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COMPRESSION COATED TABLETS AS DRUG DELIVERY SYSTEM (TABLET IN TABLET) : A REVIEW

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ABSTRACT
Tablets are the most preferred and widely used dosage form because of their ease of administration, lower cost of manufacture, and elegance. So in this article, we describe the general characteristics, introduction,classification and formulation consideration of compression coating tablet. The compression-coating granulation or blend can be preformulated to provide desired functionalities to the coating. The only requirement for producing the compression-coated tablet dosage form described herein is that the core material should possess the ability to flow into a die during production.In past few years, chemical entity often is first formulated as a free-flowing granulation for encapsulation within hard gelatin capsules. Very conventional ideas has been used for the deployment of the drug likewise single dosage form with API and excipient, one dosage form for only one disease etc. so duration of course and treatment of the disease maximized.So for the minimization of that there are number of innovations and new approach has been profound.

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

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INTRODUCTION

Pharmaceutical coatings are an essential tool to achieve the desired formulation of pharmaceutical dosage forms.Coatings are applied to achieve superior aesthetic property of a dosage form (e.g. color, texture, mouth feel and taste masking), physical and chemical protection for the drugs in cores, and modified drug release characteristics. Coating techniques mostly used in pharmaceutical industry are aqueous or organic coating, which present some disadvantages: time consuming, stability for heat labile and hydrolysis of degradable drug and polluted environment problem. Thereby, non-solvent coating is introduced as alternative coating technique to overcome these disadvantages. Non-solvent coatings have been categorized as press coating, hot melt coating, supercritical fluid spray coating,

electrostatic coating, dry powder coating and photocurable coating [1]. Among these techniques, compression coating is the absolute dry coating without solvent and heat use. Aditionally compression coating has no limitation for the cores and hence overcomes the adhesion problem found in spraying methods. Tablets with cylinder or special shapes can be press-coated.

Tablet-in-tablet technology: Tablets are indeed the most popular solid dosage form for oral administration. One category of tablet formulations that has gained remarkable importance in drug therapeutics owing to various benefits it offers is controlled or modified release formulations. Although less popular, tablet-in-a-tablet technology (see Fig 1) gained increased interest in the recent years for creating modified released products. It involves the compaction of granular materials around a preformed tablet core using specially designed tableting equipment. Compression coating is a dry process. This type of tablet (compression coated tablet) has two parts, internal core and surrounding coat. The core is small porous tablet and prepared on one turret. After tablet core manufacture it is transferred (centrally positioned) to another slightly larger die that is partially filled with coating powder. More coating powder is filled on the top of the core and compressed again resulting in tablet with in tablet. Mechanically, it is a complex process, as the tablet may be tilted when transferred to the second die cavity. Mostly, the coat is water soluble and disintegrates easily after swallowing, in order to achieve immediate release product. This tablet readily lend itself in to a repeat action tablet as the outer layer provides the initial dose while the inner core release the drug later on. But, when the core quickly releases the drug, entirely different blood level is achieved with the risk of over dose toxicity. To avoid immediate release of both the layers, the core tablet is coated with enteric polymer so that it will not release the drug in stomach while, the first dose is added in outer sugar coating. Even so, coating operation requires interpretation while manufacturing and dawdling the manufacturing process. Sometimes, inner core may be of liquid formulation to provide immediate release of core after the coat gets dissolved.[2]

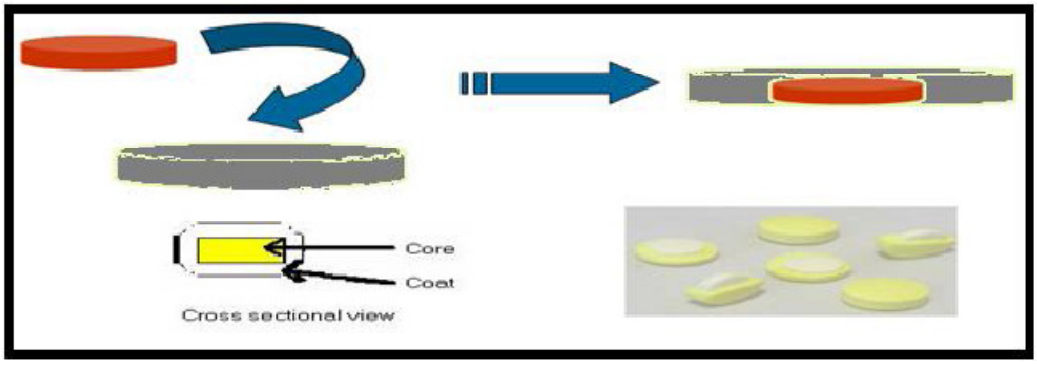

FIGURE 1 (a) : TABLET-IN-TABLET TECHNOLOGY

FIGURE 1 (b): TABLET-IN-A-TABLET TECHNOLOGY

Advantages of tablet-in-a-tablet technology

- It is simple and inexpensive.
- It is used to separate incompatible materials (one in the core and the other in the coat).
- May be used to create modified-release products such as Delayed Release (Release in Intestinal).
- It is not hazardous to the environment since it does not require the use of high amounts of organic solvents.
- Compression coated tablet (CCT) can also be used to avoid pharmacokinetic drug–drug interactions between concomitantly administered medications, creating a time interval between their releases into the gastrointestinal tract.[3]

