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Medicated Lollipops: A New Drug Delivery System for Pediatric Patients

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ABSTRACT

A medicated lollipop is a kind of sugary treat that is typically made of hard candy and placed on a stick so that it may be licked or sucked on. There are many flavors and styles of lollipops available. Alternative names include sticky-pop, Lolly and sucker. There are various dosage forms available on the market; nevertheless, an additional dosage form that functions both locally and systematically may be required. The benefits of current research include longer dosage form retention in the oral hollow space, higher bioavailability, and a decrease in gastric inflammation through first metabolism. Lollipops are medicinal dose forms with flavors that are meant to be sucked and kept in the mouth or throat. The sweetened foundation of the lollipops typically contains one or more medications. The customary dosage for medications, tablets, and syrups.

Keywords: Medicated lollipop, Flavors, higher bioavailability.

INTRODUCTION

The oral route of drug administration is often the most widely utilized method of drug delivery because to its affordability, user-friendliness, patient compliance, and formulation flexibility. Specific demographics such as pediatrics, geriatrics, and immobilized individuals often encounter challenges swallowing standard tablets or capsules.[1] This difficulty stems from issues like insufficient water intake alongside the medicine, distaste for many drugs in liquid form, poor adherence from patients. Lozenges, sometimes known as lollipops, are flavored dosage forms for medications. meant for sucking and holding in the mouth or throat, are designed to solve these constraints.[2]

When applied to the buccal mucosa, lollipops have both local and systemic effects. They offer several advantages as dosage forms, including enhanced bioavailability, reduced dosage requirements, minimization of gastric irritation, and avoidance of first-pass metabolism. The objective behind lollipops revolves around enhancing patient adherence, acceptance and convenience.

There has been a considerable surge in the demand for patient-compliant dosage forms due to the benefits associated with these technologies [3]. As pharmaceutical companies confront high costs for developing new chemical entities, they are increasingly directing their efforts towards improving existing drug delivery systems to elevate efficacy and bioavailability while reducing dosing frequency to mitigate adverse effects.[4]

Medicated lollipops, which consist of drug-containing hard dosage forms with a sweetened base, are created to dissolve gradually in the patient's mouth and release their contents. These components can either operate or can be taken up locally to ease oropharyngeal discomfort or be absorbed systemically via the buccal pathway. Such lollipops can encompass various types of drugs like antibiotics, antitussives and analgesics. For instance, In the case of paracetamol, this formulation can improve bioavailability and avoid first-pass metabolism. Moreover,

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the benefits of medicated lollipops extend to increased patient adherence, particularly among pediatrics, suitability for individuals facing swallowing challenges, cost and time efficiency in production, and reduced dosing requirements.[5]

Advantages of medicated lollipops:

Formulas are easily changed, and patients can be particular. prolonging the duration of drug contact with the oral mucosa. It has a pleasant flavor and extends the quantity of medication that remains in the verbal depression for a therapeutic effect. Additionally, drug specialists may plan sweets on the go with the least amount of time and gear. People who are experiencing trouble swallowing can be given lollipops. extending the time a medication is taken orally in order to get a specific result. Simple to make, requiring little time and equipment. Water intake is not necessary when administering. It is a non-invasive procedure, similar to a parenteral.[6]

Disadvantages of Medicated lollipop:

Because of the high temperatures required for manufacturing, heat-sensitive medicines are incompatible with this formulation. Drugs with the least bitter flavor are acceptable. Drugs that can tolerate heat are acceptable.[7]

History

It's likely that other copies of the lollipop have been created, given the concept of a sugary, sweet treat on a stick is not very complex. In the medieval era, the upper class would frequently consume boiling sugar with various stick-like handles. These are the earliest candies that resemble what we now call lollipops. The term "lollipop" was first documented by English lexicographer Francis Grose in 1796.The words "lolly" (tongue) and "pop" (slap) may have inspired the phrase's genesis. The 1920s saw the first references to the lollipops in their current form."[8,9]

Types of Lollipops:

Durable Candy lollipops:

