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FORMULATION AND EVALUATION OF MEDICATED LOZENGES: A COMPARATIVE REVIEW OF HERBAL AND NON-HERBAL LOZENGES.

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ABSTRACT

Lozenges are one of the oldest and most widely accepted oral solid dosage forms designed to provide local and, in some cases, systemic therapeutic effects through gradual dissolution in the oral cavity. Their ability to prolong drug residence time in the mouth, improve patient compliance, and mask unpleasant tastes has made them valuable in the management of throat infections, oral disorders, cough, and other conditions. This review presents a comprehensive overview of the formulation and evaluation of medicated lozenges with a comparative emphasis on herbal and non-herbal preparations. The article discusses the historical development of lozenges, their classification based on texture, composition, and site of action, and the role of various excipients in ensuring product stability, palatability, and controlled drug release. Different manufacturing techniques employed for hard, soft, and compressed lozenges are described along with key evaluation parameters including physical characteristics, drug content uniformity, dissolution behavior, stability, and patient acceptability. Furthermore, the review highlights the growing interest in herbal lozenges due to their natural origin, safety profile, and therapeutic potential, while also examining the advantages of conventional non-herbal formulations in terms of standardized dosing and proven clinical efficacy. The comparative assessment indicates that both herbal and non-herbal lozenges offer unique benefits, and their selection depends on therapeutic requirements, formulation feasibility, patient preference, and regulatory considerations. Overall, medicated lozenges continue to represent an effective and patient-friendly platform for oral drug delivery with significant opportunities for future pharmaceutical innovation.

KEYWORDS: Medicated lozenges, Herbal lozenges, Non-herbal lozenges, Oral drug delivery, Buccal drug delivery, Pharmaceutical excipients, Formulation and evaluation, Drug release.

INTRODUCTION

Oral dose forms offer advantages over other dosage form. They are cost-effective and safe for the patient. They are the most natural and convenient method of drug administration. The medication does not require nursing assistance, allowing the patient to take it independently. The extended beginning of action makes them less toxic, allowing for easier recovery compared to other dose forms. These treatments are suitable for all patients, regardless of age. Oral dosing forms have drawbacks as well. These medicines may not be the first choice for those experiencing chronic vomiting. They are not suitable for uncooperative patients, including children and newborns. They are not ideal for emergency situations or unconscious individuals. They are inconvenient for patients with gastrointestinal disorders such diarrhea, constipation, ulceration, or stomach hyperacidity. These methods are difficult for patients with malabsorption syndrome, which prevents absorption through the small intestine. Oral dosing forms are inadequate for drugs that can be inactivated or destroyed in the gastrointestinal tract. Insulin, a protein, is processed in the stomach similarly to other proteins found in foods like meat and fish. Medication can cause difficulties in the gastrointestinal tract. Long-term use of NSAIDs, such as aspirin, can cause stomach ulcers. Finally, absorption leads to a delayed onset of action. Lozenges are oral solids that dissolve within the mouth or pharynx. They might have one or more medicaments in a flavoured and sweetened base and are

meant to treat local irritation or infection of the mouth or pharynx and used for systemic drug absorption.[1]

Lozenges are designed to soothe and purge the throat. They can be used to relieve coughs. Lozenges can have a systemic effect if the substance is well absorbed through the buccal linings or ingested.[2]

Lozenges are placed in mouth cavities. Since the sublingual lozenges may be impractical due to their size, buccal lozenges are produced and have been extensively used and are designed to be inserted between the cheek and the gums. The disintegration period of lozenges varies depending on the patient, who can control the rate of dissolution and absorption by sucking on them until they disintegrate. This can lead to significant variations in the amount of medication supplied with each lozenge administration. Sucking and saliva production can dilute drugs and raise the risk of unintentional swallowing.[3]

History of Lozenges

Lozenges, also known as troches or pastilles, are among the oldest oral pharmaceutical dosage forms. Their origin can be traced to ancient civilizations where medicinal substances were mixed with honey, herbs, gums, and sugars to create slowly dissolving preparations intended to soothe throat irritation and deliver therapeutic agents locally within the oral cavity. Early Greek and Roman physicians used "trochisci" (small medicinal cakes or discs) as a convenient means of administering medications for throat and respiratory ailments.[4]

