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FAST DISINTEGRATING TABLET TECHNOLOGY: NEWLY PROSPECTS

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ABSTRACT

Tablet that disintegrate rapidly in the mouth are convenient for patient who have difficulty in swallowing conventional dosages forms. Although various formulation technologies like Zydis Technology, Durasolve Technology, Orasolve Technology, Flash Dose Technology, Wow Tab Technology, Flash Tab Technology, Quicksolv Technology, Lyos Technology, Fast Melt Technology and Zip-lets Technology are used. This review highlights numerous techniques to explain the phenomenon of preparing mouth disintegration tablets like Freeze Drying, Moulding, Sublimation, Spray Drying, Direct compression, Wet granulation and Dry granulation.

Keywords: Mouth disintegrating tablet, technology, patented

INTRODUCTION

Recently pharmaceutical preparations used for elderly patients have been investigated to improve the treatment compliances and quality of life of patients.[1] Recent advances in Novel Drug Delivery System (NDDS) aims to enhance safety and efficacy of drug molecule by formulating a convenient dosage form for administration and to achieve better patient compliance. One such approach is "Mouth Dissolving Tablet".[2,3]

The concept of Mouth Dissolving Drug Delivery System emerged from the desire to provide patient with conventional mean of taking their medication. Difficulty in swallowing (Dysphasia) is a common problem of all age groups, especially elderly and pediatrics, because of physiological changes associated with these groups of patients. [4] Other categories that experience problems using conventional oral dosage forms includes mentally ill, uncooperative and nauseated patients, those with conditions of motion sickness, sudden episodes of allergic attack or coughing. Some times it may be difficult to swallow conventional products due to unavailability of water.[5] These problems led to the development of novel type of solid oral dosage form called "Mouth Dissolving Tablets". This tablet disintegrates instantaneously when placed on tongue, releasing the drug that dissolves or disperses in the saliva.[3]

On placing mouth-dissolving tablet in the mouth, saliva serves to rapidly dissolve the dosage form. The saliva containing the dissolved or dispersed medicament is then swallowed and the drug is absorbed in the normal way. Some drugs are absorbed from the mouth, pharynx and esophagus as the saliva passes down into the stomach & it may produce rapid onset of action.[6] In such a cases bioavailability of drug is significantly greater than those observed from conventional tablet dosage form.[2] The dispersible tablets allows dissolution or dispersion in water prior to administration but the Mouth Dissolving Tablet instead of dissolving or disintegrating in water is expected to dissolve or disintegrate in oral cavity without drinking water. The disintegrated mass then slides down smoothly along the esophagus along with saliva.

The growing importance of mouth dissolving tablet was underlined recently when European Pharmacopoeia adopted the term "Orodispersible Tablet" as a tablet that to be placed in the mouth where it disperses rapidly before swallowing.[7 -8] Mouth dissolving tablets are also known as fast dissolving tablet, melt in mouth tablet, rapiment, porous tablet, orodispersible tablet, Rapidly Disintegrating tablet, or mouth disintegrating tablet.[9]

Fundamentals of Mouth Dissolving Tablet

For rapid dissolution or disintegration of dosage form, water must rapidly penetrate into the tablet matrix to cause quick disintegration & instantaneous dissolution of the tablet. Several techniques are used to achieve these fundamentals, to formulate mouth-dissolving tablet. Some of the techniques are described below.

1) Freeze Drying

Freeze-drying or lyophilization can be utilized to prepare mouth-dissolving tablets, which are very porous in nature and which quickly disintegrate or dissolve upon contact with saliva. This method involves incorporation of the drug in water-soluble matrix, which is then transferred to the preformed blister with peelable foil, as the Zydis units are not strong enough to withstand being pushed through the lidding foil of a conventional blister, freeze drying is then done to remove water by sublimation. [10]

2) Moulding

Moulded tablets are prepared by using water-soluble ingredients so that the tablet dissolve or disintegrate rapidly and completely.[11] Powder is moistened with the help of hydro alcoholic solvent and then moulded into tablets under pressure less than the conventional dosage form. The solvents are removed by air-drying. The tablet posses porous structure, which facilitate easy dissolution. Adding sucrose, acacia or PVP.30, 22, may increase the mechanical strength of the tablet. [12]

3) Sublimation

The basic principle involved in preparing fast dissolving tablets by sublimation technique is addition of a volatile salt to the tabletting components, mixing the components to obtain a substantially homogeneous mixture and volatizing a volatile salt. The removal of volatile salts creates pores in the tablet, which help in achieving rapid disintegration when the tablet comes in contact with saliva. Camphor, Naphthalene, Urea, ammonium bicarbonate, etc, can be used to prepare porous tablets of good mechanical strength. Koizumi et al. used mannitol as diluent and camphor as a volatile material to prepare porous compressed tablets.[13] The tablets were subjected to vacuum at 80^0C for 30 min to eliminate the camphor and thus forms the pores in the tablet. The major steps involved in the sublimation technique are shown in following figure.

