IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
Review Article
February 2015 Vol.:2, Issue:3

A Review on Immediate Release Tablet Dosage Form

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

JISHAN ALI AHMED*

Jaipur College of Pharmacy, Department of Pharmaceutics, ISI-15, RIICO Sitapura Institutional Area, Jaipur (Rajasthan)-302011, India

Submission: 25 January 2015
Accepted: 4 February 2015
Published: 25 February 2015

www.ijppr.humanjournals.com

Keywords: Immediate release tablet, Conventional techniques, Rapid Disintegration

ABSTRACT

Among all the different routes of administration, oral route of administration continues to be the most preferred route due to various advantages including ease of ingestion, avoidance of pain, versatility and most importantly patient compliance. Likewise among all dosage forms tablet is the most popular dosage form existing today because of its convenience of self administration, compactness and easy manufacturing. Sometimes immediate onset of action is considered obligatory immediate release tablets are the final option. Recently immediate release tablets have started gaining popularity and acceptance as a drug delivery system, mainly because they are easy to administer and lead to better patient compliance. In the present work, we engage in discussion about formulation, development, and evaluation of immediate release tablets. An immediate release dosage form allows a manufacturer to extend market exclusivity. They are also a tool for expanding markets, extending product life cycles and generating opportunities.

INTRODUCTION

Oral route is most popular for systemic effect due to its easy of ingestion, pain, avoidance, versatility and most importantly, patient compliance. Solid oral delivery systems (especially tablets) is system of choice among all drug delivery system and they do not require special treatment and are therefore less expensive to manufacture, likewise immediate release tablets are more acceptable among all the tablets[(1)]. Based on their drug-release characteristics, tablets can be classified into three types, immediate release, extended release and, delayed release. For immediate release tablets the drug is intended to be released rapidly after administration, or the tablet is dissolved and administered as a solution. This is the most common type of tablet and includes disintegrating, chewable, effervescent, sublingual and buccal tablets. They design to disintegrate and release their medication with no special rate controlling features [(2,3)]. Immediate Release Tablets are those tablets which are designed to disintegrate and release their medication with no special rate controlling features, such as special coatings and other techniques[(4)]. In pharmaceutical industries, manufactures of generic tablets are usually focused on the optimization of the excipients mixture composition to obtain a product that meet established standard[(5)].

An ideal dosage regimen in the drug therapy of any disease or the goal of any drug delivery system is the one, which immediately attains the desired therapeutic concentration of drug in plasma (or at the site of action) and maintains it constant for the entire duration treatment[(6,7)].

Pharmaceutical products designed for oral delivery and currently available on the prescription and over-the-counter markets are mostly the immediate release type, which are designed for immediate release of drug for rapid absorption[(8)]. Immediate release drug delivery systems are designed to provide immediate drug levels in short period of time[(9)]. In recent decades, a variety of pharmaceutical research has been conducted to develop new dosage forms considering quality of life, most of these efforts have been focused on ease of medication[(10)].

An immediate release dosage form allows a manufacturer to extend market exclusivity, while offering patients a convenient dosage form or dosage regimen[(11)]. Recently immediate release tablets have started gaining popularity and acceptance as a drug delivery system, mainly because they are easy to administer, has quick onset of action is economical and lead to better patient

compliance. They are also a tool for expanding markets, extending product life cycles and generating opportunities. Superdisintegrants are first choice of excipients which are extensively used for the formulation development of the immediate release tablets as they effectively result into the immediate disintegration, release and absorption of the drug after administration into the body. Cross carmellose sodium which is commonly known as Ac-di-sol is cross linked carboxy methyl cellulose sodium and sodium starch glycolate is a carboxy methyl starch and both of which are stable through hygroscopic material[2,12].

Ideal Properties

Immediate release dosage form should

1. It should dissolve or disintegrate in the stomach within a short period In the case of solid dosage.
2. Should show first absorption and dissolution of drug.
3. Rapid onset of action always seen with immediate release tablets.
4. Must be compatible with taste masking.
5. Be portable without fragility concern.
6. It should not leave minimal or no residue in the mouth after oral administration.
7. Provides pleasing mouth feel.
8. Exhibit low sensitivity to environmental condition as humidity and temperature.
9. Be manufactured using conventional processing and packaging equipment at low cost[1,13].

