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STRESS EASE CHEWS: FORMULATION AND EVALUATION OF ANTI STRESS CHEWING GUMS

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ABSTRACT:

Chewing gum, often known as medicated chewing gum (MCG) or non MCG is a medicine delivery technique that is expected to develop further in current research and appear to become more standardized in the future industry. It can deliver nutrients or pharmaceuticals. MCG is intended to function as an extended release dose form that releases the medication continuously. Chewing gum-like materials, also known as masticatory resins, date back 5000 years, but the ancient Greeks used to obtain a chewable resin from a tree called mastic. In Finland and Sweden, resin fragments have even been discovered with tooth traces. Regular gum chewers report lower levels of stress and chewing gum has been shown to lower anxiety and stress brought on by an acute social stressor, but other studies have not found a decrease in either. Chewing gum may lessen symptoms of depression, a stress-related illness, if it can lower stress levels. Remarkably, gum was more effective in reducing depression than antidepressant medication alone in a clinical sample of patients with mild-to-moderate depression. Chewing gum for two weeks has been shown in a nonclinical population to lower stress, anxiety, and depression among university employees and students.

Keywords: Chewing gum, Medicated Chewing gums, Gum Base, Drug Delivery System.

Introduction:

Chewing gum, often known as medicated chewing gum (MCG) or non MCG is a medicine delivery technique that is expected to develop further in current research and appear to become more standardized in the future industry. It can deliver nutrients or pharmaceuticals. MCG is intended to function as an extended release dosage form; delivering a steady release of the medication it contains [1]. Chewing gums were first marketed in 1848 after the Sapodilla tree's fruit was harvested. After boiling spruce tree sap and adding sugar, flavour, and fillers, John Curtis and his son rolled the mixture to create masticatory sticks, which they then wrapped in paper and marketed. As their business grew, the son realized they needed to upgrade both the business and the machinery, so he created a device that could generate gums in large quantities. Doctor William F. Semple of Ohio granted the first chewing gum patent in 1869[2, 3]. Chewing gum and stress reduction is one topic that has drawn a lot of interest. Stress is a significant problem for the general public as well as for particular clinical groups. It is a growing issue in a variety of particular contexts, including the workplace and educational institutions [4, 5]. Regular gum chewers report lower levels of stress and chewing gum has been shown to lower anxiety and stress brought on by an acute social stressor, but other studies have not found a decrease in [6, 7, and 8]. Chewing gum may lessen symptoms of depression, a stress-related illness, if it can lower stress levels. Remarkably, gum used with antidepressant medication lowered depression more than medication alone in a clinical sample of patients with mild to moderate depression [9, 10, 11, and 12]. Chewing gum for two weeks has been shown in a nonclinical population to lower stress, anxiety, and depression levels in university employees and students [13, 14]. In conclusion, it seems that the data supporting gum's ability to reduce chronic stress is stronger than that supporting its ability to reduce acute stress [15]. It is yet unknown whether a one-day intervention will lessen stress, anxiety, and depressive symptoms in a sample of working individuals given this disparity between short- and long-term effects. Medicated chewing gum is a solid, single-dose product that needs to be chewed rather than eaten; it includes one or more active chemicals that are released during chewing [16]. Chewing gum has been used all across the world since ancient times, when people realized how much fun it was to chew a variety of materials [17]. A thousand years ago, the Mayan Indians chewed tree resin from the sapodilla tree to clean their teeth and freshen their breath. The development of the synthetic gum bases that are still in use today was facilitated by the scarcity of natural gum bases during World War II. Herbal chewing gum is a special kind of medicine delivery that can be applied topically to treat oral conditions or absorbed systemically through the oral mucosa. It has an active pharmacological component in its gum basis. Herbal chewing gum is believed to be a means of providing active compounds that improve nutrition and general health, or a method for administering medications [18].Chewing gum is a fun activity. Chewing gum is a portable way to administer medication. A chewing gum's gum core usually has one coating or none at all. Chewing gum requires no preservatives and has comparatively low water content.

Health Benefits of Chewing Gum:

1. Gum improves memory.
2. Chewing gum reduces the symptoms of stress.

3. Gum helps people control their weight.
4. The gum aids with digestion.
5. Chewing gum is good for your teeth.
6. Chewing gum promotes improved oral hygiene and helps prevent foul breath.
7. Gum aids with quitting smoking.
8. Deal with halitosis [19].

