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SOLID DISPERSIONS FOR SUBLINGUAL DRUG DELIVERY: AN UNDEREXPLORED STRATEGY FOR RAPID ONSET AND IMPROVED BIOAVAILABILITY

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ABSTRACT: Rapid, reliable sublingual medication absorption is nevertheless hampered by poor water solubility and sluggish breakdown. However, by employing hydrophilic carriers to disperse the drug with limited water solubility in the hydrophilic matrix, improving the wettability and rate of dissolution and raising the bioavailability of drug with limited aqueous solubility, solid dispersion technology can effectively overcome these obstacles. In particular, solid dispersions will be critically assessed in relation to sublingual drug delivery methods in this review of the literature, focusing on the physiological attributes of the sublingual mucosa, the classifications and evolution of solid dispersion systems, the types of drugs that are suitable for solid dispersions, carrier selection, and drug release mechanisms. The review will also discuss solid dispersions for the enhancement of dissolution rate, reduce doses, provide a means of masking taste and providing a uniform release of drug. Recent developments associated with synthetic, natural, and modified hydrophilic carriers will also be summarized. Some of the major challenges associated with solid dispersions will also be highlighted, including physical stability issues, scale-up challenges, interindividual variability, and regulatory challenges. Future opportunities, including personalized medicine and the use of artificial intelligence to develop formulations, will also be addressed.

INTRODUCTION: Sublingual drug delivery system improved bioavailability by providing fast onset of action. In sublingual route of administration, the disintegrates rapidly and bypass gastrointestinal degradation and first pass hepatic metabolism, making it suitable for drugs requiring immediate therapeutic action¹.

Nonetheless, for active pharmaceutical ingredients that have low solubility in water, the substantial barrier to sublingual delivery occurs because of the need for rapid drug dissolution from saliva prior to being absorbed through the oral mucosa. Therefore, developing new methods of enhancing or improving solubility will help ensure that active drugs reach adequate concentrations when administered sublingually².

There are various methods to improve solubility such as- physical modification, chemical modification for the drug release and other techniques³. Solid dispersion is the highly effective and widely used technique to improve solubility

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and of poorly water-soluble drugs. This can be defined as the molecular mixture of hydrophobic drug in hydrophilic carries ⁴. The combination of solid dispersions and sublingual formulations is an attractive method for providing a rapid release and/or increased bioavailability of a drug.

MATERIAL AND METHOD: A systematic literature search was conducted to identified peer-reviewed studies related to solid dispersions and sublingual drug delivery systems.

Electronic databases including PubMed, ScienceDirect, Google Scholar, and Web of Science were searched for articles published in English. Keywords such as solid dispersion, sublingual drug delivery, solubility enhancement, polymers were used alone and in combination. In order to capture recent developments in the field, the research was restricted to articles published in the last 20 years (2005-2025).

Physiological Consideration of Sublingual Mucosa: The sublingual mucosa is a type of tissue in the mouth that has characteristics that make it easy to absorb medications quickly into the bloodstream and distribute them throughout the body ^{5, 6}. Because the sublingual area contains many blood vessels, any drugs that are absorbed will be taken up right away into the body's systemic circulation and avoid passing through the liver where they would be first metabolized; thus, the bioavailability is greater, and the effect of the drug occurs more quickly. The Saliva's neutral pH (around 6.0-7.0) allows for easy absorption of drugs that have the right lipid solubility and are not ionized. However, these factors also have limited volumes and constant flows of saliva, which limits how long the medication can stay in the mouth ^{6, 7}. Drug after administration *via* sublingual delivery, will have a much more rapid and systemic response compared with longer acting *via* the GIT ⁸.

