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NATURAL POLYMER: A REWARD FOR FAST DISINTEGRATING TABLET

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ABSTRACT

At present, there are several solid unit dosage form such as capsule, tablets and many- more, but for high bioavailability and for emergencies conditions, the fast disintegrating tablets by sublingual route is preferred. And for its better performance the natural polymer shows its great efficacy to overcome the limitations of the synthetic polymers as a superdisintegrants in FDT. Natural polymer like starch, Fenugreek seed mucilage, mango peel pectin, Guar gum, Isapghula Husk, Soy polysaccharides, Chitosan etc. are used generally as a superdisintegrant in various pharmaceutical preparation to increase its bioavailability.

KEYWORDS:- Fast Disintegrating Tablets, Sublingual routes, Synthetic polymer, Natural superdisintegrants, Novel drug delivery, Bioavailability.

INTRODUCTION

When it comes to better patient comformity and better choices in emergencies, the novel drug delivery system of drug is in demand from last twenty years. For giving instant onset of pharmacological effect, the sublingual route was choosen for systemic drug delivery. Difficulty in swallowing which is also known as Dysphagia is a common issue for all age group, especially for those who are unconscious or old age people or children. Sublingual route is the route of the administration of drug in which the drug was placed under the tongue

and reaches directly to systemic circulation. By using the sublingual route for administration of drug, the absorption of drug increases by 3 to 10 times in comparision of oral route. For these preparation through sublingual route is less quantity of saliva is required for disintegration of tablet in the mouth. The drugs absorbed by sublingual route gives rapid onset of action but the efficacy of the drug through this route is for short period of time.[1-5]

The basic need of today's scenario is the preparation of drug into an accepatable form. The preparation of drug into a doasage form is a suitable way for the application of drug into a living organism. There are different types of dosage forms which are having different type of drug delivery mechanism such as patches, injections, suppositories, transdermal, suspension, tablets, syrups. These different types of dosage, either traditional or modern have few merits and demerits. Hence, we can say that, the preparation of a perfect drug delivery system is very difficult for a pharmacist in today s scenario. The drug should be distributed at target site in such a way, that the drugs rate and concentration helps to get the maximum therapeutic effect and lowest side effects. For thepreparation of a compatible and specific dosage form, it is very important to perform its preformulation studies and to study its physiochemical properities.[6,7]

This difficulty of drug delivery system can be solve by the preparation of rapidly fast disintegrating tablets (FDTs) and perfectly fit for the patient compliance. The FDT preparation is defined by the Food and Drug Administration (FDA) as "a solid dosage form containing medical substances which disintegrates rapidly, usuallywithin few seconds, when placed upon the tongue." According to European Pharmacopoeia, "The FDT should disperse/disintegrate in less than three minutes.[8,9,10]

Necessities of fast disintegrating tablet

There are various facilities that have been made FDT enable to achieve this immitable function. For making an ideal fast disintegrating tablet, the following criteria should be fulfill:[11-15]

- On the oral administration of Fast disintegrating tablet, it should disintegrate in the mouth within fewseconds, it should not require water for administration of FDT.[16]
- For producing the rapid onset of action the drug should be dissolve and absorb quickly.[17-20]
- The FDT help in providing more safety, so that there is no risk of chocking or suffocation duringadministration through oral route of drugs in their conventional form

due to physical obstruction.[21]

- The taste masking agent and other excipients must be compatible with FDT drug.[22]
- Due to reduced dosage and pre-gastric absoption of FDT, it can be leads to enhance the bioavailability.[23]
- A good FDT should not left over any residue in mouth after oral administration.[24]
- It is very helpful, when there is any emergency case and ultra-quick onset of action required, such as Angina Pectoris, Motion Sickness, Coughing or sudden episodes of allergic attack etc.[25]
- It is cost effective and high drug loading is possible.[26]

Merits of fast disintegrating tablets

There are many benefits of these dosage form which are increasing day by day in both academies and pharmaceutical industries. There are dual advantages of FDT that is solid dosage forms and liquid dosage formsalong with special factors as following:[27-34]

- There is no requirement of water for swallowing the tablet[35]
- This is an ideal option for old age people and children and due to its quality of unit solid dosage form, it is easy portability and manufacturing provide accurate dose and having good stability(chemically and physically).[36]
- As some drugs absorbed, when given from mouth, pharynx and isophagus, when passing down into stomach by saliva, the FDT increases bioavailability by 10 times.[37]
- When patients are travelling, they can take it without access of water, there is no obstruction.[38]
- FDT avoids first pass metabolism thus, bioavailability increase dose and adverse effect decreases.[39]
- The manufacturing of FDT tablets cost low due to conservative processing and packaging instruments.[40]
- In comparison of liquids dosage form it has more accurate dosing.[41]
- It offers betters patient conformity.[42]

