



Review Article

RECENT RESEARCH ON ORODISPERSIBLE TABLETS – A REVIEW

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Abstract: Recent developments in the dosage form technology resulted in the development of orally disintegrating tablets (ODTs) with improved patient compliance and convenience. ODTs are solid unit dosage forms, which disintegrate or dissolve rapidly in the mouth without chewing and water. Orally disintegrating tablets provide an advantage particularly for pediatric and geriatric populations who have difficulty in swallowing conventional tablets and capsules. Literature on ODTs, their formulation and evaluation methods, patented technologies along with recent research in this area is reviewed in this article.

Key words: Orally disintegrating tablets, Formulation and evaluation methods, Patented technologies, Recent research, Review

INTRODUCTION

Over a decade, the demand for development of orally disintegrating tablets (ODTs) has enormously increased as it has significant impact on the patient compliance. Orally disintegrating tablets offer an advantage for populations who have difficulty in swallowing. It has been reported that dysphagia¹(difficulty in swallowing) is common among all age groups and more specific with pediatric, geriatric population along with institutionalized patients and patients with nausea, vomiting, and motion sickness complications². ODTs with good taste and flavor increase the acceptability of bitter drugs by various groups of population.

Orally disintegrating tablets are also called as orodispersible tablets, quick disintegrating tablets, mouth dissolving tablets, fast disintegrating tablets, fast dissolving tablets, rapid dissolving tablets, porous tablets, and rapid melts. However, of all the above terms, United States Pharmacopoeia (USP) approved these dosage forms as ODTs. Recently, European Pharmacopoeia has used the term orodispersible tablet for tablets that disperses readily and within 3 min in mouth before swallowing.³ United States Food and Drug Administration (FDA) defined **ODT** as "A solid dosage form containing medicinal substance or active ingredient which disintegrates rapidly usually within a matter of seconds when placed upon the tongue." The disintegration time for ODTs generally ranges from several seconds to about a minute.

Currently these tablets are available in the market for treating many disease conditions like hypertension, migraine, dysphasia, nausea, vomiting, Parkinson's disease, schizophrenia and pediatric emergency⁴⁻⁸.

Several drugs belonging to various pharmacological categories^{9, 10} such as Analgesics and Antiinflammatory Agents (fenbufen, flurbiprofen, ibuprofen, indomethacin, mefenamic acid, nabumetone, piroxicam, sulindac); Anthelmintics (albendazole, cambendazole, praziquantel, pyrantelmonate, thiabendazole); Anti- Arrhythmic

(amiodarone, disopyramide, flecainide acetate, quinidine sulphate); Anti- Epileptics(carbamazepine,paramethadione, phenobarbitone, phenytoin, valproic acid); Anti-Hypertensives (amlodipine, carvedilol, diltiazem, felodipine, nicardipine, nifedipine, reserpine) ; Anti- protozoals (diloxanide furoate, metronidazole, nitrofurazone, amidazole, tinidazole) ; Anxiolytics, Sedatives, Hypnotics and Neuroleptics (alprazolam, barbitone, bromazepam, chlormethiazole, chlorpromazine, flupenuixol decanoate, lorazepam, methaqualone, nitrazepam, zopiclone) are formulated as orodispersible tablets(ODTS).

Desired Criteria for Orodispersible Tablets¹¹

Orodispersible Tablet should-

- Not require water to swallow, but it should dissolve or disintegrate in the mouth within matter of seconds.
- Be compatible with taste masking
- Be portable without fragility concern.
- Have a pleasing mouth feel.
- Leave minimal or no residue in the mouth after oral administration.
- Exhibit low sensitivity to environmental condition as humidity and temperature.
- Be manufactured using conventional processing and packaging equipment at low cost.
- Salient features of mouth fast dissolving tablets¹¹
- 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.
- No need of water to swallow the dosage form, which is highly convenient feature for patients who are traveling and do not have immediate access to water.
- Good mouth feel property of MDDS helps to change the basic view of medication as "bitter pill", particularly for pediatric patients. Rapid dissolution and absorption of drug, which may produce rapid onset of action.

- Some drugs are absorbed from the mouth, pharynx and esophagus as the saliva passes down into the stomach, and 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.

