

A Review on Multifunctional Throat Spray

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ABSTRACT:

One of the health issues is pharyngitis, which affects individuals worldwide. It causes pain, irritation and difficulty in swallowing, because of viral or bacterial diseases, environmental influences, etc. Lozenges, gargles and oral medicines are traditional methods with temporarily effects because of swallowing. This results under-treatment and overdosing. Throat sprays are used as good delivery system for localized relief. These sprays administer the drug to the affected area, for quicker action. Throat sprays of modern times are taken with mucoadhesive and film forming technologies to enhance the retention time at actionsite. The formulation has mucoadhesive agents, film forming agent They work by allowing the drug longer-lasting relief and effective therapy. This review is a compilation of information with formation and optimization of throat sprays. With formulation elements, roles of mucoadhesive technologies and film-forming technologies. Offers a variety of throat spray preparations, delivery techniques.

KEYWORDS: Sore throat, throat spray, film-forming spray, mucoadhesion, multifunctional formulation, delivering technologies.

I. INTRODUCTION

Pharyngitis, also known as sore throat, is an ordinary health disorder in which pain is experienced, scratches or soreness in the throat which gets worse when swallowing. It is among the upper respiratory tract issues, millions of people being affected all over the world. The causes of sore throat are generally divided into infectious and non-infectious factors.^[1]

Viral infections: Influenza virus, rhinovirus, adenovirus, are viral infections in sore throat.

Bacterial Infection: Streptococcus pyogenes, resulting in strep throat caused by antibiotics.

Environmental Factors: Dry air, smoke, allergens,

cause irritation of throat.^[2]

Introduction of Throat Sprays:

It have been used for a long time The local acting preparations used to administer the drug are throat sprays delivered to the throat mucosa to relieve fast, directly to affected area.^[3]

Active pharmaceutical ingredients (APIs): analgesics, anti-inflammatories, antiseptics.

Excipients: lubricants, sweeteners, humectants, mucoadhesive polymers, and Preservatives.^[4]

Weaknesses of Standard Dosage Forms:

Tablets and Capsules: Swallowing may hurt patients with sore throats.

Lozenges: Have to be administered frequently.

Mouthwashes: Relief is only temporary with majority of the solution being expelled.^[5]

Benefits of Throat Sprays:

Fast action: Direct delivery to mucosa is fast acting.

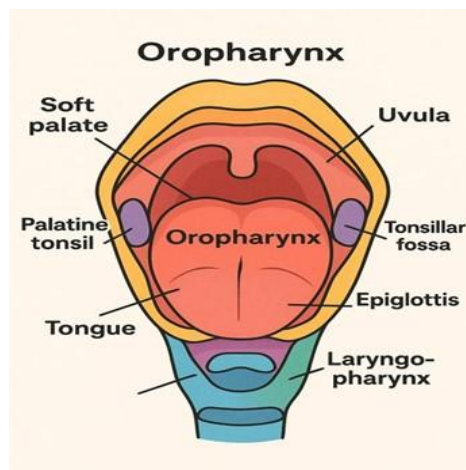
Local action: Reduces the effects and exposure of the system. Convenience in administration: Easy and painless to administer, for children elderly.^[6]

Oropharyngeal Mucosal Anatomy And Physiology:

The mucosa performs a protective role and is also the location of the absorption of drugs. The Oropharyngeal Mucosa consists of multiple layers: The surface mucosa, the intermediate corneousomes, and the deepest most profound layer, called the free mucosa of the tongue.

Lamina propria: Plays a role in immune defense and transport of nutrients.

Muscular layer: Beneath the mucosal, helps in swallowing and speech.^[7]



Anatomy Of Oropharynx

Multifunctional Formulation Approach

It is fundamentally different from the classical-synthetic approach that exclusively utilized the data to build a comprehensive understanding of students and their characteristics.

The approach of multifunctional formulation is radically opposite to the classical-synthetic approach that was purely based on the data to construct a complete picture of students and their attributes.

Mucoadhesive agents: assure increased residence time, which is sustained action.

Lubricating agents: decrease the dryness and discomfort.

