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COMPARATIVE STUDY OF VARIOUS HERBAL GUMS IN MEDICATED CHEWING GUM USED IN MOTION SICKNESS

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ABSTRACT: MCG is a great drug delivery method for self-medication because it is practical and may be used without water. numerous benefits, including patient compliance and a quick commencement of effect. The administration gets direct access to the systemic circulation via the buccal route, which is advantageous. This prevents local drug loss at the location as well as first-pass hepatic metabolism. Elastomers, emulsifiers, waxes, antioxidants, softeners, food coloring, flavoring, and in the case of medicated chewing gum, active ingredients make up the gum base. In this paper, we show the various benefits and applications of natural gum like Gum Base, carrier agents, natural fibers, coating agents, stabilizers, and many food industries.

Key Words: Medicated chewing gum, Gum Base, patient compliance, excellent drug delivery system.

INTRODUCTION

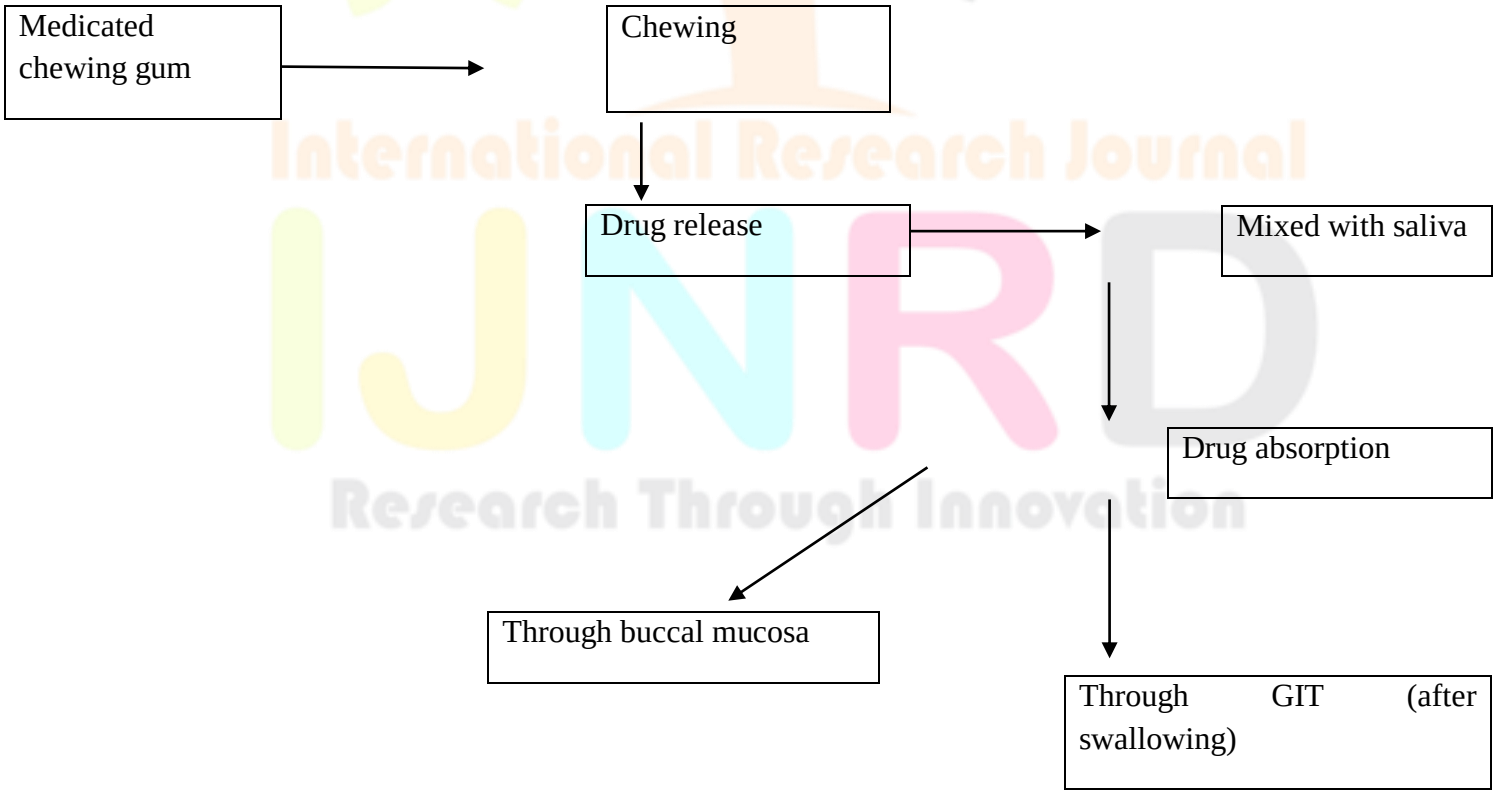
In 1948, "State of Maine pure spruce gum," the first chewing gum sold commercially, was introduced in the United States. In 1869, the first patent was submitted **(Conway et al., 2003)**. The gum was never commercialized despite being designed as dentifrices. In 1928, "Asperum," the first medicated chewing gum, was introduced. Promethazine HCl-containing motion sickness chewing gum is another commercially available medicinal gum. MCG is the most recent system with potential applications in pharmaceuticals, OTC drugs, and nutraceuticals **(Lee et al., 2001)**. Chewing gum is a useful delivery method for medications whose oral cavity action necessitates low water/saliva solubility.

