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FAST DISSOLVING DRUG DELIVERY SYSTEM

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ABSTRACT

Swallowing tablets is a significant problem faced by adults and children, causing patients to fail to comply with medication complaints. To solve these problems, we have developed a new type of medicine that dissolves quickly and dissolves in saliva, called rapid-acting tablets. There are many fast-acting preparations on the market today, such as Claritin Reditab (manufacturer R.P. Scherr, Inc.). Risperdal M-Tab (manufactured by Jansen Pharmaceuticals), Tempra Quicklets (manufactured by Cima Labs, Inc.), and the technology is still being developed. Tablets are considered the most popular due to their easy transportation and low production costs, but patient outcomes are poor for children and the elderly with dysphagia. Tablets, capsules and syrups. Various MDDs are marketed, such as orally dissolving tablets and oral film-coated tablets (MDFS). MDF has emerged over the past few years from the food industry and oral care into breathtaking products, becoming a new and widely used product by consumers. The purpose of this review is to investigate the feasibility of rapid elimination of prescription drugs. Once administered, the tablets dissolve or disintegrate in the mouth without additional water to help preserve the active ingredient. Rapidly disintegrating tablets (FDTs) have become more and more in demand over the years and have become a rapidly growing area in the pharmaceutical industry as most tablets dissolve or burst in saliva within 60 seconds.

Key words – Fast Dissolving Drug Delivery System (FDDS), Superdisintegrants, Mouth Dissolving Tablet, Mouth Dissolving Films(MDFs).

INTRODUCTION

Rapid drug dissolving drug delivery system. In these systems, tablets disintegrate rapidly when they come into contact with saliva in the mouth. Many adults and children have difficulty digesting so much information. Easy to swallow for Elderly Patients (FDDS) dosage. Systems that rapidly dissolve or disintegrate within seconds after being placed in the mouth without using water (FDDS) can reduce the problem of tablets coming out and mixing with the blood. When saliva enters the stomach, a small amount of the drug is absorbed through the mouth, esophagus and pharynx. In this case, the bioavailability of the drug is higher than that found in conventional tablet dosage forms. FDDS breaks down rapidly in saliva without the use of water [1]. It provides very precise doses, stability, ease of production, small packaging and ease of transportation. The drug is absorbed more quickly in the pregastric region, resulting in a rapid onset of action. The drug is absorbed from the stomach, preventing hepatic metabolism, thereby reducing dosage and increasing bioavailability. Patients follow disabled patients in ambulances and on foot and intensively (not ready to enter the water). FDDS improves clinical outcomes in May. As well as improving clinical outcomes, reducing toxicity, improving patient compliance and discovering new treatments. FDDS is required for all these patients. Most FDDS systems have films that must contain chemicals that mask the odor of the active ingredients. This mask material, along with the insoluble and insoluble material, is then swallowed with the patient's saliva. These are also called orodispersible tablets, redissolving tablets, porous tablets, orodispersible tablets, fast-dissolving tablets or fast-dissolving tablets. Different types of films are used in FDDS, such as hydroxypropyl methylcellulose. Polyvinyl alcohol, glycerin, sorbitol, menthol, etc.

More than 70% of the drugs in the market are in oral form because they are versatile and prevent pain. Oral disintegrant drug delivery system[2]

