**Advances in Applied and Pharmaceutical Sciences Journal**

Volume 1, Issue 3 (2017): 1-13
Available online at www.aapsj.in

**Review Article**

# Compression Coating Tablet As A Novel Dosage Form: A Review

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**Article information**
Received: 15 November 2017
Received in revised form: 19 December 2017
Accepted: 25 Drcember 2017
Available online: 1 January 2018
Subject: Pharmaceutical Sciences
Branch: Pharmaceutics

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**DOI:** 10.26768/AAPSJ.1.3.1-13

**Quick Response Code**

## Abstract

Tablets are most widely used dosage form because of its ease of manufacture, administration, lower cost, good aesthetic appearance .In this article,we describe the introduction, classification, formulation consideration, polymer used and defects of compression coating tablet (CCT). Nowa day'sformulation of conventional tablet in the form of modified tablet dosage forms like floating, coated tablets, sustained release matrix, controlled release tablet and fast release, etc.is an emerging trend.Compression coated tablets includes its classification, various commonly used polymers, formulation method of compression coated tablet and existing formulations of various categories of drugs. The compression coating Tablet technique can be applied to modified extended release with multiphase pattern and delayed release (it is based on the time controlled, pH controlled release and bacterial degradable controlled release). Drug release of compression-coated tablets can be modified as extended release by the adjusting drug-polymer ratio in core and coat.

**Keywords:** *Tablet, Tablet in tablet technology, Compression coated tablet, OSDRC, Inlay tablet.*

***Cite this article***
*R.Chat, A Dube, SR Shahi " Compression Coating Tablet As A Novel Dosage Form: A Review"Advances in Applied and Pharmaceutical Sciences Journal 1 (2) 2017: 1-13*






e-ISSN No 2457-0842, [Available online at aapsj.in]

## Introduction

Tablet is defined as unit solid dosage form containing medicaments with or without excipients. Pharmaceutical coating isa essential tool tomask unpleasant odor and taste, enteric delivery,physical and chemical protection for the drug,and to get modified drug release. In a conventional aqueoussugar-coating process, natural gums are added to get bettertexture of the coating surface as well as to improve the bindingof the coat to the uncoated tablet surface. This type ofaqueous coating process suffers from the problemslike batch to batch variation in appearance as well as in vitro release.

**Classification of Tablet**

The tablets are classified into various categories which is listed in the following table.

**(A) Tablets ingested orally:**

**1. Compressed tablet:** Compressed tablet is prepared by application of compressive force. The coating of these tablets mainly depends on the property of the material to be coated. For the preparation of compression coated tablet various methods are used such as dry granulation, wet granulation or direct compression.

**2. Multiple compressed tablet:** When there is involvement of two or more incompatible materials within the same tablet then these kind of tablet are prepared.

**Advantage:**

**A.** Drug release in controlled manner
**B.** Drug release for extended period of time
**C.** Incorporation of incompatible material within same tablet

**3. Repeat action tablet:**

Compression coating technique or sugar coating is used to formulate repeat action tablet. The active constituents are divided in parts and are coated to release the drug at specific intervals of time

**4. Delayed release tablet:** The conventional tablets are coated with the material resistant to acidic medium and hence drug not released in stomach but easily get released in intestine. To avoid the first pass metabolism of drug delayed release tablet is good alternative.

**5. Sugar coated tablet:** To mask the unacceptable properties like taste, odor, colour etc. sugar coated tablet are prepared.This is very useful approach in case of paediatric and geriatric patients.

**6. Film coated tablet:** Film coating is used as alternative to sugar coating and also provide the additional strength to the tablet. The polymers such as HPC (Hydroxypropyl cellulose), HPMC (Hydroxypropylmethyl cellulose), Ethyl cellulose are used for this technique. It is simple process as compare to sugar coating process.

**7. Chewable tablet:** Chewable tablet is get disintegrated by chewing and gives faster onset of actin.

**(B) Tablets used in oral cavity:**

**1. Buccal tablet:** These tablets are placed in the buccal cavity to get faster disintegration of tablet.

**2. Sublingual tablet:** These tablets are placed below the tongue to avoid first pass effect and get quick onset of action.

**3. Troches or lozenges:** These are candy like tablets used for the local action of the drug. The cough lozenges of Zeal,Vicks and Strepsils etc are the good examples of troches and lozenges.

**4. Dental cone:** These tablets are prepared to place in the dental cavities. These tablets are generally used to avoid microbial attack in teeth cavities.

**(C) Tablets administered by other route:**

**1. Implantation tablet:** These tablets are placed in the body cavities to provide extended drug release from several days to months up to year.

**2. Vaginal tablet:** These tablets are incorporated in vaginal cavity to prevent the infections. **(D)**

**Tablets used to prepare solution:**

**1. Effervescent tablet:** These tablets are dispersed in the water to produce a solution or suspension with release of carbon dioxide before the administration. These tablets are generally used for carminative effect to expel the gases from the G.I.T.

**2. Dispensing tablet:** These are same as that of effervescent tablets as dispersed in water but the concentration of the drug in the dispersion are taken into consideration.

**3. Hypodermic tablet:** These are one type of sterile preparations. In these, tablets are dissolved in the WFI or sterile water to inject before the actual injection in the hypodermic cavity.