Ideal Characteristics of Orodispersible Tablets¹²

Mouth Feel:

Mouth-feel is critical, and patients should receive a product that feels pleasant. Any large particles from the disintegrating tablet that are insoluble or slowly soluble in saliva would lead to an unpleasant gritty feeling. This can be overcome by keeping the majority of the particles below the detectable size limit. In some cases, certain flavors can improve mouth-feel perception, resulting in a product that is perceived as being less gritty, even if the only change is the flavor. Effervescence can be added to aid disintegration and improve mouth-feel by reducing the "dryness" of a product.

Hygroscopicity:

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

Friability:

In order to allow fast dissolving tablets to dissolve in the mouth, they are made of either very porous or soft molded matrices or compressed into tablets with very low compression force, which makes the tablets friable and/or brittle which are difficult to handle, often requiring specialized peel off blister packing. To overcome this problem, some companies introduced more robust forms of fast dissolving tablets, such as Wowtab by Yamanouchi-Shadlee and Dura Solve by CIMA labs.

FORMULATION OF ODTs:

Excipients:

Excipients balance the properties of the actives in ODTs. This demands a thorough understanding of the chemistry of these excipients to prevent interaction with the actives. Determining the cost of these ingredients is another issue that needs to be addressed by formulators. The role of excipients is important in the formulation of fastmelting tablets. These inactive food-grade ingredients, when incorporated in the formulation, impart the desired organoleptic properties and product efficacy. Excipients are general and can be used for a broad range of actives, except some actives that require masking agents.

Bulking Materials:

Bulking materials are significant in the formulation of ODTs. The material contributes functions of a diluent, filler and cost reducer. Bulking agents improve the textural characteristics that in turn enhance the disintegration in the

mouth, besides; adding bulk also reduces the concentration of the active in the composition. The recommended bulking agents for this delivery system should be more sugar-based such as mannitol, polydextrose, lactitol, DCL (direct compressible lactose) and starch hydrolystate for higher aqueous solubility and good sensory perception. Mannitol in particular has high aqueous solubility and good sensory perception. Bulking agents are added in the range of 10 percent to about 90 percent by weight of the final composition.

Emulsifying Agents:

Emulsifying agents are important excipients for formulating fast-melting tablets they aid in rapid disintegration and drug release without chewing, swallowing or drinking water. In addition, incorporating emulsifying agents is useful in stabilizing the immiscible blends and enhancing bioavailability. A wide range of emulsifiers is recommended for fast tablet formulation, including alkyl sulfates, propylene glycol esters, lecithin, sucrose esters and others. These agents can be incorporated in the range of 0.05 percent to about 15 percent by weight of the final composition.

Lubricants:

Lubricants, though not essential excipients, can further assist in making these tablets more palatable after they disintegrate in the mouth. Lubricants remove grittiness and assist in the drug transport mechanism from the mouth down into the stomach.

Flavours and Sweeteners:

Flavors and taste-masking agents make the products more palatable and pleasing for patients. The addition of these ingredients assists in overcoming bitterness and undesirable tastes of some active ingredients. Both natural and synthetic flavors can be used to improve the organoleptic characteristic of fast-melting tablets. Formulators can choose from a wide range of sweeteners including sugar, dextrose and fructose, as well as non-nutritive sweeteners such as aspartame, sodium saccharin, sugar alcohols and sucralose. The addition of sweeteners contributes a pleasant taste as well as bulk to the composition.

Advantages of ODTs:

- 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.
- Pre-gastric absorption can result in improved bioavailability and as a result of reduced dosage, improved clinical performance through a reduction of unwanted effects.

Orally disintegrating tablets offer all advantages of solid dosage forms and liquid dosage forms along with special **advantages**, which include:

- i. As ODTs are unit solid dosage forms, they provide good stability, accurate dosing, easy manufacturing, small packaging size, and easy to handle by patients.^{13, 14, 15, 16, 17}
- ii. No risk of obstruction of dosage form, which is beneficial for traveling patients who do not have access to water.
- iii. Easy to administer for pediatric, geriatric, and institutionalized patients (specially for mentally retarded and psychiatric patients)
- iv. Rapid disintegration of tablet results in quick dissolution and rapid absorption which provide rapid onset of action.¹⁸
- v. Medication as "bitter pill" has changed by excellent mouth feel property produced by use of flavors and sweeteners in ODTs.
- vi. Bioavailability of drugs that are absorbed from mouth, pharynx, and esophagus is increased.^{19, 20, 21}
- vii. Pre-gastric absorption of drugs avoids hepatic metabolism, which reduces the dose and increase the bioavailability²²

TECHNIQUES FOR ODTs

Various processes employed in formulating ODTs include freeze-drying, cotton candy process, molding, spray drying, mass extrusion, and compaction. [Table 1] enlists various drugs explored for developing ODTs.