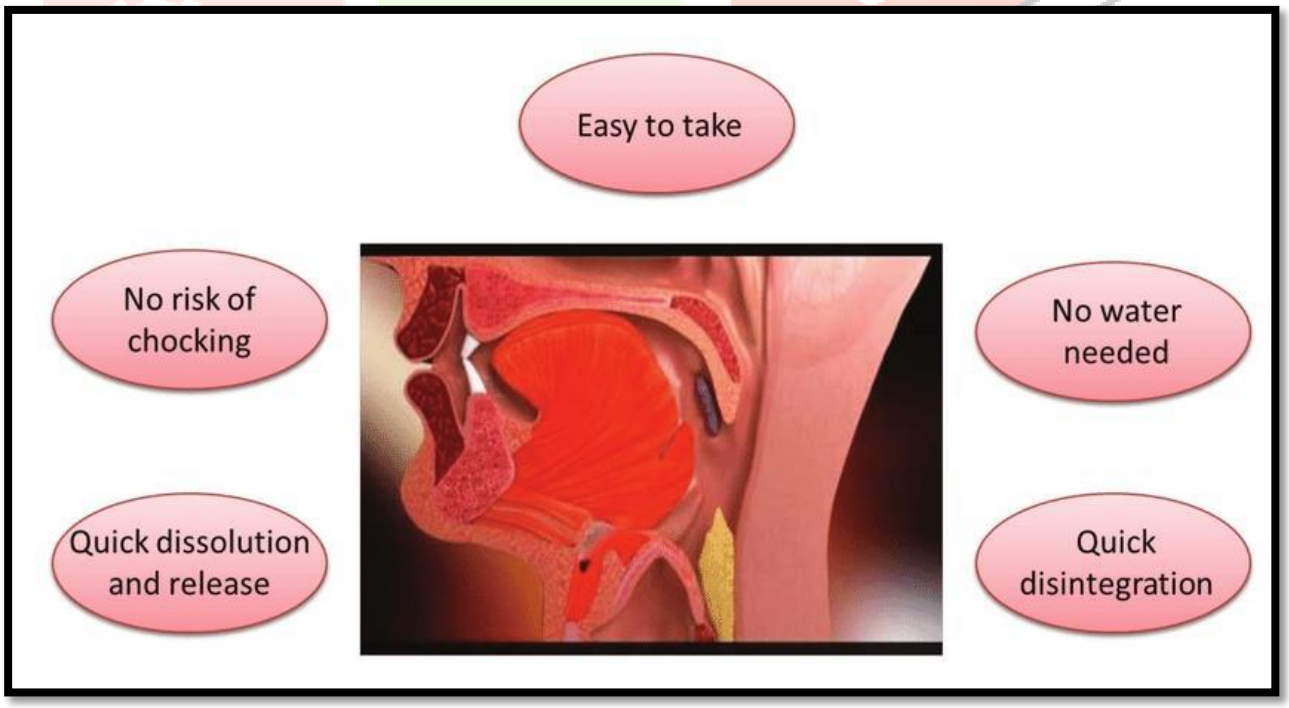

Fig : 1 Advantage of Fast Dissolving Drug Delivery System

It was first developed by scientists at Wyeth Laboratories in the United Kingdom in the 1970s. According to the European Pharmacopoeia, this FDDS should dissolve or disintegrate within three minutes. The US FDA defines FDDS as "a dosage form containing medication and active ingredients that rapidly dissolves within seconds when placed on the tongue." Rapidly dissolving drug delivery systems are faster, more effective, have good

bioequivalence, and have good stability and ease of use. " Rapid dissolution of medication is also called oral dispersible drug delivery system, oridispersible tablets, rapid dissolving or rapidly disintegrating tablets. Advances in tablet formulation techniques have led to the development of potent tablets that dissolve easily in under 50 seconds and can be produced in sizes ranging from 11 to 15 months. The tablets are built to be durable and can withstand transportation in reliable tablet containers. Preclinical studies of various formulations have demonstrated palatability and ease of administration. Rapid drug elimination reduces side effects due to bioavailability and rapid drug absorption from the oral cavity, pharynx and esophagus via salivary delivery and pregastric absorption [3,4].