**4. Tablet triturates:** These are usually prepared by using triturate moulds which are rapidly and almost completely soluble.




e-ISSN No 2457-0842, [Available online at aapsj.in]

**TABLE 1: Classification of Tablet**

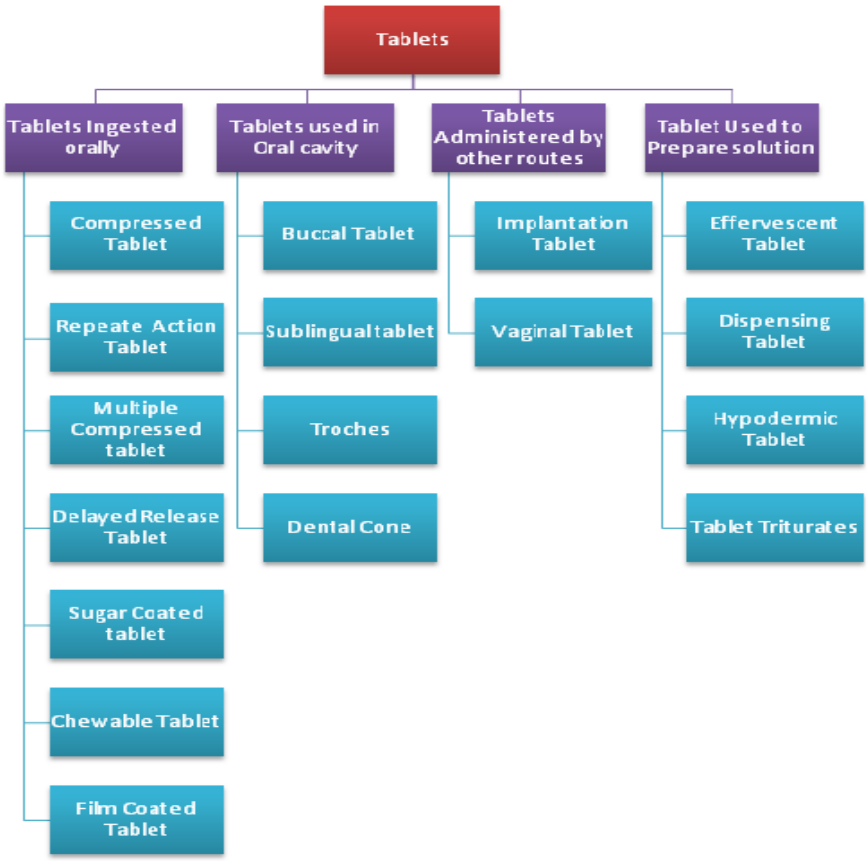


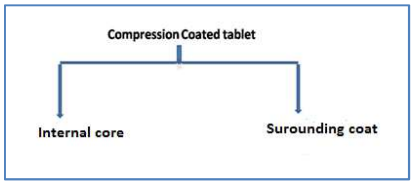

**TABLE 2: List of marketed formulations of various types of tablet**

| Types of Tablet | Example | Brand name | Manufacturer |
|---|---|---|---|
| **A)Tablets ingested orally** | | | |
| 1)Compress tablet | Acetaminophen | Calpol | GlaxoSmithkline |
| 2)Multiple compressed tablet | Orphenadrine citrate | Norgesic | 3M Pharmaceuticals |
| 3)Repeate action tablet | Dexchorpheniramine Maleate | Dexchlor | Taj Pharma |
| 4)Enteric coated tablet | Naproxen | Naprosyn | Rochepalo |
| 5)Sugar coated tablet | Conjugated Oestrogen | Premarin | Wyeth Ltd. |
| 6)Chewable tablet | Pyrantal Embonate | Combantrin | Johnson & Johnson |
| 7)Film coated tablet | Dicolfenac | Voltaren | Novartis Pharma |
| **B)Tablets used in oral cavity** | | | |
| 1)Buccal tablet | Fentanyl | Onsolis | Mylan Pharma |
| 2)Sublingual tablet | Nitroglycerin | Nitrostat | Pfizer |
| 3)Troches | Clotrimazole Troches | Mycelax | Jeednya Pharma |
| 4)Dental cone | Colagen | Parasorb | Resorba |
| **C)Tablets administered by other route** | | | |
| 1)Implantation tablet | Estradiol | Vagifem | Novo Nordisk Inc |
| 2)Vaginal tablet | Clotrimazole | Lotrimin | MSD Consumer Care |
| **D)Tablet used to prepare solution** | | | |
| 1)Effervescent tablet | Rantidine | Zentac | GlaxoSmithkline |
| 2)Dispensing tablet | Naproxen Sod | Aleve | Bayer Healthcare |
| 3)Hypodermic tablet | Morphine Sulfate | Astramorph PF | Parka,davic & co |
| 4)Tablet triturates | Enzyme Tab | Digiplex | Medplus Pharmacy |

## Compression Coated Tablet

It is a system in which the entire surface of an inner core is totally surrounded by the coat these coats prevent drug release from the core until the polymeric or drug coat is fully eroded, dissolved or removed.

**TABLE 3: Composition of compression coated tablet**




It is simple and unique technology used to provide tablets with a programmable lag phase, followed by a rapid, or rate controlled drug release. Release of drug depends upon the coating layer and core composition. It has a solvent-free coating and facilitates manufacturing process. It can be used to deliver one or more drugs.

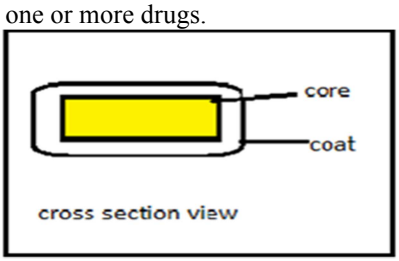



**Figure 1:Cross section view of core and coat**

It is one of theapproaches which combine the features of both controlled release tablet and instant release tablet in one dosage form. It functions like sugar-coated or film-coated tablets in which the coating may cover a bitter substance, conceal an unpleasant or mottled appearance. Providea barrier for a substanceirritating to the stomach or single inactivated by gastric juice.This gives a far more accurate dose than in the case with sugar coating.