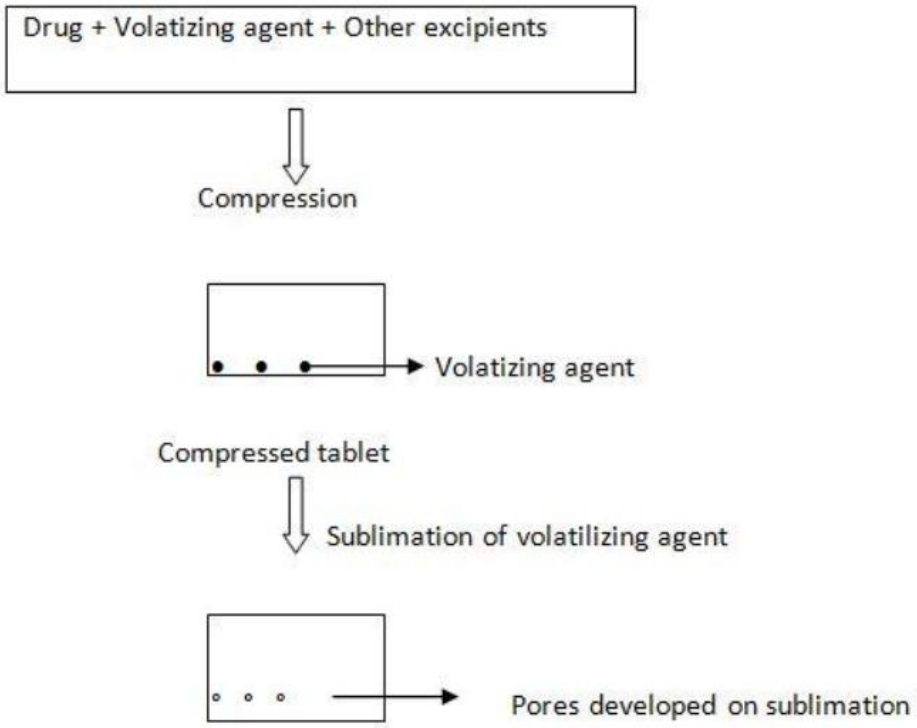

Fig 1: Steps involved in sublimation

4) Spray Drying

Spray Drying can be used to prepare rapidly dissolving tablet. This technique is based upon a particulate support matrix that is prepared by spray drying and aqueous composition containing support matrix and other components to form a highly porous & fine powder. This is then mixed with active ingredient & compressed into tablet. The fast dissolving tablet prepared from spray drying technique disintegrated within 20 seconds.[14,15]

5) Direct compression

The term direct compression is used to define the process by which tablets are compressed directly from powder blends of active ingredient and suitable excipients, which will flow uniformly in the die cavity and forms a firm compact. Direct compression methods are very popular because it reduces the number of steps involved and the materials required. [12,16]

6) Wet Granulation

Wet granulation is the process in which a liquid is added to a powder in a vessel equipped with any type of agitation that will produce agglomeration or granules. These granules after drying are compressed to form tablets.

This method has more operational manipulations, and is more time-consuming than the other methods. The wet granulation method is not suitable for drugs, which are thermolabile or hydrolysable by the presence of water in the liquid binder. [12,16]

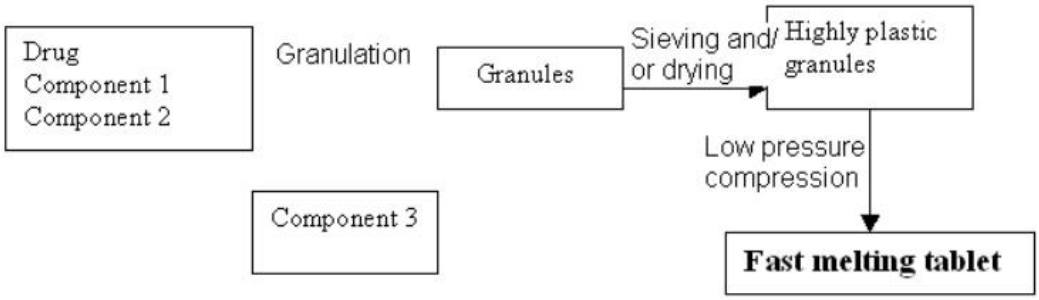

Fig 2: Flow Sheet of the wet granulation process for Fast melting tablet production