Advantages

An immediate release pharmaceutical preparation offers

1. Improved stability, bioavailability.
2. Decreased disintegration and dissolution times for immediate release oral dosage forms.
3. Suitable for controlled, sustained release actives.
4. High drug loading is possible.
5. Ability to provide advantages of liquid medication in the form of solid preparation.
6. Adaptable and amenable to existing processing and packaging machinery.
7. Cost- effective.
8. Improved compliance added convenience[1,13].

9. Accurate dose: The immediate/fast dissolve dosage forms have the added advantages of convenience and accurate dosing as compared to liquids.
10. Ease of swallowing is possible[8].
11. Bilayer tablet is possible for sequential release of two drugs in combination and separate two incompatible substance[14].

Disadvantage

1. Frequent dosing is necessary for drug with short half life.
2. Drug release at a time may produce high plasma concentration which may produce toxicity.

Salient Features

- Drugs should possessing long biological half life for immediate release drug delivery.
- The drug is released quickly and completely in one shot.
- High bioavailability expected with immediate release dosage form[15].
- Lower clearance and lower elimination half life are also requirement for immediate release drug delivery system[16].
- But main criterion for immediate release dosage form is poor solubility of the drug and need the immediate action of drug to treat unwanted defect or disease (Papanas *et al*., 2009; Natarajan *et al*., 2011)[9,17].
- Rapid drug therapy intervention is possible.
- New business opportunities like product differentiation, line extension and lifecycle management, exclusively of product promotion[8].

Criteria for Drug Selection

Poor solubility of the drug and need immediate drug action in case of immediate release dosage form.

The immediate release compositions comprise micronized drug in an amount sufficient to provide the desired daily dosage, that is, an amount of about 10 mg to about 1000 mg, more preferably an amount of about 20 mg to 400 mg[1,18].

Immediate release compositions from which about 50% of the micronized drug is dissolved in vitro within about 15 minutes, more preferably at least about 80% of the drug is dissolved in vitro within about 30 minutes[1].

Carrier materials for immediate release compositions preferably are selected to provide a disintegration time less than about 30 minutes, preferably about 20 minutes or less, more preferably about 18 minutes or less[1,17].

Unsuitable drug characteristic for immediate release tablets

- Drug are not suitable for immediate release tablets which having short biological half life.
- Drug with low bioavailability are also not desirable candidate for immediate release tablets.
- Drug with higher clearance and higher elimination half life are also not desirable candidate for immediate release tablets[17].

Technology for Immediate release Tablets

Conventional Techniques

Conventional technique used in the preparation of immediate release tablets

* Tablet molding technique
* Direct compression technique
* Granulation technique
* Mass extrusion technique[1]

Several Technologies are available to manufacture immediate release tablets. The most common preparation methods are moulding, lyophilisation or freeze drying, direct compression, spray drying and sublimation[19].

Tablet molding technique

Water-soluble ingredients are used in tablet molding technique which facilitate tablet to disintegrate and dissolve rapidly. A hydro alcoholic solvent use to moisten powder blend and is molded in to tablet using compression pressure lower than used in conventional tablets compression. The solvent is then removed by air-drying. Two problems commonly encountered are mechanical strength and poor taste masking characteristics in this technique[1].

Direct Compression Method

In this process tablets are compressed directly from powder mixture. No special treatment is required for the powder blend. Amongst all tablets preparing techniques, direct compression is the most advanced technology[1].

Granulation technique

Immediate release tablets are prepared by granulation technique. In this technique generally two methods are use, one is wet granulation another is dry granulation. Among this wet granulation is most popular method to prepare a tablet[20].

Mass-Extrusion (Mass-Extrusion)

Here softening of active blend done with 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. In case of bitter drug granules can be coated with the help of dried cylinder to achieve taste masking [21].

Immediate release solid dosage forms prepared by solid dispersions

When formulating such solid amorphous dispersions into immediate release solid dosage forms for oral administration to a use environment such as the GI tract of an animal such as a human, it is often desirable to maximize the amount of dispersion present in the dosage form[22].