The oral route of medicine delivery has seen significant technological and scientific advancements in recent years. The oral channel of drug delivery—medicated chewing gum—has gained notoriety on a global scale throughout the year as a result of increased patient compliance, not only in geriatric and pediatric patients but also in the general population. Chewing gum can be utilized as a portable medication delivery system for systemic and local drug administration. It is a superb drug delivery system for self-medication due to its simplicity and capacity to be used

without water**. (shaikh A et al., 2017)** A lipid-soluble substance will dissolve in the gum base and then be slowly and incompletely released, but a saliva-soluble chemical will virtually completely release within 10-15 minutes of chewing. The active ingredient is absorbed into the saliva, depending on its properties, and then swallowed, resulting in a subsequent systemic absorption, as mastication promotes saliva production.

To create a systemic pharmacologic impact, a drug may be supplied by a variety of methods. The oral route, in which the medication is ingested and then circulated throughout the body, is the most popular way to take medication. There are numerous dose formulations available for oral administration. Gum for chewing is the most common of these. It may be an effective way to deliver medications both locally and systemically **(Gajra B et al., 2016)**. Since ancient times, chewing gum has been used to freshen breath and clean the mouth. The buccal route has the advantage that systemic circulation can be directly reached by administration. This prevents local drug loss at the location and first pass hepatic metabolism **(Shah KR et al., 2014)**.

The medication in the gum product is released from the mass when chewing and enters the saliva. From there, it either enters the stomach for gastrointestinal absorption or is swallowed and absorbed through the oral mucosa. Once the medication has been released, most of the leftover material (gum cud) is spit out. Due to the fact that traditional chewing gum bases are not biodegradable nor digested, it is a social issue that contributes to unattractive litter when gum cud is disposed of. Because they are readily available, readily biodegradable, and biocompatible, natural gum bases are preferable to synthetic gum bases. **(Barcelona SA et al., 1994)**



Schematic flowchart of drug releases in medicated chewing gum

Because it provides a quicker beginning of action and a fantastic opportunity for the delivery of medications that are unstable in the body's metabolism, medicated chewing gum is advantageous to other traditional dosage forms. By giving the medication via the buccal route, issues such high first-pass metabolism and drug degradation in the gastrointestinal environment can be avoided **(Bandyopadhyay AK et al.,2006)**