Solid sugar syrups are what hard lollipops are known as. Sugar and other ingredients are boiled before being poured into a mold to generate these dosage forms. Hard candies and hard lollipops are similar. Many hard lollipop recipes are actually derived from hard candy recipes. The dosage form only needs a small amount of moisture. Water evaporates from the sugar mixture when it is boiled during the compounding process. An amorphous or glassy mixture of sugar and other carbohydrates makes up a hard candy lollipops. With moisture contents ranging from 0.5% to 1.5%, these sweets could be described as thick sweet syrups. Instead of disintegrating, lollipop hard should erode or break down gradually over the course of 30 minutes in a homogeneous manner.[10]

Soft candy Lollipops

Because they are simple to make and may be utilized for a number of purposes, soft lollipops are very popular. Acacia or a similar material like glycerol, gelatin, or a combination of pegs is frequently used as the main component of the base. Depending on the desired outcome of the integrated medication, these candies can be flavored and colored. They can also be swallowed or softly dissolved in the mouth.[11]

General things to think about when creating medicated lollipops:

Pharmaceutical companies are literally concentrating all of their efforts on creating new drug delivery systems for their current medications with increased bioavailability and efficiency, along with fewer dose intervals to reduce side effects, because the expense of developing a new chemical entity is so high. Usually, oral candidacies manifest as an adherent, white, curd-like plaque. Currently on the market, there are numerous pharmacological dose forms for treating the same illness, including lozenges, pills, inhalers, and syrups. To have a local or systemic influence, these preparations are frequently utilized. In this area, novel drug designs are always advantageous to doctors, patients, and the pharmaceutical industry. Different dosages are offered on the market, but there is a critical need for additional dose forms that work incredibly well both locally and systemically.[12]

Formulation of Medicated lollipop.

Sugar: The three disaccharides that come from sugarcane or beets are sucrose, glucose and fructose. Depending on availability and location, either cane sugar or beet sugar is utilized. Because of their importance as neutral sweeteners, their solubility, and their ability to act as a "drier" to reduce the load of the confection by crystallization, sucrose and sucrose products are used in medicated lollipops.[13]

Corn syrup is used in practically all confections to control the crystallization of dextrose and sucrose, which can lead to crumbling. When mixed with sucrose and dextrose in the appropriate quantities, corn syrup generates an amorphous glass and gives candy the perfect appearance. When making medicated candies, the following characteristics of the syrup—density, hygroscopicity, pressure, melting point depression, sugar crystallization, and dextrose equivalent—are crucial.[14]

Sugar bases: Sugar bases often utilized in lozenge tablets include sucrose (also known as compressible sugar), dextrose, mannitol, and sorbitol. Different excipient companies supply these sugar bases in a variety of tableting grades. They can be used with the specified binders in wet granulation systems, although they are primarily meant for applications requiring direct compaction. A natural or synthetic sugar substitute with a sweetness level above or comparable to sucrose might be classified as a nonnutritive sweetener. Nonnutritive sweeteners include sorbitol, mannitol, xylitol, invert sugar, and others.[15]

Binders are commonly used in compressed tablets as discrete granules to hold particles together. Examples of these include methylcellulose, sucrose, gelatin, acacia, corn syrup, and sugar syrup.[16]

Lubricants: These contain stearate of PEG, Stearate of calcium, Stearic acid and Magnesium are used to enhance the flow of the final troche mixture and prevent the candy from adhering to teeth.[17]

Colorants: Medicated lozenges are formulated with colorants to enhance their look, aid in product recognition, and conceal physical deterioration Before using dyes and other organic colorants, it is critical to investigate their compatibility with pharmaceuticals, excipients, and process conditions since they can deteriorate under the influence of light or heat through reactions like photo-oxidation, hydrolysis, and oxidation.[18]

Acidulants are frequently utilized to improve and strengthen the medicated lozenges' flavor profile. The most commonly utilized organic acids are tartaric, fumaric, malic, and citric acids. Citric acid, either by itself or in conjunction with hydroxy acid, is the most widely used. Medicated lollipop frequently have their pH altered with acids in order to maintain the drug's legitimacy.[19]