Disintegrates addition

An excipient called disintegrant are added to a tablet or capsule blend to aid in the breakup of the compacted mass when it is put into a fluid environment. Disintegrant are used in immediate release tablets to enhance dissolution and hence bioavailability of any drug. Disintegration is one of important process. “Superdisintegrants” newer substances are more effective at lower concentrations with greater disintegrating efficiency and mechanical strength (Bhowmik et al., 2010)[23]. Few Super-disintegrants are available commercially as Croscarmellose sodium, Crospovidone and Sodium starch glycolate[24,25]. In the present investigation, we tried to judge the disintegration efficiency of disintegrants by comparing various parameters such as disintegration time, wetting time, maximal water uptake capacity and dissolution study of tablet. Disintegrants powder properties like swelling and hydration capacity was compared[1,19].

Few therapeutical area uses in the formulation of immediate release dosage form

1. Analgesics and Anti-inflammatory Agents: Ibuprofen, Indomethacin, Ketoprofen, Meclofenamic Acid, Mefenamicacid, Nabumetone, Oxyphenbutazone.
2. Anthelmintics: Albendazole, Mebendazole, Oxantel, Embonate, Embonate, Thiabendazole.
3. Anti-Arrhythmic Agents: Amiodarone Hcl, Disopyramide.
4. Anti-bacterial Agents: Penicillin, Ciprofloxacin HCl, Clarithromycin, Clofazimine, Doxycycline, Erythromycin, Nalidixic Acid, Nitrofurantoin, Rifampicin, Sulphabenzamide, Sulphamethoxazole, Sulphapyridine, Trimethoprim.
5. Anti-coagulants: Dicoumarol, Dipyridamole.
6. Anti-depressants: Amoxapine, Ciclazindol, Maprotiline HCl, Mianserin HCl,Trazodone HCl.
7. Histamine H,-Receptor Antagonists: cyclizine, cyproheptadine HCl, dimenhydrinate, flunarizine HCl.
8. Anti-diabetics: Acetohexamide, Chlorpropamide, Glibenclamide,Gliclazide, Glipizide.
9. Anti-hypertensive Agents: Amlodipine, Carvedilol, Benidipine, Darodipine, Dilitazem HCl, Diazoxide, Guanabenz Acetate, Indoramin, Isradipine, Minoxidil, Nicardipine HCl, Nifedipine, Nimodipine, Reserpine.
10. Gastro-intestinal Agents: cimetidine, cisapride, diphenoxylate HCl,famotidine, loperamide, mesalazine,nizatidine, omeprazole.
11. Diuretics: Acetazolamideamiloride, bendrofluazide, bumetanide, chlorothiazide, chlorthalidone, ethacrynic acid,frusemide, metolazone, spironolactone, triamterene.
12. Cardiac InotropicAgents: Amrinone, Digitoxin, Digoxin, Enoximone, Lanatoside C, Medigoxin.
13. Anxiolytic, Sedatives, Hypnotics and Neuroleptics: Etizolam, Alprazolam, Amylobarbitone, Barbitone, Bentazepam, Bromazepam, Bromperidol, Brotizolam, Chlormethiazole, Chlorpromazine, Diazepam, Droperidol.
14. Histamine H,-Receptor Antagonists: Acrivastine, astemizole, cinnarizine, cyclizine, cyproheptadine HCl, dimenhydrinate, flunarizine HCl[(1)].

Table 1: A List of Marketed Product of Immediate Release Tablets

Sl. No.	Brand name	Active ingredient	Application	company
1	Voltaren 50/75 mg	Diclofenac potassium	used to treat pain or inflammation	Novartis Pharmaceuticals
2	Cataflam 50 mg	Diclofenac potassium	used to treat pain or inflammation	Novartis
3	Diltiazem 120 mg	Diltiazem	Treating high blood pressure and chronic stable angina (chest pain)	Piramal enterprises ltd.
4	*Nucynta 58.24/ 87.36 mg*	*Tapentadol*	used to treat moderate to severe chronic pain	Janssen Pharmaceuticals
5	Isoptin 40/80/120mg	Verapamil hydrochloride	Treating high blood pressure and angina (chest pain)	Abbott
6	Calan 80mg	Verapamil	high blood pressure and chronic stable angina (chest pain)	Pfizer

