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Review Article

Brief overview on pharmaceutical coating

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Article History	Abstract
Received: 03-10-2022 Revised: 19-10-2022 Accepted: 20-11-2022	One of the common methods used in the pharmaceutical industry to coat tablets is to add a thin polymer-based coating to a tablet or granule that contains the medicament. Solid dosage forms, such as a capsule or pill, are frequently used. Controlled release is one of the primary causes. The amount of coating on the tablet surface has a significant impact on how effective the oral dosage form is. Tablets are typically coated by spraying specialised coating solutions over their bed-free surface in that horizontally rotating pan. Tablet coating has a number of benefits, including masking flavour and odour, safeguarding the medication from physical and chemical harm, and safeguarding the environment. Tablets can be coated using a variety of methods, including enteric coating, film coating, and sugar coating. Coating methods that address the many problems with solvent-based coatings are recent developments in pharmaceutical technology. The most recent coating techniques do not employ a solvent; instead, ingredients are applied directly to the surface of solid dosage forms. This article provides a brief overview of tablet coating, including its different varieties, benefits, and drawbacks.
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**Introduction**

A tablet is an oral dose type used in pharma. Several excipients and the drug are compressed to create solid dosage forms. In order to get specific benefits, including those that range from controlled medication release from the dosage form to ease of product identification, the coating process may be characterised as the application of a coating material layer to a dosage form's surface [1]. Coated tablets are those that have one or more layers of a mixture of different materials, such as gums, resins, sugar, plasticizers, etc., covering and protecting them. When coating is applied, materials are typically used as a suspension or solution that evaporates on the vehicle [2]. The coating's formula is applied to a batch of tablets in a tumbled pan coating, covering the tablet's surface with a

goeey or sticky polymeric film. The surface of the tablet transforms throughout this process, from a tacky liquid to a tacky semisolid, and finally to a non-sticky dry surface [3].

**Objectives of Coating**

The tablet coating objectives are listed below

- To increase patient compliance and cover up the unpleasant taste, odour, or colour of the tablet.
- To provide a chemical or physical barrier to the API and shield the medication from the elements (especially air, light, and moisture) in order to increase stability.
- To prolong the medicine's shelf life
- Large dose forms are now easier to swallow.
- To lessen the loss of volatile materials

- To modify and/or regulate the rate of drug release, such as in products that have a repeat action, a delayed release (enteric coated), or a sustained release
- To collaboratively combine incompatible medications in a single-dose form.
- The dose form's mechanical strength has been improved [4-6].

#### **Tablet Coating Advantages**

- Tablet coatings must be stable in any condition and able to survive the handling of the tablet. It must not make the sticky nature of tablets stick together during the coating process and should follow the fine logos on tablets or contours of embossed characters.
- Coatings can also facilitate printing on tablets, if needed. Coatings are essential for tablets that have an unpleasant taste, and a smoother finish makes the large tablets simpler and easier to swallow.

#### **Tablet Coating Disadvantages**

- The demerit of sugar coating is that factors such as its relatively long coating time, high cost, and high bulk have led to the use of other materials for coating.
- However, because the coating process is time-consuming and tedious, it needs the expertise of a highly skilled technician.

#### **Factors Affecting Tablet Coating**

##### **Tablet Properties**

- The tablets should be resistant to chipping and abrasion to last through heavy attrition striking over the walls of coating equipment or other tablets.
- A sphere is the best shape possible for coating [7].

##### **Coating Process**

- Equipment selection for tablet coating is specialised, and its automation also has an impact on coating.
- Factors like temperature, humidity and air flow have an impact on the coating process.

##### **Coating Composition**

- Colorants
- Plasticizers
- Solvents
- Polymers [6].

#### **Various Kinds of Tablet Coating**

##### **Sugar Coating**

In the beginning, the coating on tablets was made using sugar to cover up the bad taste.

and provide the tablet's core portion with an appealing, visible appearance. The steps involved in coating tablets are as follows:

##### **Sealing**

To stop moisture from getting inside the tablet's core, a sealant is applied. The original purpose of shellac was as a sealer. But zein changed it because of issues with polymerization (a compound protein derivative).

##### **Sub coating**

This is the process where the tablet's edges are rounded and its weight is increased.

##### **Syrup Coating**

The defects in the surface of the tablet are capped up, and the predetermined size is attained. Maximum skill is required in this step.

Coloring: This step is to give the tablet its final color.

Polishing: Powdered wax (beeswax or carnauba) is used to offer a desired luster [8].

##### **Film Coating methods**

A film coating is nothing more than a thin, polymer-based coating that is commonly sprayed onto the tablet, pellet, capsule, or other solid pharmaceutical dosage form. Film coating is a crucial step in resulting in the finished drug product since it can affect both its pharmacokinetics and appearance.

The most frequent type of medication coating used in oral dosage forms is called a "film coating." The primary reasons for coating dosage forms with film are aesthetic factors (colour, gloss, and branding), increasing the shelf life by creating a barrier between the environment and the drug, and improving the dosage form's ease of use and swallowability. Non-functional film coatings are the name given to these kinds of film coatings. It may also be used to speed up or slow down the absorption and distribution of drugs, or to delay release and absorption until the entire dose has travelled through the GIT. Functional film coatings are the name given to these kinds of film coatings.

