Larix Publications

Journal of Pharma Research

https://jprinfo.com/

Vol. 9, Issue 10, 2020 ISSN: 2319-5622

USA CODEN: JPROK3

Original Article

A Comprehensive Review On Medicated Chewing Gums- A Novel Drug Delivery System

Kapil Kumar*, Adesh Sharma, Deepak Teotia, Gurleen Kaur

Global Institute of Pharmaceutical Education and Research, Kashipur-244713, Uttarakhand, India

Received on: 10-10-2020; Revised and Accepted on: 27-10-2020

ABSTRACT

M*edicated chewing gums are the up-to-the-minute novel drug delivery system gaining much acceptance as an oral drug delivery system. The medicated chewing gums are basically single solid dosage forms consisting of gums and having one or more active ingredients that are intended to be chewed not swallowed. Basically used as a local treatment for mouth diseases and systemic absorption by oral mucosa. It is a patient acceptable drug delivery system. The objective of this study is to assess the possible therapeutic effect of medicated chewing gum for patients featuring advantages and disadvantages, compositions, method of preparation and further evaluation parameters. It represents the most recent system with budding uses in pharmaceuticals.*

Keywords: *medicated chewing gum, novel drug delivery system, gum bases*

INTRODUCTION:

Medicated chewing gum is a novel drug delivery system containing one or more active ingredients that has to be chewed not swallowed. The drug is released by chewing the chewing gum for certain time period and the remaining mass is discarded. During the process active ingredients is released from the gum base into the saliva possibly absorbed through the oral mucosa or swallowed for gastro-intestinal absorption.[1]

Greek word "mastic" means to chew. Mastic is a resin taken from a bark of a mastic tree found mainly in Turkey and Greece.[2]

Due to acceptance of oral drug delivery systems among patients, medicated chewing gums became compliance to patients for the ease of convenient administration. The release rate of the active ingredient from medicated chewing gum is determined by physiochemical properties of the drug and by the patient chewing performance means different chewing time, frequency and intensity as patient with oral-mucosal diseases may alter the chewing performance.[3]

***Corresponding author**:

Kapil Kumar, Global Institute of Pharmaceutical Education and Research, Kashipur-244713, Uttarakhand, India

DOI: doi.org/10.46978/jpr.20.9.10.1

The ability of a medicated chewing gum is to release active ingredient into oral cavity having steady and rapid action potential of both systemic and local delivery system. Appropriate for extensive use in food and pharmaceutical industries[4, 5].

Advantages of medicated chewing gums[6-9]:

1. Rapid onset of action due to chewing effect.
2. Having high bioavailability as it directly absorbed from the oral mucosa and less degradation of drug from gastric pH
3. Ease of administration.
4. Administered without water increases higher patient compliance.
5. Having both systemic and local effect.
6. Highly acceptable by children and for patients who find difficulty in swallowing.
7. Having pleasant taste.
8. Avoid hepatic circulation.

Disadvantages of medicated chewing gums[10-13]:

1. Influence the pattern and release of chewing on drug release.
2. Adhere to enamel denatures and fillers
3. By salivary dilution the drug from oral cavity is disappeared.
4. Allergic reaction by artificial sweeteners.
5. Decaying of tooth by sugar coated gum
6. Presence of sorbitol in some formulation may cause flatulence and diarrhea.

Material of chewing gum

Chewing gum is a mixture of either natural or synthetic ingredients that mainly consist of water-soluble bulk portion and water in-soluble gum bases. These two portions are responsible to carry different ingredients[14]. In medicated chewing gum active pharmaceutical drug is added.

Gum base is the non-nutritive part of gum which doesn't dissolve while chewing the gum. 15 to 30% of medicated chewing gum is gum base it is a mixture of natural gums, latex, plastics, solid paraffin, and bees-wax but in present gum bases no use of natural rubber or only a minimal amount .[15]

Elastomer they are the polymer with elasticity make flexible against its breaking or cracking. These are of two types natural and synthetic Elastomer materials applied in chewing gum formulations.[16]

Emulsifier it allows two immiscible phases to disperse and improve softness and ability to make bubble gum requires chewing consistency and mouth feel. It contributes to up-taking of saliva and softness during shelf life and hydration effect while chewing.[17]

Plasticizer is a material which provides cohesiveness of product to make chewing gum composition soften. It promotes plasticity and reducing the bitterness.

Texturizer promotes smooth texture and facilitates blending and other processing stages. Like chewing ability and stretch.[18]

Sweeteners it provide sweetness to formulation and progress the taste. Aqueous sweeteners include corn syrup, hydrogenated starch, and sorbitol helps to hold on to moisture and freshness of the final product..

Flavoring agents it provide an adequate flavor to the product and act as taste-masking agents for bitter drugs to cover the taste of active ingredient[19].

Colorants it develop the color of the formulation by producing temperate and soft color.