CLASSIFICATION OF COMPRESSION-COATED TABLETS BASED ON CORE SURFACE COATING:

The application of compressed polymeric coat on tablets for modified or controlled drug delivery systems have been developed and investigated to improve the performance of drugs, to increase the pharmacological effect and reduce side effects. Based on the simplest matrix device where the drug is homogenously dispersed in the polymer network. If surface of cores is partially coated with different properties of polymer, a variety of modified or controlled release can be obtained [4,5]. The preparation development based on this concept can improve or adjust the drug release in a desired manner. A compression-coated tablet is a system in which the all surface of an inner core is completely surrounded by coat. These coats prevent drug release from the core until the polymeric coat is entirely eroded, dissolved or removed (breaking down). Different drug release fashion could be obtained depending on coating layer and core composition.

A) Controlled release systems from compression-coated tablets : Compression-coated tablet consists of a core (fast disintegration or modified release) which is coated by compression with a solid barrier. The barrier could contain polymeric material, diluent (as a release modifier) and drug (for extended release). Compression-coated tablets could be modulated to provide different release patterns depending on the drug distribution and plus with different type of controlling polymer used in core and coat. Based on this concept, the possibly obtainable modified drug releases are extended release and delayed release (time, pH and microbially control) for specific region of gastrointestinal tract.

B) Multiphasic release : Multiphasic release is a delivery system designed for many diseases which have marked diurnal rhythms, while constant drug release does not meet the optimum therapeutic efficiency. In such diseases, drug concentrations are needed to vary during the day. Drug levels need to be highest when symptoms are most severe. In the system, drug is presented in coat and core as a non uniform drug distribution matrix which results in biphasic drug release With the combination of therapeutic drugs in one tablet, a variety of drug release: sequential release of different drugs or multi-phasic release of drugs is achievable. Compression-coated tablets with multiple layers for desirable therapeutic use can be prepared. Multiple layer compression-coated tablets containing immediate release (outer coat), extended release (middle coat) and immediate release (core), have been patented by Impax Pharmaceuticals Inc.. Different drug release patterns can be obtained with adjusting drug loading and polymer type in each layer.[6]

C) Delayed release : Delayed release, defined with lag phase and followed with release phase, is obtained when all surface of core is compression-coated. Pulsatile release defined by fast drug release after a certain lag time could be categorized within this group as well. Lag time for drug release could be controlled by the application of different polymeric coats which were differentiated with triggering factors to control drug release as mainly mentioned in colonic drug delivery system.[7]

D) Time controlled release: A delayed release tablet consists of a drug core which is compression-coated with different polymeric (pH independent) barriers. This delayed drug release is programmed for the treatment of disease that depends on

circadian rhythms. The lag time of drug release is controlled by the compression coating, which prevents drug release from the core until the polymer coat is completely eroded, swollen or ruptured. Drug release pattern depends on the compression-coat properties. The press-coating could be performed with water soluble polymers (hydroxypropylcellulose, hydroxylpropyl-methylcellulose, pectin, polyethylene oxide), water insoluble polymer (ethylcellulose) and wax (Behenic acid). Verapamil HCl tablets with floating-pulsatile release properties were prepared by compression coating of the drug core in an hydroxylpropylmethylcellulose compression-coat.[7]. Type and amount of salts and surfactants can control the lag time of drug release by changing the solubility of this polymer. The influence of both could be explained by lowering the critical point solution temperature (LCST) or inverse phase transition temperature of the polymer. As the temperature increases beyond the LCST, polymer become insoluble and phase separation occurs. Below this temperature, the polymer is soluble in aqueous media and the polymer chains are extended and surrounded by water.[8]

E) pH controlled release : A delayed release system using enteric polymers as a coating can provide site-specific drug delivery especially for colon. This system has attracted a great interest for the local treatment of a variety of bowel diseases and for improving systemic absorption of therapeutic agents susceptible to enzyme digestion in the upper gastrointestinal (GI) tract, while time controlled release can not achieve owing to large variations in gastric emptying time. Fukui *et* al. (2001a) have prepared the compression-coated tablets of diltiazem hydrochloride intended for the colon targeting[. 9].

