Potential Drug Candidates for Fast Dissolving Drug Delivery - A Review

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ABSTRACT

Researchers throughout the world are focusing intensively on the methods for the development of new drug delivery systems to enhance patient’s compliance. The oral route however still remained as the best administration route of therapeutic agents for its ease of ingestion, pain avoidance and versatility. Hence, fast dissolving tablets become an emerging trend in the pharmaceutical industry. Fast dissolving tablets are ideal for all types of people, including for people who have swallowing difficulties, paediatric, geriatric, and bedridden patients. It is also for active patients who are busy, travelling and may not have access to water. Fast dissolving tablets are also known as orodispersible tablets, mouth-dissolving tablets, orally disintegrating tablets, melt-in-mouth tablets, rapimelts, porous tablets, quick dissolving etc. This type of tablets disintegrates quickly once introduced into the mouth in the absence of additional water for easy administration of active pharmaceutical ingredients. Many drugs have the potentials to be made into orodispersible tablets. They vary from analgesics to neuroleptics and anti-psychotic drugs. However only a small percentage of them are researched on and some have been manufactured and marketed. In this review article, drug candidates suitable for fast dissolving drug delivery and the available marketed products have been listed.

Keywords: Fast dissolving tablet (FDT), Marketed fast dissolving tablets, Potential candidates,
INTRODUCTION

Fast-dissolving drug-delivery systems were initially developed in the late 1970s as an alternative to tablets, capsules, and syrups for paediatric and geriatric patients who experience difficulties in swallowing traditional oral solid-dosage forms. [1] The speed of solubility of drug affects the rate of absorption of the drug. The faster the drug dissolve into solution, quicker the absorption and onset of clinical effect. They should readily dissolve or disintegrate in the saliva generally within <60 seconds. Some drugs are absorbed from the mouth, pharynx and oesophagus as the saliva passes down into the stomach. The significance of orodispersible dosage forms are progressively being recognized in both, industry and academics. [2]

Orally Disintegrating (OD) Tablet technology has been approved by United States Pharmacopoeia (USP), Centre for Drug Evaluation and Research (CDER). USFDA defined OD tablet as “A solid dosage form containing medicinal substances, which disintegrates rapidly, usually within a matter of seconds, when placed upon the tongue”. Besides, the European Pharmacopeia adopted the term orodispersible tablet for a tablet that disperses or disintegrates in less than 3 minutes in the mouth before swallowing. Such a tablet disintegrates into smaller granules or melts in the mouth from a hard solid to a gel-like structure, allowing easy swallowing by patients. [4]

There are several factors that should be considered while selecting an appropriate drug candidate for development of orally disintegrating dosage forms. The ultimate characteristics of a drug for dissolution in the mouth and pregastric absorption from ODTs include:

- Ability to permeate oral mucosal tissue.
- Good solubility in water and saliva.
- Free from bitter taste.
- Dose lower than 20 mg.
- Ability to diffuse and partition into the epithelium of the upper GIT (log P >1, or preferably >2).
- Small to moderate molecular weight.
- Partially non-ionized at the oral cavity's pH.

However, there are some characteristics of a drug that maybe rendered unsuitable for delivery as an orally disintegrating dosage form, such as drugs with short half-life and frequent dosing, very bitter or unacceptable taste, and drugs which require controlled or sustained release. [3]