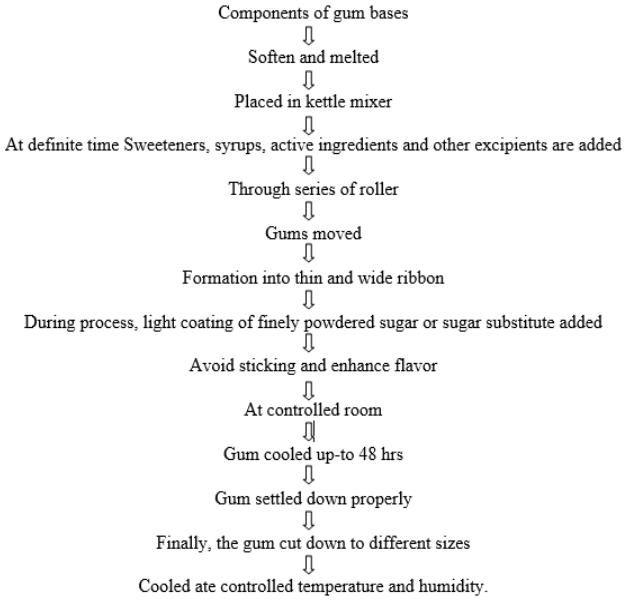
Anti-oxidants it prevent the growth of microorganisms by inhibiting oxidation.

Method of preparation:

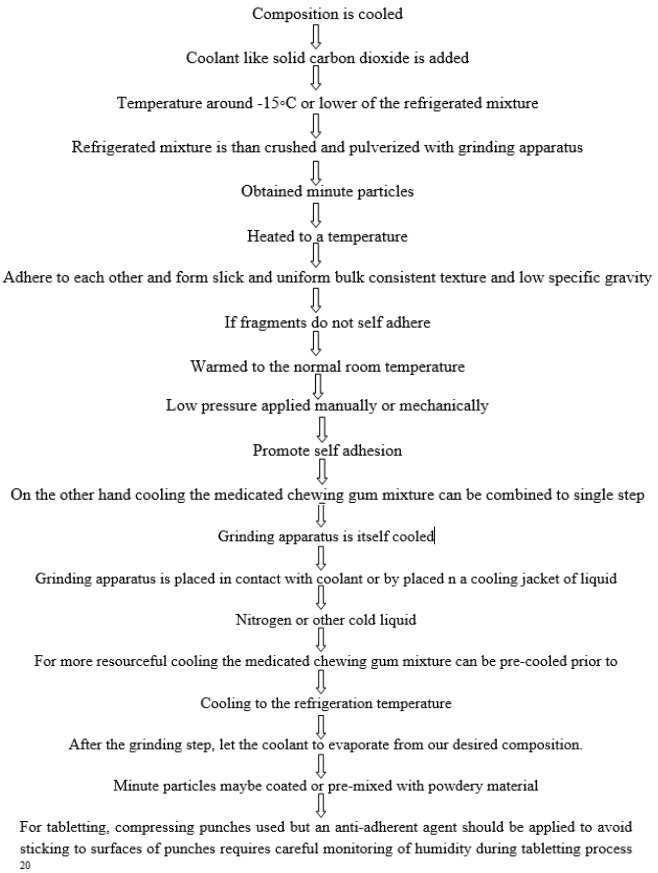
Different method are used for the manufacturing of medicated chewing gum further classified into three parts:

1. Conventional method
2. Direct compression method
3. Cooling, grinding and tabletting method

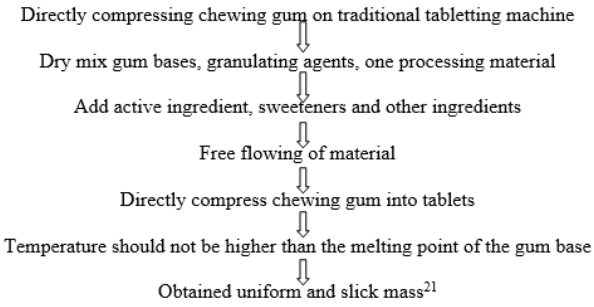
1. Conventional method



1. Cooling, grinding and tabletting method



2. Direct compression



Factors affecting release of active ingredients:

Solubility: Release of active ingredients from medicated chewing gum, saliva soluble active ingredient will release within few minutes but lipid soluble releases first into the gum base and then further released slowly

Formulation factor: Addition of active ingredients with hydrophilic compounds or hydrophobic compounds affects rate of release of active ingredient. Release rate is decreased by increased lipophilic fraction of gum[18].

Individual characteristics: Chewing characteristics of chewing gum varies from person to person according to frequency and intensity of chewing which further affects the release of drug accordingly 60 chews per minute is appropriate for drug release.[23]

Contact time: Systemic and local effect is basically depend upon the contact of time of medicated chewing with oral cavity. According to clinical trials, 30 minutes are considered chewing time.[24]

Evaluation Parameters:

Organoleptic properties: Color, taste, surface texture is measured and recorded.

Content uniformity: Randomly selected ten medicated chewing gums measured the content. Content should be between 85% and 115%.