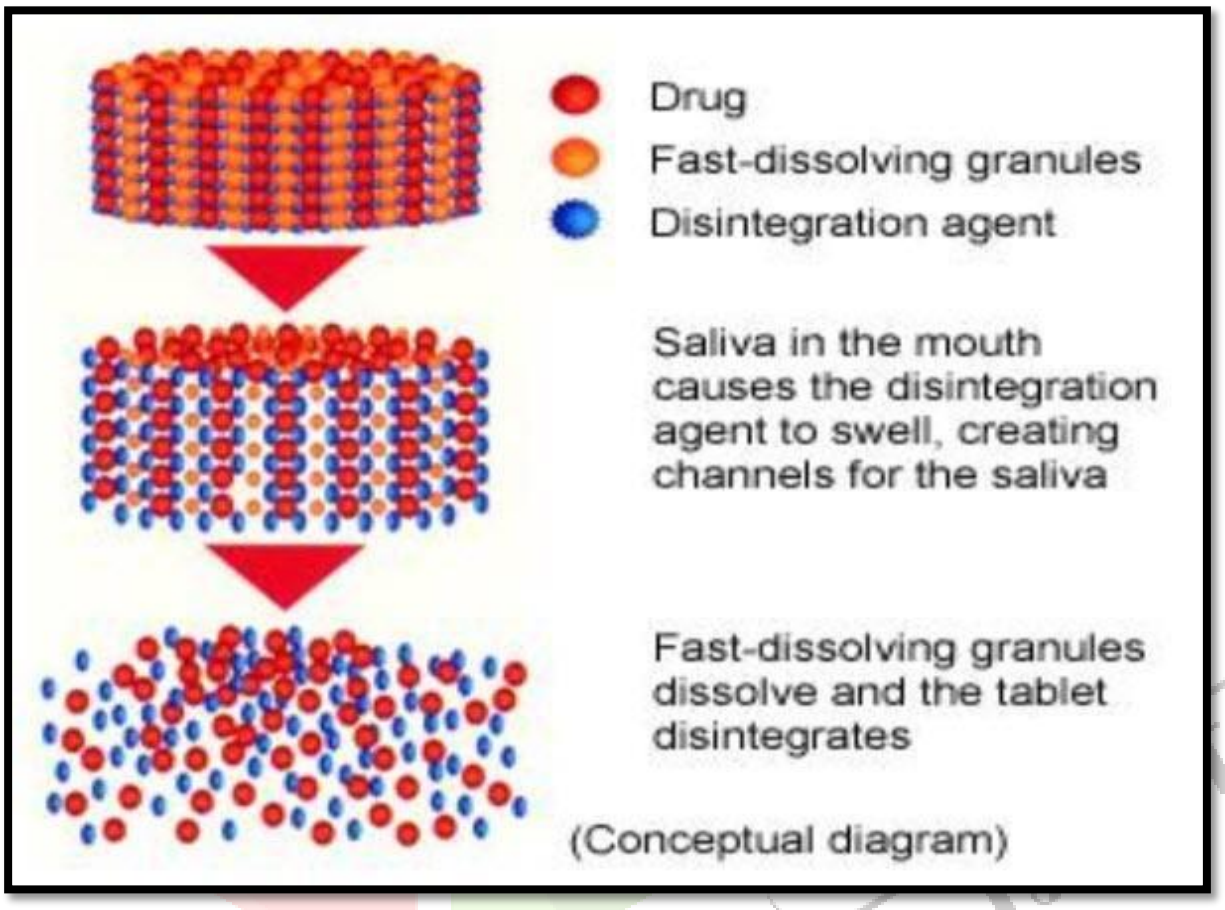

Fig : 2 Conceptual Diagram of fast dissolving drug delivery system

Characteristics of Fast Dissolving Drug Delivery System

Taste of Medicines

The fast-dissolving delivery system has a taste-masked form of the drug. Taste masking is important in FDDT design. Most oral suspension, syrup. Chewable tablets, on the other hand, contain sweeteners, sweeteners and other sugars to increase the bitter taste of the medicine. Most taste masking methods for tablets are prepared with sugar and sweeteners.

Easy to manage

The application system is easy to use and manage, thus increasing patient compliance. Rapid removal of waterless control [10]

Hygroscopicity

Materials that can absorb and absorb water or moisture in the environment are called hygroscopic. The same amount of disinfectant will quickly become hygroscopic and will not maintain its physical integrity like regular soil in a special container.

Friability

In these rapid delivery systems, tablets are prepared in direct comparison with low compression, which requires less time for oral distribution. The ingredients are used to make tablets. The tablets are made to be crunchy and soft and are usually packaged in special peelable blister packs. [10]

Taste

Taste is important in the rapid distribution of the drug because the patient's palate is happy to receive the desired product. Any size of the disintegrated tablet that dissolves slowly in saliva can cause unpleasant sensations. This can be overcome by keeping most items below the size scale. Sometimes even with a single change, the flavor is absorbed and produced in the mouth, causing the product to have an almost overwhelming feeling [12].

Approaches for fast dissolving tablet

Rapid disintegration of tablets is when water quickly enters the tablet matrix causing the tablets to break rapidly

Conventional technologies for fast dissolving tablet

Lyophilization

Tablets prepared by freeze-drying or freeze-drying are porous in nature and rapidly disintegrate or dissolve in saliva. In this process, water sublimates from the solid after freezing. First, the material is frozen below the eutectic point. Initial drying is then carried out to reduce the moisture content to approximately 4% w/w of dry matter. Finally, secondary drying is performed to reduce the moisture content to the desired volume. However, freeze drying is limited due to high material and labor costs. Another disadvantage of the final recipe is the lack of physical resistance of the bubble packaging process.[13]

Moulding

Meanwhile tablet preparation This is a spoiled product. The physical form of the drug in the tablet depends on how soluble it is in wet materials. The drug may be present as individual particles or microparticles within the matrix. It can be completely dissolved or partially dissolved in a molten vehicle to form a solution, the remainder (if any) remaining unmixed and dispersed within the matrix. Disintegration time, drug dissolution rate, and oral quality depend on the type of dispersion [13].

Different molding techniques can be used to prepare orodispersible tablets:

Compression molding

A powder mixture, previously moistened with a solvent such as ethanol/water, is pressed into a mold to form a moistened batch.