Antimicrobial agents: Prevent the development of infection.^[8] This kind of approach enhances the effectiveness of the treatment, decreases the necessity to use numerous medications, and increases patient satisfaction

II. THERAPEUTIC STRATEGIES FOR OROPHARYNGEAL CONDITIONS

One of the most prevalent problems of the upper respiratory tract is sore throat in which pain is experienced. The etiology includes viral, bacterial infections, allergic reactions and environmental

factors. Conventional dosage forms, e.g. lozenges and syrups, suffer restrictions, such as low residence time, slow reaction, and low patient compliance.^[9]

The solution to these limitations is the creation of throat sprays the products that deliver a rapid action, ease of local action of administration, and increased patient compliance. Multifunctional sprays incorporate. A single formulation with an antimicrobial, anti-inflammatory and analgesic effect, maximizing the potential therapeutic efficacy.^[10]

Excipients In Throat Sprays

Mucoadhesive polymers raise residence-time of the formulation on the mucosal surface. Some of the common polymers are Carbopol, HPMC K4M, E5, and E15, PVP, and sodium. Alginate.^[11,12]

Hydrogen bond formation to mucin, to be strongly adhesive. Enhancing efficacy and longer period of action of therapy.

Examples: methylparaben, benzalkonium chloride, propylparaben.

Additives in the flavoring and sweetening category include artificial sweetener, brazzein, cyclamate. Palatability is enhanced by the additives such as menthol, and honey flavor, sorbitol, xylitol.

Table 1: Common Mucoadhesive Polymers, Their Mechanisms, and Functions.^[14,15]

Polymer	Example Grades	Mechanism of Mucoadhesion	Primary Functions
Carbopol	934, 940, 941, 980	Forms hydrogen bonds with mucin, electrostatic interactions	Increases residence time on mucosa, enhances drug retention, therapeutic effect
HPMC (Hydroxypropyl Methylcellulose)	K4M, E5, E15	Hydrogen bonding, physical bond with mucin	Enhance mucoadhesion, drug release, improves therapeutic efficiency
PVP (Polyvinylpyrrolidone)	K-30, K-90	Hydrogen bonding with mucin	Improves drug retention on mucosal surface, local absorption
Sodium Alginate	—	Ionic interactions with mucin, gel formation.	Forms gel in contact with mucosa, increases local drug absorption, prolongs action

Active Pharmaceutical Ingredients

The treatment drugs used to treat pain, inflammation, or infection are API. Selection depends on local efficacy, stability, taste and patient compliance.^[16]

Benzydamine Hydrochloride :

NSAID, analgesic, anti-inflammatory and low-level antimicrobial. Difflam spray is used in medications such as Difflam spray.^[17,18]

Flurbiprofen :

NSAID in pain and local inflammation management. Localized delivery minimizes the side effects of the system.^[19,20]

Cetylpyridinium Chloride :

Quaternary ammonium antiseptic is effective because it can penetrate through the skin . Destroys gram-positive and some Gram-negative bacteria. ^[21]

Table 2: Common APIs and Their Roles in Throat Sprays.^[22,23,24]

API	Category	Primary Action	Typical Concentration
Benzydamine HCl	NSAID	Pain relief, anti inflammatory	0.15–0.2% w/v
Flurbiprofen	NSAID	Anti-inflammatory	8.75 mg/dose
Cetylpyridinium Chloride	Antiseptic	Kills bacteria	0.05–0.1% w/v
Liquorice Extract	Herbal	Mild antimicrobial	1–3% w/v

Theories of Mucoadhesion

The prolonged residence and long-term action requires mucoadhesion.

Wetting Theory: Wetting is a process that is dependent on the spreadability of liquid polymers on mucosal surface. ^[25]

Diffusion Theory: virulence of polymer chains with mucin adhesion. ^[26]

Electronic Theory: The creation of the electrostatic force between mucosal and polymer. ^[27]

Adsorption Theory: The Adhesion is by van der Waals and hydrogen bonding. ^[28]

Pharmaceutical Concerns

PH and viscosity of mucoadhesion. Taste masking in order to provide patient adherence.^[29] The preservative compatibility is also determined by stability. ^[30]

Film-Forming Throat Sprays

The film-forming sprays are a method of delivering drugs to the oropharyngeal cavity.