During the Middle Ages, apothecaries prepared medicated lozenges by combining herbal extracts with sugar or honey. These formulations were particularly valued for treating coughs, sore throats, and oral infections. The increased availability of refined sugar during the Renaissance facilitated the production of more palatable medicinal preparations, leading to the wider use of lozenges as pharmaceutical dosage forms.[5][6]

By the eighteenth and nineteenth centuries, lozenges had become well-established in European pharmacy. Pharmacopoeias described various forms such as *trochisci*, *pastilli*, and medicated confectioneries, which were commonly prepared using sugar, gums, and medicinal ingredients. These preparations were recognized as both therapeutic agents and medicated confectioneries designed to prolong drug contact within the oral cavity.[7]

The industrial revolution and advances in pharmaceutical manufacturing during the nineteenth and twentieth centuries enabled large-scale production of standardized lozenges. Commercial throat lozenges and cough drops became widely available, incorporating antiseptics, anesthetics, demulcents, and flavoring agents. Modern lozenges are now formulated as hard candy lozenges, soft lozenges, and compressed tablet lozenges, serving both local and systemic drug delivery purposes. Their popularity continues because of ease of administration, improved patient compliance, prolonged residence time in the oral cavity, and effective management of throat and oral conditions.[8][9]

Advantages of Lozenges

- It is easy to administer to both pediatric and geriatric patients.
- The approach is non-invasive and similar to parenterals.
- It can be administered to people who have difficulty swallowing.
- It extends the duration of the medication in the mouth in order to get a certain result.
- It is simple to make, requiring minimal time and equipment. It does not require a water intake form.
- Drugs may be absorbed systemically via the buccal cavity.
- Sweeteners and flavors in the formulation can mask the taste of the drugs.
- It may increase bioavailability.
- It can reduce the frequency of doses.
- Enhanced patient compliance.
- It is able to avoid first-pass metabolism.
- It may enhance the onset of activity.
- It may alleviate stomach discomfort.[10]

Disadvantages of Lozenges

- Lozenges can be used safely by children older than six.
- Certain drugs, such as benzocaine, may not react well with aldehyde confectionery bases.
- Medicine and saliva are likely to leak from the mouth cavity into the stomach.
- Children may mistake the lozenge dosage form for candy.
- A hard candy lozenge must be prepared at a high temperature.
- Grainy lozenges get hard.[11]

Lozenges classification

Lozenges are variously shaped solid dosage forms that typically contain a medical drug and a flavoring substance and are designed to dissolve slowly in the oral cavity for localized or systemic impact. They are sometimes known as troches or pastilles. Pastilles have a softer texture and a high sugar or gelatin content. Many lozenges are made with hard candy bases of sugar and syrup, and they frequently include an adhesive material like acacia. Commercial lozenges (troches) can be created using a tableting machine with high compression pressures. Lozenges are intended to dissolve slowly in the mouth. They are designed to dissolve rather than disintegrate. If ingredients are going to be mixed into freshly made lozenges, they should be heat stable. Soft and chewable lozenges have just been reintroduced into pharmacies and are becoming increasingly popular. The soft lozenges typically have a polyethylene glycol foundation, whereas chewable lozenges have a

glycerinated gelatin base. These are normally chewed and used to transfer the substance to the gastrointestinal tract for systemic absorption.

1) According to Site of Action

a) Local effect
Example: Antiseptics, Decongestants.

b) Systemic effect
Example: Vitamins, Nicotine.

2) According to texture and composition-

a) Chewy or Caramel Based Medicated Lozenges (Soft Lozenges)

Chewy or caramel-based medicated lozenges are a chewable form of medication that replaces oral dissolution. Most formulations use the glycerinated gelatin suppository formula, which contains glycerin, gelatin, and water. These lozenges are typically fruit-flavored and slightly acidic to mask the harsh taste of glycerin. The lozenges' components include a candy base, whipping agent, humectants, lubricants, flavoring, and medications. The candy base is made with a 50:50 to 75:25 sugar-to-corn syrup ratio. Whipping agents add air to toffee-based confections, resulting in a soft chew. These include milk protein, egg albumin, gelatin, xanthan gum, starch, pectin, algin, and carageenen. Humectants like glycerin, propylene glycol, and sorbitol increase chewing and mouthfeel. Lubricants are added to prevent confectionery from sticking to the teeth when chewing. It contains vegetable oils and fats. Medications up to 35-40% can be included. Seeding crystals involves adding 3-10% fine powdered sugar to warm candy mass to accelerate crystallization and create tablets faster. Adding 3-10% fine powdered sugar to warm candy mass accelerates crystallization and allows for faster tablet formation.[12]

b) Hard candy Lozenges (Hard Lozenges)