A wide range of potential drug candidates suitable for the production of fast dissolving tablets with additional researches done are included in this review along with the list of commercialized products of FDTs which are available in market given in Table 1.
<table>
<thead>
<tr>
<th>NO.</th>
<th>DRUG NAME</th>
<th>THERAPEUTIC USE(S)</th>
<th>BRANDS AVAILABLE</th>
<th>MANUFACTURER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acetaminophen</td>
<td>Pain reliever</td>
<td>Excedrin® QuickTabs</td>
<td>Bristol-Myers Squibb, NY, USA</td>
</tr>
<tr>
<td>2</td>
<td>Aripiprazole</td>
<td>Anti-psychotics</td>
<td>AbilifyDiscmelt</td>
<td>Otsuka America/Bristol-Myers Squibb</td>
</tr>
<tr>
<td>3</td>
<td>Acyclovir</td>
<td>Antiviral Agents</td>
<td>Acivir DT</td>
<td>Cipla</td>
</tr>
<tr>
<td>4</td>
<td>Alprazolam</td>
<td>Anti-anxiety Agents</td>
<td>Niravam</td>
<td>Schwarz Pharma</td>
</tr>
<tr>
<td>5</td>
<td>Baclofen</td>
<td>Anti-spastic analgesic</td>
<td>Kemstro™</td>
<td>Schwarz Pharma</td>
</tr>
<tr>
<td>6</td>
<td>Clonazepam</td>
<td>Sedation</td>
<td>Klonopin® wafer</td>
<td>Roche</td>
</tr>
<tr>
<td>7</td>
<td>Clozapine</td>
<td>Anti-psychotics</td>
<td>FazaClo</td>
<td>AzurPharma</td>
</tr>
<tr>
<td>8</td>
<td>Cisapride Monohydrate</td>
<td>Gastrointestinal Prokinetic Agent</td>
<td>Propulsid® Quicksov®</td>
<td>Jannsen</td>
</tr>
<tr>
<td>9</td>
<td>Cetirizine HCL</td>
<td>Anti-histamines</td>
<td>Zotacet MD</td>
<td>ZotaPharma</td>
</tr>
<tr>
<td>10</td>
<td>Cefadroxil</td>
<td>Anti-Bacterial Agents</td>
<td>Cefadur DT</td>
<td>Cipla (protec)</td>
</tr>
<tr>
<td>11</td>
<td>Cefixime</td>
<td>Anti-Bacterial Agents</td>
<td>Cefinar DT</td>
<td>ZydusAlidac</td>
</tr>
<tr>
<td>12</td>
<td>Citalopram</td>
<td>Anti-depressants</td>
<td>Citalopram ODT</td>
<td>Biovail</td>
</tr>
<tr>
<td>13</td>
<td>Caffeine</td>
<td>Anorexigenic Agents</td>
<td>Caffeine FD Film</td>
<td>Hughes medical corporation, U.S.A</td>
</tr>
<tr>
<td>14</td>
<td>Carbidopa</td>
<td>Anti-parkinson Agents</td>
<td>Parcopa</td>
<td>Schwarz Pharma</td>
</tr>
<tr>
<td>15</td>
<td>Diphenhydramine citrate</td>
<td>Sinus pressure relief</td>
<td>Benadryl® Fastmelt®</td>
<td>Pfizer Inc., NY, USA</td>
</tr>
<tr>
<td>16</td>
<td>Diphenhydramine and Pseudoephedrine</td>
<td>Vasocconstrictor Agents, Sympathomimetic, Bronchodilator Agents</td>
<td>Benadryl Fastmelt</td>
<td>Warner Lambert, NY, USA</td>
</tr>
<tr>
<td>17</td>
<td>Domperidone</td>
<td>Anti-emetics, Anti-Parkinson Agents</td>
<td>UNISOM SleepMelts</td>
<td>Chattem</td>
</tr>
<tr>
<td>18</td>
<td>Donepezil</td>
<td>Parasympathomimetics</td>
<td>Aricept ODT</td>
<td>Eisai Co.</td>
</tr>
<tr>
<td>19</td>
<td>Desloratadine</td>
<td>Anti-histamines</td>
<td>ClarinexRediTabs</td>
<td>Schering-Plough Corp., USA</td>
</tr>
<tr>
<td>20</td>
<td>Hyoscyaminesulphate</td>
<td>Anti-ulcer</td>
<td>NuLev®</td>
<td>Schwarz Pharma</td>
</tr>
<tr>
<td>21</td>
<td>Ibuprofen</td>
<td>NSAID</td>
<td>Cibalginadue FAST</td>
<td>Novartis Consumer Health</td>
</tr>
</tbody>
</table>