F) 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, chondroitin sulfate, dextran, galactomannan (guar gum, locust bean gum), inulin, karaya gum, laminarin, pectins, starch, tragacanth gum, xanthan gum and xylan, could be employed as a coat. The investigated polysaccharides used for colonic-specific drug delivery which could also be used in compression-coated tablets included high methoxy pectin [10], pectin plus HPMC [11]. Combination of time (pH) and bacterially controlled systems by using of spray-dried chitosan acetate and ethyl cellulose was investigated, .

FACTORS AFFECTING ON THE DRUG RELEASE

A) Tablet cores

a) Drug solubility: Higher solubility drug containing cores in compression-coated tablets provided shorter lag time than lower solubility drug containing cores. Rapidly and completely release of diclofenac sodium and salbutamol sulfate was presented, while theophylline anhydrous exhibited fast release and curved down after 60%. The partial transformation of theophylline anhydrous to theophylline hydrate was their explanation for the retardation release behavior. The effect of drug solubility: diclofenac sodium, theophylline anhydrous and salbutamol sulfate in cores containing sodium starch glycolate (50% of drug) as disintegrant and ethylcellulose (fined powder) was used as the compression-coat, [12].

b) Tablet core formulation: The higher solubility of spray-dried lactose and HPMC facilitated the dissolution in the core to make a faster disintegration time and a shorter lag time. The compression-coated tablets containing the same coat but different cores showed identical in vitro release profile but they were different in the bioavailability. The in *vivo* results (the area under the curve of acetaminophen plasma concentration–time) revealed that compression-coated tablets having larger core erosion could provide the higher drug absorption from the GI tract. Soluble diluent and appropriate amount of super disintegrant in core tablets enhanced drug release while osmotic agent slightly retarded drug release.Drug release from compression-coated tablet containing a fast release core was faster

than extended release core containing coated tablet when the same coating composition was used [13]. The release behavior and the lag time were dependent on the type of excipient used in the core.

B) Compression coating

a) Polymer type : The pharmaceutical polymers used (single or combination) in compression coating are cellulose derivatives (e.g.hydroxypropylmethylcellulose acetatesuccinate, ethylcellulose ,hydroxypropylmethylcellulose, hydroxypropylcellulose and hydroxyethyl-cellulose), polysaccharides (e.g. guar gum, sodium alginate and pectin),water soluble polymer (polyethylene oxide) and wax (behenic acid) and methacrylate copolymers .The coats containing these polymers could be divided into groups such as water insoluble (ethylcellulose),erodible (low molecular weight hydroxypropylmethyl-cellulose, hydroxypropylcellulose, polyethylene oxide),gellable or swellable (high molecular weight hydroxypropylmethylcellulose),pH dependent soluble (hydroxypropyl-methylcellulose acetate succinate, methacylic acid copolymer),waxy and bacterial digestible.The properties of these polymers control drug release in different manners as previously mentioned. Poly (N-isopropyl acrylamide) was used as compression-coat. The delayed release of drug was controlled by the type and the amount of salt incorporated in the core. This was attributed to the effect of lowering the LCST (lower critical point solution temperature) or inverse phase transition temperature of the polymer by the added salt. As the temperature increased beyond the LCST, polymer became insoluble and phase separation occurred. Below this temperature, the polymer was soluble in aqueous media and the polymer chains were extended and surrounded by water. Conte et al. (1993) showed that the release behavior from compression-coated tablets was controlled and modulated by type and molecular weight of the polymer used as shell [14].

b) Particle size of polymer used: Compression-coated tablets prepared with smaller particles sizes of ethylcellulose provided longer lag time. compression-coated tablets prepared with smaller particles sizes of ethylcellulose provided longer lag time. The smaller particle size of ethyl cellulose used in coat provided less porosity and higher tortuous path for medium infiltration, then the longer lag time of drug release was obtained. Lag time of compression-coated tablets containing ethylcellulose mixtures (granules and fine powder, 1:1) as coat was only slightly different from tablets containing fine powder as coat because fine ethylcellulose powder was filled the inter- and intraparticulate gaps of coarse ethylcellulose powder. The influence of particle size of coating material in form of granules was more pronounced than in form of powder.Compression-coated tablets from granulated coat provided faster drug release and shorter lag time compared to tablets from fine powder coat. Different lag time and drug release mechanism of ethyl-cellulose compression-coated tablets were illustrated by incorporation of different excipients into the upper coat of compression-coated tablets with the same lower coat, ethylcellulose coarse powder [15]. (Fig. 2).