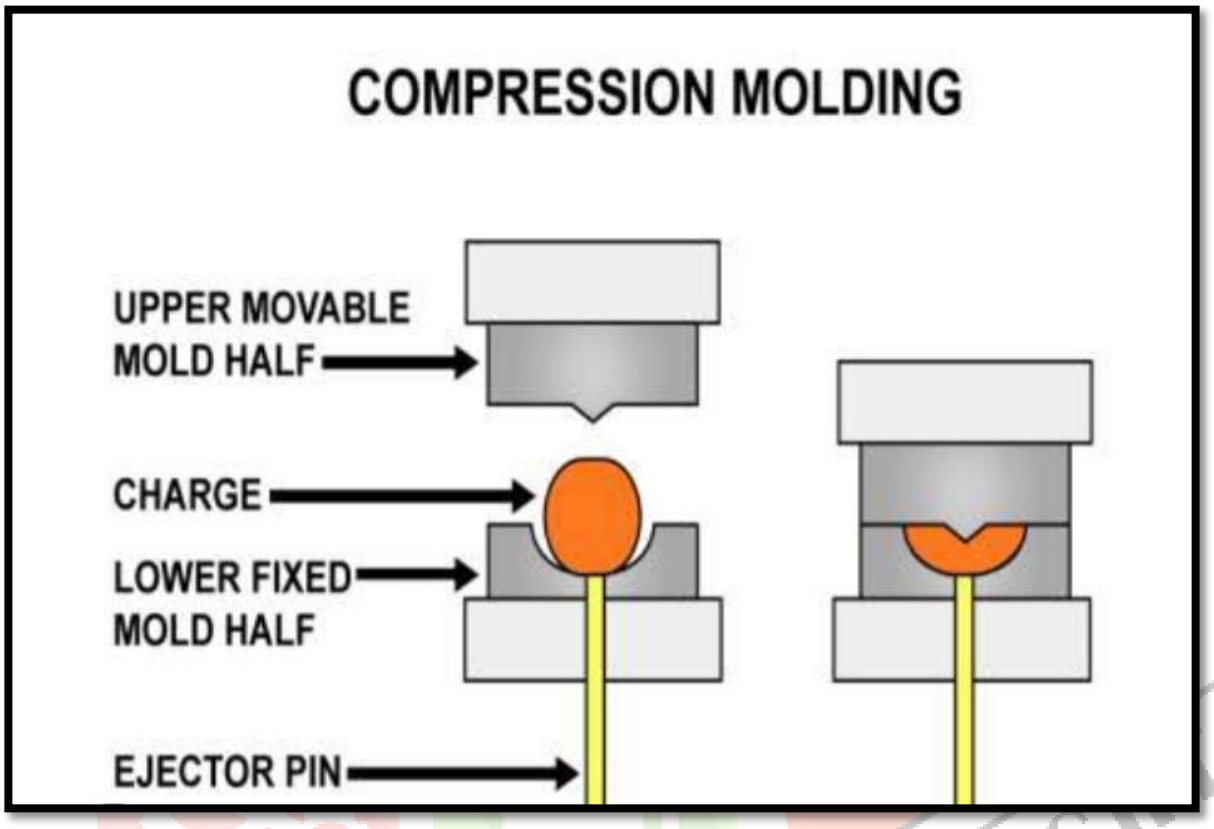

Fig : 3 Compression Molding

Thermoforming

The molten matrix in which the drug is dissolved or dispersed can be formed directly into tablets that can be dispersed in the mouth.

No need for vacuum lyophilization

The process involves evaporating the solvent from the solution or suspension according to the model pressure. Molded tablets have a porous structure for quick and easy disintegration. The taste of the molded tablet is improved due to the presence of water-soluble sugar in the dispersion matrix. However, molded tablets are not durable at all and can break or corrode.

Spray drying

The drying process produces fine powders that are porous and dissolve quickly. The formulation contains hydrolyzed and non-hydrolyzed gelatin as support, mannitol as filler, sodium starch glycolate or croscarmellose sodium as disintegrant, as well as acidic substances (e.g. citric acid) and/or root integration of sexual information (such as I). .). Sodium bicarbonate to improve cracking and breakage). Tablets compressed from spray-dried powder disintegrate within 20 seconds when immersed in an aqueous medium [6,13].