Lyophilization or Freeze-Drying:

Formation of porous product in freeze-drying process is exploited in formulating ODT. Lyophilization is a process, which includes the removal of solvent from a frozen suspension or solution of drug with structure-forming additives.

Freeze-drying of drug along with additives imparts glossy amorphous structure resulting in highly porous and lightweight product. The resulting tablet has rapid disintegration and dissolution when placed on the tongue and the freeze-dried unit dissolves instantly to release the drug. Several technologies are patented involving lyophilization process, which are discussed in this article. However, the ODT formed by lyophilization has low mechanical strength, poor stability at higher temperature, and humidity¹⁵. Along with above complications and its expensive equipment freeze-drying use is observed to be limited

Molding:

Molding process includes moistening, dissolving, or dispersing the drug with a solvent then molding the moist mixture into tablets (compression molding with lower pressure than conventional tablet compression), evaporating the solvent from drug solution, or suspension at ambient pressure (no vacuum lyophilization), respectively.²³

The molded tablets formed by compression molding are air-dried. As the compression force employed is lower than conventional tablets, the molded tablet results in highly porous structure, which increases the disintegration and

dissolution rate of the product. However, to further improve dissolution rate of the product powder mixture should be sieved through very fine screen. As molding process is employed usually with soluble ingredients (saccharides) which offers improved mouth feel and disintegration of tablets. However, molded tablets have low mechanical strength, which result in erosion and breaking during handling.²⁴

Cotton Candy Process:

This process is so named as it utilizes a unique spinning mechanism to produce floss-like crystalline structure, which mimic cotton candy. Cotton candy process²⁵ involves formation of matrix of polysaccharides or saccharides by simultaneous action of flash melting and spinning. The matrix formed is partially recrystallized to have improved flow properties and compressibility. This candy floss matrix is then milled and blended with active ingredients and excipients and subsequently compressed to ODT. This process can accommodate high doses of drug and offers improved mechanical strength. However, high-process temperature limits the use of this process.

Spray Drying:

Highly porous, fine powders are obtained by this method. Allen *et al.*²⁶ utilized this process for preparing ODT. The ODT formulations consisted of hydrolyzed/ unhydrolyzed gelatin as supporting agent for matrix, mannitol as bulking agent, and sodium starch glycolate or croscarmellose sodium as disintegrating agent. Disintegration and dissolution were further improved by adding effervescent components, i.e. citric acid (an acid) and sodium bicarbonate (an alkali). The formulation was spray dried to yield a porous powder. The ODT made from this method disintegrated in <20 s.^{27, 28}

Mass Extrusion:

This technology involves softening the active blend using the solvent mixture of water-soluble polyethylene glycol and methanol and subsequent 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.²⁹

Compaction:

Melt granulation:

Abdelbary *et al.*³⁰ prepared ODT by incorporating a hydrophilic waxy binder (super polystate) PEG-6-stearate. Superpolystate is a waxy material with an m.p. of 33-37°C and an hydrophilic lipophilic balance of 9. It not only acts as a binder and increases the physical resistance of tablets, but also helps the disintegration of tablets as it melts in the mouth and solubilizes rapidly leaving no residue. Super polystate was incorporated in the formulation of ODT by melt granulation method where granules are formed by the molten form of this material. Crystallized paracetamol was used as model drug and in addition the formulation included mannitol as a water-soluble excipient and croscarmellose sodium as disintegrating agent.

Phase transition process:

Kuno *et al.* [31] investigated the disintegration of ODT by phase transition of sugar alcohols using erythritol (m.p. 122°C), xylitol (m.p. 93-95°C), trehalose (97°C), and mannitol (166°C). Tablets were produced by compressing a powder containing two sugar alcohols with high- and low-melting points and subsequent heating at a temperature between their melting points. Before heating process, the tablets do not have sufficient hardness because of low compatibility. The tablet hardness was increased after heating process, due to the increase of inter particle bonds or the bonding surface area in tablets induced by phase transition of lower melting point sugar alcohol.