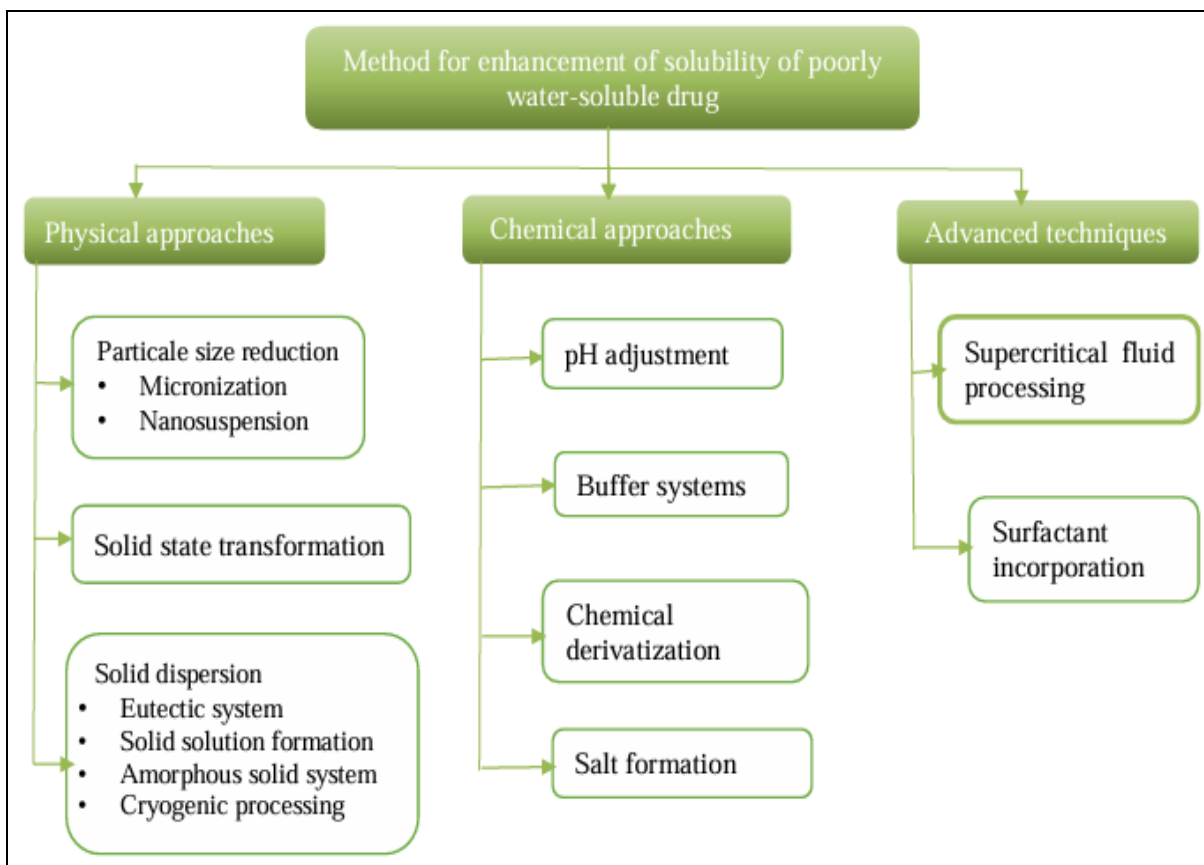


FIG. 1: METHOD FOR ENHANCEMENT OF SOLUBILITY OF POORLY WATER-SOLUBLE DRUG

Solid Dispersion: Concept and Classification:

The solid dispersion is a solid-state system that includes one or more poorly soluble drugs in water (hydrophilic) in an inert carrier. There are many

ways to prepare this type of drug formulation; the most common way is by molecularly dispersing the drug into this carrier. Drugs can be either amorphous or crystalline within this formulation ¹⁰.

Solid Dispersion Classification^{12, 13}: There are two ways to categories solid dispersion:

1. Based on the drug's molecular structure and physical state.

2. Based on the carrier system's generation-wise development.

Classification According to the Physical Form of the Incorporated Drug:

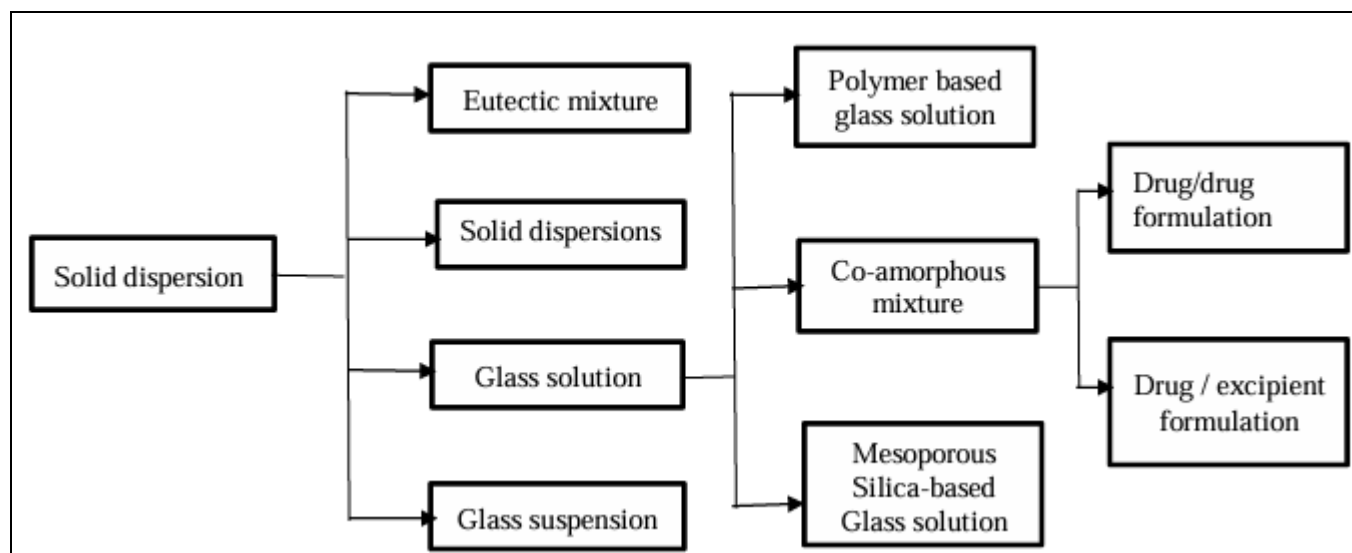


FIG. 2: CATEGORIZATION OF SOLID DISPERSION SYSTEM ACCORDING TO THE DRUG PHYSICAL CHARACTERISTICS

Eutectic Mixtures: A eutectic mix is combination of a drug that is made up of its carrier. The two substances will blend at a certain temperature to form a solid solution, and once cooled, they separate and crystallize as two different solids^{10, 13, 14}.

Solid Dispersion: Systems that fall under this category encompass drugs being distributed throughout a carrier using different solid forms as a result of how the drug was developed/formulated, these can be polymer- based glass solutions and co-amorphous systems^{4, 10}. Glass solution Glass solutions are amorphous and homogeneous systems, wherein a drug is dispersed through molecular diffusion inside the base (carrier) matrix of glass. Although thermodynamically unstable, glass solutions have a stable kinetic (viscosity) matrix that supports the physical and chemical integrity of the drug over time^{4, 15}.

Polymer-Based Glass Solutions: A glass solution that is made from a polymer (or other materials) contains the drug uniformly distributed throughout the carrier, in this case, a polymer carrier; hence it is classified as a single- phase system^{13, 16}.

Co-amorphous Mixtures: This system made up of two low-molecular-weight components that form a homogeneous amorphous phase¹⁷.

Co-Amorphous Drug-Drug Systems: In this system, two medications use intermolecular interactions like ionic or hydrogen bonding to stabilise one another in the amorphous form^{17, 18}.

Drug-excipients Co-amorphous System: In this system the drug is stabilized in the amorphous form by a low molecular weight excipients improving physical stability and dissolution behavior^{15, 17}.

Mesoporous Silica-Based Glass Solutions: In this system the drug is constricted within the pores of mesoporous silica in an amorphous or non crystalline state. Physical constriction reduce recrystallization and enhance dissolution^{19, 20}.

Glass Suspensions: This system consists of amorphous or crystalline drug particles which are dispersed within an amorphous carrier matrix. Unlike glass solutions, the drug is not fully molecularly dispersed^{4, 16}.

Classification Based on the Generation Wise Evolution of Carrier System:

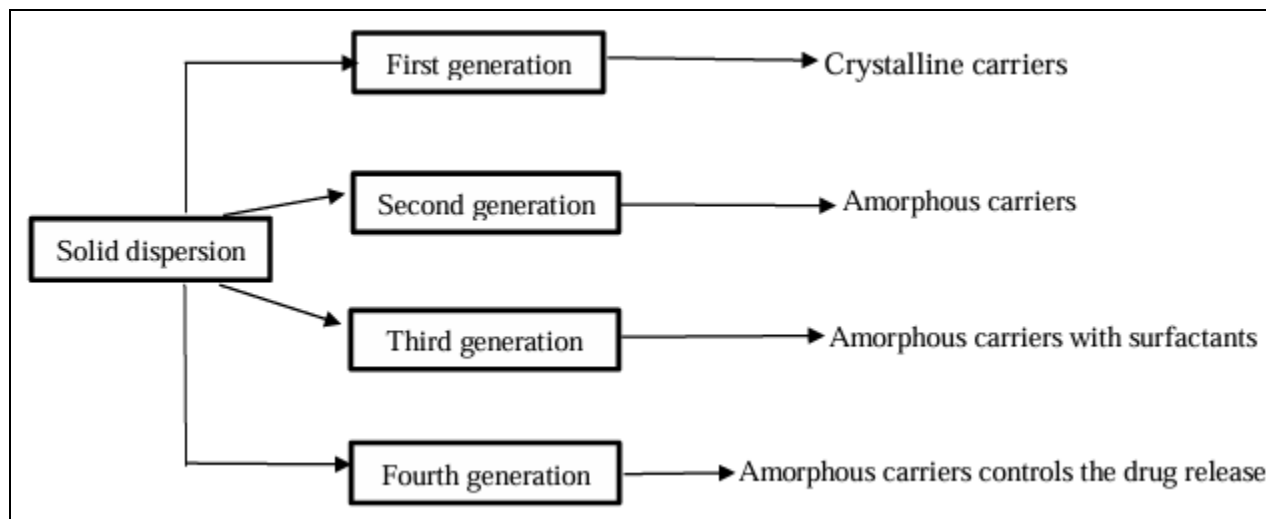


FIG. 3: CLASSIFICATION OF SOLID DISPERSION BASED ON THE GENERATION WISE EVOLUTION OF CARRIER SYSTEM

First Generation Solid Dispersions System:

Urea, in addition to sugars, can be used to create solid dispersion systems for uric acid (UA). First-generation solid dispersion systems are created from crystalline carriers, including eutectic mixtures and crystalline solid solutions. Typically, they improve the dissolution behavior of the drug as well as the dispersion matrix^{4, 10, 14}.

Second Generation Solid Dispersions System:

Second generation solid dispersions are formulated using amorphous polymer-based carriers like Amorphous Polyvinylpyrrolidone (PVP), Amorphous Polyethylene Glycol (PEG) and Amorphous Hydroxypropyl Methylcellulose (HPMC)^{12, 13, 16}.

Third Generation Solid Dispersions System:

Surfactants-active agents and self-emulsifying excipients are combined with polymeric carriers to create third generations delivery system. Surfactants increase the wettability of delivery system, prevent recrystallization of drugs, and enhance the dissolution characteristics of drugs^{21, 22, 23}.

Fourth Generation Solid Dispersions System:

Functional carriers are used to create fourth-generation solid dispersions that provide both solubility improvement and targeted or sustained release of drugs. These systems can improve the kinetics of dissolution as well as the pharmacokinetics of the drug in the body, allowing

for the use of solid dispersions in modern drug delivery methods^{24, 25}.

Relationship of Solid Dispersion in Sublingual Formulation:

Solid dispersion technology is a successful formulation method to assist with the development of sublingual therapeutic delivery platform, especially for drug exhibiting limited aqueous solubility. Because of the advantages of using the sublingual route, such as reduced time to achieve therapeutic effect and increased absorption (due to bypassing liver first-pass metabolism), there are also significant limitations associated with poor aqueous solubility and slow dissolving rate for many drugs. Solid dispersion provides a means to overcome both of these limitations by dispersing the active pharmaceutical ingredient within a hydrophilic polymer, thus enabling enhanced dissolution, absorption, and overall therapeutic effectiveness^{21, 22, 25}.

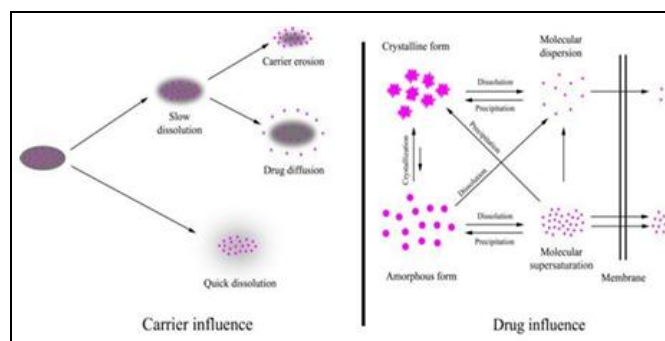


FIG. 4: SCHEMATIC REPRESENTATION OF THE ROLE OF SOLID DISPERSION IN SUBLINGUAL DRUG DELIVE

Dissolution Enhancement: The main benefit of solid dispersion systems for sublingual formulations is that they enhance the dissolution rate of the drug. By turning the drug from crystalline to amorphous, the drug's lattice energy is reduced and the drug's surface area increased, thus making it easier to wet and dissolve quickly when mixed with saliva. Additionally, hydrophilic

polymeric carriers, including polyethylene glycol, polyvinylpyrrolidone, and hydroxypropyl methylcellulose, assist in supersaturating the drug and keeping the drug from recrystallizing back into its crystalline state. For sublingually delivered drugs, rapid dissolution is even more important because of how quickly the drug is removed from the oral cavity^{22, 24, 25}.