Preformulation Studies

Bulk Density (ρ_B)

Bulk density is determined by constant mass method using graduated cylinder. The bulk density is an apparent density. The bulk density of a powder is the ratio of the mass of an untapped powder sample to its volume, including the contribution of the interparticulate void volume[26]. It is expressed in gm/ml and is given by[27]

$$\textbf{Bulk density } (\rho_B) = M / Vo$$

Where,

M = mass of the powder (weight taken in g)

Vo = Void volume (Untapped Volume in ml)

Tapped density

Tapped density is the ratio of total mass of the powder to the tapped volume of the powder. Taped volume is measured by taping measuring cylinder till there is little bit or no change of reading. It is expressed in gm/ml and is given by[28]

$$\textbf{Tapped density } (\rho_T) = M / V_f$$

Where,

M = mass of the powder (weight taken in g)

V_f = Tapped Volume (Final bulk volume after tapped in ml)

Hausner ratio

Hausner ratio is an indirect index to predict of powder flow. It is calculated by the following formula[7].

Hausner ratio = Tapped density (ρ_T) / Bulk density (ρ_B)

Hausner ratio is also calculated by following formula[28]

$$\textbf{Hausner ratio} = V_o / V_f$$

Compressibility index (Carr's index)

Compressibility index (Carr's index) is an indirect parameter to assume flow property of powder. Compressibility index determined by measuring the initial volume (Vo) and final volume (V_f) after complete tapings of powder sample in a measuring cylinder. It is calculate using equation[28]

$$\textbf{Compressibility index (CI)} = \frac{V_o - V_f}{V_o} \times 100$$

Alternatively, compressibility index may be calculated using measured values for bulk density (ρ_B) and tapped density (ρ_T) as follows[7,19]

$$\textbf{Compressibility index} = 100 \times \{(\rho_T - \rho_B) / \rho_T\}$$

Table 2: Flowability according to Compressibility & Hausner Ratio

Compressibility Index (%)	Flow character	Hausner ratio
≤10	Excellent	1.00 – 1.11
11 – 15	Good	1.12 – 1.18
16 – 20	Fair	1.19 – 1.25
21 – 25	Passable	1.26 – 1.34
26 – 31	Poor	1.35 – 1.45
32 – 37	Very poor	1.46 – 1.59
≥38	Very, very poor	>1.60

In recent years Compressibility index and Hausner ratio have become simple, fast and popular methods of predicting powder flow characteristics [28].

Angle of repose

The angle of repose is three-dimensional angle (relative to the horizontal base) assumed by a cone-like pile of material formed by different methods. The angle of repose has been used in several branches of science to characterize the flow properties of solids. A variety of methods are reported in the literature to calculate angle of repose, but most common method is fixed height method. In fixed funnel method employ a funnel that was secured with its tip at a given height (2cm), above the graph paper that was placed on a flat horizontal surface. Granules or tablet blend were carefully poured through the funnel until the apex of the conical pile just touches the tip of the funnel. Thus, with r being the radius of the base of the conical pile. Angle of repose is calculate using formula[13].

$$\mathbf{Tan\ \theta = h / r}$$

$$\mathbf{Angle\ of\ repose\ (\theta) = \tan^{-1}(h / r)}$$

Where,

h = height of the powder pile

r = radius of pile circle

Table 3: Flow Properties and Corresponding Angle of Repose

Flow property	Angle of repose (degrees)
Excellent	25 – 30
Good	31 - 35
Fair	36 – 40
Passable	41 – 45
Poor	46 – 55
Very poor	56 - 65
Very, very poor	>66

Drug–Excipient Interaction Study

Drug will be in intimate contact with one or more excipients in all the dosage forms. Interaction could affect the stability of drug[6]. The drug, polymer and other formulation ingredients were characterized by IR spectroscopy using a FTIR. The spectra were taken by KBr discs method in different range like 4000-400 cm^{-1} and subjected to DSC to find out the interaction between formulation ingredients which helps to avoid harmful ingredients in the formulation to produce a stable product[19].

Evaluation of immediate release tablets

All tablets are evaluated for different parameters as appearance, thickness, diameter, hardness, friability, uniformity of weight, disintegration time, drug content and *in vitro* dissolution study.