##### **Types**

##### **Organic solvent-based Film Coating**

Organic solvent is utilised in film coating, which is frequently employed to provide protective coatings to the oral dosage form and increases the shelf life of the finished drug product. Due to its potential for toxicity in the finished drug product and flammability during the film coating process, this form of film coating may be dangerous. As a result, when film coating, it's crucial to have adequate ventilation and safety precautions in place.

#### Aqueous based Film Coating

Aqueous film coating is currently employed and is the most common method of film coating. Aqueous-based film coating employs water as an alternative to organic solvents during the film coating process. As a result, film coating becomes safer because organic solvents' poisonous and combustible characteristics are avoided. Water-insoluble polymer combinations are required for aqueous film coating, together with a plasticizer. Aqueous film coating takes longer than organic solvent-based coating, despite its broad fame and popularity, because more time is needed for the complete evaporation of water.

#### Solventless based Film Coating

Due to the benefit of not requiring a drying step, solvent-free film coating is most frequently employed to coat medications that are sensitive to heat. An inert film coating that does not react with API is the end product of this solvent-free film coating method. Injection hot-melt coating, moulding coating, and spray congealing are a few techniques for making a solvent-free film coating. Each approach has advantages and disadvantages of its own, but the requirement for highly specific conditions that can effectively apply a film coating to the oral dosage form is the one that unites them all. Its lack of broad application is due to the fact that it is an unsuitable sort of film coating [9].

#### Properties

##### Non-Functional film coating

When a film coating is of the non-functional type, it affects the appearance of oral dosage forms. Such modifications have a negative impact on an oral dosage form's appearance, swallowing abilities, and organoleptic properties. They also provide protection against harsh environmental conditions that could harm the API. These changes are carefully monitored to improve outcomes and adherence to the oral dosing form. For instance, changing the colour of the drug can change how it looks and make the final product more appealing. For people suffering from dysphagia, changing the swallowing qualities can make it simpler and easier. Finally, applying a layer that protects against harsh surroundings, such as oxidation, humidity, or light, lengthens the shelf life of the finished product.

##### Functional Coating

Similar to non-functional film coatings, functional film coatings have several additional qualities that can have a negative impact on drug release. The area of the gastrointestinal tract where the final drug product is discharged is altered by these modifications [10].

#### Process

There are two stages involved in adding film coatings to oral dosage forms: drying and spraying [9]. The spraying phase involves coating the core of the oral dosage form with a layer of a polymer, colourant, plasticizer, opacifier, solvent, and vehicle [10].

#### Enteric coating

Enteric coating means it can prevent the release of medication before it reaches the small intestine. An enteric coating is a barrier that controls the location of oral medication [11].

An enteric coating material can be made alone or blended with other materials for coating preparation [12].

The bitter taste of drug shall be masked by a combination of microencapsulation by coacervation and subsequent functional membrane coating on the microcapsules with acrylic polymers [13].

#### Tablet Coating Defects

##### Picking and sticking

This happens when the coating separates a piece of the tablet from the core. Excessive film tackiness or over wetting causes tablets to stick to one another or to the coating pan. On drying, at the point of contact, a piece of the film may persist adhered to the pan or to another tablet, giving a "picked" appearance to the surface of the tablet and finally resulting in a little exposed core area.

##### Mottled Color

This can take place when the coating solution is inappropriately prepared; the actual or usual spray rate may differ from the target rate if the cores of the tablet are cold or the drying rate is less than 12 hours [14].

##### Bridging

This will happen when the coating fills the logo or lettering on the tablet and is commonly caused by inappropriate application of the solution, high coating viscosity, poor design of the tablet embossing, a higher percentage of solids in the solution, or improper atomization pressure.

##### Erosion

This can be the result of soft tablets, an over-wetted tablet surface, inadequate drying, or a lack of tablet surface strength [7].

##### Capping and Lamination

It is defined as when the lower or upper portion of the tablet separates or is removed horizontally, i.e., either completely or partially from the main body of the tablet, and comes off as a cap during subsequent handling or during ejection of the tablet press. The uncoupling of the tablet into two or more distinct layers is known as lamination. It occurs due to the entrapment of air during

the compression process or due to the expansion of the tablet during ejection.[15]

#### **Twinning**

Two tablets sticking to one another or together is called "twinning", which is a usual difficulty with capsule-shaped tablets. This is a problem where the tablet's surface coating has been peeled away in a sheet. Peeling denotes that the coating solution did not lock into the surface of the tablet. This will happen because of a defect in the coating solution, high moisture content in the tablet core, or over wetting.

#### **Chipping**

In this case, the film becomes chipped, usually at the tablet edges. This is the outcome of a friable tablet core, high pan speed, or a coating solution that lacks a good plasticizer [16].

#### **Orange peel**

This refers to the texture of the coating, which resembles an orange surface. The problem is where the film becomes chipped and dented, commonly at the tablet edges. It is commonly the outcome of high atomization pressure in combination with spray rates that are too high.

#### **Blushing**

It is a problem where the film becomes chipped and dented, usually at the tablet edges.

#### **Blooming**

In this type, the surface becomes dull immediately or after a long time [17, 18].

#### **Conclusion**

The coating of pharmaceutical dosage forms increases the product's quality. The coating is applied to a dosage form that is already functionally complete. Bioavailability of the drug can be modified by coating process. Several other problems may also arise during the coating process. These problems can decrease the users' satisfaction and the potency of the product. In this review, we discussed coating defects, types of coating, and factors affecting various coating processes and the advantages and disadvantages of coating have been discussed. In the future, there is an enormous possibility of developments and improvements in the area of tablet coating that will achieve specific benefits.

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