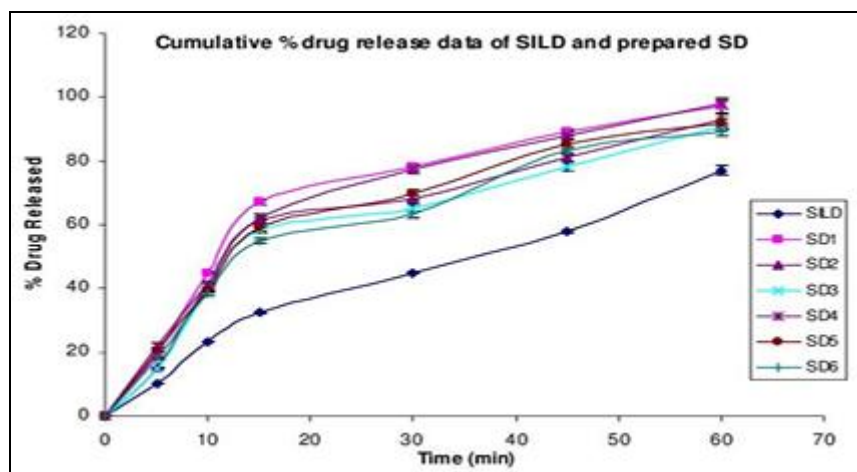


FIG. 5: COMPARATIVE DISSOLUTION PROFILES OF PURE DRUG AND SOLID DISPERSION FORMULATION

Dose Reduction: Solid dispersion systems have improved drug dissolution rates and enhanced drug permeability through the mucosa, allowing for improved dosing efficacy while minimizing risks associated with using higher doses. These systems improve bioavailability. Lower doses of active components can give an equal or greater pharmacological effect compared to larger doses^{22, 24, 26}.

Taste Masking: For patients who take sublingual medications, taste masking is important because it aids in patient compliance. The solid dispersion systems used in these types of medications have been shown to mask the bad taste associated with most medicines, especially those that are bitter or irritating in nature, by trapping the drug molecules in either the polymer matrix or molecularly dispersing them so that they do not come into direct contact with the taste receptors on the tongue²³.

Uniform Drug Release: Solid dispersion technology can be used to produce a uniform dispersion of drugs throughout the carrier material and allows consistent and reliable drug delivery. Solid dispersions prevent the occurrence of dose dumping and thus provide predictable pharmacokinetic profiles and consistent availability

of the drug to the sublingual mucosa. Uniform drug delivery also provides consistent efficacy and safety in sublingual formulations^{21, 24}.

Drug Release Mechanism from Solid Dispersion: A carrier system, through a series of physical and chemical processes working in conjunction, causes the release of drugs. When in contact with biological fluids, hydrophilic carriers are quickly wetted and hydrated; therefore, making drug-medium interaction more efficient and allowing release to begin^{10, 25}. Depending on the type of carrier used, it is possible for the carrier completely to disintegrate or, alter the structure of the carrier and form a hydrated polymeric matrix, thus exposing the drug to the dissolution medium²⁶. The drug then starts to dissolve from the surface of the carrier; because the carrier alters the form and characteristics of the drug, it will dissolve more quickly than pure crystalline solids because of decreased particle size, increased surface area, increased wettability, and in some instances the presence of the drug in amorphous form. In the case of swellable carriers or matrix forming carriers, drug molecules diffuse through the hydrated polymer; in the case of erodible carriers,

drug release will be determined by gradual erosion of the polymer over time^{21, 22}.

Carriers used in Solid Dispersion The formulation of solid dispersions can be attributed to the choice of carriers (or excipients), which can possess hydrophilic (variable solubility in water), hydrophobic (limited solubility in water), or hydro swellable (water soluble) properties depending on their composition²⁷. Carrier attributes will define the rate at which drug molecules are released from the solid dispersion, i.e., the carrier may act as a release retardant or as a release-enhancer. Furthermore, dissolution rates of drug molecules will vary as a result of carrier properties or attributes²⁸.

The following standards should be used when choosing a carrier:

- ❖ It should dissolve in a range of solvents.
- ❖ It should be pharmacologically inert, inexpensive, and non-toxic.
- ❖ It ought to be heat-stable.

The medicine and it should be chemically compatible. In the case of solid dispersions formulated with solvent-based processes (spray drying, co- precipitation), it was found that these solid dispersions exhibited better chemical stability compared to that of solid dispersions produced using fusion (hot melt extrusion, KinetiSol® dispersing technology) processes²⁹. Hydro-philic carriers are classified according to their origin for use in solid dispersions. **Table 1** shows list of synthetic hydrophilic carriers.