**Advantages :-**

1) This technique is simple and inexpensive
2) The organic solvents useful in this technique are required in very less quantity and hence the hazard to the environment is very less using this method
3) The pharmacokinetic drug-drug interaction can also be avoided by this method
4) This technique is a short manufacturing process requires less time as compared to liquid coating.

**Disadvantages:-**

1) The erosion of the core tablet may occur during the second compression of coat
2) Specially designed tablet compression machine are required to prepare compression coated tablets
3) Polymer mixing during the compression may alter the release pattern of the drug.
4) Unequal width of coat diameter may occur in this method.

**Applications**

1. To protect hygroscopic, light-sensitive or acid-labile drugs
2. To separate incompatible drugs from each other and achieve sustained release
3. To modify drug release pattern (delayed, pulsatile and programmable release for different drugs in one tablet)
4. The CCT are very useful in the chronological condition
5. It is also applicable to separate two incompatible materials
6. The sustained release formulation is one of the wide application of this technique

**Approaches**

**1. Multiphasic release:**

Multiphasic release is a delivery system designed for many diseases which have marked diurnal rhythms. In the system, drug is presented in coat and core as a non uniform drug distribution matrix which results in biphasic drug release the combination of therapeutic drugs in one tablet. Compression-coated tablets with multiple layers for desirable therapeutic use can be prepared.

**2. Delayed release:**

Delayed release is obtained when all surface of core is compression coated. Lag time for drug release could be controlled by the application of different polymeric coats.

**3. Time controlled release:**

A delayed release tablet consists of a drug core which is compression converted with different polymeric (pH independent) barriers. This delayed drug release is programmed for the treatment of disease that depends on circadian rhythms.

**4. pH controlled release:**

A delayed release system using enteric polymers as a coating can provide site-specific drug delivery especially for colon and intestine.

**5. Microbial controlled release:**

A delayed release system may be aimed for colon drug targeting. This system is based on the degradation of the polymeric compression-coat by specific enzymes produced by entero-bacteria in the colon. microbially degradable polysaccharides containing glycosidic bonds such as alginates, amylase, arabinogalactan, arabinoxylan, cellulose, chitosan.

**Formulation Consideration Of Compression Coating Techniques**

**1) Compression-coating amount:**

Coating amount is the most important parameter to achieve a coating uniform for compression-coated tablets.

1. The compression-coating should about twice the weight of the core.
2. The volume must be greater than that of the core itself.
3. If the cores are comprised mainly of low density materials, such as fats and waxes, the amount or

weight of coating must be even greater to assure a uniform volume of coating material for covering the core and adhesion of core and coating.

**2) Position of core in coated layer:**

The main drawback of this system is the centralization of core in the compression-coated tablets. The reproducibility of drug release from compression-coated tablet is questionable, since the faults of press-coating can happen. Examples of press-coating fault are unequal coating, cocking and off-center.

**3) Compression force and Compressibility of materials:**

The compressibility of coated tablets is depended on the coating material. Thus, cohesiveness and plasticity of the powder coat are needed to obtain satisfactory mechanical strength of the coating. The cohesiveness indicates the continuity of the coating around the edge of the core, which depends on its strength and the plasticity responses for the expansion of the core after the final tablets are released from the die.

The final compression force applied to prepare compression-coated tablets has to be higher than the compression force which was applied to the core, to ensure the adhesion between core and coat. Tablets with adhesive coating can be applied as core to ensure adhesion of compression coat and core.

**4) The Interaction between Drug and Compression coat:**

The interaction of drug and coating is needed to be considered when gellable compression coats are used for drug release control. Drug in compression-coated tablets diffuses through the swollen coat. This process might enhance some possible interaction between drug and coat.

## Recent Technologies Can Be Used In Compression Coating Method

Compression coating technique erstwhile described as compressing a coat above a core using specially designed processes. This process involves preliminary compression of the core, then transferred to a large die already containing some coating material. Once centralizing the core, then coating material is added and the entire compressed to form the compression-coated tablets. The machines available for the preparation of press-coated tablets drop into two basic types: core earlier prepared on other machines; compression of the core and coat in one nonstop circle (Windheuser and Cooper, 1956). Core and coat prepared in the significant sequence of the OSDRC process first, the lower/outer layer can formed by pre-compression from the upper/center punch. Then lower/center punch was slid down and the upper/center punch moved up. The powder for the core canbe filled and pre-compressed by the upper/center punch. Lastly, the lower/outer punch slid downward and powder for the 2nd outer layer can filled and compressed by the upper and lower punches in which the center/upper punches are united with the outer/lower punches. This system can be assembled on the turn table of a rotary tableting machine and can make dry coated tablet in a single turn. By use of OSDRC system, compression-coated tablets with a side outer coat thickness of 1 or 0.5 mm can be prepared (Ozeki et al., 2004).

**1. OSDRC(One step dry coated tablet manufacturing method):**

The OSDRC system was capable of producing compression coated tablet in one process without previous core tablet preparation. The core and coat were prepared in schematic sequence of the OSDRC system. The lower outer layer was formed by pre-compression by the upper-center punch was slid down and the upper-center punch. The lower-outer punch was slid downward and the powder for the second outer layer was filled and compressed by the upper and lower punches in which the center punches are unified with the outer punches. OSDRC system can be arranged in table of a rotary tableting machine and can make a dry coated tablet in a single turn. The OSDRC system is compression coating tablet with a side outer coat thickness of 0.5 - 1mm.

**2. DCCT (Dividable compression - coated tablets ):**

The purpose behind the formation of the dividable CCT is the dose adjustment with the formation of dividable CCT, the dose adjustment from individual to individual can be possible. The feasibility of this tablet can be checked by comparing it with the non-divisible CCT. Other CCT with more than two layers can be formulated like three layered tablet.