TABLE 1: LIST OF FAST DISSOLVING TABLETS AVAILABLE IN THE MARKET
<table>
<thead>
<tr>
<th></th>
<th>Drug Name</th>
<th>Category</th>
<th>Product Name</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Famotidine</td>
<td>Anti-ulcer</td>
<td>Pepeid® ODT</td>
<td>Merck &amp; Co., NJ, USA</td>
</tr>
<tr>
<td>23</td>
<td>Fexofenadine</td>
<td>Anti-histamines</td>
<td>Allegra ODT</td>
<td>Sanofi Aventis</td>
</tr>
<tr>
<td>24</td>
<td>Fluoxetine</td>
<td>Anti-depression</td>
<td>Fluoxetine ODT</td>
<td>Biovail</td>
</tr>
<tr>
<td>25</td>
<td>Loratadine</td>
<td>Antihistamine</td>
<td>Claritin® RediTabs®</td>
<td>Schering-Plough Corp., NY, USA</td>
</tr>
<tr>
<td>26</td>
<td>Loperamide HCL</td>
<td>Antidiarrheal</td>
<td>Imodium Istant Melts</td>
<td>Janssen</td>
</tr>
<tr>
<td>27</td>
<td>Lansoprazole</td>
<td>Anti-Infectives</td>
<td>Prevacid SoluTab</td>
<td>Takeda Pharmaceuticals</td>
</tr>
<tr>
<td>28</td>
<td>Mirtazapine</td>
<td>Anti-depression</td>
<td>Remeron® SolTab®</td>
<td>Organon Inc.</td>
</tr>
<tr>
<td>29</td>
<td>Mosapride</td>
<td>Gastroprokinetic Agent</td>
<td>Mosid MT</td>
<td>Torrent Pharmaceutical, India</td>
</tr>
<tr>
<td>30</td>
<td>Metoclopramide</td>
<td>Anti-emetics</td>
<td>Metoclopramide Zydis</td>
<td>Salix Pharmaceuticals</td>
</tr>
<tr>
<td>31</td>
<td>Montelukast</td>
<td>Anti-Asthmatic Agents, Antiarrhythmic Agents</td>
<td>Romilast</td>
<td>Ranbaxy lab. Ltd., India</td>
</tr>
<tr>
<td>32</td>
<td>Mirtazapine</td>
<td>Anti-depression</td>
<td>Mirtazapine ODT</td>
<td>Teva Pharmaceuticals</td>
</tr>
<tr>
<td>33</td>
<td>Nimesulide</td>
<td>NSAIDs</td>
<td>Nimulid MD</td>
<td>Panacea Biotec, India</td>
</tr>
<tr>
<td>34</td>
<td>NAcetylcyesteine</td>
<td>Mucolitic</td>
<td>Flumucid</td>
<td>Alpex Pharma SA / Zambon Group</td>
</tr>
<tr>
<td>35</td>
<td>Olanzepine</td>
<td>Psychotropic</td>
<td>Zyperxa®</td>
<td>Eli Lilly, Indianapolis, USA</td>
</tr>
<tr>
<td>36</td>
<td>Olandansetron</td>
<td>Antiemetic</td>
<td>Zofran® ODT</td>
<td>Galaxo Smith Kline</td>
</tr>
<tr>
<td>37</td>
<td>Piroxicam</td>
<td>NSAIDs</td>
<td>Feldene Melt®</td>
<td>Pfizer Inc., NY, USA</td>
</tr>
<tr>
<td>38</td>
<td>Paracetamol</td>
<td>Analgesic, antipyretic</td>
<td>Febrectol</td>
<td>Prographarm, Chateauneuf, France</td>
</tr>
<tr>
<td>39</td>
<td>Phloroglucinol Hydrate</td>
<td>Anti-spasmodic</td>
<td>Spasfon Lyoc</td>
<td>Farmalyoc</td>
</tr>
<tr>
<td>40</td>
<td>Prednisolone</td>
<td>Inflammatory, auto</td>
<td>Orapred ODT</td>
<td>Sciele Pharma</td>
</tr>
</tbody>
</table>
41. Rizatritpan benzoate Migrane Maxalt®-MLT® Merck & Co, NJ,USA
42. Risperidone Schizophrenia Resperdal® M-TabTM Janssen
43. RamosetoronHCl Anti-emetic Nasea OD Yamanouchi
44. Rofecoxib NSAIDs Dolib MD Panacea Biotec, India

Orthoref MD Biochem
Rofaday MT Lupin
Torrox MT Torrent Pharmaceuticals, India

45. Selegiline Parkinsons disease ZelaparTM ElanAmarin corp.
46. Tepoxelin Canine NSAIDs ZubrinTM (Pet drug) Schering-Plough Corp.,USA
47. Tramadol HCl Analgesics RaliviaFlashDose® Fuisz Technology, Ltd.

