Medicated Mastication Gum: A Progressive System for Transferring Bioactive Compounds

1Nitika Kumari, 2Neelam Sharma, 3Sunil Gupta, 4Abhinav Verma

Department of pharmaceutics
Amar shaheed baba Ajit Singh Jujhar Singh memorial college of pharmacy Bela Ropar, Punjab

ABSTRACT: Mastication gum is one of the novel-fangled systems of medication administration via the mucosa of the mouth and is a valuable implement to distribute drugs systemically. It is an intelligent system for medication on their own with illicit substances as it is opportune and can be managed solely deprived of water. It is solid solitary-dosage preparation, which may contain a masticatory gum base along with a pharmacologically energetic constituent that is envisioned to chew not to be swallowed is unconstrained by chewing the medicated chewing gum, there is dissolution or dispersion of API in spittle, therefore the medication is expelled from the gum into the salivary stream, where it can be absorbed by the mucous membrane of the mouth. The oral path of medication direction affords unswerving access to the rotation of the system through the jugular vein sidestepping the liver’s initial metabolic pathway resulting in great obtainability. Medicinal gum was made by unswerving solidity. This technique involved adding the essence to the validated bioactive components while stirring continuously in a mortar for 15 minutes. After 30 hours, the flavoring agent was sieved, and 30g of the inspection agent, anticorrosive agent, and sweetener were precisely weighed and sieved in advance, sieved through a sieve (0.600mm), and mixed for 10 minutes. Finally, a device for pressing tablets was used to flatten the prepared medication mixture.

Keywords: Innovative drug conveyance system, Mastication gum, Resin bases, Self-administrable, Trans buccal, Universal effects

[1] INTRODUCTION
The exudate remains a helpful instrument for systemic medication administration and one of the innovative oral transmucosal medication conveyance techniques. Due to its convenience and capability towards be used shorn of liquid, it is a great drug delivery device for self-medication. It is a chewable, single-dose formulation with a basis of masticatory gum that may contain a pharmacologically active component. [1,9]

Chewing the medicinal chewing gum releases API, which dissolves or disperses in saliva and in the oral cavity after being released, wherever the thing can be fascinated concluded the buccal mucosa. The oral method of medication delivery enables jugular access to systemic circulation by natural chewing. [2,3,10]

Any nutrients or medicinal substances added to chewing gum to support certain bodily processes are referred to as medicated chewing gums. When chewing gum is classified as edible, colonic bacteria can break down the gum base in the body. After chewing, gum bases are discarded, creating non-biodegradable trash that is damaging to both the environment and living things. Therefore, in order to offer active chemicals that substantially minimize environmental pollution, we must scale up the manufacture of biodegradable chewing gum. [4,46]

Purposeful chewing gum promotes both local and systemic benefits and is supposed to be chewed for roughly 30 minutes. It is absorbed either directly or by salivary influx into the gastrointestinal tract and rapidly initiates its action. It provides higher bioavailability, reducing dosage and reducing gastric side effects. [5,47]

[II] NEED OF MEDICATED CHEWING GUM AS A DRUG DELIVERY SYSTEM
This new formulation exploits the permeable to water polymers' proficiency to cling to moist surfaces when applied as adhesives, tissues otherwise mucous membranes. Accordingly, these polymers are called wet adhesives or mucous membranes. Therefore, we must scale up the manufacture of biodegradable chewing gum. [4,46] chewing gum provides novel modest merits concluded conventional medication conveyance systems.

1. Proligate/speedy commencement of the accomplishment.
2. Evade first-pass metabolism and enhanced bioavailability.
3. Enjoyable sense of perception.
4. Relaxed designed for direction shorn of water encourages developed enduring agreement.
5. Excellent endorsement among descendants and patients who have trouble taking pills.
6. Due to the co - processed' characteristics, G.I.T. hurts less because exudate has no effect on the stomach.