Sublimation:

The presence of a highly porous structure in the tablet matrix is the key factor for rapid disintegration of ODT. Even though the conventional tablets contain highly water-soluble ingredients, they often fail to disintegrate rapidly because of low porosity. To improve the porosity, volatile substances such as camphor can be used in tableting process, which sublimated from the formed tablet.

Koizumi *et al.*³² developed ODT utilizing camphor, a subliming material that is removed from compressed tablets prepared using a mixture of mannitol and camphor. Camphor was sublimated in vacuum at 80°C for 30 min after preparation of tablets. The presence of a highly porous structure in the tablet matrix is the key factor for rapid disintegration of ODT. Even though the conventional tablets contain highly water-soluble ingredients, they often fail to disintegrate rapidly because of low porosity. To improve the porosity, volatile substances such as camphor can be used in tableting process, which sublimated from the formed tablet.

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Conventional methods

Conventional methods in formulating tablets such as dry granulation,³³ wet granulation,³⁴ and direct compression methods were adapted to produce ODTs. In formulating ODTs, one of the important components is the super disintegrants.

A disintegrant is used in formulation that enables the tablet to break up into smaller fragments upon contact with gastrointestinal fluids. Superdisintegrants are used at a low level in the solid dosage form, typically 1–10% by weight relative to the total weight of the dosage unit. Cross linked cellulose (Croscarmellose, Ac-Di-Sol, Primellose, Solutab, Vivasol); Crosslinked PVP (Crospovidone, Kollidon, Crospovidone M, Polyplasdone); Crosslinked starch (Sodium starch glycolate, Explotab, Primogel); Cross linked alginic acid (Alginic acid NF, Satalgine); Natural superdisintegrant (Soy polysaccharides, Emcosoy). The proper choice of disintegrant and its consistency of performance are critical to formulation development of such tablets. Microcrystalline cellulose and low substituted hydroxypropylcellulose were used as disintegrating agents in the range of 8:2 – 9:1 to prepare oro dispersible tablet. Agar powder is used as disitegrant for ODTs by enhancing the porosity of agar by water treatment. Sodium starch glycolate, crospovidone and croscarmellose are some of the popular superdisintegrants³⁵

Patented Technologies

Patented technologies for ODTs are summarized in Table 1

Table1:Patented Technologies for ODTs

Patented Technology	Technology Based on	Technology developed by Company	Example (Brand name)
Zydis ^{36, 37}	Porous matrix	R.P.Scherer, Inc.	Olanzapine (ZyprexaZydis)
Quicksolv ³⁸	Lyophilization	Germany Janssen Pharmaceutical Inc	Cisapride monohydrate (PropulsidQuicksolv)
Lyoc ³⁹	Freeze drying	USA, Pharmalyoc, France	Phloroglucinol Hydrate (SpasfonLyoc)
Flashtab ⁴⁰	Tableting with disintegrants and swelling agents	Ethypharm France	Ibuprofen (NurofenFlashTab)
Orasolv ^{41, 42}	Tableting with effervescent disintegrants	Cima Labs, Inc USA	Paracetamol (TempraQuicklets)
Durasolv ⁴³	Direct compression	Cima Labs, Inc. USA	Zolmitriptan (Zolmig ZMT)
Wowtab ^{44, 45}	Tableting with low and high moldability saccharides	Yamanouchi Pharma Tech. Inc. USA	Famotidine (Gaster D)
Ziplets ⁴⁶	Tableting with water in soluble ingredient and effective disintegrants	Eurand International Italy	Ibuprofen (CibalginaDueFast)

Advatab ⁴⁶	Microcaps and diffuscap CR Technology	Eurand International Italy	Cetirizine hydrochloride Advatabcetirizine
Flashdose ^{47,48}	Cotton Candy Process	Fuisz Technology, Ltd. USA	Tramadol HCl (Relivia Flash dose)
Oraquick ⁴⁹	Micromask taste Masking	KV Pharm.Co., Inc. USA	Hyoscyamine Sulfate ODT

EVALUATION OF ODTs

Evaluation parameters of tablets mentioned in the pharmacopoeias need to be assessed, along with some special tests are discussed here.

Hardness/crushing strength

A significant strength of ODT is difficult to achieve due to the specialized processes and ingredients used in the manufacturing. The limit of crushing strength for an ODT is usually kept in a lower range to facilitate early disintegration in the mouth. The crushing strength of the tablet may be measured using conventional hardness testers.