**3. Inlay tablets(IT):**

Inlay tablet is a type of layered tablet in which instead the core tablet being completely surrounded by coating, the top surface is completely exposed. Tablet compressing be done with core rod tooling in which only one surface of core is expose to outside and other drug is incorporated in cup portion. While preparation, only the bottom of the die cavity is filled with coating material and core is placed upon it. The main body portion may consist of an uncoated granulation which is compressed around the enteric coated inlay portion In this modification the main body portion of the tablet is first released and assimilated in the gastrointestinal tract while the enteric coating protects the inlay portion for a predetermined period of time so as to provide time delayed or sustained medication.

**Advantages of Inlay tablet:-**

1) Tablets are various shapes can be formulated by using this technique.

2) The modified as well as immediate release dosage form of API is possible.

3) Adverse effects of the drugs can be avoided.

**TABLE 4: Recent compression coating technology**

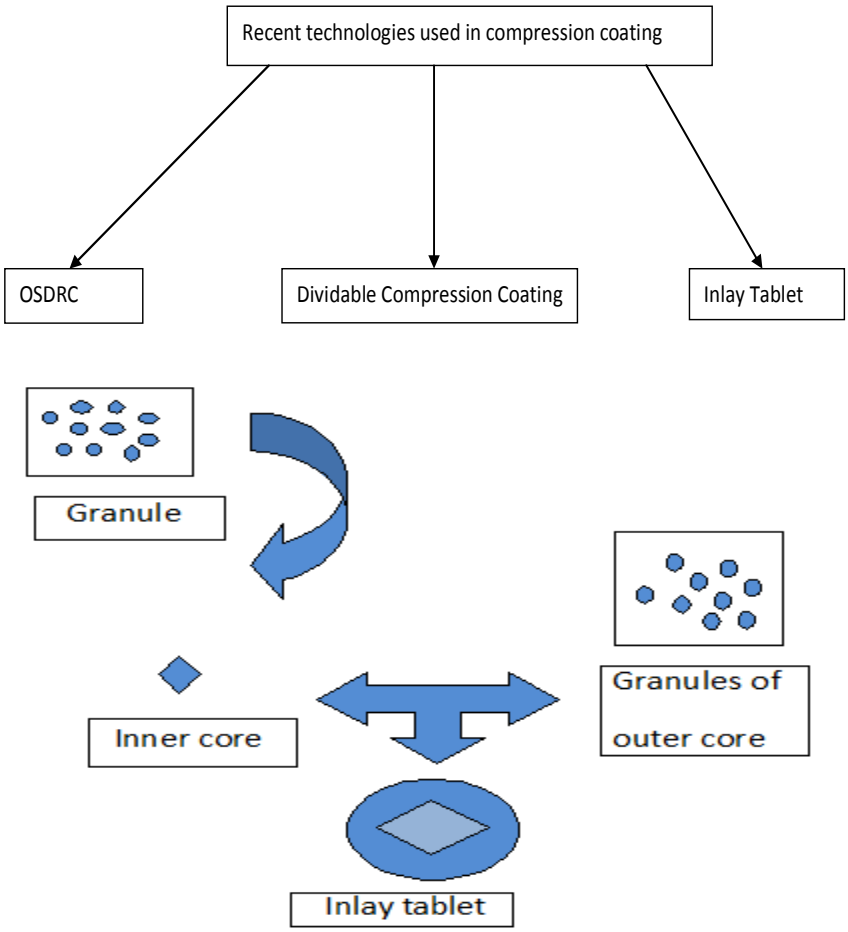



**Figure 2: Preparation of Inlay tablet**

## Tablet Coating

Coating is a layer of substance spread over a surface for protection or decoration of a covering layer

**Recent Trends In Tablet Coating Techniques**

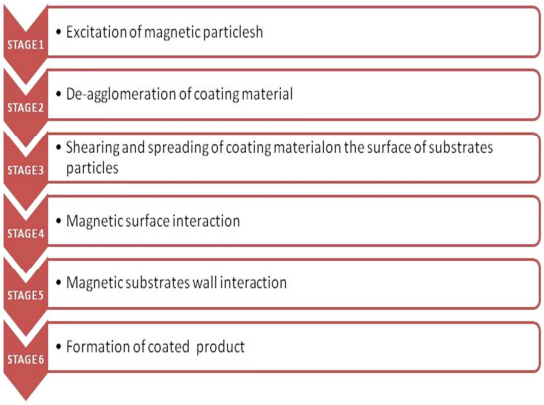
**Electrostatic dry powder coating**

Electrostatic dry powder coating is a new technique of tablet coating in which no solvent or water is required as no coating solution has to be prepared in it. It was done for the first time in a pan coater system. If the process is optimized well, then the tablet with smooth surface, good coating is useful in coating of living cells, tablet coating and capsule coating. The principle of dry powder coating involves the spraying of the charged finely powdered particles and polymers on the substrates surface without use of any solvents or water. The substrate is then heated in an oven so that the particles and polymers get fused with the substrates as a film.

**Magnetically assisted impaction coating (MAIC):-**

It is useful for estimating the coating time.The powder coat particles, the substrate and the magnetic particles are set in a fluidized state with the help of velocities which are of Maxwell-Boltzmann type. The collisions between the coat particles and substrates particles are important for the fixing of a semi-permanent coat.

**Mechanism of coating in MAIC process:-**




**Aqueous film coating:-**

Sugar coating technology is very ancient and time consuming process. The Film coating process was done only with the organic solvent for many years after its discovery.