<table>
<thead>
<tr>
<th>Invention</th>
<th>Medication /contents</th>
<th>Suggestions</th>
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<tbody>
<tr>
<td>Asperum</td>
<td>Acetylsalicylic acid</td>
<td>Numbing</td>
</tr>
<tr>
<td>Nicorette, nicotinoyl</td>
<td>Nicotine</td>
<td>Smoldering termination</td>
</tr>
<tr>
<td>Fluorite- novum</td>
<td>Sodium fluoride</td>
<td>Prevention of dental carries</td>
</tr>
<tr>
<td>Stay alert</td>
<td>caffeine</td>
<td>Lipolytic, thermogenic, anti-hunger</td>
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</table>
[III] **Components of medicinal mastication gum**

- **Elastomer (40-70% of the gum base weight)**: Elastomer augments springiness and supports to preserve the consistency gluey. E.g.: polyvinyl acetate.
- **Plasticizing agents (3-20% of the gum base's weight)**: Which are exploited to resistor the artefact's reliability. E.g.: Glycerol
- **Filler phrases (2-60% of the gum base's weight)**: Inflate munching by totaling quality. E.g.: Magnesium and Calcium Carbonate, Talc.

**WATER SOLUBLE BULK PORTION:**

- **Softener**: It is supplementary to munching gum to improve chomping ability. Emollients comprise of full of fat acids such as glycerine, stearic acid, palmitic acid, oleic acid, and linoleic acid.
- **Sweeteners**: Sugars such as sucrose, glucose, malt sugar, dextrin, fruit sugar, and galactose are examples of sugar components. Unsweetened additives include sugar spirits such as sorbitol, mannitol, xylitol, and hydrogenated thickening agent hydrolysate.
- **Flavouring**: Wintergreen Oil is one of the flavouring representatives’ cast-offs to augment the flavour of chomping gum.

**Active Ingredients:**
The energetic pharmacological representative may be confined in the middle, shell, or in cooperation of munching chewing exudate.

[IV] **METHODS OF PREPARATION OF MEDICATED CHEWING GUM**

- **MELTING METHOD**
  - It relied on the consistency of gum melting at 60 degrees Celsius in a China dish.
  - Utilizing a z-blade mixer, add the rest of the ingredients to this and thoroughly mix them together.
  - Immediately following that, the entire mixture is coated with CaCO₃ powdered material.
  - Latex is then trimmed to the suitable dimension and shape.
  - Elementary benefit of the melting performance as it is unassuming and ought to a low-slung price.

- **MOULDING METHOD**
  - Based on chewing gum that melts in a China bowl.
  - Add other ingredients to this and mix well.
  - Pour the molten mixture into the mold.
  - The piece of gum is then cooled over no fewer than forty-eight hours in a precisely regulated environment. This will enable you to put the gum in satisfactorily.
  - Then expurgated the chewing gum to the desired size and shape.

Mucosa prevents the reduction in the potency or amount.
mucosa prevents the reduction in the potency or amount.
mucosa prevents the reduction in the potency or amount.
mucosa prevents the reduction in the potency or amount.

Grinding mortar pestle  molding tray  obtained cubic chewing gum

FIG 4.1: Manual method of preparation of medicated chewing gum

[V] ASPECTS IMPACTING ACTIVATED INGREDIENT DELIVERY

WILDLIFE OF API AND EXUDATES: API contenders that are decipherable in slobber release rapidly, although hydrophobic entrants’ proclamation more slowly from latex base material. Hydrophilic drug candidates release 60-70% of their medication in the first 10-15 minutes and the remainder in the next 15-20 minutes. Gums that are hard in nature restrict release, which can be mitigated by accumulation excipients such as emulsifiers and softeners, or in cooperation, during invention. [15,16]

CONTACT TIME: The interaction period duration of the gum in the mucous membrane determines the therapeutic efficacy on both the local and systemic sides of physiology. It should be in contact with the region for at least 30 minutes and chewed roughly 60 times per minute for the best impact. [17,18]