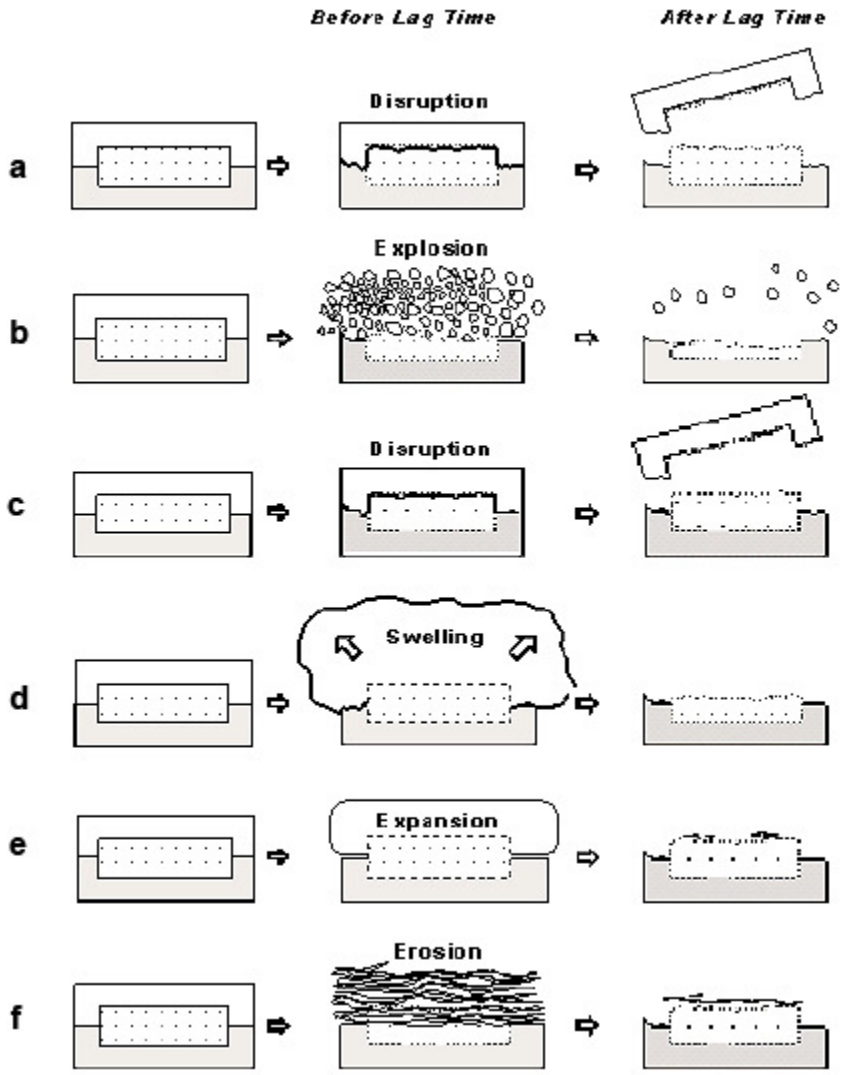

FIGURE 2 : schematic dissolution process for drug release from compression-coated tablets containing the same lower compression-coat (ethylcellulose coarse powder) and different upper compression-coats: (a) ec coarse powder and ec fine powder = 6:1; (b) ethylcellulose coarse powder and explotab = 6:1; (c) ec coarse powder and avicel = 6:1; (d) ethylcellulose coarse powder and hydroxylpropylmethyl-cellulose = 6:1; (e) ethylcellulose coarse powder and spray dried lactose = 6:1; (f) ethylcellulose coarse powder and dibasic calcium phosphate = 6:1 [16].

c) Porosity or release modifier incorporated in coat : When hydrophilic excipients are incorporated into an insoluble coating, they possibly act as a pore-forming agent for water penetration and the higher content of water soluble excipient in the coating results in shorter lag time. Different release behaviors from compression-coated tablets containing different hydrophilic excipients were resulted from different physiochemical properties. For compression-coated tablets comprising cores in impermeable cup devices with modified surface matrix layer, the lag time for drug release was controlled by varying the ratio of water soluble diluent (lactose) and behenic acid in surface layer. A higher ratio of lactose to behenic acid resulted in shorter lag time of drug release obtained. This could be attributed to the more porous after lactose leakage or less tortuous surface layer.The lag time from press-coated tablets containing an ethylcellulose/hydroxypropyl-methylcellulose E4M shell was longer when compared with

ethylcellulose/spray dried lactose shell due to higher water solubility of the latter [17].

d) Core-coat ratio : For the time controlled release system from compression-coated tablets, the amount of the outer shell is a key factor for controlling the lag time. Higher amount of the outer coating added would prolong the lag time of drug release.Insufficient polymer amount of coat would result in absent of the lag time, since the drug might be released through the incomplete form of ethylcellulose compression-coat. For insoluble polymer coat like ethyl cellulose, the influence of polymer amount or thickness of coat onthe lag time and drug release was investigated.[17].