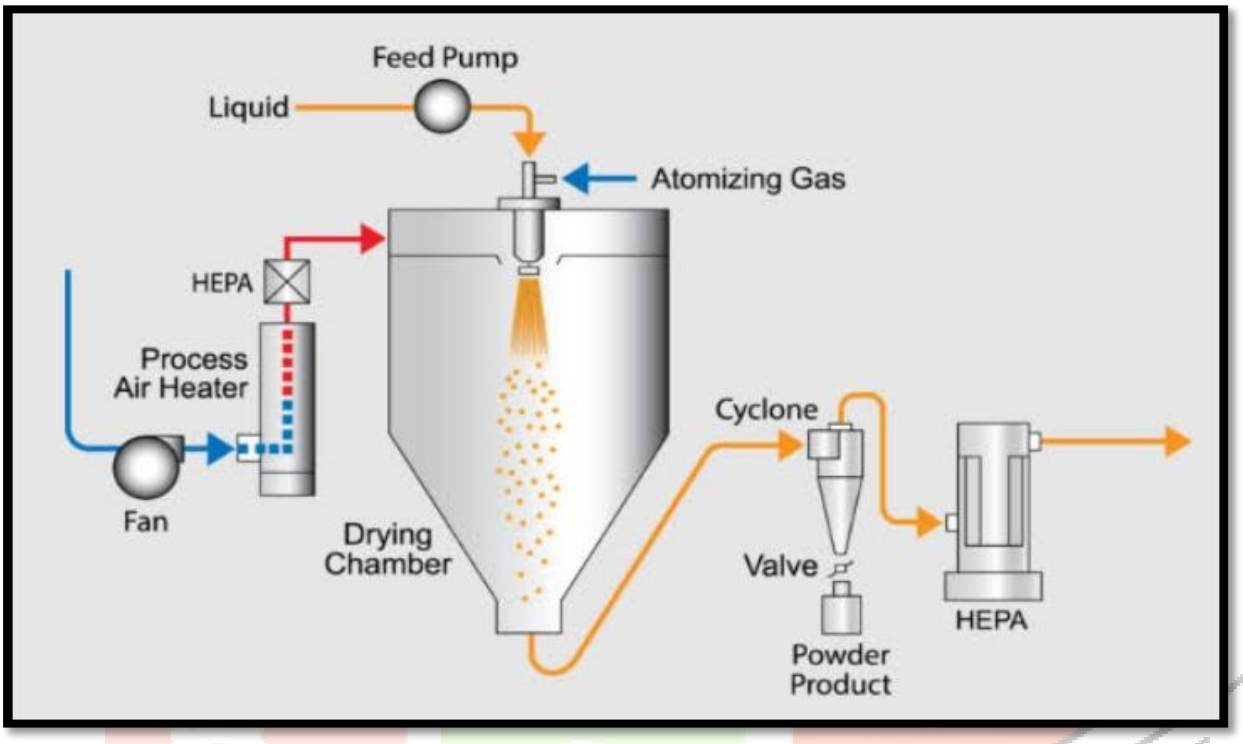

Fig : 4 One loop system shown for aqueous processing

Sublimation

Even compressed tablets containing highly water-soluble ingredients dissolve slowly due to the low porosity of the tablets. Inert ingredients (urea, ammonium carbonate, ammonium bicarbonate, hexamethylenetetramine, camphor, etc.) are added to the other ingredients in the tablet and the mixture is compressed into a tablet. The volatile solution is then removed via sublimation [6]

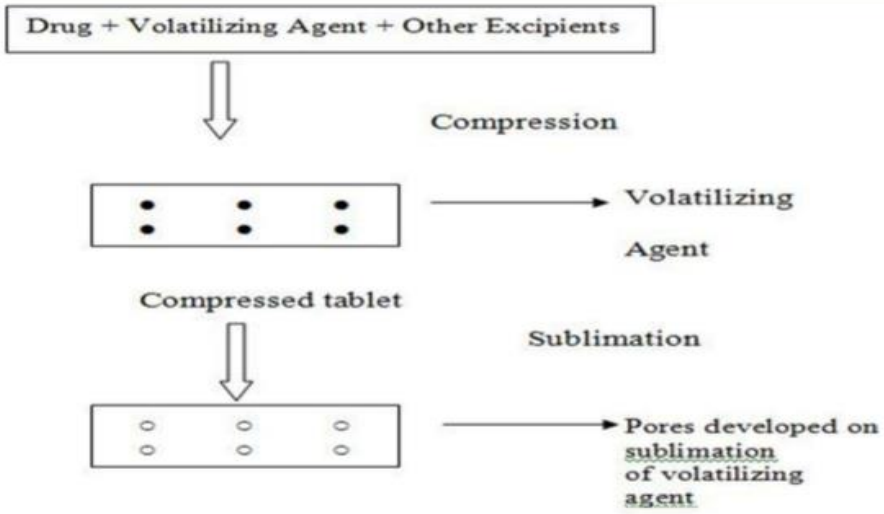

Figure 1 Various steps involve in sublimation

Fig : 5 Various steps involve in sublimation

Superdisintegrant

In many oral disintegrator tablet technologies based on direct compression, the addition of superdisintegrant often affects the disintegration rate and therefore dissolution. The presence of other ingredients, such as water-soluble excipients and effervescent substances, accelerates the degradation process [7].