Biovail

48. Various combination Pediatric cold cough,Allergy Triaminic® Softchews® Novartis consumer Health
49. Valdecoxib NSAIDs Valus Glenmark
50. Zolmitriptan Anti-migraine Zomig-ZMT® Rapimelt® AstraZeneca
51. Zolpidem tartrate Sleep disorders Zolpidem ODT Biovail

DRUG CANDIDATES SUITABLE FOR FAST DISSOLVING DRUG DELIVERY:

1. ANALGESICS AND ANTI-INFLAMMATORY AGENTS:

Aloxiprin, Auranofin, Azapropazone, Benorylate, Diflunisal, Ketorolac Tromethamine, Etodolac, Fenbufen, Fenoprofen, Calcim, Flurbiprofen, Ibuprofen, Indomethacin, Ketoprofen, Meclofenamic Acid, Mefenamic Acid, Nabumetone, Naproxen, Oxaprozin, Oxyphenbutazone, Phenylbutazone, Piroxicam, Sulindac, Rofecoxib. [39]

Omaima A. Sammour et al investigated to increase the solubility and dissolution rate of Rofecoxib by the preparation of its solid dispersion with polyvinyl pyrrolidone K30 (PVP K30) using solvent evaporation method. It was concluded that the study showed the suitability of PVP K30 as a carrier for the preparation of Rofecoxib solid dispersions. Compared with the experimental optimized preparation, the observed responses were in close agreement with the predicted values of the optimized one, thereby demonstrating the feasibility of the optimization procedure in developing Rofecoxib mouth dissolve tablets. [5]

Sudhir Bhardwaj et al attempted to formulate and evaluate the fast dissolving tablets of Aceclofenac. They concluded that the fast dissolving tablets of the poor soluble drug can be
made by direct compression technique using selective super disintegrants showing enhanced dissolution, taste masking and hence better patient compliance and effective therapy.[6]

Taksande J B. et al formulated and characterized Lornoxicam fast dissolving tablet using natural superdisintegrants. The natural superdisintegrants used were banana powder, soy polysaccharide and synthetic superdisintegrant crospovidone. It was concluded that natural super disintegrants should be preferred as having nutritive value as well as cost benefit in formulation and development of orodispersible tablets than synthetic polymers. [7]

Venkata Naveen Kasagana et al formulated and evaluated fast dissolving Piroxicam tablets using different superdisintegrants, namely crospovidone, sodium starch glycolate and pregelatinized starch. They concluded that FDTs of Piroxicam can be prepared by direct compression method using three superdisintegrants crospovidone, sodium starch glycolate and pregelatinized starch. Crospovidone was found to be a better superdisintegrant for the formulation of Piroxicam Fast Dissolving Tablets. [8]

Cirri M et al developed a tablet formulation based on an effective Flurbiprofen-cyclodextrin system, able to allow a rapid and complete dissolution of this practically insoluble drug. The drug solubility improvement obtained by the different binary systems varied from a minimum of 2.5 times up to a maximum of 120 times, depending on both the cyclodextrin type and the system preparation method. Selected binary systems were used for preparation of direct compression tablets with reduced drug dosage. [9]

Prashant Khemariya et al developed and evaluated mouth dissolving tablets of Meloxicam. These tablets were prepared by wet granulation procedure. Sublimation of camphor from tablets resulted in better tablets as compared to the tablets prepared from granules that were exposing to vacuum. [10]

Amit Modi et al formulated and evaluated fast dissolving tablets of Diclofenac sodium using different superdisintegrants by direct compression method. It was concluded that the batch which was prepared by using combination of crospovidone and sodium starch glycolate as a superdisintegrant shows excellent disintegration time, enhance dissolution rate, taste masking and hence lead to improve efficacy and bioavailability of drug.[11]

2. ANTHELMINTICS

Albendazole, Bephenium Hydroxynaphthoate, Cambendazole, Dichlorophen, Ivermectin, Mebendazole, Oxarnniquine, Oxendazole, Oxantel Embonate, Praziquantel, Pyrantel Embonate, Thiabendazole.[39]

Devendra Revanand Rane et al researched to formulate fast dissolving tablets of Albendazole to achieve a better dissolution rate and further improving the bioavailability of the drug. They concluded that the fast dissolving tablets of Albendazole can be successfully prepared by direct compression techniques using selected superdisintegrants for better patient
compliance and effective therapy. The relative efficiency of these superdisintegrants to improve the disintegration and dissolution rate of tablets was found in order i.e. Crospovidone>Croscarmellose sodium. [12]