Types of Chewing Gums:

Among the most often eaten flavours are mint, peppermint, spearmint, wintergreen, cinnamon, licorice, sour apple, cherry, grape, orange, watermelon, strawberry, lemon, and blueberry. Chewing gum comes in a variety of shapes, sizes, and tastes. Although gum can take many different shapes, it usually takes the shape of a little stick or wad. Chewing gum is essentially made by combining a water-insoluble phase with a water-soluble phase of food colouring, sweeteners, and tastes. There are several types of chewing gum designed for dental hygiene. Gums are used to freshen breath, clean teeth, and whiten teeth [20].

1. **Medicated gum[21]:**

2. **Bubble gum[22]:**

3. **Tube gum [23]:**

4. Ball gum [24]:

3. **Tab gum:**

4. **Nicotine gum[25]:**

5. **Wrap gum:**

6. **Sugar free gum[26]:**

Epidemiological surveys of stress at work and in education:

Stress has a significant financial and personal cost; according to data from the UK's HSE website, 400,000 of the 1,152,000 work-related sickness cases that occurred there in 2010–2011 were stress-related. In a similar vein, 85% of college students surveyed by Princeton Review and Wrigley [27]. Reported feeling anxious and stressed before exams. Given that chronic stress has been linked to bruxism and that abbreviated progressive relaxation training, which involves tensing and relaxing different body parts (much like chewing), has been shown to reduce stress , it would appear that clenching the jaw muscles is a normal response to stressors that may lessen the severity of experienced stress[28,29].

Composition:

Chewing gum is made out of a blend of natural and synthetic materials, including water-soluble bulk material and water-insoluble gum bases. These two sections are in charge of transporting various ingredients [30, 31].

The non-nutritive portion of gum that does not dissolve when chewed is called gum base. Modern gum bases employ either very little or no natural rubber; 15–30% of chewing gum is gum base. Gum bases are a mixture of natural gums, latex, plastics, solid paraffin, and beeswax [32].

Elastomers are polymers that are flexible against breaking or cracking due to their strong elasticity and elongation capabilities. Chewing gum formulas use a variety of materials, including natural and synthetic elastomers. The kinds and quantities of elastomers determine how well the formulation process works [33].

Emulsifiers can increase softness and the production of bubble gum by allowing two insoluble phases to disperse within one another. It helps with the hydration impact while chewing as well as blending and softness throughout shelf life [34, 35].

Chewing gum composition can be softened and made more consumer-friendly by adding plasticizer. By adding fluidity, decreasing brittleness, and softening the elastomers, it enhances gum texture [36].

Chewing gum composition can be softened and made more consumer-friendly by adding plasticizer. By adding plasticity, decreasing brittleness, and making the elastomers softer, it enhances gum texture [37, 38, and 39].

6 Problems Associated With Manufacturing Chewing Gums:

1. the most frequent processing issues are sticking, picking, laminating, and capping [40]
2. One issue with the first approach is that an excessive amount of moisture in the matrix may result in a low viscosity, which lowers the compressive and shear forces; in fact, more gum base particles are more likely to separate and float [41].
3. It may be challenging to regulate the drug's precision and consistency when it is heated or melted [41].

4. It is challenging to create hygienic conditions for MCG production [41].

5. In the second approach, the gum's moisture content could clog the punches and blades of the equipment, screens, surfaces, and wall of the chamber [40].

6. The second technique stops gum pieces from forming by caking and balling the gum [41].
7. The third way makes it difficult to discharge the finished compressed mass from the mixer; it may stick to punches and get jammed up in the tubes [42].

8. The process of creating a low-calorie chewing gum has produced a chewy, unsatisfactory texture, and an off-taste [43].

9. The compound's constituents have an unpleasant taste and a bad door.

10. Sugar lumps or patches could show up in the finished texture and give off an unpleasant vibe.

11. The mucosa may get irritated by some active substances and agents.

12. Using a high temperature to help mix the gum base can cause other ingredients to go bad [43].

13. To prevent gum hardness, water must be removed from the finished formulation using sophisticated procedures.

Evaluation Test:

Content Uniformity:

Ten MCGs are chosen at random, and their contents are measured. If each preparation's content falls between 85% and 115% of the average content, it will pass the test; if it falls outside of this range, it will fail.

Mass Uniformity:

Twenty MCGs are chosen at random and weighed; the average mass should not differ by more than two single masses.