Sugar-based excipients

This is another method of producing ODT by direct compression. The use of sugar products, especially fillers that exhibit water solubility and sweet taste, such as glucose, fructose, isomalt, lactitol, maltitol, maltose, mannitol, sorbitol, starch hydrolysates, polysaccharides and xylitol, thus imparting taste masking power and pleasant taste. [7].

Taste Masking

Taste masking is an important requirement for the commercial success of instant-dissolve tablets. Taste mask consisting of active ingredients can be made using many techniques. Unpleasant-tasting chemicals can be microencapsulated in pH-sensitive acrylic polymers. Cefuroxime axetil is microencapsulated in different types of acrylic polymers (such as Eudragit E. Eudragit L-55 and Eudragit RL) by solvent evaporation and extraction techniques. These polymer microspheres have effective taste masking properties and dissolve completely in a short time. The bitter taste of sparfloxacin when coated with water-insoluble polymer (e.g. ethylcellulose) is covered by the good properties of the drug and disintegrant (e.g. low-substituted hydroxypropylcellulose). Compared with conventional tablets, the addition of low-conversion hydroxypropyl cellulose as disintegrant to the tablet core can improve the disintegration rate and bioavailability of sparfloxacin [10,13].

Large Scale Extrusion

The technology involves increasing the strength of the mixture using a solvent mixture of water-soluble polyethylene glycol and methanol, then removing the product through an extruder or syringe. Hot knife separated products are segmented to form cylindrical tablets [14].

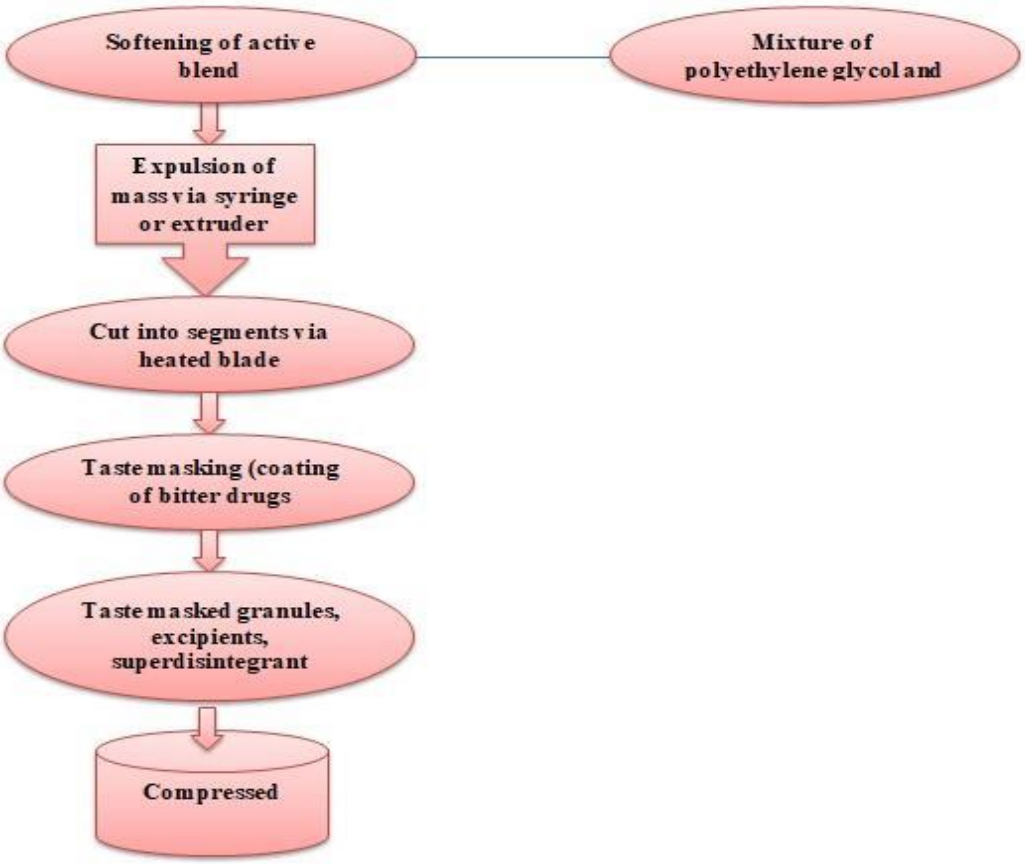

Fig : 5 Schematic Flowchart of the large scale Extrusion

Cotton Candy Process

This process is so named because it uses a unique process to create the crystal material that makes marshmallow s. The marshmallow process involves the formation of a polysaccharide or sugar matrix through the simultaneo us operation of high speed and rotation. The resulting matrix is
partially recrystallized to improve flow and compressibility. This marshmallow base is then ground and mixed with active ingredients and excipients before being pressed into ODT. This system can accommodate larger dos es and provide more energy. However, high processing temperatures limit the use of this technique [14].