Three major factors have to be considered in aqueous coating technique:-

1) Tensile strength of the film coating formulation
2) Elasticity of the resultant film
3) Film tablet surface interaction

Due to these factors it is very important to use an optimized formula for the preparation of the coating solution

**Supercell coating:-**

The conventional coating technique becomes very tedious as size of pan coater is large and the time required for coating is also high. Also the heating is high in such process and the heat labile substances cant be coated with it.

The avoid all these problem, niro company developed a new technology called supercell coating. In this techniques the controlled amount of coating can be done accurately even if the particles and tablet are hygroscopic or friable. This technique is controlled amount of coating. As the speed of spraying, rate of drying are uniform, the accuracy increases and the amount to be used for coating also gets decreased. The API can be incorporated in the coating as the uniformity and accuracy is maintained.

**Various Types of tablet coating:**

**1. Sugar Coated Tablets (SCT):**

Tablet has sweet taste it is because of bitter medicine coated with sugar-coat,so that the bitter taste is minimized or counterbalance. Suitable also for drugs that smells fishy or disagreeable smell. Typically, because of coating, absorbs process become slower. Sugar Coated tablets are commonly used for children. Sugar Coated Tablet involves consecutive application of sucrose-based coating formulations to tablet cores, in apposite coating equipment. Water Evaporate from the syrup remains a thick sugar layer around each tablet. Sugar coats are frequently shiny and greatly colored.

**2. Film Coated Tablets (FCT):**

This type of coating is the most frequently used. The point is to smarten the tablets with a variety of colors, protect the tablet to stay stable and Mask a bad taste. Drugs are not attractive in color like as herbal extract or irregular color could be covered. Not all of drugs need to be coat. There are still shows its unique color or added color at the period of mixing, before compression. Film Coated Tablet involves the deposition, commonly by spraying method, of a thin consistent film of a polymer formulation nearby a tablet.

Two methods are (FCT):

1. Pan-pour method
2. Pan spray method

**Materials used in film coating:-**

The coating materials may be a physical deposition of the materials on the tablet substrate and they may form continuous film with a wide variety of properties depending upon the composition of coating formulations.

Film coating contains:

1. Film forming polymer
2. Plasticizer's
3. Solvents
4. Colorant's

1) Film forming polymer: list of film forming polymer illustrated in table5
2) Plasticizers:-

Plasticizers mainly are used to control the film formation process of coating based on drying film forming materials.

Plasticizers function is by reducing film formation temperature and elasticize.

3) Solvents:-

The primary function of a solvent system is to dissolve or disperse the polymers and other additives and convey them to the substrates surface. All major manufacturers of polymers for tablet coating provides basic physical and chemical data on their polymers.

4) Colorants:-

Coating solution formulation may contains a wide variety of components in addition to the film former solvent and plasticizers .colorants may be soluble in a solvent system or suspension pended as insoluble powder.They are used to provide distinctive color and elegance to a dose age form.

**3) Enteric Coated Tablet (ECT):-**

In Enteric coated tablets have great potential in creating bioavailability problems because the coat dissolves only in the alkaline pH of the intestine and it may take as long as 2-4 hours for such a tablet to empty from the stomach into the intestine depending upon the meals and the GI motility.

Pharmacological response may eventually be delayed by 6-8 hours. The problem of gastric emptying can, however be overcome by enteric coating granules pellets and presenting them in a capsule compressing into a tablet.

**Table 5: Film forming polymer**

| Modified release | Enteric | Immediate release |
|---|---|---|
| 1)Ethyl cellulose | 1)HPMC Phthalate | 1Hydroxypropyl cellulose) |
| 2)Acrylics | 2)HPMC,Acetate succinate | 2)Polyvinyl pyrrolidone |
| 3)HPMCAS | 3)Acrylics | 3)HPMC |
| 4)Polyvinyl Acetate | | 4)Methyl cellulose |

**Table 6: List of materials used in enteric coating**

| | |
|---|---|
| Material used in enteric coating | 1)HPMC Pthalate<br>2)Diethyl Pthalate<br>3)Pharmaceutical shellac<br>4)Polyvinyl acetate phthalate<br>5)Cellulose acetate phthalate |

**4) Compression Coating(CC):-**

Even if less popular, it gains increased interest in the recent years for creating modified-release formulation. It involves the compaction of granular materials around preformed tablet core using specially designed tableting equipment. Compression coating is dry process.

**5) Gelatin coated tablet**

The trendsetter product, Gelacap, is a capsule fashioned compressed tablet coated with gelatin layer.

**1) Electrostatic coating:**

Electrostatic coating is an efficient method of applying coating to conductive substrates. A strong electrostatic charge is applied to the substrates. The coating materials containing conductive ionic species of opposite charge is sprayed onto the charge substrate complete and uniform coating of corners and intagliations on the substrates is achieved.

**2) Dip coating:**

Coating is applied to the tablet cores by dipping them into the coating liquid. The wet tablets are dried in a conventional manner in coating pans this process lacks the speed, versatility, and reliability of spray-coating techniques. Specialized equipment has been developed to dip-coat tablet.

**3) Vacuum Film coating:**

Vacuum film coating is a new coating procedure that employs a specially designed baffled pan. The pan is hot water jacketed,and it can be sealed to achieve a vacuum system. The tablet are placed in the pan is displaced by nitrogen before the desired vacuum level is obtained

**4) Compression coating:**

The compression coating granulation can be preformulate to provide preferred functionalities to the coating. The simply requirement for producing the compression coated tablet dosage form described here is that the core material should possess the capability to flow into a die during production. Different approaches that have been studied for targeting orally administered drugs include usage of pro-drugs, pH responsive polymers and time reliant dosage forms. Relatively more recent approach that has been come into existence is the one that combine the features of controlled release tablets and instant release tablet in one dosage form. This type of system is known as compression coated tablets. The compression coated tablets function like film-coated or sugar-coated tablets in that the coating cover a bitter substance. Coverup a mottled or unpleasant appearance or provide a blockade for a substance irritating to the stomach or such one inactivated by gastric juice. One more application of the compression coated dosage form is in sustained release preparations. Coating containing the instant release portion is compressed over a slowly releasing core. It gives a more accurate dose than is the case with sugar coating. In this tablet involves the compaction of granular materials around a preformed tablet core using particularly designed tableting equipment. This type of tablet has two parts first internal core and second surrounding coat.