Hard lozenges are solid, glass-like preparations produced by heating sugar and corn syrup to high temperatures followed by cooling into molded forms. They typically contain sucrose, glucose syrup, flavoring agents, colorants, and active pharmaceutical ingredients. Hard lozenges dissolve slowly in the oral cavity over 5–10 minutes, providing prolonged local drug action. Due to their low moisture content, they exhibit excellent physical and microbial stability.[13][14]

c) Compressed Lozenges (Tablet Lozenges)

Compressed lozenges are manufactured by tablet compression techniques similar to conventional tablets but are formulated to dissolve slowly in the mouth. They contain diluents, binders, lubricants, sweeteners, and active ingredients. These lozenges provide accurate dosing, ease of large-scale production, and improved formulation flexibility.[15]

d) Chewable Lozenges

Chewable lozenges are designed to be chewed before swallowing and are prepared using mannitol, sorbitol, or other directly compressible excipients. They are especially useful for pediatric and geriatric populations who may experience difficulty with slowly dissolving dosage forms.[9]

e) Medicated Lozenges

Medicated lozenges contain active pharmaceutical ingredients intended for local or systemic therapeutic effects. Common drugs incorporated include antiseptics, local anesthetics, antimicrobials, antifungals, antitussives, and vitamin supplements. Depending on the formulation, medicated lozenges may be prepared as hard, soft, or compressed dosage forms.[13]

f) Non-Medicated Lozenges

Non-medicated lozenges contain soothing agents, sweeteners, flavors, or herbal ingredients without a pharmacologically active drug. They are primarily used to relieve throat dryness, freshen breath, and improve oral comfort.[15]

Table1: Classification of Lozenges According to Texture and Composition.

Type of Lozenges	Texture	Major composition	Characteristics
Hard Lozenges[13][14]	Hard, glass	Corn syrup, sucrose	Slow dissolution, high stability
Soft Lozenges[12]	Soft, gummy	Glycerin, acacia, gelatin, PEG	Suitable for heat-sensitive drugs
Compressed Lozenges[15]	Tablet-like	Diluents, binders, lubricants	Accurate dosing, easy manufacturing
Chewable Lozenges[9]	Chewable	Mannitol, sorbitol	Suitable for children and elderly
Medicated Lozenges[13]	Variable	API	Local or systemic therapeutic action
Non-Medicated Lozenges[15]	Variable	Flavors, sweeteners, herbal ingredients	Soothing and oral comfort effects

Excipients and their role in Lozenges

Excipients play a crucial role in the formulation of lozenges by providing structural integrity, palatability, stability, and controlled drug release. The selection of excipients depends on the type of lozenge (hard, soft, or compressed), the physicochemical properties of the active ingredient, and the desired therapeutic effect.

1) Sweetening Agents

Sweeteners improve taste and patient compliance by masking the bitterness of active pharmaceutical ingredients. Sucrose and glucose syrup are commonly used in hard lozenges, while sugar-free formulations often contain polyols such as sorbitol, mannitol, xylitol, and isomalt. Artificial sweeteners including aspartame, saccharin sodium, sucralose, and acesulfame potassium may also be incorporated.

2) Corn syrup

Corn syrup is commonly used in confections to prevent crystallization of sucrose and dextrose, which can lead to crumbling. The use of corn syrup in the right ratio with sucrose and dextrose allows for the formation of amorphous glass as well as the production of candies with a beautiful appearance. Corn syrup's physical properties, including density, dextrose equivalent, hygroscopicity, sugar crystallization, viscosity, freezing point depression, and osmotic pressure, are vital for manufacturing medicated sweets.

3) Diluents and Fillers

Diluents increase the bulk of the formulation and improve compressibility. Commonly used diluents include lactose, mannitol, sorbitol, dextrose, microcrystalline cellulose, and calcium phosphate. Mannitol is particularly preferred because of its pleasant cooling sensation in the mouth

4) Binders

Binding agents provide cohesiveness and maintain the structural integrity of the lozenge. Acacia, gelatin, pectin, polyethylene glycol (PEG), tragacanth, and carrageenan are frequently used in soft lozenges and pastilles. In compressed lozenges, microcrystalline cellulose and other binders facilitate tablet formation.