CHEWING INTENSITY: Chewing frequency or chewing intensity is expressed in cycles per minute or chewing per minute. It has a huge impact on drug release and varies from one individual to another. The rate at which you chew has an impact as well. According to established books such as the European Pharmacopoeia, 60 rotations per minuscule is ideal for a decent proclamation. [18,50]

COMPOSITIONAL FACTORS: The countryside of the gum sordid additional substances, as well as their relative proportions, have a massive upshot on the releasing. The water loving quality of latex bases encourages the API to be released quickly, whereas hydrophobic bases induce the API to be released slowly. If more than the recommended amount of gum base is used, the release will be reduced by up to half. [19,20]

[VII] ASSESSMENT OF MASTICATION EXUDATES

Evidently are plenty of stipulations that can be cast off for appraisal, but none of the ones mentioned are tackled in any monograph; Pharmacopoeia European recommends only shelter constraints, dissolution constraints, and assays. Supplementary options are provided underneath. [21,44]

Organoleptic evaluation:
In human testing, advent, shade, taste, and melodiousness index are resolute by an unpretentious volunteer receipt or inspection using a Rating scale of 5 themes. Mock tongue replication may also be used as an overall eating tester. The texture profile is another key part of the physical examination. It is a corporeal evaluation and study of qualities such as solidity, glueyness, and stickiness in the case of gums with force-time curve standards. After two folding the model in a gesture that replicates the action of the orthodontic jaw, the textural qualities are examined. For this, compression plates and flat surfaces, as well as a conventional probe, are employed. As a result, the device duplicates the oral munching progression or caricaturists the cutting movement of the mouth. [22,23]

Melting point of gum base:
Any relevant approach is used to determine the temperature at which the sordid loses its texture and behaves as a fluid.

Excipient’s evaluation:
To explore the connections in the dose form, discrepancy skim through calorimetry techniques, or Fourier transform infrared spectroscopy (FTIR) are employed. [42,43]

**Weight variation:**
It can function in accordance with Pharmacopeia's commands for compact dosage form by utilizing 10 pieces of gum chosen at random. [24]

**Moisture content:**
The IR moistness balancing system, dehydration, or warm air oven method can be used to determine moisture content. [42]

**Uniformity of drug content:**
The active content of around 10 parts from each invention was discretely assessed using the appropriate procedure described in the monographs, which involves crushing and combining chewing gum with 100 ml of synthetic saliva. After filtering and diluting the solution as necessary, an instrument such as an ultraviolet spectroscopy or liquid chromatographic technique was used to interpret the results. [25,41]

**In vitro dissolution study:**
It was also performed according to the European Pharmacopoeia monographs provided below. By studying the R value and selecting the most appropriate model, the zero-order, first-order, Higuchi matrix, Korsmeyer, and Pepas models were incorporated to fix the algorithm for drug release and accelerated processes of the rate at which the medication dissipates from the formulation of the medication. [26]

**Fig 6.1: Gadgets for measuring pharmaceutical release from medicinal munching gum**

**Table 6.1: working of dissolution apparatus**

VII Stability studies:
Research on the accelerated stability of any formulation is feasible, in accordance with Intercontinental Consultation on Harmonization (ICH) Q1A (R2).[27]

Table 7.1: ICH storage circumstances for assessing stability

<table>
<thead>
<tr>
<th>Learning category</th>
<th>Storing ailment (temperature and relative dampness)</th>
<th>Minutest period frame</th>
</tr>
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<tbody>
<tr>
<td>Prolonged term</td>
<td>25°C±2: RH*60±5% or 30°C±2: RH 65%±5</td>
<td>12 calendar months</td>
</tr>
<tr>
<td></td>
<td>25°C±2: RH*60±5% 30°C±2: RH 65%±5</td>
<td>6 calendar months</td>
</tr>
<tr>
<td>Equidistant</td>
<td>30°C±2: RH 65%±5</td>
<td>6 calendar months</td>
</tr>
<tr>
<td>Boosted</td>
<td>40°C±2: RH 75%±5</td>
<td>6 calendar months</td>
</tr>
</tbody>
</table>