Dissolution Test:

The purpose of mastication devices is to mimic how people chew. The following test is required in order to simulate a drug release in these apparatus or devices.
A portion of MCG is put in the chamber of a device that has the following components in order to measure the rate at which the active elements in MCG dissolve:

1. a chamber for chewing.

2. Horizontal pistons with sealed rings and

3. A vertical piston, Horizontal pistons chew MCG, while vertical pistons restore it [44].

The pace of the apparatus and the pistons' movements should be regulated during each chewing cycle to avoid interfering with one another's function. In reality, the teeth and tongue are replaced by horizontal and vertical pistons, respectively.

Two pistons, a reservoir, a thermostat, and a control of the chewing chamber's rate make up one of the earliest chewing machines built by Christrup and MØller. A new chewing machine was created. The ribs swirl the dissolving media. The machine has a 20 rpm rotating speed and a 30-cycle-per-minute cycle frequency [45].

Wintergreen (Kvist et al.) took into account the impact of occlusal surfaces, rotational and shearing motions, and medium temperature on drug release in another device they built [46].

A specific volume of dissolution medium is poured into the mastication chamber of the first device that EP used. Phosphate buffer raises the medium's acidity to pH 6.0, and the temperature should be 37°C ± 0.5°C. The piston speed is 60 rpm.

A portion of MCG or the entire gum is put into the chamber, the technology is adjusted, and the process is initiated. A typical individual chews 60 times per minute. A sample of the dissolution medium is made after the machine stops at a predetermined time, the remaining gum is removed, and the content of the active agent or agents is ascertained using an appropriate method. Following each sampling, the dissolution medium may have been swapped out for a brand-new medium so that the dilution factor can be computed. It was also possible to ascertain the amount of active agent or agents present in the gum residue. Three MCGs are subjected to this test three times.

Factors affecting release rate and amount:

The amount of active components and their unique chewing properties, in addition to formulation parameters, affect the drug's release from MCG both in vivo and in vitro.

1. Water solubility: Drug release occurs at the end when the active ingredient is water soluble, as opposed to other active ingredients with only weak water solubility. Lipid-soluble drugs experience more release issues than others because they are bonded to gum bases and lipophilic substances and release gradually into the oral cavity.

2. Formulation factor: The drug's release is impacted when active components are combined with hydrophilic or hydrophobic molecules. Formulations with slower release profiles frequently exhibit more complete drug release, while faster release does not always equate to more complete drug release.

3. **Physicochemical properties**: Highly lipid-soluble compounds are released into the gum base first, followed by saliva. Compounds that are more soluble in saliva will be released right away within a few minutes of chewing. When it comes to drug release and absorption through the mucosa, the stability of gum base and its constituents against salivary enzymes, molecular mass, and ionization are crucial.

4. **Personal traits**: The release of active substances is influenced by the speed, intensity, frequency, and kind of chewing features of each individual; EP suggests 60 chews per minute for the proper release of active components. However, the duration of MCG retention in the mouth also affects how many chews are necessary; in clinical trials, this duration is typically around 30 minutes. These variations result in different medication release outcomes [47, 48].

Stability:

Compared to other oral components, chewing gum has lower moisture content and is less reactive, making it a very stable product [49].

The shelf life, storage conditions, and impact of certain additives that impress stability present a significant difficulty in the manufacturing of chewing gum. Even though a small amount of water in chewing gum is found to be an annihilator and hazardous for other ingredients, no water can be used in the manufacturing process because it can cause the growth of microorganisms and chemical degradation. However, water can also be bound to other compounds, making it not readily available to active agents.

Antioxidants are required to prevent the medicine from oxidizing, but preservatives are not necessary because of the low water content [50].

Gum base and xylitol are essential bulking agents for maintaining water content without noticeably changing at low or high atmospheric moisture concentrations. These chewing gums can be manufactured with additional desirable chemicals and active agents, and they remain stable in harsh environments. When it comes to these gums' moisture stability, no stiffening, compacting, or softening is seen.

Additionally, xylitol would improve the gum's storage stability, which implies that under both high and low humidity levels, the gum's water content stays at a desirable level and its softness, flexibility, elasticity, and splitting do not significantly alter. These alterations are caused by xylitol's impact on the crystalline structure and its capacity to bind water.

Since chewing gum shields the active ingredient from light, moisture, and oxygen, its stability is generally good. By increasing other powers, it is possible to avoid using high temperatures to facilitate mixing for some heat-sensitive components.