TABLE 1: SYNTHETIC POLYMER SYSTEMS APPLIED IN SOLID DISPERSION FORMULATION

S. no.	Polymer matrix	Model drug	Processing technique	Performance summary
1	Pectin-poly (vinyl pyrrolidone) system ³⁰	Curcumin	Spray-assisted drying	Marked enhancement in dissolution behavior
2	Palm stearin-derived polyester amide (PSPEA) ³¹	Mefenamic acid	Fusion -based preparation	Improved solubility and drug release profile
3	Eudragit E/ Plasdone S/ Soluplus blend ³²	Theobromine	Hot-melt extrusion/ freeze drying/ supercritical processing	Enhanced dissolution characteristics
4	Poly(2-ethyl-2-oxazoline) ³³	Glipizide	Solent removal technique	Approx..2-3-fold increase in solubility observed
5	Poloxamer-TPGS blend ³⁴	Febuxostat	Solvent removal approach	Nearly twofold increase in drug release compared to pure compound
6	Dextrin matrix ³⁵	Micronized amlodipine	Spray drying	Enhanced systemic availability observed
7	Poloxamer 188&407 ³⁶	Boswellic acid	Kneading/solvent evaporation	Improved solubility of poorly water-soluble drug
8	Poloxamer 188 ³⁷	Losartan potassium	Melt method	Faster dissolution profile achieved
9	Mannitol carrier ³⁸	Diazepam	Spray drying	Noticeable improvement in dissolution behavior
10	Brij 35-pluronic F127 system ³⁹	Progesterone	Solvent evaporation	Approx.. 20-fold rise in aqueous solubility
11	Compritol 888 ATO ⁴⁰	Metformin HCL	Solvent removal technique	Developed controlled-release solid dispersion
12	Gelucire-sorbitol blend ⁴¹	Ritonavir	Melt/ solvent evaporation	Enhanced drug released characteristics
13	Eudragit S100 ⁴²	Berberine HCL	Solvent evaporation	Improved therapeutic performance
14	CMC-sodium alginate blend ⁴³	Praziquantel	Solvent evaporation	Increased solubility profile
15	HPMC-PVA-PEG graft copolymer ⁴⁴	Kaempferia parviflora extract	Solvent evaporation	Suitable carrier for herbal dispersion system
16	Sodium acetate ⁴⁵	Docetaxel	Freeze drying	Improved dissolution leading to better bioavailability
17	Tocopheryl PEG 1000 succinate (TPGS) ⁴⁶	Dutasteride	Solvent evaporation	Enhanced dissolution and oral absorption
18	Soluplus ⁴⁸	Telmisartan	Hot melt extrusion/ spray	Significant improvement in

		/dutasteride	drying/ solvent evaporation	solubility compared to pure drug
19	PVP-VA64/PVP-HPMC blends ⁴⁹	Dronedarone HCL	Solvent evaporation	Improved dissolution behavior and aqueous solubility
20	Urea-based system ⁵⁰	Rofecoxib	Fusion method	Reduce mean dissolution time with faster drug release
21	Polyvinylpyrrolidone (PVP) ⁵¹	Oxcarbazepine	Spray drying	Enhanced solubility characteristics
22	PVP (various grades) ⁵²	Celecoxib	Spray drying	increased dissolution rate observed
23	PEG6000 with poloxamer 407 ⁵³	Rebamipide	Spray drying	Increased solubility and drug release
24	PEG-PVP combinations ^{54, 55}	Flurbiprofen	Solvent evaporation/spray drying	Improved dissolution profile
25	PVP K -series (K12/k17/k30) ⁵⁶	Chlortetracycline HCL	Solvent evaporation	Enhanced release depending on polymer ratio
26	Polyethylene oxide (PEO) ⁵⁷	Griseofulvin	Solvent removal technique	Higher dissolution and improved wettability
27	Polyvinylpyrrolidone (PVP) ⁵⁸	Oleanolic acid	Evaporation assisted technique	Marked increase in dissolution efficiency
28	Polyethylene glycol4000 ^[59]	Glipizide	Microwave-assisted dispersion	Enhanced drug release compared to conventional system
29	Polyoxymethylene 40 stearate ⁶⁰	Cyclosporine A	Melt-based processing	Drug release reached 99% within 12 hours
30	PEG4000/6000 ^{61, 62}	Glipizide / Gliclazide	Fusion technique/microwave-assisted dispersion	Improved solubility with increased dissolution rate

In recent times, plant-derived polymers have gained popularity for their ability to be used in many ways in the pharmaceutical industry, and additionally, they are typically more readily available, easier to use, and provided with a greater number of environmentally sustainable options than synthetic products. The majority of

polysaccharides are produced from plant material that is harvested from the seeds, fruits, or incisions on the trunks of plants as a result of metabolic processes occurring in the plants (natural gums)⁶³. Various natural hydrophilic carriers used till date are given in **Table 2**.

