orally disintegrating tablets, Tropical Journal of Pharmaceutical Research, 2009; 8(2): 161- 172.
3. Garg A, Gupta M, Taste Masking and formulation development and evaluation of mouth dissolving tablets of levocetirizine dihydrochloride. Journal of Drug Delivery and Therapeutics, 2013; 3(3): 123-130.
4. Sharma D, Chopra R, Bedi N, "Development and Evaluation of Paracetamol Taste Masked Orally Disintegrating Tablets of Perindopril.
5. Fu Y, Yang S, Jeong SH, Kimura S, Park K. Orally fast disintegrating tablets: Developments, technologies, taste masking and clinical studies. Critical Review in Therapeutic Drug Carrier System, 2004; 21: 433-76.

6. European Directorate for quality of medicines. Pharmaeuropa, 1998; 10(4): 547. http://www.pheur.org. Accessed 6 February 2007.
7. Kumaresan C, Orally Disintegrating Tablet- Rapid Disintegration, Sweet Taste, And Target Release Profile, Pharmainfo.net Sep 9 2008.
8. Shaikh S, Chiragra R V, Quazi A. Fast Disintegrating Tablets: An overview of Formulation and Technolgy. Inter J. Pharmacy pharma science, 2010; 2(3): 9-15.
9. Hablb W, Khankari R, Hontz J. Fast dissolving drug delivery system. Critical Reviews in Therapeutic Drug Carrier Systems, 2000; 17(1): 61-72.
10. Behnke K. Sogard J. Martin S. Bauml J. Ravindran AV. Agren H, et al. Mirtazapine orally disintegrating tablet versus sertraline; a prospective onset of action study, Journal of Clinical Psychopharmacology, 2003; 23(4): 358-364.
11. Velmurugan S and Sundar Vinushika, Oral Disintegrating Tablets: An Overview, International Journal of Chemical and Pharmaceutical Sciences, 2010; Dec., 1(2).
12. Reddy L.H, Ghosh B, and Rajneesh.Fast Dissolving drug delivery systems: a review of the literature. Indian Pharmaceutical Science, 2002; 64(4): 331-336.
13. Camarco W, Ray D and Druffner A: Selecting superdisintegrants for orally disintegrating tablet formulations. Pharmaceutical Technology supplement, 2006.
14. Reddy AM, Babu PS, Harshita B, Sravya R. Conventional and patented technologies in Oral dispersible tablets: a review. Journal of Chemical and Pharmaceutical Science Review and Research, 2010; 4(2): 87-96.
15. Bhardwaj S, Jain V, Sharma S, Jat RC and Jain S: Orally disintegrating tablets: a review. Drug Invention Today, 2010; 2(1): 81-88.
16. Superdisintegrants: an introduction to chemistry and performance. April 12, Sandipan kundu, P.K. Sahoo recent trend in the development of orally disintegrating tablets pharmatimesApr 2008; 40(4).
17. Ramjiyani KM, Jethra SI, Patel MR, Fast dissolving tablets: novel approach to drug delivery. World Journal of Pharmaceutical Research, 2015; 4(3): 1197- 1215.
18. Prateek S, Gupta R, Singh U, Chaturvedi A, Gulati A. Sharma M. Fast dissolving tablets: a new venture in drug delivery. American Journal pf PharmTechResearch, 2012: 2(4): 252-279.
19. Jalmini M, Ranga S, Kumar A. Sharma S, Chauhan BS. A review on immediate release drug delivery system by using design of experiment. Journal of drug discovery and Therapeutic, 2013; 1(12): 21-27.
20. Kapse NK, Bharti VP, Birajdar AS, Munde AV, Panchal PP, Co-processed super disintegrants: novel technique for design orodispersible tablets. Journal of innovations in Pharmaceutical and biological science, 2015; (4): 541-555.
21. Jeong SH, Takalshi Y, FuY, Park K. Materials properties for making fast dissolving tablets by a compression method, Journal of Materials Chemistry, 2008; 18(1): 3527-3535.