Certain chemicals can be coated or encapsulated with appropriate materials to reduce the amount of contact between compounds and avoid undesirable reactions between them. [51].

REFERENCES:

1. Directorate for the Quality of Medicine and Health Care of the Council of Europe. European Pharmacopoeia. 7th ed. Strasbourg: Directorate for the Quality of Medicine and Health Care of the Council of Europe; 2009. p. 289, 709.
2. Rathbone MJ, Hadgraft J, Roberts MS. Modified-Release Drug Delivery Technology, New York: CRC Press; 2002.
3. Jacobsen J, Christrup LL, Jensen NH. Medicated chewing gum. Is J Drug Del 2004; 2:75-88?
4. Allen AP, Smith A. A review of the evidence that chewing gum affects stress, alertness and cognition. J Behave Health Serv Res. 2011; 9: 7-23.
5. Allen AP, Smith A. Chewing gum: cognitive performance, mood, well-being and associated physiology. Biomed Res Int. 2015; 2015: 654806.
6. A. P. Smith, "Chewing gum, stress and health," Stress and Health, vol. 25, no. 5, pp. 445–451, 2009.
7. A. Smith, "Effects of chewing gum on stress and health: a replication and investigation of dose-response," Stress and Health, vol. 29, no. 2, pp. 172–174, 2013.
8. K. Sketchley-Kaye, R. Jenks, C. Miles, and A. J. Johnson, "Chewing gum modifies state anxiety and alertness under conditions of social stress," Nutritional Neuroscience, vol. 14, no. 6, pp. 237–242, 2011.
9. G. Gray, C. Miles, N. Wilson, R. Jenks, M. Cox, and A. J. Johnson, "The contrasting physiological and subjective effects of chewing gum on social stress," Appetite, vol. 58, no. 2, pp. 554–558, 2012.
10. A. J. Johnson, R. Jenks, C. Miles, M. Albert, and M. Cox, "Chewing gum moderates multi-task induced shifts in stress, mood, and alertness. A re-examination," Appetite, vol. 56, no. 2, pp. 408–411, 2011.
11. L. K. Torney, A. J. Johnson, and C. Miles, "Chewing gum and impasse-induced self-reported stress," Appetite, vol. 53, no. 3, pp. 414–417, 2009.
12. F. M. Erbay, N. Aydin, and T. Sati-Kirkan, "Chewing gum may be an effective complementary therapy in patients with mild to moderate depression," Appetite, vol. 65, pp. 31–34, 2013.
13. A. P. Smith, K. Chaplin, and E. Wadsworth, "Chewing gum, occupational stress, work performance and wellbeing. An intervention study," Appetite, vol. 58, no. 3, pp. 1083–1086, 2012.
14. A. P. Smith and M.Woods, "Effects of chewing gum on the stress and work of university students," Appetite, vol. 58, no. 3, pp. 1037–1040, 2012.
15. A. P. Allen and A. Smith, "A review of the evidence that chewing gum affects stress, alertness and cognition," Journal of Behavioral and Neuroscience Research, vol. 9, no. 1, pp. 7–23, 2011.
16. Anand SS (2010) Chewing Gum: A Friendly Oral Mucosal Drug Delivery System. International Journal of Pharmaceutical Sciences Review and Research 4(2): 12.
17. Medicated Chewing Gum – A Novel Approach to improve Patient Compliance International. Journal of Research in Pharmaceutical and Biomedical Science.
18. Chanale AM, Mishra RP (2016) formulation and evaluation of herbal Antibacterial chewing gum containing Neem extract 5(1): 8-13.
19. Pagare PK, Satpute CS, Jadhav VM, Kadam V (2012) Medicated chewing gum: A novel drug delivery system. Journal of applied pharmaceutical science 2(7): 40-54.
20. Bumrela SB, Kane RN, Dhat SP (2005) Medicated chewing gum: A new reformulation technique. Pharma news 3: 1-7.
21. https://www.nicorette.com.sg/products/gums.
22. https://blinkit.com/prn/wrigleys-hubba-bubba-fruit-flavour-chewing-gum/prid/492502.
23. https://www.amazon.in/Lutti-Tubble-Frutti-Flavor-Bubble/dp/B0D8G34XC1.
24. https://www.flipkart.com/center-fruit-tennis-ball-shape-pineapple-chewing-gum/p/itm810c9e21fde52.
25. https://www.truemeds.in/otc/nicotex-paan-2-mg-sugar-free-chewing-gum-12-tm-gues1-000040.
26. https://www.jiomart.com/p/groceries/happydent-wave-sugarfree-chewing-gum-17-g/590067164.
27. Princeton Review, Wrigley. Study habits survey. 2005. New York: Princeton Review.
28. Pawlow, LA, Jones GE. The impact of abbreviated progressive muscle relaxation on salivary cortisol. Biol Psychol. 2002; 60: 1-16.
29. Ahlberg J, Rantala M, Savolainen A, Suvinen T, Nissinen M, Sarna S, Lindholm H, Könönen M. Reported bruxism and stress experience. Community Dent Oral Epidemiol 2002; 30: 405- 408.
30. Khatun S, Sutradhar KB. Medicated chewing gum: An unconventional drug delivery system. Int Curr Pharm J 2012;1:86-91.
31. Bumrela SB, Kane RN, Dhat SP. Medicated chewing gum: A new reformulation technique. Pharma news 2005;3:1.
32. Available from: http://www.madehow.com/Volume-1/ChewingGum.html [Last accessed on 2013 July 15].
33. Asija R, Patel S, Asija S. Oral dosages forms: Medicine cntaining chewing gum: A review. J Drug Delivery Ther 2012;2:90-5.
34. Available from : http://www.alsiano.com/Food/container/ container/Food/Confectionery/Chewing-gum.aspx [Last accessed on 2013 Aug 24].
35. Patel MM, Reed MA, Yatka RJ. Environmentally Stable Chewing Gum Composition Containing Xylitol. US Patent No. 4,931,294; 1990.
36. Nagasamy VD, Toprani PS, Mukherejee S, Tulasi K. Medicated chewing gums - A review. Int J Pharm Sci 2014;4:581-6.
37. Gadhavi AG, Patel BN, Patel DM, Patel CN. Medicated chewing gum-A 21st century drug delivery system. Int J Pharm Sci Res Aslani, et al.: Medicated chewing gum, a review 411 Journal of Research in Medical Sciences | April 2015 | 2011;2:1961-74.
38. Sameja K, Raval V, Asodiya H, Patadiya D. Chewing gum: A modern approach to oral mucosal drug delivery. Int J Pharm Res Dev 2011;4:001-16.
39. Cosgrove T, Erol AH, Voss MG. Chewing Gum Composition. US Patent Application No. 12/449,622; 2008.
40. Athanikar NK, Gubler SA. Process for Manufacturing a Pharmaceutical Chewing Gum. US Patent No. 6,322,828; 2001.