TABLE 2: NATURAL POLYMER-BASED CARRIERS INVESTIGATED FOR SOLID DISPERSION SYSTEM

S. no.	Natural polymer source	Drug incorporated	Solid dispersion approach	Observed effect
1	Sericin ⁶⁴	Felodipine, meloxicam, lornoxicam	Spray drying/ball milling	Significant solubility enhancement
2	Extract of Vigna radiate ⁶⁵	Clopidogrel bisulphate	Solvent evaporation	Maximum release -96% in optimized batch
3	Soyabean seed polymer ⁶⁶	Pioglitazone HCL	Not specified	Notable increase in drug solubility
4	Gelatin 50PS ⁶⁷	Multi-component pharmaceutical formulation	Freeze drying technique	Demonstrated suitability as carrier for lyophilized dispersions
5	Neem gum ⁶⁸	Atorvastatin	Solvent evaporation/kneading	Improved solubility , bioavailability
6	<i>Daucus carota</i> extract ⁶⁹	Ambroxol	Solvent evaporation/kneading	Better release compared to conventional method
7	Water soluble gelatin & egg albumin ⁷⁰	Nifedipine	Kneading method	Increased wettability and dissolution rate
8	Oleaster-based blend (with MCC & crospovidone) ⁷¹	Ibuprofen	Co-grinding	Increased drug release potential
9	Caffeine-assisted system ⁷²	Celecoxib	Solubilization method	Improved solubility and dissolution profile
10	<i>Aegle marmelos</i> gum ⁷³	Atorvastatin calcium	Microwave fusion/freezing drying	Faster dissolution compared to conventional

11	Arginine complex system ⁷⁴	Simvastatin	Freeze drying	preparation Marked solubility rise observed I acidic and basic media
12	Alginate polymer ⁷⁵	Lovastatin, indomethacin	Solvent removal technique	Improved dissolution behavior with better stability
13	<i>Flaeagnus angustifolia</i> blend ⁷⁶	Piroxicam	Co-grinding	Increased dissolution rate
14	Chitosan derivatives ^{77, 78}	Abietic acid/ Tanshinone IIA	Solvent evaporation	Noticeable improvement in solubility and dissolution
15	Skimmed milk carrier ⁷⁹	Simvastatin	Lyophilization	Enhanced cumulative drug release
16	Sodium alginate matrix ⁸⁰	Telmisartan	Grinding approach	High release achieved with optimized polymer ratio
17	Tamarind seed polysaccharide ⁸¹	Clopidogrel bisulfate	Co-grinding/kneading	Maximum release approximately 96% in optimized formulation

Limitations, modifications to gum polysaccharides can be accomplished through physical and chemical processes. Physical modification involves warming with dry heat, use of microwaves, and exposure to ultraviolet and gamma radiation. Chemical modifications include carboxymethylation and carboxymethylation, which involves adding new functional groups to the polymer backbone (e.g., replacing the free OH groups) to enhance the solubility of drugs in water. Overall, when natural gum polysaccharides are

modified using heat or processed into the aqueous state, their properties (e.g., viscosity, density, swelling index, moisture-retention capacity, and flow properties) change, resulting in improved performance compared with unmodified gum polysaccharides. In addition, increased hydrophilicity due to carboxymethylation of natural gum polysaccharides enhances drug solubility in aqueous systems⁸². Various modified hydrophilic carriers and semi synthetic carriers used are shown in **Table 3** and **Table 4**.

TABLE 3: EXAMPLE OF MODIFIED NATURAL POLYMERS EMPLOYED IN SOLID DISPERSION SYSTEM

S. no.	Modified carrier	Drug incorporated	Preparation technique	Result obtained
1	Modified hupugum ⁸³	Clopidogrel bisulfate	Gel incorporation technique	Significant improvement in solubility
2	Treated fenugreek seed polymer ⁸⁴	Simvastatin	Co-precipitation method	Solubility enhancing and stabilizing carrier
3	Modified locust bean gum/guar gum ⁸⁵	Glibenclamide	Solvent evaporation technique	Better dispersion characteristics observed
4	Modified xanthan gum ⁸⁶	Pioglitazone HCL	Kneading process	Improved cumulative drug release performance
5	Processed guar gum ⁸⁷	simvastatin	Microwave-assisted solid solid dispersion	Higher drug release compared to reference product
6	Modified LBG (locust bean gum) ⁸⁸	Lovastatin	Kneading/spray drying/solvent evaporation	Increased dissolution behavior
7	Modified guar gum blend ⁸⁹	Licofelone	Co-grinding approach	Improved dissolution efficiency
8	Treated karaya polymer ⁹⁰	Nimodipine	Co-grinding/kneading technique	Enhanced dissolution profile
9	Modified karaya gum ⁹¹	Glimepiride	Solvent evaporation method	Enhanced aqueous solubility

TABLE 4: EXAMPLE OF SEMI-SYNTHETIC POLYMER CARRIERS UTILIZED IN SOLID DISPERSION FORMULATION

S. no.	Polymer combination	Drug	Technique used	Observed effect
1	HPMC-based system (E5LV) ^{92,95}	Raloxifene, Irbesartan	Fusion/ spray drying	Improved solubility and dissolution characteristics
2	HPMC-silica ternary ASD ⁹³	Indomethacin	Hot melt extrusion	Enhanced release profile and stability