5) Flavoring Agents

Flavoring agents enhance the sensory appeal of lozenges and help mask unpleasant drug tastes. Peppermint, menthol, eucalyptus oil, lemon oil, orange oil, cherry, honey, and various fruit flavors are commonly employed. The choice of flavor depends on the therapeutic purpose and target patient population.

6) Coloring Agents

Colorants improve product appearance and facilitate product identification. Both natural and synthetic colorants may be used, provided they comply with regulatory requirements. Common examples include caramel, titanium dioxide, FD&C dyes, and natural pigments such as beetroot extract and curcumin. The current regulatory status of colourants can be found in great detail from colour suppliers.

7) Lubricants and Glidants

Magnesium stearate, calcium stearate, stearic acid, and PEG are some of these additives that are used to prevent candies from sticking to teeth and to enhance the flow of the final troche mixture.

8) Demulcents and Soothing Agents

Demulcents provide a protective coating over irritated mucosal surfaces and contribute to symptomatic relief. Common demulcents include glycerin, pectin, acacia, honey, and gelatin. These ingredients are frequently incorporated into throat lozenges.

9) Acidulants

Acidulants are commonly used to enhance and fortify the flavor profile of therapeutic lozenges. The most often used organic acids are citric, malic, fumaric, and tartaric acids. Tartaric acid is the most popular, either alone or in combination with citric acid. Acids are also employed in medicinal lozenges to adjust the pH and protect the medication's efficacy.

10) Preservatives

Preservatives are often unnecessary in these solid dosage formulations. However, because hard candy lozenges are hygroscopic, if not adequately covered, the water content may rise, resulting in bacterial proliferation. The resulting very concentrated sucrose solution is bacteriostatic in nature and will not stimulate bacterial proliferation since some of the sucrose will be dissolved by the existing water. It would be appropriate to make some notes on the flavors and effects of preservatives.

Formulation methods of different Lozenges

i. Chewy or Caramel Based Medicated Lozenges

Cook the candy base at 95-125℃ and transfer to a planetary or sigma blade mixer. Allow mass to cool down to 120℃. Whipping agent should be added at temperatures below 105℃. Medications are added around 95-105℃. Color is disseminated in humectant and added to the mass above 90℃. Seeding crystals and flavor are then added below 85 ℃, followed by lubricant addition above 80℃. Rope shaping is used to make candies.

ii. Compressed tablet Lozengers

Compressed tablet lozenges can be developed using direct compression or wet granulation. Direct compression involves completely mixing the chemicals before compressing. Wet granulation involves mechanically pulverizing sugar content into a fine powder (40-80 mesh size). Medication is introduced and properly mixed. The combined mixture is granulated with sugar or corn syrup, then screened using a 2-8 mesh screen. The material is then dried and milled to a mesh size of 10-30. Flavour and lubrication are introduced before compression.

iii. Soft Lozenges

These lozenges' soft texture allows for hand rolling and cutting into pieces or pouring into a plastic mold. When using PEG, it's important to overfill the mold cavity because it contracts as it cools. Chocolate does not

shrink, eliminating the need for this step. Phaechamud and Tuntarawongsa molded clotrimazole soft lozenges and assessed parameters influencing their physical qualities. Researchers discovered that adding PEG 1500, xanthan gum, or xylitol increased the hardness of the lozenge. Increased actives and hardness led to longer disintegration time.[16]

iv. Hard Candy Lozenges

To cook the candy base, dissolve the necessary amount of sugar in one-third water in a candy base cooker. This is maintained until the temperature reaches 110℃. Add corn syrup and simmer until temperature reaches 145-156℃. After cooking, the candy mass is transferred to a greased container and weighed on a scale. Color is then added using solutions, pastes, or color cubes. After transferring the mass to a water-jacketed stainless steel cooling table, mix in the flavor, drug, and ground salvage. After cooling, the mass can be poured into a mold or twisted into a ribbon and cut to the desired length. The lozenges are packed. Cocaine voice tablet lozenges and pastilles were produced in the late 1800s and listed in the Extra Pharmacopoeia in 1888. Singers and public speakers utilized them to treat hoarseness and huskiness in their voices.[17]

Evaluation Parameters of Lozenges

The prepared lozenges were evaluated for properties such as drug content uniformity, hardness, thickness and diameter, weight variation, friability and in vitro dissolution test, drug content, moisture content analysis, and stability studies using industry-accepted pharmaceutical standards.

a. Diameter

The lozenges' thickness and diameter were measured using vernier callipers. Three lozenges from each batch were used to calculate average values.