Patented technologies for fast dissolving tablet

Zydis Formula

Zydis Formula is a unique instant tablet preparation technology. It is a freeze-dried tablet technology in which the drug is physically dissolved or cemented into a matrix of rapidly dissolving carrier material. Water does not need to be swallowed because “when the zydis unit is placed in the mouth, the sample is quickly freeze-dried. Alginate demonstrates durability when working with polymers such as dextran and mixed gelatin.” Sugars such as sorbitol or mannitol are added to achieve beauty, hardness and crystallinity. Glycine is often used as a dehydrating agent to prevent shrinkage of “zydis units” during the freeze-drying process or long-term storage. Milk should be packaged in bubble wrap to protect it from moisture. [14].

Durasoly Technology

It is a patented technology of CIMA LAB (US Patent No. 6,024,981), based on direct compression technology, using suitable materials with improved materials, especially super-disintegrants, which accelerates swelling, thereby accelerating disintegration. Swelling[51] These systems are made of quality indirect compression fillers (glucose, mannitol, sorbitol, etc.) that melt quickly without making them gritty or gritty in the mouth. Water-soluble substances (and sometimes effervescent substances) can also be used to assist the degradation process [28]. DuraSolv® technology is designed to deliver strong tablets that can be packaged in blister packs, eliminating the need for careful packaging [16].

Wow Technology

Patented by Yamanouchi Pharmaceutical Company, Wow tends to be "waterless". In this process, high sugars (such as oligosaccharides, mannitol) are mixed with low sugars (such as glucose, lactose and mannitol) to obtain a strong sugar that dissolves quickly. Tablet PC [30].

Shearform Technology

The basis of this technology is the preparation of the paste. Dental treatment is prepared with electrical heating equipment containing sugar. Mix sucrose plus mannitol or dextrose with surfactant and mix well. This is the main mix. During the heating process, the cargo material exhibits a flowing state, is affected by the heat, and comes out of the rotating head. The bristles forming the above are longer fibers and are further cut by the high shear solution granulator to convert them into smaller particles. Recrystallization is achieved by treating the fabric with ethanol (1%), which is sprayed on it and then evaporates, thus forming flow and adhesive material. This recrystallized matrix is then mixed with drugs and other excipients and compressed. Tablets made by this process are porous, have a pleasant mouthfeel, and dissolve immediately when the sugar comes into contact with saliva [31].

Flashdose Technology

This technology is similar to a marshmallow using a special spinning machine to create a crystal structure. This product has a large surface area, dissolves quickly on the tongue and is easy to disperse. Rapid dose tablets have a self-adhesive, slip-form matrix called "dental floss" [32] .

Ceform Technology

The key to this process is that the dry powder containing pure chemicals and additives is put into a high-speed spinning machine. The centrifugal force of the rotating head of this machine mixes the dry chemical powder at high speed through the heated nozzle. The chemical mixture is liquefied into spheres by microbursts of heat produced by carefully controlled temperature. This does not affect the stability of the drug. Microspheres are mixed and/or compressed into preselected oral dosage forms [33]

Flashtab Technology

This technology is designed to produce effervescent microencapsulated and easily dispersible tablets with rapid gastrointestinal release. A commonly used polymer is Eudragit for rapid release. The equipment uses a wet/dry granulation process followed by a conventional compression process. Drug microparticles, taste masking agents, disintegrants, and swelling are used to produce drugs [34]. These tablets have good physical properties and the use of hygroscopic materials for packaging is recommended as materials such as PVC/Aluminum foil have better protective properties compared to traditional PVC or polypropylene foils [34].

Nanocrystal Technology

This technology increases separation by reducing size and increasing area. Nanocrystalline particles are chemical substances (less than 1000 nm in diameter) that are ground by weight from raw materials. Machine collision.

Nano crystal rapid dissolution technology is provided. Multiple dosages per unit (up to 200 mg API per unit). Products can be effectively classified based on proprietary and patent-protected methods. Improved pharmacokinetics of oral drugs. Economical and cost-effective use of active ingredients that are not sensitive to moisture. The colloidal dispersion of nanocrystals is mixed with water-soluble GRAS (Generally Recognized as Safe) ingredients and then packaged in blisters to produce freeze-dried wafers. They are very strong but dissolve in small amounts of water within seconds; This is desirable when working with strong or hazardous materials [35].