Appearance

In general appearance of a tablet is its visual identity which is determine directly by observing tablets. Appearance is including elegance, shape, color, surface textures. These all parameters are essential for suitability and consumer acceptance[13].

Dimensional Analysis

Thickness and diameter of tablets are determined using Vernier Caliper. Randomly twenty tablets selecte from each batch are use and average values are calculated. Thickness is expressed in Mean ±SD and unit is mm[9].

Hardness

Hardness of tablet is an indication of its strength against resistance of tablets to capping, abrasion or breakage under conditions of storage, transportation and handling before usage. Hardness is measuring the force required to break the tablet using a specific device. Hardness of 10 tablets (randomly) from a complete batch are determined by Different hardness tester (Monsanto hardness tester, Pfizer hardness tester). Hardness measured in kg/cm^2[26].

Weight variation test

Weight variation test is carried out in order to ensure uniformity in the weight of tablets in a batch. Individual weights of 20 tablets are taken randomly from whole batch. Individual weight is then compared with the average weight for the weight variations. USP 30-NF25 limits for

weight variation in case of tablets weighting up to 130mg or less is ± 10%, 130 mg to 324 mg is ± 7.5% and more than 324 mg is ± 5%[29]. IP limit for weight variation in case of tablets weighting up to 80mg or less is ± 10%, 80 mg to 250 mg is ± 7.5% and more than 250 mg is ± 5%[30].

$$\mathbf{PD = [(W_{avg} - W_{initial}) / (W_{avg})] \times 100}$$

Where, PD = Percentage deviation,

W_{avg} = Average weight of tablet,

$W_{initial}$ = Individual weight of tablet[9].

Friability test

Tablet friability test is determined for compressed uncoated tablets with friabilator. Measurement of tablets friability supplements other physical strength measurement, such as tablet crushing strength. For tablets with a unit mass equal to or less than 650mg take a sample of whole tablets n corresponding as near as possible to 6.5 g. For tablets with a unit mass of more than 650 mg, take a sample of 10 whole tablets. The tablets should be carefully dedusted prior to testing. Accurately weigh the tablet sample, and place the tablets in the drum. Rotate the drum 100 times, and remove the tablets. Remove any loose dust from the tablets as before, and accurately weigh. The drum is attached to the horizontal axis of a device that rotates at 25 ±1 rpm. Thus, at each turn the tablets roll or slide and fall onto the drum wall or onto each other. A maximum mean mass loss from the three samples of not more than 1.0% is considered acceptable for most products[28,31].

$$\text{\% friability} = \frac{\text{Initial weight - final weight}}{\text{Initial weight}} \times 100$$

Wetting time study

Five circular tissue papers of 10cm diameter were placed in a petridish containing 0.2% w/v solution of amaranth (10ml). One tablet was carefully placed on the surface of the tissue paper. The time required for develop blue color due to amaranth water soluble dye on the upper surface of the tablets was noted as the wetting time[13].

Water absorption ratio

A small piece of tissue paper folded twice was placed in a small petridish containing 6ml of water. A tablet was put on the paper before that initial weight of tablet is noted. The wetted tablet is then weighed. Water absorption ratio (R) is determined using equation,

$$R = (Wa - Wb) / Wa \times 100$$

Where,

Wa = weight of the tablet before absorption.

Wb = weight of the tablet after absorption[13,32].

Disintegration test

Disintegration test is carried out with the help of disintegration apparatus. Place 1 dosage unit in every tubes (six) of the basket, if prescribed use a disk. Use water as immersion fluid in not specified, maintained at $37^{o} \pm 2^{o}C$ in immersion fluid. Operate the apparatus till each of the unit dosage come out from the basket, 15 minutes for uncoated tablets[30]. 30 minutes for plain tablets, and 60 minutes for coated tablets and pills[28]. If 1 or 2 tablets fail to disintegrate completely repeat the test on another 12 tablets, not less than 16 tablets of the total 18 tablets are disintegrated[29].

Drug content

10 tablets were powdered and 100mg drug equivalent powder dissolved in suitable media (buffer or 0.1N HCl). Volume of the solution made up to 100ml by that media. Solution was filtered and diluted 100times and analyzed spectrophotometrically and further calculation carried out to determine drug content in one tablet[13].