The diameter of the lozenges deviated from the target value by ± 5%.

b. Weight variation

The weight variance was calculated by weighing each of the twenty lozenges independently, calculating the average weight, and comparing the weights of the individual lozenges to the average.

Weight variation = Average weight – Initial weight /Average weight

c. Hardness

A Monsanto Hardness tester was used to determine the lozenges' hardness, and the force required to shatter them was noted. The units used to express hardness were kg/cm2.

d. Friability

The friability of the lozenges was evaluated using the Roche Friabilator.

Weighed lozenges were placed inside the friabilator, which ran at 25 rpm for four minutes.

The tablets were then cleared of any remaining dust and weighed again. The percentage of friability was computed.

e. Moisture Content analysis

One gram of the material was weighed after being crushed in a mortar, and the moisture content was determined using the Helium moisture balance apparatus.

f. Mouth Dissolving time test

Using a phosphate buffer with a pH of 6.8 at 37 degrees Celsius, hard-boiled candy lozenges were put into each tube of the USP Disintegration apparatus, and the amount of time it took for the lozenges to completely dissolve was noted. This technique was employed to ascertain the duration required for the candy to fully dissolve.

g. In-vitro Drug dissolution study

The rate of dissolving of the tablet lozenge may be related to its efficacy. In 800 ml of phosphate buffer with a pH of 6.8, the USP II paddle method was used to investigate dissolution at 150 rpm.

For UV spectrophotometer analysis, samples were taken out at 5-minute intervals and promptly put back in with an equal volume of new buffer.

h. Drug content

The absorbance of the solution is measured using spectrophotometry after the proper number of lollipops are crushed and dissolved in the appropriate solvent.

i. Stability studies

The purpose of the stability tests was to assess the drug's physical and chemical stability, which could affect the lozenges' organoleptic properties. An accelerated stability study was conducted at 45°C and 75% relative humidity for seven weeks in compliance with ICH recommendations (zone IV). Enough ideal formulae were kept in screw-capped, amber-colored bottles in an incubator set at 37°C. To evaluate the organoleptic properties and ascertain the drug content, samples were taken every 15 days.

j. Storage

It is important to keep these preparations out of the heat and out of children's reach. They should not be exposed to high humidity. Depending on how the medication and base need to be stored, either room temperature or cooled temperature is usually advised.

k. Packaging

Hard candies can often absorb moisture from the air since they are hygroscopic. It is necessary to consider the hygroscopic nature of the candy base, the manner and duration of the lozenges' storage, and the potential for drug interactions. These items should be stored in tight containers to avoid drying out.

The chewable lozenges may dry up excessively and become challenging to eat. If a disposable mould with a cardboard sleeve is utilised, it is recommended to place this unit inside a sealable plastic bag that has been appropriately labelled.

