International Journal of Humanities Social Science and Management (IJHSSM)
Volume 3, Issue 2, Mar.-Apr. 2023, pp: 596-601 www.ijhssm.org

Compression coating technique: A Review

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Date of Submission: 18-03-2023 Date of Acceptance: 03-04-2023

ABSTRACT
In the past some years the number of products based on new drug delivery system has significantly increased, andthis extension is expected to continue in the future. Tablet dosage form is convenient and relevant as compared toother dosage forms. Innovation in tablet dosage form provide product of higher selectivity for the drug for medicaltreatment. There are so many existing drug delivery technologies in recent years developed. This is an attempt tobeing made to compile some of the most successfully marketed drug delivery technology in this article. Thepresent review focus on innovation in tablet system i.e. Tablet in tablet system. Evolution of an existing drugmolecule from a conventional form in to said technology can improve performance in terms of safety, efficacy andpatientcompliance.

Keywords: New drug delivery system, Tablet, tablet in tablet, safety, efficacy.

I. INTRODUCTON

It is a system in which the entire surface of an inner core is completely surrounded by the coat.These coats prevent drug release from the core until the polymeric or drug coat is entirely eroded, dissolved or removed.
The technique, a simple and unique technology, is used to provide tablets with a programmable lag phase, followed by a fast, or rate-controlled, drug release.
Release of drug depends upon the coating layer and core composition. it has a solvent-free coating and facilitate manufacturingprocess.
It can be used to deliver one or more drugs.0
It is one of the approach which combines the features of both controlled release tablet and immediate 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.Provides a barrier for a substance irritating to the stomach or one inactivated by gastric juiceThis gives a far more accurate dose than in the case with sugar coating.
The process is as follows
1. Firstly core tablet is formulated which is small in size
2. Then for the upper coating, large size punches are used
3. Half amount of coating material is placed in die cavity
4. Then carefully place a core tablet on it
5. After that remaining half amount of coating material is taken

6.And finally the tablet is Compression coating also referred to as press coating or dry coating is the process by which a fine dry granulation is compressed onto a tabletcore of drug.
This is usually achieved using a specially designed tablet press such as Drycota (Manesty) and Prescota (Killian).
Compression coating is essentially a dry process and thus may be suitable for coating tablets containing heat and moisture liable drug(s) such as aspirin and penicillin.
This coating process has also been used to separate two incompatible active pharmaceutical ingredients; one contained in the tablet core and the other in the coating.

Repeat action and sustained action tablets are produced by this coating method. Although traditionally a less popular process, compression coating has gained increased interest in recent years as a means of creating specializedmodified-release products.It involves the compaction of granular materials around a preformed tablet core using specially designed tableting equipment. Compression coating is a dry

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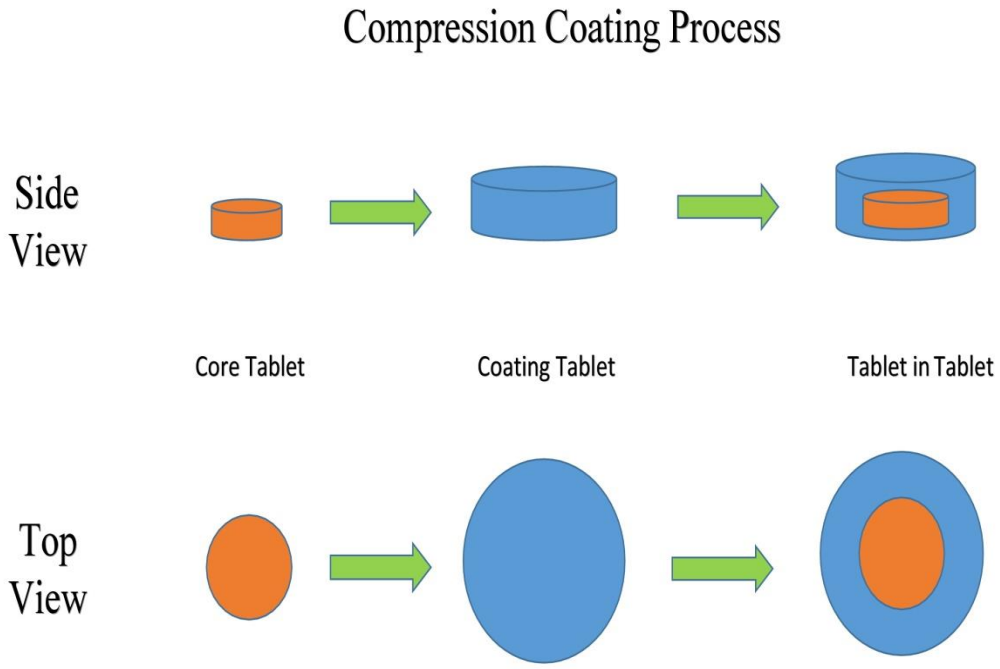
process. It has advantages in some cases in which the tablet core cannot tolerate organic solvents or water and yet needs to be coated for taste masking, or to provide delayed or enteric properties to the product.