e) Compression force : Absence of compression force effect on drug release was found when the compression force for coating was constant. In addition, the influence of compression force applied to the coat on the drug release of ethylcellulose compression-coated tablets was presented. When an insoluble coat is applied on a core with different compression forces, the lag time and drug release rate will be modified. The lag time of drug release increased and the release rate decreased when the compression force applied to the coating increased till a critical point. Their result could be explained by a decrease of coat porosity with higher compression forces leading to slower diffusion or lower permeability of water through the porous polymer matrix as compression coat Higher compression force applied in compression coating leading to lesser porosity in the coat results in longer lag time. The effect of compression force applied to inner core on drug release from ethylcellulose compression-coated tablet was studied.[17]

FORMULATION CONSIDERATION OF COMPRESSION-COATING TECHNIQUE :

A) Compression-coating amount : Coating amount is the most important parameter to achieve a coating uniform for compression-coated tablets. A compression-coated tablet requires a coating which is about twice the weight of the core or, more general, the volume must be greater than that of the core itself. 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. Recently, increasing the drug loading by decreasing the compression coat could be performed with a novel compression tool (one-step dry coated tablet manufacturing method; OSDRC-system) [18].

B) 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. However, this drawback has been recently overcome by the novel compression tools (OSDRC-system) which placed a core in a certain position. X-ray computed tomography as non-invasive and rapid characterization method in online processing control for press-coated tablets. This technique provided cross-sectional images, which can be accumulated and built up three-dimensional images. This is based on the difference in X-ray transmittance, depended on the density of the tablet reflecting geometrical structure of compressed tablets [19].

C) Compression force and Compressibility of materials : The compressibility of coated tablets is mainly 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 need 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 [20].

D) 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. The difference in drug release of the enantiomers of verapamil hydrochloride from compression-coated tablets containing chiral polymers (pectin, galactomannan and scleroglucan) as the coat has been found.[21].

RECENT TECHNOLOGIES USED IN COMPRESSION COATING METHOD :

Compression coating technique has been described as compressing a coat around a core using specially designed processes. The process involves preliminary compression of the core, which is then transferred to a large die already containing some (a half) coating material. After centralizing the core, further coating material is added and the whole compressed to form the compression-coated tablets. The machines available for the preparation of press-coated tablets fall into two basic types: core previously prepared on other machines; compression of core and coat in one continuous circle.

A) OSDRC : A novel one-step dry coated tablet manufacturing method (OSDRC-system) was introduced. The OSDRC-system was capable of producing compression-coated tablets in one process without previous core tablet preparation.The core and coat were prepared in the schematic sequence of the OSDRC process (Fig. 3). First, the lower-outer layer was formed by pre-compression from the upper-center punch. Then, the lower-center punch was slid down and the upper-center punch was moved up. The powder for the core was filled and pre-compressed by the upper-center punch. Finally, the lower-outer punch was slid downward and the powder for the 2nd outer layer was filled and compressed by the upper and lower punches in which the center punches are unified with the outer punches. This system can be assembled onto the turn table of a rotary tableting machine and can make a dry-coated tablet in a single turn. By using the OSDRC-system, compression-coated tablets with a side outer coat thickness of 1 or 0.5 mm can prepared. [22 , 23]

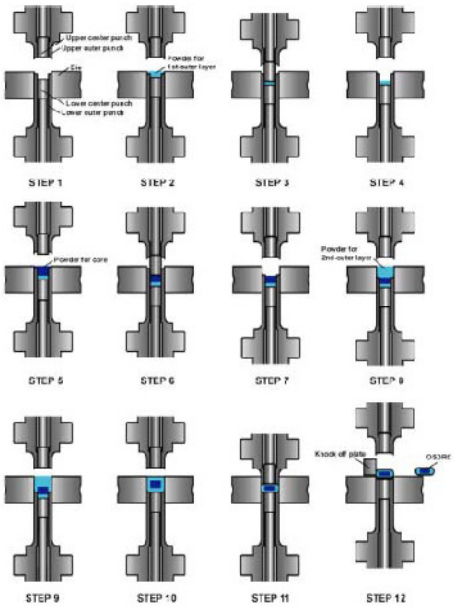

FIGURE 3 :PROCESS OF OSDRC MANUFACTURING METHOD AS DESCRIBED.

B) Dividable compression-coated tablets : It contains two cores in the controlled-release coat were prepared [18],(Fig. 4). The aim of dividable compressioon-coated tablets development was to

match the drug kinetics to individual patients (dose adjustment). The feasibility of this dividable control-released compression-coated tablet has been illustrated with comparable drug release from dividable and non-dividable compression-coated tablets.