3. ANTI-ARRHYTHMICS

Amiodarone, Disopyramide, Flecainide Acetate, Quinidine Sulphate. [39]

Soumya M. et al made an effort to prepare the fast dissolving tablets of Flecainide acetate by direct compression method. The fast dissolving tablets of Flecainide acetate proved to show better release profile in all aspects as compared to marketed formulation. The use of superdisintegrants crospovidone and croscarmellose showed faster disintegration and dissolution profile. [13]

4. ANTI-ASTHMATIC

Deepak Sharma aimed to prepare the fast disintegrating tablet of Salbutamol sulphate for respiratory disorders for paediatrics. The investigation was undertaken with a view to develop a fast disintegrating tablet of Salbutamol sulphate which offers a new range of products having desired characteristics and intended benefits. Superdisintegrants such as sodium starch glycolate was optimized. Different binders were optimized along with optimized superdisintegrant concentration. The tablets were prepared by direct compression technique. [14]

5. ANTI-BACTERIAL AGENTS

Benethamine Penicillin, Cinoxacin, Ciprofloxacin, Clarithromycin, Clofazimine, Cloxacillin, Demeclocycline, Doxycycline, Erythromycin, Ethionamide, Imipenem, Nalidixic Acid, Nitrofurantoin, Rifampicin, Spiramycin, Sulphabenzamide, Sulphadoxine, Sulphamerazine, Sulphacetamide, Sulphadiazine, Sulphafurazole, Sulphamethoxazole, Sulphapyridine, Tetracycline, Trimethoprim.

Kamal Saroha et al formulated and evaluated the fast dissolving tablets of amoxicillin trihydrate using synthetic disintegrants. They concluded that formulation (F8) having 10% CCS and showed promising results than formulation (F4) having 10% SSG. FDT of amoxicillin trihydrate in formulation F8 showed extremely fast dissolution rate than that of tablets of formulation F4. [15]

Bhandari Neeraj et al prepared fast dissolving tablets of Cefuroxime Axetil using different superdisintegrants. Different super disintegrants were used such as croscarmellose sodium (CCS), sodium starchglycolate (SSG) and crospovidone (CPVP). They concluded that mouth-dissolving tablets of Cefuroxime Axetil can be successfully prepared by wet granulation technique using selected superdisintegrants for the better patient compliance and effective therapy. [16]
Ravi S Wanare et al prepared Azithromycin Dihydrate using different super disintegrants such as croscarmellose sodium (CCS), sodium starch glycolate (SSG) and crospovidone (CPVP). A direct compression method was failed to formulate dispersible tablet of Azithromycin so wet granulation method was used. They concluded that tablets that were formulated (wet granulation) using crospovidone, croscarmelose sodium and sodium starch glycolate exhibited quicker disintegration of tablets. [17]

6. **ANTI-COAGULANT**

Dicoumarol, Dipyridamole, Nicoumalone, Phenindione

7. **ANTI-CONVULSANT**

Anupama Kalia et al investigated with a view to develop mouth-dissolving tablets of Oxcarbazepine, which offers a new range of product having desired characteristics and intended benefits. In this study, the mouth dissolving tablets were prepared using two different technologies, direct compression method and solid dispersion technology. The results compared for both the technologies showed that the Oxcarbazepine tablets prepared using solid dispersion technology was found to have good technological properties and satisfying and reproducible drug dissolution profiles. [18]

8. **ANTI-DEPRESSANTS**

Amoxapine, Ciclazindol, Maprotiline, Mianserin, Nortriptyline, Trazodone, Trimipramine Maleate, Acetohexamide, Chlorpropamide, Glibenclamide, Gliclazide, Glipizide, Tolazamide, Tolbutamide.

Danish Kurien et al successfully formulated and evaluated fast dissolving tablets of Escitalopram oxalate by using hydroxypropyl beta cyclodextrin. Based on wetting time, absorption ratio and percentage drug release of Escitalopram oxalate containing 5% crospovidone is revealed as the best formulation. [19]

9. **ANTI-DIABETICS**

Glipizide, Tolazamide, Tolbutamide Acetohexamide, Chlorpropamide, Glibenclamide, Gliclazide.