Traveling can be uncomfortable due to the prevalence of motion sickness. Given how quickly nausea and stomach statis are brought on by motion sickness, administering medication orally is ineffective. The drug must have a quicker start of action for the patient, and its formulation must be simple to take anytime, anywhere, and without water. These demands are shown to be satisfied by medicated chewing gum. **(Graudins LV et al., 2009)**

fig: different types of medicated chewing gums

ADVANTAGES: **(Morjaria Y et al., 2014)**

1convenient, encouraging greater compliance

2. Disclosed stigmatisation

3. Anywhere can use administration without water.

4. Very good for use in acute medicine

5. Beneficial for those who have trouble swallowing tablets

6. Delightful flavour

7. Reverses dry mouth By promoting salivary secretion and preventing

8.Candidates and cavities

Herbal Gum: Natural gums are polysaccharides that can significantly increase a solution's viscosity even at low concentrations. The majority of them are botanical gums, which are present in woody plant parts or seed covers. In a variety of sectors, the natural plant-based gums are utilized as a binder, disintegration agent, emulsifier, suspending agent, thickening, gelling agent, and stabilizing agent. One example of a natural gum basis with good chewiness is gliadin, also known as a prolamin, which is a storage protein found in Triticum aestivum (wheat grain) (family Gramineae). Using 70% aqueous ethanol, gliadin is isolated from wheat flour grain **(Gregova E et al., 2009).**

Table: list of herbal gum used in medicated chewing gums **(Glicksman M 1969)**:

S.no	Type	Example	Source
1.	Plant seed gum	Guar gum	Cyamopsis tetragonolobus
2.	Microbial gum	xanthan gum	Xanthomonas comprstris
3.	Mucilage gum	Psyllium gum	Plantago ovata
4.	Seaweed gums	Alginates	Brown algae
5.	Exudate gum	Acacia gum	Acacia Senegal
6.	Plant seed gum	Prolamin	Wheat

1. Acacia Gum: Acacia Senegal produces the majority (80%) of the exudate gum known as gum Arabic, however, small amounts are also generated by other acacia tree species **(Kennedy JF et al., 2011)**. Among the exudate gums, Arabic gum is the earliest industrial gum. It has been used by humans for about 5000 years. Acacia trees are typically grown to stop soil erosion and to produce gum Arabic, which has a variety of uses. Due to their vast roots and ability to grow in dry environments, acacia trees can stop the invasion of the dessert. Acacia trees come in about 900 different species, and they can be found all over India, Australia, the United States, and sub-Saharan Africa. Sudan, Senegal, Nigeria, Mauritania, Mali, and Chad are major providers of gum arabic on the international market. Acacia Senegal, Acacia laetia, Acacia seyal, etc. are some of the more common acacia tree species.

fig: acacia gum

Applications: (Renard D et al., 2006):

1. Due to its qualities, including viscosity, stability, thickening, emulsification, nutrition, and surface features, gum Arabic can be used in a number of food applications.
2. Gum Arabic is widely used in the creation of encapsulated products, including flavors, oils, bioactive ingredients, etc. These encapsulated materials can also be utilized in dry mixes and have a longer shelf life.
3. Fruit powder made from fruit juices has also been produced using gum Arabic as a carrier agent in the drying of fruits. Fruit juices are tough to spray dry because they contain a lot of sugar.
4. Gum Arabic as a carrier agent reduces stickiness in the final fruit powder and aids in spray-drying fruit juice by raising the glass transition temperature**.**
5. Gum Arabic is also used in confectionery products to emulsify fat ingredients and prevent sucrose from crystallizing. Low-sugar sweets can also be made with it.
6. Due to its ability to bulk up dishes without adding calories, gum Arabic can also be utilized in the creation of dietetic foods.

Guar Gum: Guar gum aids in numerous processes and has a number of beneficial qualities. It has a high viscosity, is used as a surfactant and for fracturing fluid, and has the potential to reduce water and fluid loss. The following characteristics are listed; Cold water-soluble Exceptional thickening, emulsion, stabilizing, and film forming characteristics, Strong hydrogen bonding properties Stability to govern the water phase and control rheology.