***In- vitro* drug release study**

Drug release studies were carried out in dissolution test apparatus using specified volume 900ml of dissolution media maintained at $37 \pm 0.5^{0}C$. The tablets are kept in the cylindrical basket or directly placed in medium and immediately operate the apparatus at the specified rate. Within the time interval specified (5, 10, 15 & 30 minutes) or at each of the times stated, withdraw a specimen from a zone midway between the surface of the Dissolution Medium and the top of the rotating basket or blade, not less than 10 mm from the vessel wall and same volume of fresh

medium is replace each time. The samples are filter and from the filtrate 1ml is taken and dilute to 10ml. These samples are analyzed and further calculation is carried out to get drug release. The drug released data were plotted and tested with zero order (Cumulative % drug released Vs time), First order (Log % Remained Vs time). The *in-vitro* dissolution kinetic parameters, dissolution rate constants, correlation coefficient and dissolution efficiency were calculated[13,28]. The recent International Conference on Harmonization (ICH) Q6A guideline recommends using a single-point measurement test to measure the release of drug substance from immediate-release drug products[33].

Packaging

Packaging is important part in formulation and development of a dosage forms because a perfect formulation that satisfies all the criteria will not pack in a proper way, there is no use of maintain precautions (quality aspect) during formulation process. Packaging is done for immediate release tablets as per the normal tablets such as blister pack, strip pack, bubble pack, tamper-resistant pack etc. But for the photosensitive drug packing should done in *alu-alu* pack[34].

Stability testing

The ICH Q1A, Q1B, Q1C, and Q5C are publications on stability. Lack of drug stability may affect the purity, potency, and safety of the drug product. Pharmaceutical stability may be applied a formulation, a drug product, or a packaged product. Changes in drug stability could risk patient safety, since the dosage amount to patient may be lower than expected or instability may also lead to formation of toxic degradants. Stability testing therefore allows the establishment of recommended storage conditions, retest periods, and ultimately product shelf-life and expiry dating. A combination of temperature and humidity is necessary to evaluate the stability of a drug substance or drug product. In storage chamber temperature must be controlled within $\pm 2^0$C, and the humidity controlled within ±5% relative humidity. For drug product stored at room temperature. The guideline recommends that testing will be done every 3 months over the first year, every 6 months over the second year, and annually thereafter. It does indicate that a minimum of three time points (including the initial and final time points) is necessary for accelerated and four time points for intermediate conditions[35].

Stress Testing

Stress testing is necessary to evaluate the drug substance and drug product under various conditions of elevated temperature and humidity. Data from these stress studies could also be useful in understanding the stability profile during manufacturing, storage, shipping, and patient use. These studies provide insight into the potential degradation products and assist in establishing the degradation pathways. These stressed samples could also be used to challenge the stability indicating power of the analytical procedures[35].

Intermediate condition

The ICH guideline defines an intermediate condition of 30°C ± 2 °C / 65% RH ±5% RH[35]. When testing at the intermediate storage condition is called for as a result of significant change at the accelerated storage condition, a minimum off our time points, including the initial and final time points (e.g. 0, 6, 9 and12 months), from a 12-month study is recommended[36].

Accelerated Stability study

Under accelerated condition of 40°C ± 2°C / 75% RH ±5% RH according to the ICH guideline[35]. At the accelerated storage condition, a minimum of three time points, including the initial and final time points (e.g. 0, 3 and 6 months), from a six-month study is recommended. If accelerated testing are likely to approach desirable criteria, testing should be increased either by adding samples at the final time point or by including a fourth time point in the study design[36].

Long term stability testing

In general case 25 °C ±2 °C / 60% RH ±5% RH or 30 °C ±2 °C / 65% RH ±5% RH or 30 °C ±2 °C / 75% RH ±5% RH is use for long term stability. The frequency of testing at the long-term storage condition should normally be every three months over the first year, every six months over the second year and annually thereafter throughout the proposed shelf-life. The long-term testing should cover a minimum of six or 12 months at the time of submission and should be continued for a period of time sufficient to cover the proposed shelf-life[36].