Gnana Chaitanya et al prepared and evaluated oral fast disintegrating tablet formulations of Sitagliptin phosphate using the superdisintegrants for various parameters. It can be concluded that the parameters disintegration time, dispersion time, wetting time and water absorption ratio are inversely related to the disintegrants quantity. Based on the above parameters one formulation was finalized as the optimized formulation which is showing lowest values for the disintegration time, wetting time, and highest values for the water absorption ratio and dissolution rate. [20]
10. **ANTI-EMETICS**

Basawaraj S. Patil et al attempted to prepare fast dissolving tablets (FDT) of Granisetron Hydrochloride by sublimation technique. The prepared formulations were evaluated for pre-compression and post-compression parameters. They concluded that fast dissolving tablets of Granisetron Hydrochloride are showing enhanced dissolution rate with increasing concentration of subliming agents. [21]

M Koland et al carried out study to formulate and evaluate fast dissolving films of Ondansetron hydrochloride for sublingual administration. They concluded that the use of water-soluble sweeteners, especially mannitol not only enhanced the taste of the Ondansetron containing films, but also increased drug release and drug permeation through oral mucosa. [22]

11. **ANTI-EPILEPTICS**

Beclamide, Carbamazepine, Clonazepam, Ethotoin, Methoin, Methsuximide, Methylphenobarbitone, Oxcarbazepine, Paramethadione, Phenacemide, Phenobarbitone, Phenytoin, Phensuximide, Primidone, Sulthiame, Valproic Acid. [39]

Swamy P.V. et al had prepared orodispersible tablets of Carbamazepine to enhance patient compliance by direct compression method using full factorial design. They found that the formulation containing 2% w/w Crospovidone and 30%w/w micro crystalline cellulose was more promising. [23]

Shirsand.S.B, et al successfully prepared fast dissolving tablets of Clonazepam by direct compression method by using crospovidone, croscarmellose sodium and mannitol. They concluded that the formulation which was prepared by using 10%crospovidone and 35%w/w microcrystalline cellulose is the best formulation (t50% - 1.8 minutes). [24]

12. **ANTI-FUNGAL AGENT**


13. **ANTI-GOUT AGENTS**

Allopurinol, Probenecid, Sulphinpyrazone

14. **ANTI- HISTAMINE**

Acrivastine, Astemizole, Cinnarizine, Cyclizine, CyproheptadineHCl, Dimenhydrinate, FlunarizineHCl, Loratadine, MeclozineHCl, Oxatomide, Terfenadine, Triprolidine.
Sandeep D. S. et al formulated and evaluated oral fast dissolving tablets of Promethazine HCL by sublimation method. They concluded that it was sublimation method along with superdisintegrant addition was excellent method in formulation of fast dissolving tablets of Promethazine HCl which gives quick relief from emesis. [25]

Shailesh Sharma et al optimized and formulated Promethazine theoclate fast-dissolving tablets. The solubility of Promethazine theoclate was increased by formulating it as a fast-dissolving tablet containing -cyclodextrin, crospovidone, and camphor, using direct compression method. [26]

Chandan Bisht et al also have made attempts for the development of fast disintegrating tablets of Levocetirizine Dihydrochloride by sublimation method. Their results suggest that suitably formulated fast dissolving tablets of Levocetirizine dihydrochloride containing camphor as a subliming agent can be achieved. The tablets exhibited good in vitro dispersion and wetting properties in presence of subliming agent, sublimation method shows better disintegration and drug release as compared to direct compression. [27]

15. ANTI-HYPERTENSIVE AGENTS

Amlodipine, Carvedilol, Benidipine, Dilitazem, Diazoxide, Felodipine, Indoramin, Isradipine, Nifedipine, Nimodipine, Phenoxybenzamine, Prazosin, Reserpine

C.P. Jain et al prepared fast dissolving tablets of Valsartan using different superdisintegrants by direct compression method. They discovered that the characterization of fast dissolving tablets of Valsartan with formulation containing crospovidone is the most acceptable. [28]

Jeevan T. Naikwade et al formulated and evaluated the fast dissolving tablets of Amlodipine besylate by using co-processed superdisintegrants. Among the designed formulations, the formulation (CP5) containing co processed superdisintegrant (3:1 mixture of crospovidone and sodium starch glycolate)emerged as the overall best formulation based on drug release characteristics in phosphate buffer pH 6.8. From this study, it was concluded that dissolution rate of Amlodipine besylate could be enhanced by tablets containing co-processed superdisintegrant. [29]