7) Dry Granulation

In this technique, there is no use of liquids. The process involves the formation of slugs. Then the slugs are screened or milled to produce granules. The granules formed are then compressed to form tablets. [12]

PATENTED TECHNOLOGIES

Zydis Technology

Zydis formulation is a unique freeze dried tablet in which drug is physically entrapped or dissolved within the matrix of fast-dissolving carrier material. The Zydis matrix is composed of many materials designed to achieve a number of objectives. To impart strength and resilience during handling, polymers such as gelatin, dextran or alginates are incorporated. These form a glossy amorphous structure, which imparts strength. To obtain crystallinity, elegance and hardness, saccharides such as mannitol or sorbitol are incorporated. Water is used in the manufacturing process to ensure production of porous units to achieve rapid disintegration. Various gums are used to prevent sedimentation of dispersed drug particles in the manufacturing process. Collapse protectants such as glycine prevent the shrinkage of Zydis units during freeze-drying process or long-term storage. Zydis products are packed in blister packs to protect the formulation from moisture in the environment.[2]

Durasolv Technology

Durasolv is the patented technology of CIMA labs. The tablets made by this technology consist of a drug, fillers and a lubricant. Tablets are prepared by using conventional tableting equipment and have

good rigidity. These can be packaged into conventional packaging system like blisters. Durasolv is an appropriate technology for products requiring low amounts of active ingredients.[17,18]

Orasolv Technology

This is also of CIMA lab. In this system active medicament is taste masked. It also contains effervescent disintegrating agent. Tablets are made by direct compression technique at low compression force in order to minimize oral dissolution time. Conventional blenders and tablet machine is used to produce the tablets. The tablets produced are soft and friable and packaged in specially designed pick and place system.[19]

Flash Dose Technology

This technology is based on the preparation of sugar based matrix known as floss, which is made from a combination of excipients either alone or in combination of drugs. Two platform fuisz technologies called Sheaform and Ceform are currently being utilized in the prepration of a wide range of oral fast dissolving products. Fuisz has patented Flash dose technology. Nurofen meltlet, a new form of ibuprofen as melt-in-mouth tablets, prepared using flash dose technology is the first commercial product launched by Biovail Corporation. A flash dose tablet consists of self-binding shearform matrix termed as "floss". Shearform matrices are prepared by flash heat processing.[14]

Sheaform Technology

The Sheaform technology is based on preparation of floss that is known as 'Sheaform matrix' which is produced by subjecting a feedshock containing a sugar carrier to flash heat processing. In this procedure, the sugar is simultaneously subjected to centrifugal force and to a temperature gradient, which raises the temperature of the mass to create an internal flow condition, which permits part of it to move with respect of the mass. The flowing mass exists through the spinning head that fling the floss. The floss so produced is amorphous in nature so it is further chopped and recrystallised by various techniques to provide uniform flow properties and thus facilitate blending. The recrystallised matrix is then blended with other tablet excipients and an active ingredient. The resulting mixture is compressed into tablet. The active ingredient and other excipients can be blended with floss before carrying out recrystallisation.[20,21]

Ceform Technology

In Ceform technology micro spheres containing active ingredient are prepared. The essence of Ceform micro sphere manufacturing process involves placing dry powder, containing either substantially pure

drug material or a special blend of drug material plus other pharmaceutical compounds, and excipients into a precision engineered rapidly spinning machine. The centrifugal force of the rotating head of ceform machine throws the dry drug blend at high speed through small, heated openings; the carefully controlled temperature of the resultant microburst of liquefied the drug blend to form a sphere without adversely affecting drug stability. The microsphere are then blended and/or compressed into the pre-selected oral delivery dosage form.[5]

Wow tab Technology

Wowtab Technology is patented by Yamanouchi Pharmaceutical Co. WOW means "Without Water ". In this process, combination of low mouldability saccharides and high mouldability saccharides is used to obtain a rapidly melting strong tablet. The active ingredient is mixed with a low mouldability saccharine and granulated with a high mouldability saccharide and compressed into tablet.[20]

Flashtab Technology

A Prographarm laboratory has patented the Flashtab technology Tablets prepared by this system consist of an active ingredient in the form of microcrystals. Drug microgranules may be prepared by using the conventional techniques like coacervation, microencapsulation, and extrusion-spheronisation. All the processing utilized conventional tabletting technology.[20]