3	Chito-oligosaccharide ⁹⁴	Hesperidin	Spray drying	Increased solubility with added antioxidant benefit
4	EC-HPMC matrix ⁹⁶	Hydrochlorothiazide	Solvent evaporation	Improved dissolution performance

Advantages of Solid Dispersion:

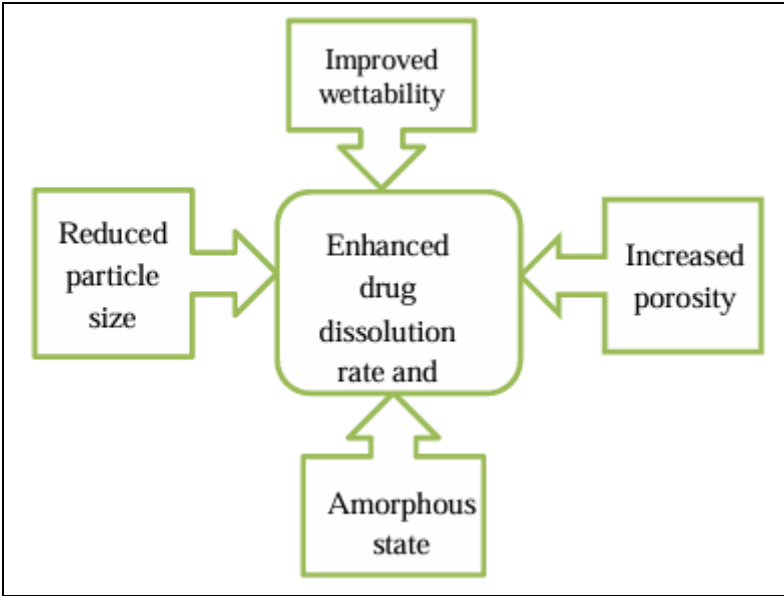


FIG. 6: ADVANTAGES OF SOLID DISPERSION

Future Prospects and Research Gaps: There are still multiple issues that need to be addressed in the development of solid dispersions for the sublingual route of administration. These include scientific, technological, and regulatory concerns. In order to bring the laboratory-based accomplishments to the clinic, it will be necessary to overcome some of these challenges ^{97, 98}.

Personalized Therapy: A potential future avenue within Solid Dispersions research will be the creation of a personalized sublingual delivery system. Between individuals, there are often large differences in the amounts of saliva present, mucosal permeability, metabolic rate, and overall health, all of which affect how quickly drugs enter into the bloodstream after being delivered sublingually and their effectiveness at producing desired effects ⁹⁷.

- ❖ Pediatric and geriatric populations
- ❖ Patients requiring rapid titration of dose
- ❖ Drugs with narrow therapeutic windows ⁹⁸

AI Based Formulation Design: Artificial Intelligence (AI) and Machine Learning (ML)

provide many possibilities to enhance the ability to develop solid dispersions. Additionally, traditional methods for formulating solid dispersion formulations mostly rely on Trial & Error processes that take a lot of time and resources. AI-Based models can ⁹⁹.

- ❖ Predict optimal drug-carrier combinations.
- ❖ Estimate miscibility, stability, and dissolution behaviour.
- ❖ Optimize polymer selection and drug loading.
- ❖ Reduce experimental workload and development time ^{100, 101}.

Regulatory Gaps: Regulatory uncertainty remains a major challenge in the development and approval of solid dispersion based sublingual formulation. While solid dispersions are widely studied, clear regulatory guidelines regarding characterization, stability assessment, and quality control are still evolving ¹⁰².

- ❖ Lack of standardized methods for evaluating amorphous stability.

- ❖ Absence of specific guidance on dissolution testing for sublingual formulations.
- ❖ Limited clarity on bioequivalence requirements for rapidly acting dosage forms.

CONCLUSION: Through solid dispersion technology, medicinal researchers are able to enhance solubility, rate of dissolution and bioavailability of many poorly soluble drugs by implementing this method. When the method is applied to sublingual delivery systems, there are added benefits such as faster release of medication, quicker onset of action, decreased dose and increased compliance from patients. The most important factors for producing sublingual preparations with enhanced efficiency are choosing the best carrier(s) and optimizing the relationship between drug(s) and their carrier(s). Also, there are no clear regulatory directions for these products, which limits their use. Significant variability between individuals has created another gap in research, and further exploration of individualized dosage forms also warrants testing. Overcoming the obstacles that currently limit the development of Solid Dispersions for use in clinical situations will ultimately create a pathway for increasing the benefits of solid dispersion for sublingual delivery in the future.

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