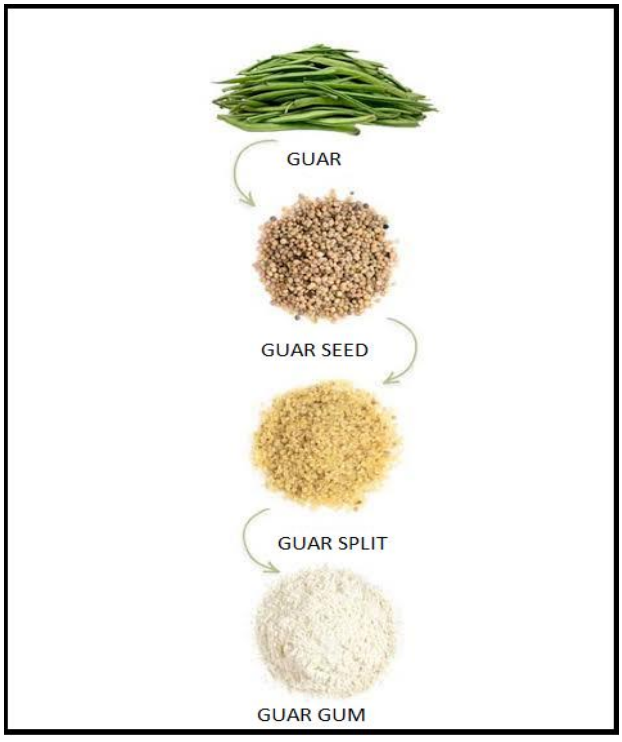


fig: guar gum

Applications:

1. Bonding agent
2. Hydrocolloid
3. Gelling agent
4. Natural Fiber
5. Natural thickener
6. Emulsifier
7. Stabilizer
8. Fracturing agent

Xanthan Gum: Xanthan gum, which has significant commercial value, is primarily employed as a thickening ingredient in a variety of foods and beverages. It is important to understand the signs of xanthan gum allergy and how to manage it because certain people may be allergic to the substance.

Because it possesses a natural thickening property that is frequently required for the binding of food ingredients, xanthan gum is utilized in some meals and beverages. This xanthan gum is utilized in a variety of products, including salads, meals, and personal care items. **(Kerkar Pramod et al., 2019)**. The source of this naturally occurring polysaccharide, Xanthomonas campestris, is where xanthan gum gets its name. In place of gluten, which is typically employed as a food additive, xanthan gum is used.

fig: xanthan gum

Applications:

1. It has a wide range of applications, from the food industry to oil drilling.
2. Xanthan gum is typically used in meals like salad dressings, sauces, gravies, dairy products, desserts, low-calorie foods, and convenience foods in general.
3. Xanthan gum is also utilized in agricultural flowable, coatings, polishes, and cleansers.
4. Xanthan gum is utilized in several foods and beverages because of its inherent ability to thicken.

Prolamin: To prevent discarding gum cud and to obtain faster action, Prolamin is a natural gum basis that was extracted from T. aestivum. **(Shete et al., 2015)**. The primary locations of prolamins on plant materials are the seeds of cereal grains like wheat (gliadin), barley (hordein), rye (secalin), corn (zein), sorghum (kafirin), and as a minor protein, avenin in oats.

Applications:

1. Used as a gum foundation in chewing gum with medications.
2. Plant storage proteins known as prolamins have a high proline amino acid concentration.

Composition of medicated chewing gum:

1. Elastomers: Elastomer delivers flexibility and maintains the gluey texture. Natural rubbers or gums like Chicle, Lechi Caspi, Jelutong, and Perillo may be used **(Asija et al., 2012)**. **(Vijay et al.,2016)** formulated an antihyperlipidemic chewing gum of Simvastatin by extracting Chicle from the Sapodilla tree. The gum base was converted into a directly compressible gum base powder in which Talc was added as filler. **(Shete et al., 2015)** formulated a medicated chewing gum to avert motion illness by extracting a natural gum base, Prolamin, from wheat. The chewing gum exhibited good elasticity and high water retention capability. The artificial gum base includes various polymers like polyvinyl acetate, polyvinyl–alcohol, polyisobutylene based on the molecular mass, and consistency looked-for. They decrease the affinity of the gum to stick to the teeth (detackifier). The gum base regulates the formulation's critical features such as elasticity, fragility, texture, smoothness, hardness, tackiness, and mouthfeel.