CONCLUSION

Immediate release tablets are applicable to a wide range of therapeutic agents. Approximately one-third of the patients need quick therapeutic action of drug. Some time immediate onset of action is desirable, to fulfill these medical needs, formulators have devote considerable effort to

develop a novel type of tablet dosage form for oral administration, one that disintegrates and dissolves rapidly with enhanced dissolution. Due to the constraints of the current technologies, there is an unmet need for improved manufacturing processes for immediate release tablets that are mechanically strong, allowing ease of handling, packaging and with low production costs. A new dosage format is possible combine with immediate release bilayer tablet, one who provide one half immediate release portion and another half extended release portion for the better efficacy from the therapy also bilayer is possible for combination dose, which also may offers the combine advantage of ease dosing and convenience for dosing. An extension of market exclusivity, which can be provide by immediate release dosage form, leads to increased revenue, while also targeting underserve and undertreated patient populations.

REFERENCES

1. Patel U, Patel K, Shah D, Shah R. A review on immediate release drug delivery system. International journal of pharmaceutical research and bio-science. 2012; 1(5): 37-66.
2. Bhattacharjee A. Formulation and evaluation of immediate release tablets of bromocriptine mesylate by direct compression method. Indo american journal of pharmaceutical research. 2013; 3(3): 2841 – 2845.
3. Alton ME. Pharmaceutics the science of dosage form design. Second edition. churchill livngstone; 2002.
4. Gowtham M, Vasanti S, Rohan RD, Ashwath N, Paridhavi M. Formulation and evaluation of immediate release folic acid tablets. Scholars Research Library. 2011; 3 (6): 157-162.
5. Pathak N, Kumar A, Methkar V, Pant P, Rao RT. Formulation and optimization of immediate release tablet of an antialcoholic drug by dry granulation method. International Journal of comprehensive pharmacy. 2011; 2(3): 1-4.
6. Shilpa SK, Kumar AM, Garigeyi P. Formulation and optimization of clopidogrel bisulfate immediate release tablet. International journal of pharmaceutical, chemical and biological sciences. 2012; 2(1): 38-51.
7. Deepak G, Rahul R, Senthil A, Uday S. Formulation and evaluation of irbesartan immediate release tablets. International research journal of pharmacy. 2012; 3(4): 410 – 415.
8. Patel N, Naruka PS, Chauhan CS, Modi J. Formulation Development and Evaluation of Immediate Release Tablet of Topiramateanti Epileptic Drug. Journal of Pharmaceutical Science and Bioscientific Research. 2013; 3(2): 58 – 65.
9. Bansal M, Bansal S, Garg G. Formulation and Evaluation of Immediate Release Tablets of Zaltoprofen, Scholars Academic Journal of Pharmacy. 2013; 2(5): 398 - 405.
10. Ansel HC, Popovich NG, Allen LV. Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems. Ninth edition. London, New Yorl. Copyright by Lippincott Williams & Wilkins; 2011.
11. Ajaykumar B, Sridivya G, Narendrababu NV, Reddi L, Ujvala K, Sekhar CB, Chandra R. Formulation and evaluation of secnidazole conventional tablets by direct compression method. International journal of pharmacy and biological sciences. 2012; 2(3): 364-371.
12. Bokshi B, Malakar A. Formulation and evaluation of allylestrenol immediate release tablets. International journal of pharmaceutical sciences and research. 2012; 3(6): 1679 – 1683.
13. Sandeep N, Gupta MM. Immediate drug release dosage form: a review. Journal of drug delivery & therapeutics. 2013; 3(2): 155 - 161.
14. Patel N, Natarajan R, Rajendran NN, Rangapriya M. Formulation and evaluation of immediate release bilayer tablets of telmisartan and hydtochlorothiazide. International journal of pharmaceutical sciences and nanotechnology. 2011; 4 (3): 1477-1482.
15. Rajesh M, Nagaraju K, SH Seyed MB. Formulation and evaluation of clarithromycin immediate release film coated tablets. International journal of pharmacy and pharmaceutical sciences. 2012; 4 (5): 352-357.