Advantol 200

Specifically designed for nutraceutical use Advantol 200 is a directly compressible excipient system that provides a “soft” effect and does not require special production equipment or tools. In order to produce strong “soft melt” tablets, a field tablet press equipped with standard equipment must be carried out according to the tablet temperature and humidity.

Frosta Technology

The basis of this technology is to produce strong tablets with high porosity by compressing the plastic material with low pressure to produce tablets quickly. This plastic product Can be divided into three categories: porous materials and plastics, water penetration and adhesives Porous plastic materials can be water-soluble or water-dispersible. Plastic deformation of the powder improves interparticle contact, which is important for the formation of bonds between particles. If the porous plastic material is a polymer; It is important not to form a layer of sticky material on the surface of the tablet when it comes into contact with an aqueous medium. One way to make such tablets is to mix the porous plastic in the sample with water [37].

Ora-Quick Technology

KV Pharmaceutical claims that its microsphere technology, called Micro Mask, uses a patented taste masking technology. Since it does not use any type of solvent, it provides faster and more efficient tablet production. It also has lower electrical properties which are good for heat treatment. The technology claims to dissolve faster in tablets and provide a better taste. Other than CV medication, there is no other product on the market designed for use with this device. Parameters evaluated by this technology include: absorption and separation, oral aesthetics, taste, physical properties, bioavailability and stability [38].

Pharmaburst Technology

Newcastle-based SPI Pharma has patented the technology. The coprocessor uses excipients and dissolves in 30-40 seconds. This machine dry mixes chemicals, flavors and lubricants and then compresses them into tablets. The resulting tablets are strong enough and can therefore be packaged in blisters and bottles [39].

Lyoc

Lyoc is Farmlyoc's patented technology. These machines are designed to be dry. Porous galenic formulation of oil-in-water emulsion placed in a bubble. The paste is frozen in Medicines or drugs containing API. A bubble. Loco products have poor properties due to their porosity, but their disintegration rate is good. An example product is Phloroglucinol Hydrate Farmlyco. Lyoc uses a freeze-drying process, but unlike Zydis, the product is frozen on a freeze-drying rack. In order to avoid inhomogeneities due to precipitation during the process, the formulations must contain large amounts of an insoluble, inert filler (mannitol) to increase the viscosity of the suspension. It produces tablets by directly incorporating the powder mixture of external lubrication [48].

Summary

Rapid elimination of the drug in the drug, where the tablet rapidly disintegrates in the oral cavity upon contact with saliva. In the context of current research, drug delivery technology has become challenging and continues to evolve as demand continues to increase. Fast-dissolving tablets (FDT) are a new and unique drug delivery system that has rapidly gained approval in the field of fast-dissolving technology research. The oral route is the easiest and safest way to administer medication because there are many medications that can be used this way. Recently, scientists have developed rapid drug delivery systems that rapidly dissolve or dissolve in oral saliva without the need to drink water. New drug delivery methods such as FDT or MDT (orally dissolving tablets) overcome many disadvantages such as difficulty swallowing or the inability to drink while traveling. FDT may also be a more effective alternative to prescription medications. This review article covers the different technologies used to prepare PDT, silencers, various patented technologies, superfragmentation mechanisms, challenges and limitations.

Conclusion

Rapid delivery systems enable better patient compliance and can provide better biopharmaceutical products, improved efficacy, and better safety compared to prescription oral drug therapy. Today, rapidly disintegrating tablets are widely available as over-the-counter products to treat allergy, cold, and flu symptoms. The future potential of this product is promising due to new technology, strong market interest and patient demand. There is potential for rapid breakthroughs and improving drug delivery in the future, but the technology is still new. Research continues. In order for this tool to be used effectively, many products must be marketed. Orodisolvent films suitable for use in the oral cavity are a new and inexpensive drug form, especially for children and geriatric applications. Oral dissolving films have many advantages over prescription and ready-made tablets. Dissolving tablets are rapidly gaining attention as an alternative to tablets and capsules due to better patient compliance. Preparation of a valid drug form requires a clear understanding of the ingredients of rapid or orally dissolving tablets. This article examines planning, performance, quality and working methods; focused on rapid delivery and evaluation of drugs in oral t Swallowing of tablets is a major problem faced by adults and children, causing patients to perform poorly due to poor quality of the medicine. Tablets can now be produced by various methods such as direct compression, wet granulation, moulding, spray drying, freeze drying and sublimation, as well as by the use of various types of superdisintegrants such as cross-linked 93 carboxymethyl cellulose (Croscarmeliose), sodium chloride, etc.

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