Table 2: A comparative review of non-herbal lozenges

Type	Ingredient	Effect	Uses
Ondansetron hydrochloride Lozenges[18]	Sucrose as base and Eudragit E100, NaCMC, hydroxyl propyl methyl cellulose K4Mand methyl cellulose as binder is used	Increased onset of action, less stomach discomfort due to first pass metabolism, and increased bioavailability	Chemotherapy induced nausea and vomiting
Diphenhydramine hydrochloride[19]	Mannitol, sucrose, dextrose, isomalt, sodium citrate	Enhance bioavailability by preventing the drug's first pass metabolism in the liver	Cough
Fluconazole tablet lozenges[20]	Maize starch, acacia, HPMC, E50, sucrose as base and gelatin as binder	Reduced gastrointestinal discomfort and increased absorption through first pass	Oral thrush
Hard and soft lozenges of Albendazole[21]	Albendazole, sucrose, dextrose, NaCMC, methyl cellulose, sorbitol solution	Hard lozenges release 99.37% of the medicine after 30 minutes, while soft lozenges release 88.92% of the drug after 50 minutes.	Worm infection
Cefixime lozenges[22]	PEG, gelatin, glycerin, citric acid, xylitol, sorbitol	Increase onset of action	Throat infection
Miconazole lozenges[23]	Maize starch dried, sucralose, citric acid, PEG400, PEG6000, methylene chloride	Good buccal resistance time	Fungal infection in pediatric and geriatric
Domperidone candy lozenges[24]	HPMCK100M, HPMCE5, sucrose, dextrose, citric acid, menthol, amaranth	Increase bioavailability	Anti-emitics
Clotrimazole Lozenges[25]	Artificial coloring and scents, methyl cellulose, guar gum, acacia, acidic substances, and sucrose base	An extended amount of time invested in oral retention	Anti Fungal
Paracetamol Lozenges[26]	Acetaminophen, Sodium Carboxymethyl Cellulose, and Sucrose	medication release gradually	NSAIDs
Ketoconazole Lozenges[27]	Hydroxypropyl methyl cellulose, hydroxy ethyl cellulose, sucrose, and citric acid	lowers intestinal discomfort by promoting first-pass metabolism	Antifungal

Table 3: A comparative review of herbal lozenges.

Type	Ingredient	Effect produced	Uses
Garlic and ginger Lozenges[28]	Sucrose, sodium chloride, poly vinyl pyrollidone, NaCMC	Taste masking with matrix-type lozenges that release well	Inhibitory activity against non- resistant C. albicans infection, nonresistant oral thrush.
Marshmallow root extract lozenges[29]	Xanthan gum as gummy base	For 30 minutes of lozenges, extend the disintegration duration beyond 30 minutes and maintain a 40% in vitro release rate.	Irritated oropharyngeal mucosa and associated dry cough
Liquorice and catechu Lozenges[30]	Galen IQ 990, liquid glucose, liquorice powder extract, black catechu powder extract	Combination of both drug produced synergistic effect	Recurrent aphthous stomatitis
Polyherbal extract based linkus	Adhatodavasica, glycyrrhizaglabra, piper	An appropriate dosage form for symptom alleviation	Sore throat and cough

lozenges[31]	longum, viola odorata,hyssopusofficinalis, cordialatifolia, alpiniagalanga		
Eucalyptus oil and coleus aromaticus oil lozenges[32]	Magnesium stearate, lactose, mannitol, gelatin, sucrose	Inhibition of nonresistance C. albicans infection	Antimicrobial activity
Polyherbal lozenge, Joshanda[33]	Joshanda with its natural decoction form	Prolonged duration of action, delayed breakdown in the mouth	coughs, sore throats, nasal congestion, and upper respiratory catarrh

CONCLUSION

Lozenges represent a versatile and patient-friendly oral dosage form capable of delivering therapeutic agents directly to the oral cavity while also offering opportunities for systemic drug absorption. Their prolonged residence time in the mouth, ease of administration, improved palatability, and potential to bypass first-pass metabolism make them valuable in the treatment of various oral and throat disorders.

This review highlights the importance of formulation variables, excipient selection, manufacturing techniques, and quality evaluation parameters in developing effective lozenge preparations. Hard, soft, compressed, and chewable lozenges each possess unique characteristics that can be tailored to specific therapeutic requirements and patient populations.

The comparative assessment of herbal and non-herbal lozenges demonstrates that non-herbal formulations provide advantages such as precise dosing, reproducible quality, and established therapeutic efficacy, whereas herbal lozenges offer natural bioactive compounds, broader patient acceptance, and potential multifunctional activities including antimicrobial, anti-inflammatory, soothing, and antioxidant effects. Several herbal formulations containing garlic, ginger, liquorice, marshmallow root, eucalyptus oil, and polyherbal extracts have shown promising outcomes in the management of cough, sore throat, oral infections, and mucosal irritation.

Overall, both herbal and non-herbal lozenges have significant pharmaceutical value and continue to evolve as effective drug delivery systems. Future research should focus on the development of sugar-free formulations, incorporation of novel therapeutic agents, optimization of drug release characteristics, and generation of robust clinical evidence to support the safety and efficacy of emerging lozenge formulations. Such advancements may further expand the therapeutic applications and commercial potential of medicated lozenges in modern healthcare.

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