16. Natarajan R, Vaishnani R, Rajendra NN. Formulation and evaluation of immediate release tablets of paroxetine hcl using different superdisintegrants. International Journal of Research in Pharmaceutical and Biomedical Sciences. 2011; 2 (3): 1095- 1099.
17. Ratnaparkhi M, Dhage K, Chaudhari S, Salvankar S. Formulation and evaluation of immediate release tablets of metformin HCL and Glibenclemide using different superdisintegrants. PharmaTech Medica. 2012; 1(3): 80-85.
18. Bansal M, Bansal S, Garg G. Formulation and Evaluation of Immediate Release Tablets of Zaltoprofen. Scholars Academic Journal of Pharmacy. 2013; 2(5): 398 – 405.
19. Patel HP, Karwa P, Bukka R, Patel NJ. Formulation and evaluation of immediate release tablets of zolpidem tartrate by direct compression. International journal of pharmaceutical sciences review and research. 2011; 7(2): 80-85.
20. Das AK, Bhanja S, Srilakshmi N. Formulation and evaluation of quetiapine immediate release film coated tablets. Asian journal of pharmaceutical and clinical research. 2013; 6(2): 109-114.
21. Vaishali Kilor, Nidhi Sapkal, Awari J, Shewale B. Development And Characterization Of Enteric-Coated Immediate-Release Pellets Of Aceclofenac By Extrusion/Spheronization Technique Using Carrageenan As A Pelletizing Agent, AAPS Pharmscitech. 2010; 11(1): 336-343.
22. Luber: Immediate Release Tablet, United States Patent 20080095845.
23. Ahmed S, Nazmi M, Hasan I, Sultana S, Haldar S, Reza S. Fexofenadine HCl immediate release tablets: *in vitro* characterization and evaluation of excipients. Bangladesh pharmaceutical journal. 2013; 16(1): 1- 9.
24. Nyol S, Gupta MM. Formulation development and evaluation of immediate drug release tablet dosage form of sitagliptin phosphate. International journal of pharmaceutical research and development. 2013; 5(3).
25. Kumar PT, Chandra S, et al. Formulation and evaluation of film coated ticlopidine hydrochloride immediate release tablets. International research journal of pharmacy. 2012; 3(5): 469 – 472.
26. British Pharmacopoeia: British Pharmacopoeia Commission Office. London; 2013.
27. Tiwari AK, Shah H, Rajpoot A, Singhal M. Formulation and in-vitro evaluation of immediate release tablets of drotaverine HCl. Journal of chemical and pharmaceutical research. 2011; 3(4): 333-341.
28. Hosokawa R: Japanese Pharmacopoeia. The Minister of Health, Labour and Welfare Ministerial Notification No. 65 16th edition; 2011.
29. USP 30-NF 25. The United States Pharmacopoeial Convention. The official compendia of standards 2007; Copyright 2006.
30. Indian Pharmacopoeia: Volume 2: The Indian Pharmacopoeia Commission Ghaziabad 2007.
31. Rai VK, Pathak N, Bhaskar R, Nandi BC, Dey S, Tyagi LK. Optimization of immediate release tablet of raloxifene hydrochloride by wet granulation method. International journal of pharmaceutical sciences and drug research. 2009; 1(1), 51 – 54.
32. Inamdar M, Abhang P. Formulation and evaluation of immediate release tablets of tramadol HCl using different superdisintegrants. International journal of advances in pharmaceutical research. 2012; 3 (11): 1240 – 1245.
33. Gupta A, Khan MA, Hunt RL, Shah RB, Sayeed VA. Disintegration of highly soluble immediate release tablets: a surrogate for dissolution. American association of pharmaceutical scientists. 2009; 10(2): 495 – 499.
34. Theobald N, Winder B. Packaging Closures and Sealing Systems. Blackwell Publishing Ltd, 9600 Garsington Road, Oxford OX4 2DQ, UK; First published 2006.
35. Kim Huynh-Ba. Handbook of stability testing in pharmaceutical development regulations, methodologies, and Best Practices, Publisher- Springer Science Business Media, LLC, 233 Spring Street, New York, NY 10013, USA; July 2008.
36. World Health Organization, Stability testing of active pharmaceutical ingredients and finished pharmaceutical products, WHO Technical Report Series, No. 953; 2009. Annex 2.