**Core Tablet**

Core tablet is the innermost part of the compression coated tablet. Core tablet in general contains the active pharmaceutical ingredient (API) which is compressed with the additives companionable with it. The core tablet is prepared simply by the compression of the active drug along with the suitable polymer and additives. Core tablet is always compressed by using a small punch. The additives and drug are well mixed and the granules are prepared by any one suitable method and then dried. The dried granules are passed to the die cavities through the hopper. The necessary compression force and weight required are adjusted with the knobs and the tablets are compressed with the punch having lower diameter than the diameter of the coating tablet.

Polymers are selected according to the release of the drug requisite. It means that the drug must be mix or coat with the polymers according to its nature like rapid release, extensive release or controlled release. Core tablet is covered with the coating material to transform the release and to protect the drug from the external environment attack.

**Coat tablet**

The coat part of the compression coated tablet is very important as it is the protective covering of the core part. The coat part of this tablet has got an extraordinary importance as no solvent is required for its application on the core and also the drug can be incorporated in it.This part can be applied on the core part on the same tablet punch machine.As no additional equipment is required for the coating process, the production cost also gets decreased .due as no use of organic solvent is required.

**Process of coating:-**

The coating can be done on a same tablet punch machine on which the core tablet is prepared.The core tablet is punched with a punch of small diameter as compared to punch of coat tablet.The half quantity of coating material is filled in a die cavity of big size diameter than the core tablet diameter after the compression of core part.The core part is then placed on a half filled coat part in and above die and

**Factor affecting core coating**

A)Tablet cores

a) Drug solubility

b) Tablet core formulation

B) Compression coating

a) Polymer type

b) Particle size of polymer used

c) Porosity or release modifier incorporated in coat

d) Core-coat ratio

e) Compression force

**Oral Pulsatile Drug Delivery Tablets Prepared By Compression Coating**


**Figure 6: Oral pulsatile drug delivery tablet**

**Table 7: List of dosage form marketed preparation pulsatile drug delivery**

| Sr no: | Drug | Mechanism | Indication for chronotherapy | References |
|---|---|---|---|---|
| **1** | Dilitiazem HCL | Diffusion | Hypertension | Expert OpinPharmaother 10;485-491(2009) |
| **2** | Verapamil HCL | Osmotic regulation | Hypertension | Am J Drug Delivery 2;131-141(2004) |
| **3** | Metformin HCL | Gastric retention delivary system erosion/Swelling | Type II Dibetes | Expert OpinPharmaother 7;803-809(2006) |
| **4** | Propranolol HCL | Controlled release as well as delayed release | Hypaertension | J Clinhypertens 6;231-241(2004) |
| **5** | Levodopa | Dual Release | Parkinsons disease | Best pract j 7;25-35(2007) |
| **6** | Amoxiciline | Immediate as well as Delayed release | Step throat | Expert OpinPharmaother 6;441-452(2009) |
| **7** | Theophylline | Slow release | Asthma | Monaldi Arch Chest dis. 49;36-43(1994) |
| **8** | Paliperidone | Osmotic regulation | Schizophreenia | Expert OpinPharmaother 6;441-331(2009) |

**Tableting Method**

**Table 8: Schematic representation of tableting methods**

| Direct compression | Dry granulation | Wet granulation |
|---|---|---|
| Drug, Diluents, Glidant | Drug, Diluents, lubricant | Drug, Diluents |
| ↓ Mixing | ↓ Compression | ↓ Mixing |
| ↓ Lubricant | ↓ Comumniation | ↓ Binder solvent |
| ↓ Mixing | ↓ Screening | ↓ Wetting |
| ↓ Compression mix | ↓ Disintigrant, Lubricant | ↓ Granulation |
| ↓ Fill dye compress tablet | ↓ Mixing | ↓ Disintigrant |
| ↓ Deducing Coating, metal check, packaging | ↓ Compression mix | ↓ Drying & Screening |
| | ↓ Fill dye compress tablet | ↓ Mixing |
| | ↓ Deducing Coating, metal check, packaging | ↓ Fill dye compress tablet |
| | | ↓ Deducing Coating, metal check, packaging |

## Preparation of Coating Material and Compression Coated Tablets

The formulations of compression coating, for coating of core tablet are shown. The coating granules were prepared by wet granulation technique using 2% w/v ethyl cellulose in isopropyl alcohol as a binder. The powders were blended in a plastic pouch to get uniform mixture and granulated with solution of ethyl cellulose. Then the granules were obtained by passing the wet mass through sieve #16. The granules were dried at 500 C for 1hr in a hot air oven (Sunshine industries, Coimbatore India). The dried granules were resized by passing through sieve # 22 and were lubricated with a mixture of talc and magnesium stearate. Then 45% weight of coating material granules were then kept in die cavity and then core tablet was placed carefully on it in centered position and then remaining 55% of coating material granules were added to cavity and compressed into tablets, by using convex punches of 10.05 mm diameter after optimizing the hardness and die cavity of rotary tablet machine, so that the tablets will be of uniform hardness and with minimal weight variation.