[VIII] THERAPEUTIC APPLICATIONS OF CHEWING GUMS

**Smoking:** It's widely acknowledged that cigarettes are terrible for your teeth. It can only be eliminated by retraining it to healthy chewing behaviors like chewing. Formulations with nicotine and Lobeline are highly effective at assisting smokers to stop. [28,29]

**Unhealthy weight:** Obesity is at the top of today's list of diseases and lifestyle disorders. Today you need to chew on anorexia or lipolytic chemicals. [30,31]

**Motion sickness:** Dimenhydrinate salts are the first medication that springs to mind for motion sickness. Dosage forms of chewing gum are already available on the market. It is easily absorbed through the mucous membrane of the cheek and enters the bloodstream. Chewing enhances digestion, produces saliva, which functions as an antacid, and avoids acid reflux, which mitigates motion sickness indications according to health surveys. [32,33]

**Ache:** For example, the main purpose of analgesics for headaches, migraines, muscle spasms, colds, coughs, etc. is to have a faster analgesic effect. In these situations, rapid uptake of the API is required. Therefore, the goal was achieved by using gum as a buccal drug delivery mechanism. Experimental studies have shown that methadone gum has approximately the same bioavailability as the tablet version and can be used even with severe allergies. Because active chemicals can only be released after chewing, the drug abuse problem was virtually eliminated in this study. [34,35]

**Multivitamin Gummies:** Vitamins have been produced to offer them in a contemporary and novel method because they are crucial to good nutrition. Another typical technique for buccal administration of different vitamins is munching gum [36]. Vitamins are promptly absorbed and most effectively used when they are chewed because they pass through the mouth's mucous membranes and into the circulation of the blood. It boosts the availability of vital nutrients such as folic acid, biotin, and vitamins A, C, D, E, B1, B2, B3, B5, B6, and B12. When combined with menthol, mint, or cinnamon, it also functions as a breath refresher. [37]

**Gum that improves men's health:** Modern researchers have discovered the amazing properties of healing gums. According to estimates, Florida-based M/S Forthcoming Régimes LLC has hurled a munching gum with male-enhancing paybacks. It can be used as a stimulant for libido, stamina, and blood flow, resulting in larger, longer, and stronger erections. Aphrodisiac herbs such as Pausinystalia yohimbe, Turnera diffusa Damiana, Lepidium meyenii, and Panax ginseng, and their variations are the principal components of gum. Additionally, it includes an animal-derived orchic powder extract along with other crucial ingredients and excipients. [38]

**Elevated cholesterol levels:** The most prevalent cardiovascular condition that necessitates continual surveillance is this one. According to research, one of the effective K-channel facilitators being tested for is the substance Nicorandil, a strong myocardial stimulant. [39] Studies are currently underway to develop and evaluate the antihypertensive and antiangiinal properties of Nicorandil chewing gum. Avoiding the metabolism's initial pass and offering a quick commencement of effect are the objectives. Dosage efficacy is also reduced to limit unwanted effects. [40]

CONCLUSIONS AND FUTURE PROSPECTS

Scientific achievements or innovations must always be fully acceptable to the general public, acceptable, accessible and effective. Until the advent of fluoride gum and, more importantly, nicotine gum in the 1970s, gum was mostly considered a snack. Both products have opened the door to greater acceptance of mastication exudate as a means of medication conveyance. Healthier munching resin will attract and benefit more patients and create a unique market trend. Standard, chewable or orally dissolving tablets can be substituted for medicated chewing gum.

This medicated gum is currently being used as an alternative to oral contraceptives, to treat erectile dysfunction, and as a sex appeal for those who hate taking pills. There are many opportunities to develop therapeutic chewing gum containing memory-enhancing ingredients, relaxants, and drugs that promote regular stools for use in future research. As we have already said, chewing gum is really promising in the fight against oral diseases and disorders and also as a fantastic future way to correct structural defects.
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