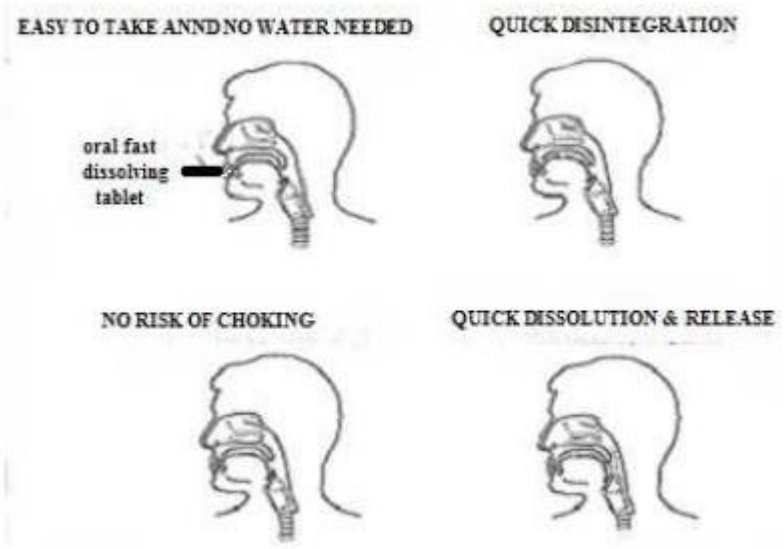

Fig. 2: Advantages of FDT.[43]

Key role of superdisintegrants

The superdisintegrants play a key role, in orally administered preparations for dissolution and disintegration of tablet, so this sector grows rapidly in pharmaceutical industry is due to its benefits of better conformity in children and age people.[44]

Types of superdisintegrants

Superdisintegrants can be categorized into following, on the basis of their source of origin

A) Natural

B) Synthetic

C) Semi-synthetic.[45]

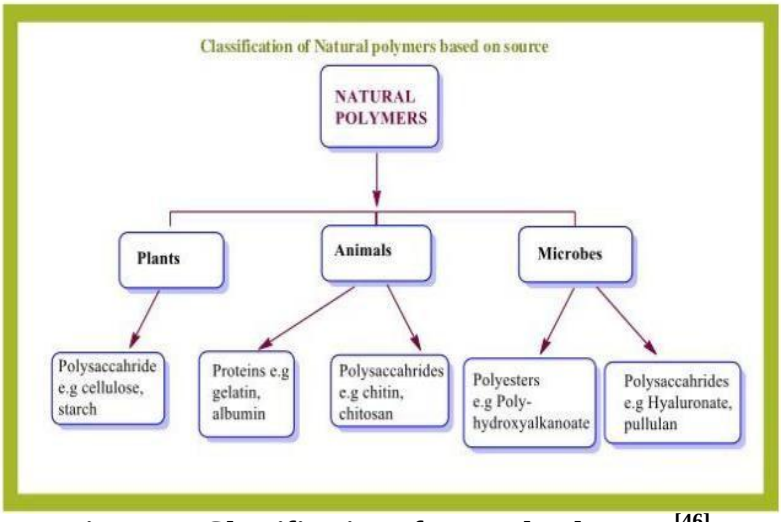

Fig no. 1: Classification of natural polymers.[46]

Natural polymer

These polymers are found in nature generally from plants and animals sources. Such as proteins, cellulose, starch,resins, etc.

Foundation of natural polymer

The natural polymer is an topic of interest because it is obtained from natural source of origin that are rich and viable and easily available. Polysaccarides are rich in nature and the various sources of polysaccharides which are available are alginates, dextran, xanthan gum, pectin, guar gum, chitosan and recombinant DNA techniques. There are many supportive properities of monosaccarides polymers for examples non-toxicity, biodegrability, higher stability, hydrophilicity and makes chemical modification easy. There is a huge variety of structural composition is present in polysaccharides plant, which is not only connected with origin of plant for example, seeds, roots, leaves etc. There are two distinctive structural topographies which can be explain the variety and complication of polysaccarides. First of all monosaccarides can be joined together in various ways and in an α or β pattern. Second, it could be done in the presence of branched site chains.[47]

Natural polymer as superdisintegrants

For the synthetic material, there are various plant based products which is used as a substitute due to theirfollowing quality:-

- Ecofriendly
- Biocompatible
- Non-poisonous
- Easily available in local area
- Patient identification as well as public acceptance.
- Sustainable and Bio-acceptable
- Cheap price as contrast to synthetic and renewable source.[48]