**Compression Coated Tablet with Process**

**A) Coating Tablet:**

Coating tablet is the outermost part of the compression coated tablet. This tablet is prepared by the compression of the polymers with or without active drug and excipients depending upon the type of tablet on the surface of the core tablet. As this tablet is used to coat the core tablet, the name coating tablet is given to it. The coating tablet sometimes may contain a drug to incorporate two incompatible drugs in one tablet having core and coat part.

**B) Polymers:**

**Polymer used in Core tablet:**

**Table 9: Polymers used in core tablet**

| Sr. No | POLYMER | USE |
|---|---|---|
| 1 | Microcrystalline cellulose(MCC) | Excellent compressibility or filter and binder |
| 2 | Shellac | Moisture protective or extended release |
| 3 | Polyethylene glycol-6000 (PEG) | Film property modifier |
| 4 | Hydroxypropylmethyl cellulose | Film former |
| 5 | compritol(CMT) | Sustained release coating agent |
| 6 | Ludipress(LDP) | Directly compressible lactose |
| 7 | Locust bean gum(LDP) | Very soft coat |

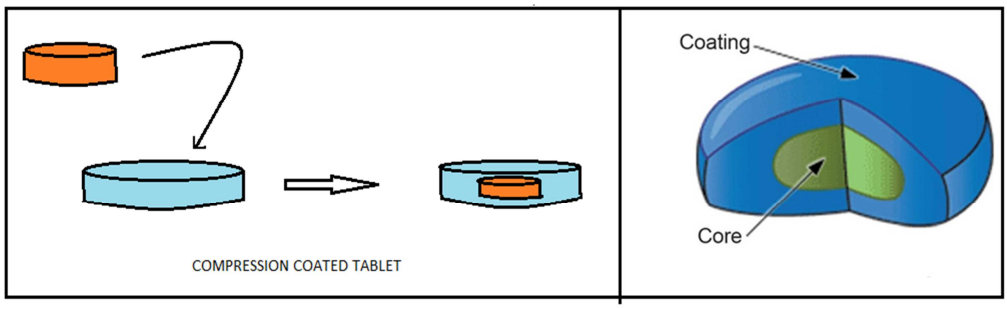



**Figure 7: Preparation of compression coated tablet**

**Defects in Coating Tablet**

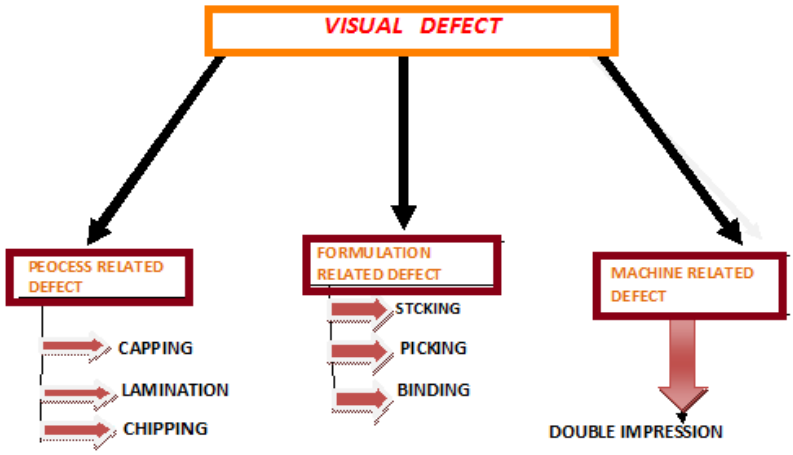



**Figure 8: List of visual defects**

**Table 10: Description of process related problems**

| | | |
|---|---|---|
| **Capping** | 1)Large amount of fines in the granulation | Remove some or all fines through 100-200 mesh screen |
| | 2)Not thoroughly dried granules | Dry the granules properly |
| | 3)Granular mass too cold to compress film | Compress at R.T. |
| | 4)High turret speed | Reduce speed of turret |
| **Lamination** | 1)Oily or waxy materials in granules | Modify mixing process add absorbent |
| | 2)Hydrophobic lubricant eg-Magnesium sterate | Use a less amount of lubricant |
| **Cracking** | 1)Too dry granules | Moisten the granules properly and add proper amount of binder |
| | 2)Tablet expand | Improve granulation |
| **Sticking** | 1)Granules not dried properly | Dry the granules properly |
| | 2)Too small or improve the lubricant | Increase or change lubricant |
| | 3)Hygroscopic granules materials | Modified granules and compress under control humidity |
| **Picking** | 1)Higher rate of coating solution inefficient drying | Use optimum and efficient drying condition |
| | | Increase the inlay air condition |

**Evaluation of Compression Coated Tablets**

**1. Preformulation Parameters**

**A. Drug excipient interaction:-**

The IR studies of pure drug and its formulation along with excipient were subjected. The excipient compatibility was established by conducting a one month compatibility study at 400C and 75% Relative humidity. In the present study, potassium bromide pellet was employed using Shimadzu FTIR Spectrometer.

B). Standard calibration curve:-

The spectrum of the drug was determined using Shimadzu UV-1700 instrument. The concentration curve of the same was obtained within a range of 1ppm to 25ppm.

**2. Evaluation Of Core Tablets**

A). Thickness:-

10 tablets from each formulation were taken randomly and their thickness was measured with a vernier calliper as per pharmacopeia specification.

B). Hardness and Friability:-

The tablets can be measured using the Monsanto Hardness Tester. The friability of a sample of 10 tablets was measured using a USP type Roche friabilator.

C). Weight variation:-

10tablets were selected randomly. Tablets were weighed individually and average weight be calculated. Then deviation of each tablet from average weight can be Calculate and percent deviation can compute.