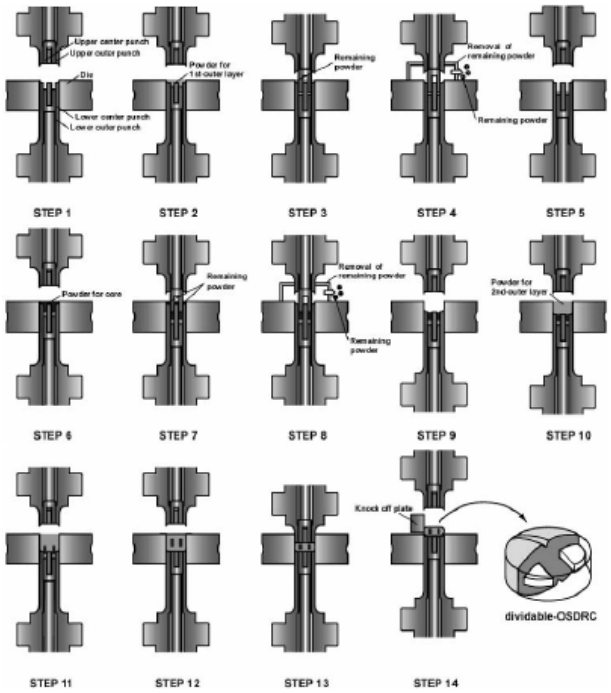

FIGURE 4 : MANUFACTURING PROCESS OF DIVIDABLE OSDRC

Compression-coated tablets in form of layer tablets (doughnut-shaped) have been prepared by partial compression coating technique using a specially designed punch set. The production process of the Manesty F3 for the three-layered tablets is shown as schematic diagram in Fig. 5 [24].

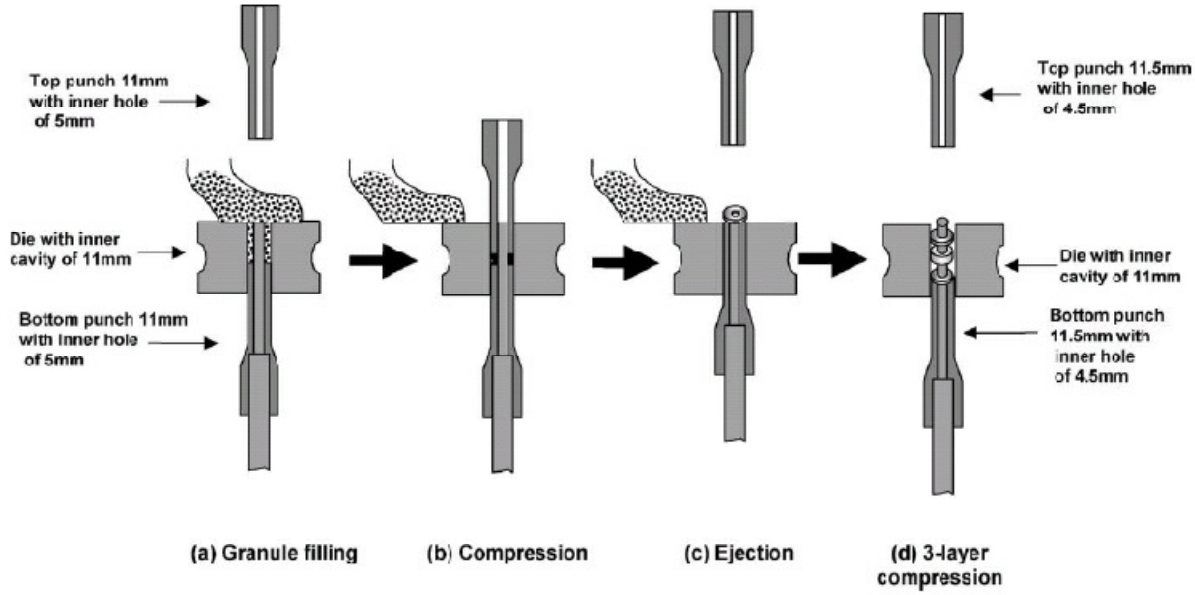

FIGURE 5 : SCHEMATIC DIAGRAM OF THE PROCESS OF THREE-LAYERED TABLETS ON THE MANESTY-F3 TABLETING PRESS.