There are different-different scientist, which have discovered the plant based pharmaceutical superdisintegrant and plant-based pharmaceutical excipients.[49] Then substitute of synthetic products are the plant based material, because they are available easily, biodegradable, renewable sources, bio-acceptable and having low prices. Due to the capability of plant polysaccharides and proteins, they have a wide range of properities based on their molecular structures, so many research have been made to witness their disintegrant properities.[50,51]

There are some boundaries that superdisintegrant carry when they are practically incorporated in pharmaceuticalproducts such as:-

- If it is a hygroscopic substances.
- If it contains anion charges, then it may cause some mild in- vitro binding with cation charges of drugs.[52]
- An acidic intermediate considerably reduces the fluid uptake pace and ability of sodium starch glycolate and croscarmellose sodium, but not crospovidone.[53,54]
- The scale of enlargement of Primojel1 (Sodium starch glycolate) and Polyplasdone XL101 (Crospovidone) is minimized following wet granulation formulation. In conclusion, the standard ionic potency was originate to have an unfavorable consequence on the swelling aptitude of croscarmellose.[55,56]

Hence, for overcoming these limitations of superdisintegrant is used as an alternative.[52]

Isapghula husk

Isapghula Husk belongs to the family of Plantagoginaceae. The Isapghulahusk and seeds are valuable sources of fibrers and mucilage of this plant. For the preparation of controlled-release drugs in the pharmaceutical industry, Isapghula Husk is used as a laxative, to lower glycemic index. The properities of Isapghula Husk to the absorption of quick water increases its weight upto 10 times. The Isapghula Husk are water soluble polysaccharides, that arewhen comes in contact of water, forms mucilage, hydrocolloids make up 10-30% of Isapghula Husk. When, thereis hydrolysis of Isapghula Husk, the mucilage divides and we obtained different types of polysaccharides such as galacturonic acid, galactose, xylose, rhamnose, arabinose. The different types of polysaccharides which we obtained are lead to the disintegrative properities of the Isapghula Husk and can be used as a natural disintegrant in drug formulation.[57]

Hibiscus rosa-sinensis Linn. Mucilage

Hibiscus rosa- sinensis Linn is also known as China rose, Chinese Hibiscus, Shoe flower plant. This Hibiscus rosa- sinensis Linn belongs to the family Malvaceae. The Hibiscus rosa-sinensis Linn is available in a huge amount, all over the India and in pharmaceutical formulations, its mucilage is used as a superdisintegrants. The plant of Hibiscus rosa-sinensis Linn consist of β-rosaterol, 2-hydroxysterculate malvate. Methyl sterculate, cyclopropanoids.[58]

Mango peel pectin

In the formulation of different pharmaceutical dosage form the mucilage of Mango peel pectin is used as an excipient. The synthetic polymer when used as an excipient, it leads to many demerits for examples toxicity, environmental pollution, non-biodegrability, high cost etc, whether the mucilage of mango peel pectin is having various properities like disintegrating, binding, emulsifying agent and suspending agent, in different fraction in various pharmaceutical formulations. As of natural mucilage pulps, pectins are considered due to their qualities like low cost, non-poisonous, freely accessible, non-irritating, emollient effect over the semi-synthetic and synthetic substances. The mango consist of various chemical constituent such as 16 to 20% tannin, namely protocatechin acid, catechin, and kinic acid. The Magnifera indica also includes the chemical constituents like alanine, magniferine, shikimic acid and resinous gum and astrigent. It has various application such as it is used as in rheumatism and as a vermifuges.[59]

Starch

Starch is found in green plants, underground organs and seeds. Starch is the principal form of carbohydrate reserved in green parts of plants. If we consider the shape and size of the starch, so starch is present in the form of granules also known as starch grains, its shape and size are specific of some species as starch also contains the fraction of the principal constituents, amylopectin and amylose. In pharmaceutical formulations, the starch have various uses. There are various grains and plants which contain starch such as, maize, wheat, potato and rice. The protein and proteinase inhibitior were formulated which is incorporated in microcapsules, for the oral administration of peptidic or proteins drugs. The interfacial cross linking with terephthaloyl chloride was used formanufacturing of starch serum albumin mixed walled microcapsules. On the duration of cross-linking procedure by incorporating protease inhibition in the aqueous phase, the micro capsules were loaded with native or amino protected aprotinin. The protective result was exposed by in vitro of microcapsules with aprotinin for starch serumalbumin.[60]

CONCLUSION

In the Today‘s scenario, the novel drug delivery plays a vital role, and the fast disintegrating tablet was shows itself a better dosage form. By concluding the whole article, we can say that, as we are using synthetic polymer for long time, we deals many disadvantages of it. To overcome these disadvantages, the natural polymer is like areward in the formulation of fast

disintegrating tablet by sublingual route.

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