Friability

To achieve % friability within limits for an ODT is a challenge to the formulator since all methods of manufacturing of ODT are responsible for increasing the % friability values. Thus, it is necessary that this parameter should be evaluated and the results are within bound limits (0.1-0.9%).

Wetting time and water absorption ratio

Wetting time of dosage form is related with the contact angle. Wetting time of the ODT is another important parameter, which needs to be assessed to give an insight into the disintegration properties of the tablet. Lower wetting time implies

The wetting time of the tablets can be measured using a simple procedure⁵⁰ five circular tissue papers of 10 cm diameter are placed in a petridish with a 10-cm diameter. Ten milliliters of water-soluble dye (eosin) solution is added to petridish. 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 the wetting time. For measuring water absorption ratio the weight of the tablet before keeping in the petridish is noted (W b). The wetted tablet from the petridish is taken and reweighed (W a). The water absorption ratio, *R* can be then determined according to the equation: $R = 100 (W a - W b)/W b$.

Moisture uptake studies

Moisture uptake studies for ODT should be conducted to assess the stability of the formulation. Ten tablets from each formulation were kept in a desiccator over calcium chloride at 37°C for 24 h. The tablets were then weighed and exposed to 75% relative humidity, at room temperature for 2 weeks. Required humidity was achieved by keeping saturated sodium chloride solution at the bottom of the desiccator for 3 days. One tablet as control (without superdisintegrant) was kept to assess the moisture uptake

due to other excipients. Tablets were weighed and the percentage increase in weight was recorded.

Disintegration test

The time for disintegration of ODTs is generally <1 min and actual disintegration time that patient can experience ranges from 5 to 30 s. The standard procedure of performing disintegration test for these dosage forms has several limitations and they do not suffice the measurement of very short disintegration times. The disintegration test for ODT should mimic disintegration in mouth with in salivary contents.

Dissolution test

The development of dissolution methods for ODTs 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 ODT. Other media such as 0.1 N HCl and buffers (pH - 4.5 and 6.8) should be evaluated for ODT much in the same way as conventional tablets.

USP dissolution apparatus 1 and 2 can be used. 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.

Kancke⁵¹ proposed USP 2 Paddle apparatus, which is the most suitable and common choice for ODTs, with a paddle speed of 50 rpm commonly used. Typically, the dissolution of ODT is very fast when using USP monograph conditions; hence, slower paddle speeds may be utilized to obtain a profile.

The USP 2 Paddle apparatus at 50-100 rpm is suitable for dissolution testing of taste-masked drug as well. The media used for the taste-masked drug should match that of the finished product to maximize the value of the test. High performance liquid chromatography (HPLC) is often required to analyze dissolution aliquots due to presence of UV absorbing components, specifically flavors and sweetener. Excipient to drug ratio may be higher since the formulation is designed to have good taste and mouth feel, decreasing the detection of the drug to background (excipient) in the UV spectrophotometer.

Recent Research on ODTs

Several studies reported the formulation and evaluation of ODTs of various drugs for different purposes. Recent research on ODTs is summarized in Table 2

CONCLUSION

Orodispersible tablets (ODTs) are innovative drug delivery systems and have potential advantages over conventional

dosage forms, with their improved patient compliance, convenience, bioavailability and rapid onset of action. Though considerable research has been done in the formulation development and technologies for ODTs, more intensive investigations are to be carried out in this promising area to result in newer cost effective technologies and better products.

Table 2: Summary of Recent Research on ODTs

S. No	Drug (therap. category)	Method used	Excipients used	Result	Reference
1.	Aceclofenac (NSAID)	Direct compression	Croscarmallose sodium, sodium starch glycolate, microcrystalline cellulose	Decreased disintegration time, faster dissolution.	52
2.	Nateglinide (anti hyperglycemic agent)	Direct compression	Pregelatinized starch, sodium starch glycolate, crospovidone.	Better patient compliance,	53
3.	Celecoxib (NSAID)	Direct compression	Microcrystalline cellulose, crospovidone, AC-DI-sol,	Increased bioavailability.	54
4.	Rosuvastatin (HMG-CoA reductase)	Solid dispersions	croscarmallose sodium, sodium Starch glycolate, Pregelatinized starch, mannitol, PEG 6000.	Enhance solubility, dissolution rate.	55
5.	Cinnarizine (H ₁ -receptor antagonist)	Sublimation	Croscarmallose sodium, sodium starch glycolate, microcrystalline cellulose, camphor, sodium saccharine.	patient compliance, rapid onset of action, increased bioavailability.	56
6.	Promethazine theoclate (anti histamine)	Direct compression	microcrystalline cellulose, camphor, crospovidone, mannitol, lactopress, β - cyclodextrin.	89% Drug release in 5 mins.	57
7.	Omeprazole (a proton pump inhibitor) and Domperidone (antiemetic)	Direct compression	Sodium starch glycolate, Kollidon CL, Ac-Di-Sol Croscarmallose	Poor aqueous solubility.	58
8.	Metformin hydrochloride (oral antidiabetic biguanide agent.)	direct compression	crospovidone, sodium starch glycolate, Mannitol, microcrystalline cellulose, Croscarmallose sodium	98.37% of drug is released within 30 minutes.	59
9.	Albendazole (Broad	Direct compression	Microcrystalline cellulose,	Better dissolution rate	60