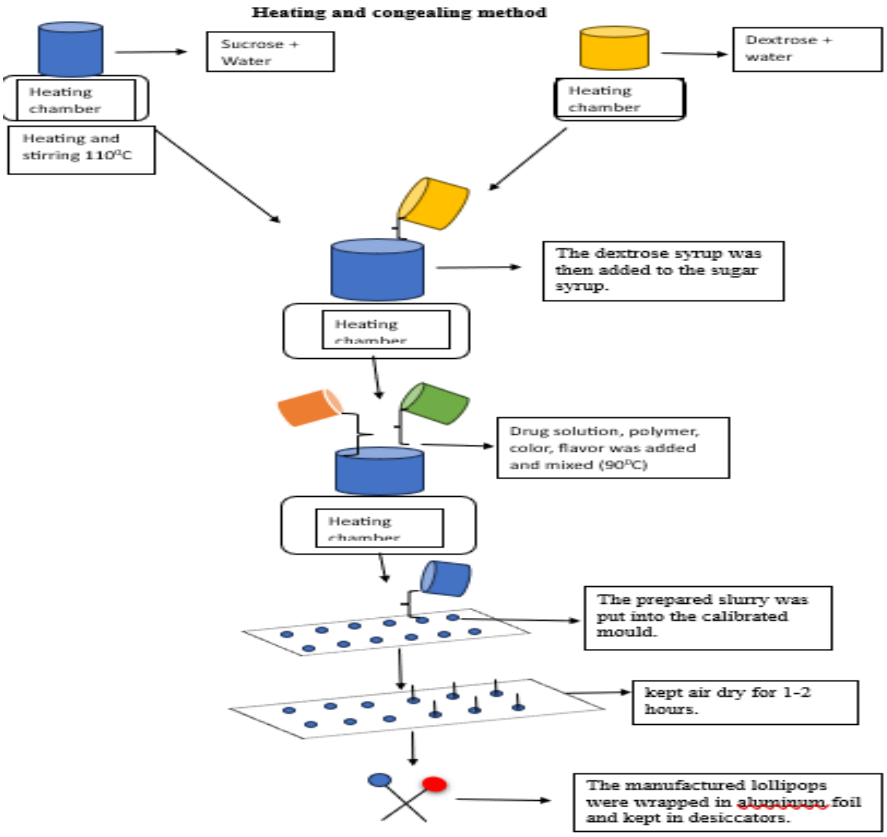
Preservatives: Preservatives are frequently unnecessary in these dosage forms since they are solid. However, because hard candy lollipop is hygroscopic, incorrect packaging may cause a rise in particle size and the growth of germs. Because some sucrose may dissolve in the present water, The extremely concentrated sucrose solution that results will have bacteriostatic properties, preventing bacterial development. Let us chat a little bit about preservative tastes and effects.[20]

Flavours: Medicated lozenges' flavors need to be compatible with the drug and its excipients, as well as robust enough to withstand manufacturing pressures. A wide range of compounds that break down in the presence of heat or light and interfere with pharmaceuticals or excipients make up flavors. Esters, ketones, and aldehydes can react with drugs. The interaction between an aldehyde and a primary amine substance (such as cocaine or phenylpropanolamine) that contains flavorings (banana, cherry, etc.) is a well-known example of a flavor-drug interaction. This interaction causes the drug to break down and lose its effectiveness and forms a Schiff base. Changing the pH of the lozenge base to bring out specific flavors, like citrus, may also make some medications, such benzocaine, incompatible with the lollipop.[21]

Method for preparation of medicated lollipop.

Sugar syrup was made by blending sugar and water in

the appropriate proportion. After dissolving dextrose in water and heating it to 110ºC, a clear, thick syrup was produced. After that, the sugar syrup was heated to 160ºC degrees Celsius and the dextrose syrup was added, causing the hue to change to golden yellow. Addition of flavor occurred between 120ºC and 135ºC. The drug, polymer, and other ingredients were then added and thoroughly mixed when the temperature was lowered to 90ºC.The resultant slurry was placed in the calibrated mold and allowed to air dry for one to two hours. The created lollipops were wrapped in aluminum foil and put in desiccators to prevent moisture absorption.[22,23,24]



Figures (1): Method for preparation of medicated lollipop

Evaluation Test of Lollipop:

Evaluation of physical properties of medicated lollipops:

1.Drug-excipient interaction study:

To explore drug-excipient interactions, manufactured lollipops were exposed to FTIR tests.[25]

2.Hardenss

Inconsistent lollipop durability. The ability of lollipops to survive physical impact is an important element. The Monsanto hardness tester was used to determine the durability of lollipops, which are measured in kg/cm^2. By randomly picking three lollipops, their durability was examined.[26]

3.Friability(F)

The lollipops' friability was evaluated using the Roche friability test instrument. The apparatus revolved a pre-

weighted lollipops 100 times at a speed of 25 revolutions per minute. The lollipops were then weighed again. A formula was used to assess the percentage friability.[27]

%Friability= [Initial Weight – Final Weight] x 100.

4.Thickness and Diameter

Vernier Calipers were utilized to measure the thickness and diameter. The evaluation involved examining ten lollipops from each formulation to determine the extent of deviation in thickness compared to the standard value, which should not exceed ± 5%.[28]

5.Disintegration Test

- Place a lollipop in each tube within the disintegration apparatus assembly.
- Suspend the setup in a beaker filled with pH 6.8 phosphate buffer and run it for 30 minutes without the discs.
- Afterward, take out the assembly from the liquid. The lollipops will proceed."

6. Weight variation

Weighed 20 lollipops individually to conduct weight variation test, then calculated the average weight. Compared the weight of each lollipop to the calculated average.[28]

$$\text{Weight Variation} = \frac{\text{Average Weight} - \text{Initial Weight}}{\text{Average Weight}}$$

7.Drug Content

- Soak lollipops in 100 ml of distilled water for 30 minutes, then sonicate and filter.
- Add 1 ml of the mixture to a volumetric flask and dilute to 10 ml (100 µg/ml) for spectrophotometric analysis at 224 nm.[29,30]

8.In-vitro permeation study

Examinations of intelligence and imagination were undertaken out using the Franz diffusion apparatus. A 100mg equivalent mass of a sweet treat was placed within a dialysis cover interposed between the provider and recipient cubicles of the diffusion tool composition. pH 6.8 PBS was introduced into the recipient chamber and vigorously swirled at 200 rpm.Samples weighing 10 milliliters were taken out of the donor chamber on a regular basis. By estimating the concentration in a UV spectrophotometer at λmax, the leaked sample ratio was determined.[31,32]

CONCLUSION

Making medicinal lollipops is a simple, time-saving procedure. When treating pediatric patients' pain, pharmaceutical lollipops offer an appealing, alternative formulation. The oral medicine delivery route offers patients compliance, convenience of use, and formulation versatility. The best dosage form is a medicated lollipop. This will give a more inventive and superior dose form. Lollipops are medicinal candies that were created in the early 20th century and are currently produced for sale. The majority of the preparations are fairly affordable dosage forms and are available over the counter medications. Both systemic and local therapy can be used with them. They can incorporate a variety of actives into their structure. Medicated lollipops hold a significant place in the pharmacy industry and will.

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المصاصات الطبية: نظام جديد لتوصيل الأدوية لمرضى الأطفال

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ملخص

المصاصة الطبية هي نوع من الحلوى السكرية، تُصنع عادةً من حلوى صلبة توضع على عصا لتُلعق أو تُمص. تتوفر المصاصات بأنواع ونكهات متعددة، منها المصاصة اللاصقة، والمصاصة المصاصة، والمصاصة المصاصة. تتوفر أشكال جرعات مختلفة في السوق؛ ومع ذلك، قد يلزم وجود شكل جرعات إضافي يعمل موضعيًا ومنهجيًا. تشمل فوائد الأبحاث الحالية بقاء شكل الجرعة لفترة أطول في تجويف الفم، وزيادة التوافر الحيوي، وانخفاض التهاب المعدة خلال عملية الأيض الأولية. المصاصات هي أشكال جرعات طبية بنكهات مُصممة للمص والبقاء في الفم أو الحلق. عادةً ما يحتوي أساس المصاصات المُحلى على دواء واحد أو أكثر. الجرعة المعتادة للأدوية والأقراص والشراب.

الكلمات الدالة: مصاصة طبية، نكهات، توافر حيوي أعلى.

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