Objective

Compression-coated formulations can be used to protect hygroscopic, light-sensitive, oxygen or acid-labile drugs, or to separate incompatible drugs from each other. They can also be used to achieve controlled release, and a number of studies have evaluated compression-coated time-controlled drug delivery systems.

Approaches

1. Multiphasic release
2. Delayed release
3. Time controlled release
4. pH controlled release
5. Microbial controlled release

1.Multiphasic release

1. Multiphasic release is a delivery system designed for many diseases which have marked diurnal rhythms.
2. In such diseases, drug concentrations are needed to vary during the day. Drug levels need to be highest when symptoms are most severe.
3. 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.
4. A variety of drug release: sequential release of different drugs or multi-phasic release of drugs is Achievable.
5. Compression-coated tablets with multiple layers for desirable therapeutic use can be prepared.
6. Different drug release patterns can be obtained with adjusting drug loading and polymer type in each layer.

2.Delayed release

1. Delayed release is obtained when all surface of core is compression coated.

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2. Lag time for drug release could be controlled by the application of different polymeric coats.

3.Time controlled release

1. A delayed release tablet consists of a drug core which is compression coated with different polymeric (pH independent) barriers.

4.pH controlled release

1. A delayed release system using enteric polymers as a coating can provide site-specific drug delivery especially for colon and intestine.
2. 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 degradation in the upper gastrointestinal (GI) tract, while time controlled release can not achieve owing to large variations in gastric emptying time

5.Microbial controlled release

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

Factor affecting core coating

A) Tablet cores
B) Drug solubility
C) Tablet core formulation
D) Compression coating
E) Polymer type
F) Particle size of polymer used
G) Porosity or release modifier incorporated in coat
H) Core-coat ratio
I) Compression force

Advantages

1. Elimination of the bitter taste and unpleasant smell of the active pharmaceutical ingredient (API).
2. Elimination of water or other solvent in the coating procedure and thereby decreasing the possible degradation of the API.
3. Easier and more economical manufacturing process.
4. Stability of moisture sensitive drugs can be improved by this technique.
5. Improves patient compliance by decreasing dosing frequency.
6. Both immediate and sustained release formulation can be prepared in single unit tablet.
7. A desirable plasma drug concentration is maintained by continuous drug release.
8. Compression coating tablets may include flavouring agents, which could improve the patient's compliance and acceptance with the drug substance.

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 comprisedmainly 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)

2. polymer coat is completely eroded, swollen or ruptured.

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-centre. 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

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

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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

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.

Applicationofcompressioncoatingtechnique inpharmaceuticalformulation:

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. Now a days 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 drug in one tablet).

However, some drawbacks of compression-coating technique are:

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.

Recenttechnologies usedincompression coating method:

A) OSDRC
B) Dividable compression-coated tablets
C) INLAY TABLETS

Review of literature on compression coating techniques

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 reformulated 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.

The present review is intended to give an update on compression coating and its applications to develop the colon-specific tablets. One of the simplest methods to gain colon-specific drug delivery is polymer coating of tablets containing active pharmaceutical ingredient. To overcome the problems related to solvent coating, pharmaceutical formulation scientists were focusing on solvent-less coating, mainly on compression coating. Compression coating is one of the promising dry coating methods that don't require either solvent or heat. Compression

Coating is not only applying to protect the drug from atmosphere but also to achieve the modified drug release. One of the significant areas where compression coating is widely used is site-specific drug delivery, particularly colon-specific drug delivery. Present article is mainly focusing on application of compression coating method on core tablets to deliver the dug to colon.

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. 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 micro environmental 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],Corresponding author: Sateesh Kumar V, Department of Pharmaceutics, MAK College of Pharmacy, Moinabad, Ranga Reddy, Telangana, India

II. 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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