	spectrum anti-helminthic)		Crospovidone, Croscarmellose sodium, PVPK30, Aspartame, Mannitol	and improved bioavailability of the drug	
10.	Carbamazepine (tricyclic anti-depressants)	Solid dispersions	Croscarmellose Sodium, PVP, Aspartame, Microcrystalline cellulose, PEG6000, sodium lauryl sulphate.	Improved bioavailability, better patient compliance.	61
11.	Lisinopril (ACE inhibitors)	Direct compression	Croscarmellose Sodium, Crospovidone, Sodium starch glycolate, Mannitol.	Improved DT, 99.99% drug release within 30 mins.	62
12.	Oxcarbazepine (NSAID)	Wet granulation	Avicel pH 102, Aerosil	Enhanced dissolution.	63
13.	Valsartan (anti-hypertensive)	Direct compression	AC-DI-SOL, sodium saccharine, Crospovidone, Sodium starch glycolate, MCC	Greater bioavailability,	64
14.	Etoricoxib (NSAID)	Direct compression	Urea, Croscarmellose, Avicel	Better patient compliance, quick DT, rapid dissolution	65
15.	Granisetron hydrochloride	Direct compression	Croscarmellose, Crospovidone	Enhanced dissolution rate	66
16.	Ramipril (Antihypertensive)	Wet granulation	Sodium bicarbonate, Polyvinyl pyrrolidone, Citric acid, Mannitol	Rapid disintegration and dissolution	67
17.	Rizatriptan benzoate (Serotonin 5-HT receptor agonist)	Mass extrusion	Eudragit EPO, Sodium starch glycolate, Croscarmellose sodium, Crospovidone, Pearlitol SD200	Complete taste masking, rapid disintegration and dissolution	68
18.	Ebastine (Second generation non-sedating H1 receptor antagonist)	Sublimation	Microcrystalline cellulose, Mannitol, Ammonium bicarbonate, Sodium saccharine, PVP, Camphor	Improved dissolution, faster disintegration (<1 min)	69
19.	Clonazepam (Antiepileptic)	Direct compression	Crospovidone, Croscarmellose, Directly compressible Mannitol,	Enhanced patient compliance	70

			Microcrystalline Cellulose		
20.	Isoxsuprine hydrochloride (Vasodilator)	Direct compression	β -cyclodextrin, Sodium starch glycolate, Ac-di-sol, Crospovidone, Microcrystalline cellulose, Mannitol	High release rate	71
21.	Levocetirizine hydrochloride (Non sedative anti-histaminic)	Direct compression	Croscarmellose,Primo jel, Crospovidone, MCC	Improved bio availability, rapid onset of action	72
22.	Meclizine hydrochloride (Antiemetic)	Direct compression	Pearlitol SD 200, Avicel pH 102, Crospovidone XL 10	Rapid disintegrate-on, quick onset of action	73
23.	Montelukast Sodium (Antineoplastic)	Direct compression	Crospovidone, Sodium starch glycolate, Mannitol Microcrystalline cellulose,	Enhanced dissolution rate	74
24.	Salbutamol Sulphate (β_2 receptor agonist)	Direct compression	Primogel, L-hydroxy Propyl cellulose, Microcrystalline cellulose, Mannitol-D	Rapid dissolution and rapid onset of action	75
25.	Telmisartan (Antihypertensive)	Direct compression	Skimmed milk powder, Poloxamer-188, Crospovidone	Better solubility, Rapid disintegration and high dissolution rate	76

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