22. Yourong FU, Shicheng Yang, Seong Hoon Jeong, Susumu Kimura, & Kinam Park; Orally Fast Disintegrating Tablets: Developments, Technologies, Taste – masking and Clinical studies, Critical Reviews in Therapeutic Drug Carrier Systems, 2004, 21(6): 433-475.
23. Saxena Vaibhav, Khinchi Mahaveer Pr, Gupta MK, Agarwal Dilip and Sharma Natasha. Orally Disintegrating Tablet: Friendly Dosage Form. IJRAP, 2010; 1(2): 399-407.
24. Priyank Patel 1, Sandip Makwanal, Urvish Jobanputral, Mihir Ravatl, Ankit Ajmeral, Mandev. Sublingual route for the systemic delivery of Ondasetron disadvantage from, October- December 2011; 76: 309-326.
25. DAali Shukla, Sanjay Singh. Mouth dissolving tablets: An overview of formulation technology Scientia Pharmaceutical Review, 2009; 76: 309-326.
26. Jaysukh J Hirani, Dhaval A Rathod, Kantilla R Vedalia. "Orally Disintegrating Tablets: A Review. "Tropical Journal of Pharmaceutical Research, 1 2009; 8(2): 161- 172.
27. Vani R, Rasheed A. Formulation of hydrochlorothiazide and ramipril mouth dissolving tablet using different superdisintegrants. International Journal of Pharma Science and Research, 2014; 5(1): 207-212.
28. Siden R, Wolf M. Disintegration of chemotherapy tablets for oral administration in patients with swallowing difficulties. Journal of Oncology Pharmacy Practice, 2013; 19(2): 145-150.
29. Brown D. Orally Disintegrating tablets. Taste over speed. Drug delivery Tech, 2001: 3(6): 58-61.
30. Lies MC, Atherton AD, Copping NM. Freeze- dried dosage forms and methods for preparing the same. US Patent, 1993; 5, 188, 825.
31. Sugihara M, Hidaka M, Saitou A. Discriminatory features of dosage form and package. Jon J Hosp Pharm, 1996; 12: 322- 328.
32. Cirri M, Valleri M, Mura P, Masterly F and Ballerina R. Development of Fast dissolving tablets of flurbiprofencyclodextrin complexes. Drug Development and Industrial Pharmacy, 2005; 31(7): 697-707.
33. Adel M, Semreen MK and Qato KM, superdisintegrants for solid dispersions to produce Rapidly DisintegratingTenoxicam Tabletsvia Camphor sublimation, Pharmaceutical Technology, 2005; 2: 68.
34. Nautiyal U, Singh S, Singh R, Gopall, Kaka S. Fast dissolving tablets as a novel boon: a review, Journal of Pharmaceutical, Chemical and biological Sciences, 2014; 2(1): 5-26.
35. Kaur T, Gill B, Kumar S, Gupta GD, Mouth dissolving tablets; A novel approach to drug

delivery. International Journal of Current Pharmaceutical Research, 2011; 3(1): 1-7.
36. Deshmukh KR, Vidyanand P, Shekhar V, Pandey Ak, Dewangan P. A review on mouth dissolving tablet techniques. International Journal of Research in Ayurveda and Pharmacy, 2011; 3(1): 1-7.
37. Tayebi H, Mortazavi AS, Formulation and evaluation of a novel Matrix – Type Orally Disintegrating Ibuprofen Tablet. Iranian Journal of Pharmaceutical Research, 2001; 10(3): 469-479.
38. Khankari RK, Hintz J, Chastain SJ, Katzner L. Rapidly dissolving robust dosage form. US Patent, 2000.
39. Amborn J, Tiger V, Apparatus for handling and packaging friable tablets. US Patent, 2001.
40. Gohel M, Patel M, AgarwalR andDev R. Formulation Design and Optimization of Mouth Dissolve Tablets of Nimesulide Using Vacuum Drying Technique.AAPS Pharm Sci Tech 3, 2004, 36.