Cotton Candy

Cotton candy process is known as candy floss process. This technique forms the basis of Flash Dose (Fuisz technologies, chantilly, VA.) In this technology, saccharides or polysaccharides are processed into amorphous floss by a simultaneous action of flash melting and centrifugal force.[22,23] The floss is then partially recrystallised to impart a good flow properties and compressibility. The floss then can be milled and blended with active ingredients and other excipients and finally that compressed in to MDT. Advantages of this technology are that the tablet can accommodate high doses and possess satisfactory mechanical strength. The candyfloss are hygroscopic, hence, their manufacturing requires control of humidity conditions.[23]

Conclusion:-

The mouth disintegration tablets are an improved pharmaceutical dosages form for oral administration. The various technologies described in this review have received considerable attention as an essential step in obtaining mouth disintegration or fast disintegration technology.

References:-

1. Sugihara M. Farumashia, "Studies of Rapidly Disintegrating Tablets in the Oral Cavity Using Co-ground Mixtures of Mannitol with Crospovidone" Chem. Pharm. Bull. , 30, pp 1396-1400 (1994)
2. Seager, H.; "Drug delivery products and zydus fast dissolving dosage forms", J. Pharm. Pharmacology.; (1998), 50, pp 375-382
3. Kuchekar B.S., Badhan A.C.and Mahajan H.S. "Mouth dissolving tablets: a novel drug delivery system", Pharma Times, 2003,35, pp 7-9
4. Bhushan S.Y., Sambhaji S.P., Anant R.P. and Kakasaheb R.M. "New drug delivery system for elderly" Indian Drugs, (2000), 37, pp 312-318.
5. Kaushik, D., Dureja, S. and Saini T.R. "Mouth dissolving tablets-a review", Indian Drugs, 41(4), pp 187-193. (April 2003)
6. Wilson C.G., Washington N., Peach J., Murray G.R. and Kennerley J. "The behavior of fast dissolving dosage form - Int. J. Pharm., (1987),40, pp 119-123
7. European directorate for quality of medicines, Pharmeuropa, (1998), 10(4), 54,
8. Indurwade N.H., Rajyaguru T.H. and Nakhat P.D.; "Novel approach Fast Dissolving Tablets", Indian Drugs, 2002,39(8), pp 405-409.
9. Abu Izza, 'Fast dissolving tablet', US Patent, 6,733,781: (May 11, 2004).
10. Gregory G.K.E. and Ho D., Pharmaceutical dosage form package, US Patent, 4,305,502, 1981.
11. European patents 3152986 (1992)
12. Rudnic, E., and Schwartz, J.B. Oral Solid Dosage Forms, Chapter 92, Tablets, pp. 1615-1641, in Remington's, 19th Ed,(2001)
13. Koizumi K., WatanabeY., Morita K., Utoguchi N. and Matsumoto M.; "New method of preparing high porosity rapid saliva soluble compressed tablet using mannitol with camphor, a subliming material", Int. J. Pharm. 1997, 152, pp 127-131
14. Roser B.J.and Blair J. Rapidly soluble oral solid dosage form, method of making same and compositions thereof, US Patent 5,762,961 (1998)
15. Allen L.V., Wang B. and Davies J.D., "Method for producing a rapidly dissolving dosage form'', US Patent 6,066,337 (2000)
16. Aulton M.E., "Pharmaceutics, The Science of Dosage Form Design", First Edition, (1988), pp 647-654.
17. Subhas P. Gore, Mouth dissolve tablets – design of an in vitro disintegration Test, Indian Journal of Pharm. Sci.. Nov- Dec, 2000.

18. Nirav M. kamdar, D-zolv – mouth dissolve tablets, Indian Journal of Pharm. Sci.. Nov-Dec, 2000.
19. Mishra, T.K., And Kearney, P."Process for preparing fast dispersing solid oral dosage form" US Patent, 5,869,098,(1999)
20. Mizumoto, T, Allen, A, Loyd, V, "Method for Producing a rapidly dissolving dosage form", US Patent, 1996,5,576,014
21. Yarwood, RJ, Burruano,B,Richard,D and Hoy Michael,R, "Method for producing water dispersible sterol formulations", US Patent, 1998,5,738,875
22. Chang, R.K., Guo, X., Burniside, B.A.and Couch, R.A. "Fast Dissolving Tablets", Pharm. Tech.; (2000), 24(6), pp 52-58.
23. S.R.parakh and A.V.Gothaskar,"A review of mouth dissolving tablet technologies,Pharmaceutical Technology,Nov.2003,pp 95-98.