C) INLAY TABLETS : A type of layered tablet in which instead the core tablet being completely surrounded by coating, top surface is completely exposed. Tablet compressing was 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 [25, 26].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. Atoz is offering Inlay tablets with combinations like Metformin 500mg sustained release (Outer coat) and Pioglitazone 15 mg (core tablet) which has a very unique advantage

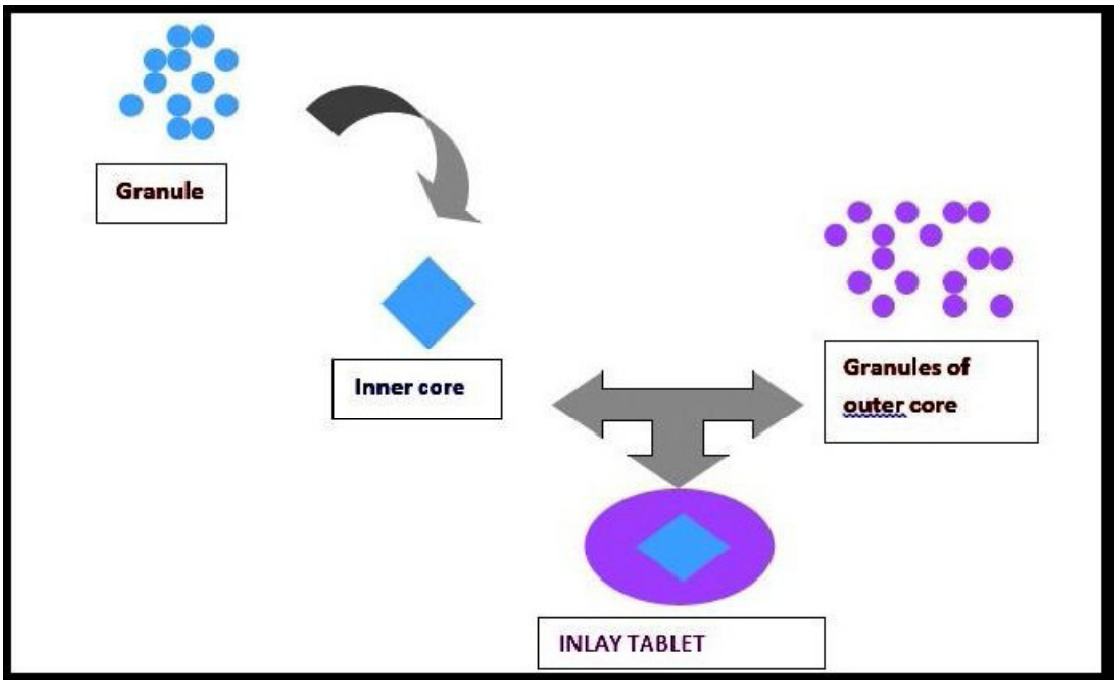

FIGURE 6 : PREPARATION OF INLAY TABLETS.

a) Advantages of inlay tablets

- Dosage form comprising of an active ingredient as modified release and an active ingredient as immediate release can be prepared.
- Has the ability to release soluble and insoluble drugs at a zero-order rate of release in dissolution media .Dosage frequency of highly water soluble drugs con be reduced providing same efficacy.
- Tablets of different shape such as triangular, rectangular, or capsule shaped tablets can be manufactured.
- Adverse effects due to sub therapeutic plasma concentration can be avoided.
- Plasma level can be maintained constant and within the therapeutic window throughout the period of treatment.
- The burst effect, namely, large release within a short period of time, is common in highly soluble drugs, and shall be avoided, as it may lead to high concentration of active ingredients in the blood stream.

Preparation Of The Compression-Coated (In-lay) Tablets: A carefully weighed amount of powder blend (coating blend) was placed in the die and compressed on a Carver Press (Wabash, IN) at a known force with the tooling shown in(Figure 7), to produce a cup-shaped tablet (cup). The cup was left within the die, and a known amount of either a model drug or a blend containing the drug was placed inside the cup and tamped lightly with the punch in an ex- tended position. A weighed amount of the coating blend was placed on top of the die contents, and the cup was compressed for a second time with the punch in a retracted position

at a known force to produce the final compression-coated tablets.