Mangesh M. Kumare et al made development of an FDT of Atenolol and to evaluate the effect of co-processed superdisintegrants on its disintegration time and release profile as the prime objective of their research work. They proved that the co-processed superdisintegrants gives the better results than the physical mixture. [30]

R. Margret Chandira et al formulated and evaluated the fast dissolving tablets of Carvedilol. The solubility was enhanced by using β- cyclodextrin as a complexing agent. Tablets were prepared by direct compression technique. They concluded that Carvedilol can be
successfully complexed with Betacyclodextrin to prepare fast dissolving tablets in the ratio of 1:4. [31]

16. ANTI-MALARIALS

Amodiaquine, Chloroquine, Chlorproguanil, Halofantrine, Mefloquine, Proguanil, Pyrimethamine, Quinine Sulphate.

17. ANTI-MIGRAINE AGENTS

Dihydroergotamine Mesylate, Ergotamine Tartrate, Methysergide Maleate, Pizotifen Maleate, Sumatriptan Succinate

Mahajan H. S. et al had successfully prepared the mouth dissolving tablets of Sumatriptan succinate by using superdisintegrants sodium starch glycolate, carboxy methyl cellulose, sodium and treated agar by direct compression method. The tablet disintegrates in-vitro and in-vivo within 10 to 16 second and 12 to 18 seconds respectively. Almost 90% of drug was release from all the formulations within 10 minutes. [32]

18. ANTI-MUSCARINIC AGENTS

Atropine, Benzhexol, Biperiden, Ethopropazine, Hyoscine Butyl Bromide, Hyoscyarnine, Mepenzolate Bromide, Orphenadrine, Oxypencylicime, Tropicamide.

19. ANTI-NEOPLASTIC AGENTS & IMMUNOSUPPRESSANTS

Aminogluthethimide, Amsacrine, Azathiopnne, Busulphan, Chlorambucil, Cyclosporin, Dacarbazine, Estramustine, Etoposide, Melphalan, Mercaptopurine, Methotrexate, Mitomycin, Mitotane, Mitozantrone, Procarbazine, Tamoxifen Citrate, Testolactone.

21. ANXIOLYTIC, SEDATIVES, HYPNOTICS & NEUROLEPTICS


Tapan Kumar Giri et al study was undertaken to develop tablets of diazepam-hydroxypropyl-β-cyclodextrin inclusion complex that disintegrate within 3 minutes and release 85% of drug within 30 minutes to provide rapid action of the drug through oro-mucosal route.
Tablets of diazepam were prepared by direct compression method that disintegrated quickly (in 13.3 seconds) and released 85% drug rapidly (in 8.98 minutes). [33]

22. ANTI-PARKINSONIAN AGENTS

   Bromocriptine Mesylate, Lysuride Maleate.

23. ANTI-PROTOZOAL AGENTS

   Benznidazole, Clioquinol, Decoquinate, Diodohydroxyquinoline, Diloxanide Furoate, Dinitolmide, Furfolidone, Metronidazole, Nimorazole, Nitrofurazone, Omidazole, Tinidazole. [39]

24. ANTI-PSYCHOTIC AGENTS

   R. S. Masareddy et al attempted to study two different methods direct compression and sublimation in formulation of mouth dissolving tablets of Clozapine. The comparative evaluation of two methods showed direct compression method is a better alternative to sublimation method as its formulations rapidly disintegrate in oral cavity. [34]

25. ANTI-THYROIDS AGENTS

   Carbimazole, Propylthiouracil

26. β- BLOCKERS

   Acebutolol, Alprenolol, Atenolol, Labetalol, Metoptolol, Oxprenolol, Propranolol.

27. CARDIAC INOTROPIC AGENTS

   Amrinone, Digitoxin, Digoxin, Enoximone, Lanatoside C, Medigoxin.

28. CORTICOSTEROIDS

   Beclomethasone, Betamethasone, Budesonide, Cortisone Acetate, Desoxymethasone, Dexamethasone, Fludrocortisone Acetate, Flunisolide, Flucortolone, Fluticasone Propionate, Hydrocortisone, Methylprednisolone, Prednisolone, Prednisone, Triamcinolone.