Spray: forms a fine polymeric coating of mucosa. polymers, which increase adhesion. API is incorporated in the polymeric matrix to be released.

Film: Film serves as a shield against mechanical irritation because the film acts as a protective shield.^[31,32,33]

Advantages :

Prolonged residence time

Long-term therapeutic efficacy.
Increased patient compliance.^[34,35,36]

Examples :

Chloraseptic Oral Spray (USA): local anesthetic/ antiseptic. Film forming polymers and emerging Indian herbal sprays.^[37]

Table 3: Polymers Used in Film-Forming Throat Sprays and Their Roles.^[38]

Polymer	Example Grades	Role in Film Formation / Mucoadhesion
HPMC	K4M, E5, E15	Forms thin film, interpenetrates mucin, sustains drug release
Carbopol	934, 940	Enhances mucoadhesion, provides gel-like protective barrier
PVA(Polyvinyl Alcohol)	—	Stabilizes film, aids in sustained API release

Multifunctional Formulation Strategy

Sprays with multiple functions combine:

Analgesic (pain relief)

Anti-inflammatory (swell lessening)

Prevent infections (antimicrobial)

Calming (flavoring, humectants) agents.

Synthetic and herbal APIs improve the treatment effects of a combination.

Mucoadhesive Polymers + film-forming approach are used to maximize residence and local effect .

Fast acting and long acting .^[39]

III. MARKETING FORMULATIONS

Pharmaceutical preparations that are popular in the treatment of sore include throats, pharyngitis, throats and other oropharyngeal irritations. The formulations provide fast local relief to traditional dosage form such as lozenges, syrups and tablets because of their direct contact on the affected mucosa. Commercial sprays would serve to deliver anti-inflammatory, analgesic, antiseptic and soothing agents in an easy carry-around form that increases patient compliance.^[40]

The traditional dosage preparations make use of limited residence time at the point of action, resulting in to dose periodicity and unpredictable mechanism of action. Syrups may have bad taste, whereas lozenges need a long process to be dissolved, slowing down the action. These constraints have led to the innovation of modernized throat sprays which are maximum. locality efficacy but with patient acceptability.^[41]

Throat Sprays Sold: General Overview

There is a great diversity of throat sprays in the world, which vary in the choice of API, excipients, flavouring agents, and therapy signs. The majority of sprays have non steroidal anti-inflammatory drugs (NSAIDs), antiseptics, anesthetics or herbal extracts. Ingredients.^[42]

The major aim of these formulations is to relieve pain, decrease inflammation, prevent or cure infections, and give symptomatic relief. Some commonly used active sprays that are sold contain ingredients such as:

The non-steroidal anti-inflammatory should be benzydamine hydrochloride, which is a local agent ,analgesic and slight antimicrobial effects.^[43]

Flurbiprofen: Localized anti-inflammatory effect with minimal systemic Exposure.^[44]

Cetylpyridinium chloride (CPC): This is a quaternary ammonium compound having. extensive antiseptic activity.^[45]

Phenol: This is a mild anesthetic that is normally applied in low concentrations to relieve pain.,soothing effect.^[46]

Herbal actives: The ones include licorice extract, turmeric extract, and honey that are soothing, antimicrobial, anti-inflammatory and anti-inflammatory effects.^[47,48]

Commercially available sprays are developed using different excipients in order to ensure maximum viscosity, mucoadhesion, stability and taste masking. Usual excipients are mucoadhesive polymers (Carbopol, HPMC), sweeteners, flavoring agents, preservatives, and stabilizers.^[49]

The sprays are set to stick to the mucosa and enable localized activity of the active ingredients. Mucoadhesive excipients enhance residence time, which guarantees long-term relief and slowing down the administration.^[50,51]

Therapeutic Indications And Usage

Throat sprays available in the market are mostly recommended in case of :

The sore throat is acute and is due to the effect of viral/bacterial infections. This irritation occurs in the throat after the intubation or surgery. Pharyngeal mucosa inflammatory disorders. High-risk people should have mild antimicrobial prophylaxis.^[52,53,54]