D). Floating property:-

The tablets were placed in a 100 ml glass beaker containing 0.1 N HCl.

i). Floating period Time: The time for which the tablet remained floating on the surface of medium was determined as floating duration time.

ii). Floating Lag Time: The time required for the tablet to rise to the surface of the medium and float was determined as floating lag time

**3. Evaluation of Compression Coated Tablets**

A). Thickness:-

Ten tablets from each formulation were taken by chance and their thickness was measured with a vernier calliper.

B). Friability:-

The friability of a sample of 10 tablets was measured using a USP type Roche friabilator.

C). Weight variation:-

Studies were done on 10 tablets and the average was calculated to check the weight variation in individual batches.

D). Drug content:-

The above method of drug content determination was again followed for the compression coated tablets.

E). Disintegration time of coating tablet:-

In-vitro disintegration time was determined for core tablets using disintegration test apparatus. The buffer of pH 1.2 was maintained at a temperature of37±0.50 C and time taken for complete disintegration of the tablet was measured in seconds.

## Conclusion

The compression coating Tablet technique can be applied to modified extended release with multiphase pattern and delayed release (it is based on the time controlled, pH controlled release and bacterial degradable controlled release). Drug release of compression-coated tablets can be modified as extended release by the adjusting drug-polymer ratio in core and coat. the delayed release system, lag phase and release phase can be modulated by changing the release controlling parameters (particle size of polymer used, pore modifier, polymer type, compression force ,compression coating thickness or core and coat ratio) to achieve programmable drug release for chronotherapy or site specific drug delivery in GI tract. The novel tableting technology (high precision and accuracy) to position core tablet in the center of the compression-coat, the application of compression-coated tablets as a tool for desirable drug release control is feasible also in industrial scale

## References

(1) Qi, X.; Chen, H.; Rui, Y.; Yang, F.; Ma, N.; Wu, Z. Floating tablets for controlled release of ofloxacin via compression coating of hydroxypropyl cellulose combined with effervescent agent. Int. J. Pharm. 2015, 489 (1–2), 210–217 DOI: 10.1016/j.ijpharm.2015.05.007.

(2) Tablets, C.; Coating, C.; Patil, P. R. Emerging Trends In Compression Coated Tablet Dosage Forms: A Review Purushottam R. Patil*, Vaibhav D. Bobade, Pankaj L. Sawant and Rajendra P. Marathe Department of Pharmaceutics, Government College of Pharmacy, Osmanpura, Aurangabad 431005, Maharashtra,. 2016, 7 (3), 930–938 DOI: 10.13040/IJPSR.0975-8232.7(3).930--38.

(3) Khadabadi, S. S.; Chishti, N. H.; Khan, F. M.; Tadvee, A. A. Formulation and evaluation of press coated tablet of Ketoprofen - A chronotherapeutic approach. Int. J. Pharm. Pharm. Sci. 2013, 5 (SUPPL 3), 733–740.

(4) Modi Foram, P.; Priyal Patel, R. Formulation, optimization & evaluation of fixed dose combination moisture barrier film coated bilayer tablet of artesunate & amodiaquine hydrochloride. Int. J. PharmTech Res. 2011, 3 (4), 2124–2134.

(5) Chickpetty, S. M.; Baswaraj, R.; Nanjwade, B. K. Studies on development of novel combined time and phdependent solventless compression coated delivery systems for colonic delivery of diclofenac sodium. Asian J. Pharm. Clin. Res. 2010, 3 (2), 110–113.

(6) Singh, A.; Dubey, H.; Shukla, I.; Singh, D. P. Pulsatile drug delivery system: An approach of medication according to circadian rhythm. J. Appl. Pharm. Sci. 2012, 2 (3), 166–176.
(7) Pollock, D. K.; Balwinski, K. M. Utility of Micronized Ethylcellulose in Compression Coatings Tablet Preparation : 1999.
(8) Rajendra, A.; Bushetti, S. S.; Giri, A. Design and evaluation of compression coated formulations for an antiinflammatory drug based on modified okra mucilage. J. Appl. Pharm. Sci. 2012, 2 (7), 238–245 DOI: 10.7324/JAPS.2012.2740.
(9) Roland Bodmeier, J. S. Novel formulation and processing aspects for compression-coated tablets and for the compression of polymer-coated multiparticulates. 2010, 17–20.
(10) Boltic, Z.; Ruzic, N.; Jovanovic, M.; Savic, M.; Jovanovic, J.; Petrovic, S. Cleaner production aspects of tablet coating process in pharmaceutical industry: Problem of VOCs emission. J. Clean. Prod. 2013, 44, 123–132 DOI: 10.1016/j.jclepro.2013.01.004.
(11) Thoorens, G.; Krier, F.; Leclercq, B.; Carlin, B.; Evrard, B. Microcrystalline cellulose, a direct compression binder in a quality by design environment - A review. Int. J. Pharm. 2014, 473 (1–2), 64–72 DOI: 10.1016/j.ijpharm.2014.06.055.
(12) Ozeki, Y.; Watanabe, Y.; Inoue, S.; Danjo, K. Evaluation of the compression characteristics and physical properties of the newly invented one-step dry-coated tablets. Int. J. Pharm. 2003, 267 (1–2), 69–78 DOI: 10.1016/j.ijpharm.2003.07.011.
(13) Furukawa, R.; Chen, Y.; Horiguchi, A.; Takagaki, K.; Nishi, J.; Konishi, A.; Shirakawa, Y.; Sugimoto, M.; Narisawa, S. Numerical evaluation of the capping tendency of microcrystalline cellulose tablets during a diametrical compression test. Int. J. Pharm. 2015, 493 (1–2), 182–191 DOI: 10.1016/j.ijpharm.2015.07.029.
(14) Toschkoff, G.; Khinast, J. G. Mathematical modeling of the coating process. Int. J. Pharm. 2013, 457 (2), 407–422 DOI: 10.1016/j.ijpharm.2013.08.022.