41. Cherukuri SR, Bikkina K. Tabletted Chewing Gum Composition and Method of Preparation. US Patent No. 4753805; 1988.
42. Chaudhary SA, Shahiwala AF. Directly compressible medicated chewing gum formulation for quick relief from common cold. Int J Pharm Investig 2012;2:123.
43. Bindi GC, Vipul PP, Tushar RD. Medicated Chewing Gum: A Review, Pharmatotur-Art-1047, 2011;1-5.
44. Caudhary SA, Shahiwala AF. Medicated chewing gum-A potential drug delivery system. Expert Opin Drug Deliv 2010;7:871-85.
45. Christrup LL, MØller N. Chewing gum as a drug delivery system. Arch Chem Sci 1986;14:30-6.
46. Kvist C, Andersson SB, Fors S, Wennergren B, Berglund J. Apparatus for studying in vitro drug release from medicated chewing gums. Int J Pharm 1999;189:57-65.
47. Sameja K, Raval V, Asodiya H, Patadiya D. Chewing gum: A modern approach to oral mucosal drug delivery. Int J Pharm Res Dev 2011;4:001-16.
48. Ughade MA, Wasankar SR, Deshmukh AD, Burghate RM, Makeshwar KB. Medicated Chewing Gum: Modern Approach to Mucosal Drug Delivery. Asian J Res Pharm Sci 2012;2:150-9.
49. Available from: http://www.gumassociation.org. [Last accessed on 2013 July 15].
50. Rathbone MJ, Hadgraft J, Roberts MS. Modified-Release Drug Delivery Technology, New York: CRC Press; 2002.
51. Mehta F, Trivedi P. Formulation and texture characterization of medicated chewing gum delivery of dimenhydrinate hydrochloride. Pharmacia Lett 2011;2:129-40.