These sprays are symptomatic and include relief on pain and inflammation. also, the antiseptic formulae are useful in the reduction of microbial loading, as a part of infection control. Compliance is a very important issue in therapeutic effect. The delicious flavor, quick effect, and ease of administration are the reasons why sprays are better than lozenges or tablets, especially in children, elderly populations.^[55]

Marketing Formulations: An Example

The throat sprays that have been popularly available include:

Diffiam Spray (India, Europe): It includes Benzydamine hydrochloride which is a non-effective in pain relief, steroidal anti-inflammatory agent, and local anti-inflammatory action.

Strepsils Intensive Spray (India, UK): This product has mucoadhesive excipients combined with Flurbiprofen, a quick acting pain reliever.

Chloraseptic Spray (USA): It provides local anesthetic and antiseptic effect; it is popular a symptomatic agent of throbbing in the throat.

Herbamed Spray (India): It contains licorice, turmeric, etc. extracts, imparting antimicrobial activity of a calming and mild nature.

Zymar Throat Spray (USA): It comprises anesthetic and antimicrobial agents locally, applied in symptom relief on a short-term basis.

Such sprays have varying API content, excipient formulation and activity period, according to the level of symptoms, the age of the patient, and comorbidities.^[56]

Table 4 : Commonly Available Throat Sprays and Their Active Components ^[57]

Brand Name	Active Component(s)	Primary Action / Benefit
Diffiam Spray	Benzydamine hydrochloride	Non-steroidal anti-inflammatory; pain relief; local anti-inflammatory
Strepsils Intensive Spray	Flurbiprofen + mucoadhesive Excipients	Rapid pain relief; enhanced mucosal retention
Chloraseptic Spray	Local anesthetic + antiseptic	Symptomatic relief of throat pain
Zymar Throat Spray	Local anesthetic + antimicrobial Agents	Short-term symptomatic relief



Figure-2: Strepsils Intensive Spray ^[58]



Figure-3 : Chloraseptic Sore Throat Spray ^[59]

Future Prospects Of Throat Sprays In The Market ^[60]

As the pharmaceutical technology advances, future sprays on the market can contain:

Combination formulations Multifunctional analgesic, antimicrobial and anti-inflammatory calamities within one product .Herbal or natural actives to be used on a more long-term basis, especially in children sensitive populations.

Mucoadhesion Polymeric systems of mucoadhesive to increase residence time and release drugs, so flat in the absence of complete film-forming technology. The use of combination sprays that are specific to post-surgery or chronic irritation of the throat combining relaxing agents and antioxidants. Individualized medications to administer to children and elderly to increase convenience of administration and of compliance.

These trends show that throat sprays are shifting towards being more patient in future efficacious formulations, multifunctional and friendly, and possible herbal compositions of synthetic hybrid.

IV. CONCLUSION

Sore throat is a common disorder that occurs among individuals of all ages, and is normally brought about by diseases, swelling, or inflammation of the oral cavity. It can significantly disrupt normal day to day activities and quality of life necessitating safe and effective treatment options. It has been used as other dosage forms like syrups, lozenges and gargles are popular and have various limitations, such as lack of time spent in contact with the affected location, slow onset of effect, and intricacy in dosage. Such restrictions

decrease their general effectiveness and compliance by patients. The use of throat sprays has become a sophisticated and effective substitute of local anesthetic and convenient one administering treatment factors to the site of action. This method offers several benefits, including quick action of relief, specificity of drug delivery and minimized systemic side effects. Patient also improves with the ease of administration and portability of throat sprays treatment acceptance and compliance. The latest developments in the science of formulations have even enhanced throat sprays with further enhancement film-forming technologies and mucoadhesive. Mucoadhesive sprays increase the residence time of drug in the area of application, which causes sustained release and increased therapeutic effect. On the contrary, film forming sprays provide a protective coating to the mucosal surface which offers physical barrier and regulation of release of the active ingredient. These inventions are used as a solution to the failures of traditional sprays, including as fast wash-off and high frequency dosage.

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