2.Plasticizer: Plasticizers are used to control the gumminess of the product and are classified into natural and artificial. It includes glycerol esters, hydrogenated rosins, terpene resins, α-pinene, dlimonene, etc. In work by **(Joshi Pandit et al., 2005)**, ester derivatives of rosin (hydrophobic gum base) were used as a base for the formulation of Diltiazem chewing gum to prevent angina. Softeners improve the chewability and mouth feel of the gum. They include Glycerin, Lecithin, Tallow, Hydrogenated Tallow, Mono/ di/ tri-Glycerides, Stearic acid, Palmitic acid, Oleic acid, Linoleic acid, etc.

3.Sweetners: Sweeteners provide the taste masking for the bitter actives present in the gum and can be used as softeners to mix the constituents and preserve moisture. These include dextrose, maltose, dextrin Sorbitol, Starch hydrolysates, xylitol, sucrose, fructose, galactose, corn syrup etc. Corn syrup provides the freshness & flexibility to the gum. High-potency synthetic sweeteners such as Sucralose, Aspartame-Acesulfame salt, Alitame, Saccharin, Glycyrrhizin, Dihydrochalcones, etc **(Sharma et al., 2013)**

4.Fillers/Texturizers: They control chewability and impart texture. Magnesium carbonate, alumina, aluminum silicate, calcium carbonate, limestone, magnesium, clay, talc, titanium oxide, Mono/ di/ tri calcium phosphate are some of the commonly used fillers **(Bumrela et al., 2005)**

5.Colorants and whiteners: They include various types of colorants, lakes, fruit-vegetable extracts, Titanium Dioxide, etc. The US FDA has permitted artificial colors for use in drugs, foods, and cosmetics, whereas, in the European Union, both artificial and natural colorants are acceptable in the food industry. **(Chaudhary and Shahiwala, 2010)**.

6.Flavoring agents: Various natural and artificial flavoring agents used to improve aroma include essential oils such as Spearmint oil, Mint oil, Clove oil, ginger oil, Citrus oil, fruit essences, and Peppermint oil, Oil of Wintergreen, etc. The Nicotine gum was formulated by **(Aslani Rafei et al., 2012)** using the gum bases, a sweetener like stevia, licorice, aspartame, a taste-masking component like zinc acetate, or sodium chloride, and a flavoring agent like cherry, peppermint, etc. All the preparations were examined for the impact of various flavors on masking Nicotine's unpleasant taste **(Bindi et al., 2011)**.

DRUGS REPORTED TO BE BEST SUITABLE IN CHEWING GUM FORMULATIONS:

Table: List of commercially available medicated chewing gums

S.no	Trade mark	Active ingredient	Indication
1.	Aspergum	Aspirin	Pain relief
2.	Orbit white	Tricalcium Phosphate	Dental hygine
3.	Happydent	Sodium chloride	Anticaries agent
4.	Travel gum	Dimenhydrinate	Motion sickness
5.	Super pep	Dimenhydrinate	Motion sickness
6.	Niorette	Nicotin	Smoking cessation
7.	Hex it	Chlorhexidne	Anti bacterial
8.	Caffeine	Caffeine	Cns stimulant
9.	Chooz	Calcium carbonate	Antacid

CONCLUSION: The review was focused on the Comparative study of various herbal gums in Medicated Chewing gum used in motion sickness. Gum chewing is a convenient and direct drug delivery method that can be used for self-medication without the need for water. The buccal route has the advantage of providing direct systemic circulation access to the administration. This prevents local drug loss at the location and first-pass hepatic metabolism. Medicated chewing gum mainly consists of Gum Base (various natural or eco-friendly gum like guar gum, gum acacia, xanthan gum etc), plasticizers, elastomers, flavoring agents, and sweetening agents. In this paper, we show the various benefits and applications of natural gum like Gum Base, carrier agents, natural fibers, coating agents, stabilizers, and many food industries

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