41. Allen LV, Wang B and Davis JD. US Patent, 1998; 5: 807 & 567.
42. Nandy BC, Mazumder B, Pathak elk, Saxena N, Jain S, Sharma S, et al. An overview on fast dissolving drug delivery system. Asian Journal of Pharmaceutical Sciences and Research, 2012; 1(2): 1-30.
43. Khirwadkar P, Dashora K. A review: fast dissolving drug delivery system: Current developments in novel system design and technology. International Journal of Biomedical and Advance research, 2012; 3(2): 82-100.
44. Wehling F, Schedule S, Madamala N.Effervescent dosageform with microparticles. US Patent, 1993.
45. Wehling F, Schedule S, Base coated acid particles andeffervescent formulation incorporating same. US Patent, 1996.
46. Ghosh T, Ghosh A, Prasad D. A review on new generation orodispersible tablets and its future prospective. International Journal of Pharmacy and Pharmaceutical Sciences, 2010; 3(1): 1-7.
47. Acosta C, Tabare R and Ouali A. US Patent, 1998; 5: 807.
48. Mizumoto T, MaudaY, Fukul M. Intra buccally dissolving compressed moldings and production process thereof. US Patent, 1996.
49. Mizumoto T, Masuda Y, Kajiyama A. Yanagisawa M, Nyshadham JR.Tablets quicklydisintegrating in the oral cavity and process for producing the same. US patent, 2003. 50. Sharma D, Kumar D, Singh M, Singh G, Rathore MS. Fast disintegrating tablets: a new era in novel drug delivery system and new market opportunities. Journal of Drug Delivery and Therapeutics, 2012; 2(3): 74-86.
50. Prabhakar V, Agarwal S, Chauhan R, Sharma S. Fast Dissolving tablets: an overview, International Journal of Pharmacy and Pharmaceutical Sciences Review and Research.
51. Fatma R, Nandi PK, Gupta AK. Novel approach for patient's compliance; fast dissolving tablets. World Journal of Pharmacy and Pharmaceutical Sciences, 2014; 3(7): 1758-1768.
52. Prajapati BG, Ratnakar N, Review onrecent patents on fast dissolving drug delivery system. International journal of Pharm Tech Research, 2009; 1(3): 790-798.
53. Kaushik D, Dureja Hand Saini TR.Orally disintegrating tablets: An Overview of melt- in mouth tablet technologies and techniques, Tablets, Capsules, 2004; 2: 30-36.
54. Roshan K, Bharkatiya M, Rathore KS, Kumar SS, Sirvi G, Somani N. Fat Dissolving tablet drug delivery system an overview. International Journal of Pharmacy, 2015; 1(5): 250-256.
55. Panigrahi D, Baghel S and Mishra B, Mouth dissolving tablets: An overview of preparation techniques, Evaluation and patented technologies. J. Pharma Research, 2005; 4(3): 33-41.
56. Shailesh Sharma. New generation of tablet: Fast dissolving tablet. Pharmainfo.net, 2008; 6(1): 111-119.
57. Ravichandiran V, Masilamani V, Kumar SS, Kumaragurubaran T, Senthilnathan B, Kamalakkannan V. Fast Dissolving Tablets: A Review, Journal of Pharmacy Research, 2011; 4(8): 2590-2592.
58. Sharma N, Sharma J, Jat RC, Rathore AS, Fast is dissolving tablets as novel dosage form, International Journal of Research and development in Pharmacy and Life Sciences, 2012; 1(3): 90-104.
59. Erande, K., Joshi, B., Mouth Dissolving Tablet: A Comprehensive Review, 2013; 2(7): 26-28.
60. Shaikh S., Khirsagar, R.V., Quazi, A Fast-Disintegrating Tablets an overview of formulations and technologies, Int. J of Pharmacyand Pharma Sci, 2010; 2(3): 9-11
61. Betahistine is defined as a pharmacological agent proposed for the treatment of Meniere's disease, primarily due to its theoretic vasodilatory effects on the blood supply to the inner ear and its weak H1-receptor agonistic and considerable H3-antagonistic properties in the central and autonomic nervous systems.
62. AI generated definition based on: Otolaryngologic Clinics of North America, 2010.