29. DIURETICS

   Acetazolarnide, Amiloride, Bendrofluazide, Bumetanide, Chlorothiazide, Chlorthalidone, Ethacrynic Acid, Frusemide, Metolazone, Spironolactone, Triamterene.
30. GASTRO-INTESTINAL AGENTS

Bisacodyl, Cimetidine, Cisapride, Diphenoxylate, Domperidone, Famotidine, Loperamide, Mesalazine, Nizatidine, Omeprazole, Ondansetron, Ranitidine, Sulphasalazine.

Shailendra Kumar et al prepared fast disintegrating combination tablets of Omeprazole and Domperidone by using pertinent disintegrants. From the results obtained, they concluded that the tablet formulation prepared with 4.76% Ac-Di-Sol (internally cross linked form of sodium carboxymethyl cellulose) i.e. 10 mg showed Disintegration time of 15 seconds in vitro. [35]

S. Patra et al developed mouth dissolving tablets of Domperidone with superdisintegrants like crospovidone, croscarmellose sodium and sodium starch glycolate in various concentrations like 3%, 4% and 6% w/w by direct compression method. The formulation F3 (containing 6% w/w concentration of crospovidone) was considered to be the best formulation, having disintegration time of 9 s, wetting time of 15 s and in vitro drug release of 99.22% in 15 min. [36]

31. LIPID REGULATING AGENTS

Bezafibrate, Clofibrate, Fenofibrate, Gemfibrozil, Probucol.

32. LOCAL ANAESTHETICS

Lidocaine

33. MUSCLE RELAXANTS

N.G. Raghavendra Rao et al designed and developed fast dissolving tablets containing Baclofen by direct compression method. Based on the results they concluded that, although differences existed between the superdisintegrants, the fast dissolving Baclofen tablets could be prepared by using any of the superdisintegrants used. Overall results indicates that formulation BD (which contain 9% CP was better one and satisfies all the criteria as fast dissolving tablet. Baclofen showing enhanced dissolution, may lead to improved bioavailability, improved effectiveness and hence better patient compliance. [37]

34. NEURO-MUSCULAR AGENTS

Pyridostigmine

35. NITRATES AND ANTI-ANGINAL AGENTS
Amyl nitrate, Glycerlitrinitrate, IsosorbideDinitrate, IsosorbideMononitrate, PentaerythritolTetranitrate.

36. NUTRITIONAL AGENTS

Betacarotene, vitamin A, vitamin B2, vitamin D, vitamin E, vitamin K.

37. OPIOID ANALGESICS

Codeine, Dextropropoxyphene, Diamorphine, Dihydrocodeine, Meptazinol, Methadone, Morphine, Nalbuphine, Pentazocine.

38. PROTEINS, PEPTIDES AND RECOMBINANT DRUGS

Insulin, glucagon, growth hormone (somatotropin), polypeptides or their derivatives, calcitonins and synthetic modifications thereof, enkephalins, interferons, LHRH and analogues (nafarelin, buserelin, zolideX), GHRH, secretin, bradykin antagonists, GRF, THF, TRH, ACTH analogues, IGF (insulin like growth factors), CGRP (calcitoningene related peptide), atrial natriuretic peptide, vasopressin and analogues (DDAVP, lypressin), factor VIII, G-CSF (granulocyte-colony stimulating factor), EPO (erythropoietin).

39. SEX HORMONES


40. STIMULANTS

Amphetamine, Dexamphetamine, Dexfenfluramine, Fenfluramine, Mazindol, Pemoline.

41. TOCOLYTIC AGENTS

P. P. Sawarikar et al aimed to investigate development and evaluation of inclusion complex of Isoxsuprine hydrochloride with β-cyclodextrin using kneading and co precipitation methods using DSC. They concluded that the fast dissolving drug delivery system of Isoxsuprine HCl can be successfully formulated. [38]

CONCLUSION

Drug delivery system has become an important subject in the past decade. Development of this system has significantly boosts the pharmaceutical market by extending product life cycles and creating opportunities for many. Researchers are using new advanced
technologies with very interesting features like extremely low disintegration time, exceptional taste masking ability, pleasant mouth feel and sugar free tablets for diabetic patients for the formulation of orodispersible tablets. Pharmaceutical companies are taking advantage of the fast dissolving tablets to extend product line and market the product first. With the rapid growth of fast dissolving tablets, it is just the matter of time for all drugs to be produced in the orodispersible tablet dosage form rather than the conventional tablets.

REFERENCES