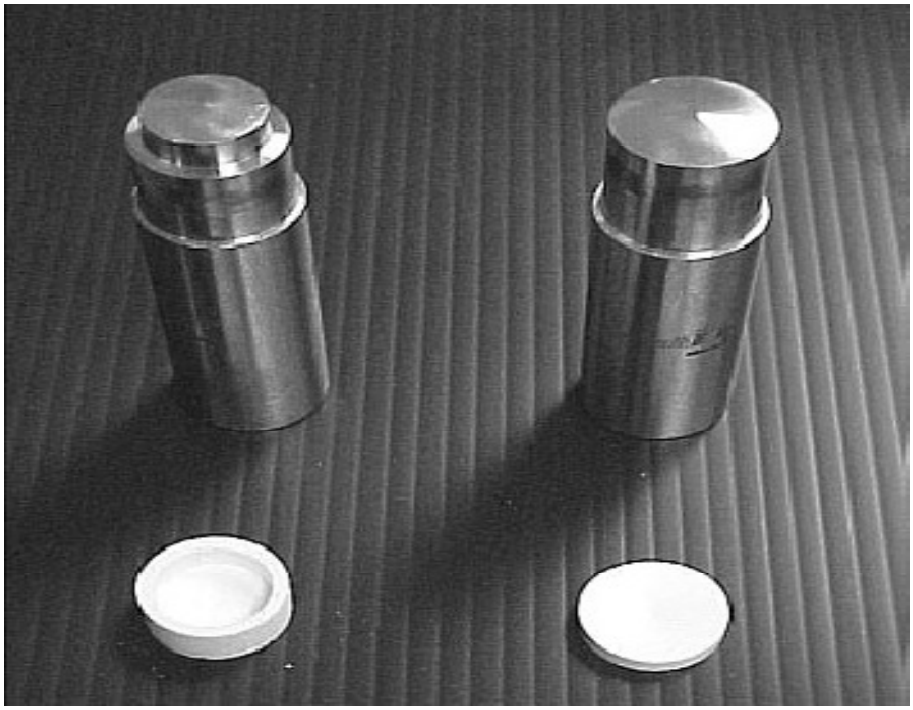

FIGURE 7 : PHOTO OF THE TOOLING USED TO DEMONSTRATE PROOF-OF-CONCEPT, A CUP, AND A FINISHED DOSAGE FORM

Patented inlay tablet formulations. [27]

1.Pravastatin Sodium (10mg) + Niacin (500mg)
2.Pravastatin Sodium (10mg) + Niacin(1000mg)
3.Lamotrigine (25mg) + Sodium Valproate(500 mg)
4.Lamotrigine (25mg) + Sodium Valproate(1000 mg)
5.Rosiglitazone Maleate (2mg) + Metformin Hydrochloride (500mg)
6.Rosiglitazone Maleate (2mg) + Metformin Hydrochloride (1000mg)
7.Rosiglitazone Maleate (4mg) + Metformin Hydrochloride (500mg)
8.Rosiglitazone Maleate (4mg) + Metformin Hydrochloride (1000mg)
9.Glimipride (1mg) + Metformin Hydrochloride (500mg)
10.Glimipride (2mg) + Metformin Hydrochloride (500mg)

APPLICATION OF COMPRESSION COATING TECHNIQUE IN PHARMACEUTICAL FORMULATION:

Compression coating, or press-coating, has been introduced during the period 1950-1960 to formulate incompatible drugs. This coating became interesting in the last two decades owning to the advantages over liquid coating, since the process does not need the use of solvents, requires a relatively short manufacturing process and allows greater weight gain to the core tablet. Nowadays, pharmaceutical aspects of compression-coated tablets in dosage form development are:

(1) To protect hygroscopic, light-sensitive, oxygen labile 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).

However, some drawbacks of compression-coating technique are:

(1) The requirement of reliable and reproducible central positioning of the core tablet within compression-coated tablet, the need of a multiple-step process or a special tableting machine. Recently, the common manufacturing problems for compression-coated tablets, such as central

positioning of the core in the compression-coated tablets and absence of core in coat, have been overcome by applying a novel one-step dry coated tablet (OSDRC) method .The OSDRC system has been introduced to improve tableting of low compressible material (such as acetaminophen) as the core, with no diluents by using high tablet ability excipient as the coat. The radial tensile strength of OSDRC tablets was the same or superior to that of physical mixture tablets. However, the advantage of OSDRC compared to physical mixture in term of drug loading has not been mentioned. A novel sugar coating method by compression using OSDRC system for moisture protection has been introduced [28]. The uses of compression coating technique in controlled release drug delivery systems have been recently published. pH independent matrix tablets containing a weakly basic drug with controlled microenvironmental pH was studied. The release of soluble pH modifiers out of tablet cores was retarded by compression coating technique, when compared to normal matrix tablet. In this case, compression-coated tablets, which contained a core of succinic acid as a pH modifier reservoir and a coat of dipyridamole, HPMC K100 and succinic acid, could successfully increase the release of the weakly basic drug in higher pH medium by reducing the microenvironment pH in the matrix coat.[29],.

CONCLUSION :

The compression coating technique can be applied to obtain flexible drug delivery systems; modified extended release with multiphase pattern and delayed release (based on time controlled, pH controlled and bacterial degradable controlled release). Drug release of compression-coated tablets as extended release can be modified by the adjusting drug-polymer ratio in core and coat. For the delayed release system, lag phase and release phase can be modulated by changing the release controlling parameters (polymer type, particle size of polymer used, pore modifier, compression coating thickness or core and coat ratio, compression force) to achieve programmable drug release for chronotherapy or site specific drug delivery in GI tract. With a 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.

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