Mass uniformity: Randomly selected twenty medicated chewing gums weight is measured , two sole mass should not vary the average mass

Hardness and plasticity: for the determination of hardness the Monsanto hardness tester is used

Stickiness: For ten minutes medicated chewing gum placed on a plane surface and 250gm cylindrical collide hammer on to it. After ten minutes mass sticked to hammered surface was observed and reported.[25]

Dissolution test: Designed mastication device to simulate chewing pattern of human. Following tests are précised to mimic release of drug in these device.

a. Chewing chamber
b. Vertical Piston
c. Horizontal piston with sealed rings

The medicated chewing gum is placed between the pistons resting on to the lower chewing surface. It consists of up-down stroke of lower masticating surface which is combined with twisting movement of upper masticating surface. Accordingly, masticating the chewing gum and agitating the medium. The chewing frequency is employed in the study with 60±2 strokes per minute. At different intervals aliquot is prepared of the artificial saliva and then the dissolution factor is calculated and further assayed for the drug content by using UV spectrophotometric.[19]

Tensile strength: The tensile test is used for the determination of force elongation properties stress and strain are obtained as given below:

Stress = σ = P/Ao (Load/Initial cross-sectional area).

Strain = e = Δl/lo (Elongation/Initial gage length).

It obeys Hook's law where the ratio of stress to strain is constant and linear relationship is observed. The main parameter obtained from the tests and the from the stress-strain curve are tensile strength, yield strength and fracture strength expressed by percent elongation and reduction in area The highest stress the sample sustain during the test and before failure is typically recorded as eventual tensile stress. After yield strength, go through the plastic region where the chewing gum will not revert to its first shape by removing the load[19].

Stability: Store 10 gm of synthetic gum base in bottle at 30°C ± 2°C/65% RH ± 5% RH (According to WHO guideline for stability) for a period of six months. After six months, examine the gum for signs of ageing and physical deformalities.[26]

CONCLUSION:

Medicated chewing gum as mobile drug delivery system they contain one or more active ingredients which is released during chewing mainly intended for the local treatment or systemic delivery after absorption through the buccal mucosa as well as increases the bioavailability of drug. It is alternative to solid and liquid dosage form. As oral route is the most preferred route for ease administration and patient compliance.

REFERENCES:

1. Rathbone MJ, Hadgraft J, Roberts MS. New York: CRC Press; 2002. Modified-Release Drug Delivery Technology.

2. Bindi G. Chavda[1] ,Vipul P. Patel[2], Tushar R. Desai[3]Jacobsen J, Christrup LL, Jensen NH. Medicated chewing gum. Am J Drug Del. 2004;2:75–88.

3. UPENDRA NAGAICH*, VANDANA CHAUDHARY[1], ROOPA KARKI[2], AKASH YADAV[3] , Formulation of Medicated Chewing Gum of Ondansetron Hydrochloride and its Pharmacokinetic Evaluations , Vol. 1, Issue 2 ISSN: 0975- 8232 IJPSR (2010)

4. Chidi E, Nwobodo NN, Offiah RO. Development and evaluation of fast dissolving thin films of aripiprazole. Universal Journal of Pharmaceutical Research 2017; 2(5): 19-23.

5. Madan N, Rathnam A. Chewing gums for optimal health. Chron Young Sci. 2011;2:7.

6. Surana AS. Chewing gum: A friendly oral mucosal drug delivery system. Int J Pharm Sci Rev Res. 2010;4:68–71.

7. Akhtar MS. Formulation and evaluation of fast dissolving tablets of antiepileptic drug. Universal Journal of Pharmaceutical Research 2019; 4(6):20-24.

8. Mehta F, Trivedi P. Formulation and texture characterization of medicated chewing gum delivery of dimenhydrinate hydrochloride. Pharmacia Lett. 2011;2:129–40.

9. Mehta F, Kartikayen C, Trivedi P. Formulation and characterization of medicated chewing gum delivery of diphenhydramine hydrochloride. Pharmacia Sin. 2011;2:182–93.

10. Igwe J. Chibueze, Emenike IV, Oduola AR. Formulation and evaluation of Finasteride sustained-release matrix tablets using different rate controlling polymers. Universal Journal of Pharmaceutical Research 2016; 1(2): 15-18.

11. Gurleen Kaur, Vaishali Chauhan, Kapil Kumar, Deepak Teotia. Development and evaluation of mesalamine gastro resistant tablets. Journal of advanced scientific research, 2019; 10(4):106-16.

12. Singh S, Virmani T, Virmani R, Kumar P, Mahlawat G. Fast dissolving drug delivery systems: formulation, preparation techniques and evaluation. Universal Journal of Pharmaceutical Research 2018; 3(4): 56-64.

13. Agarwal P, Semimul A. A comprehensive review on sustained release matrix tablets: a promising dosage form. Universal Journal of Pharmaceutical Research 2018; 3(6): 49-54.

14. Aslani A, Ghannadi A, Rostami F. Design, formulation and evaluation of Ginger chewing gum. Adv Biomed Res. 2015;4 Under publication.

15. Beskan U, Algin Yapar E. Usage of 3D printer technology in medical and pharmaceutical fields: a review. Universal Journal of Pharmaceutical Research 2019; 4(3): 37-40.

16. Aslani A, Rafiei S. Design, formulation and evaluation of nicotine chewing gum. Adv Biomed Res. 2012;1:57.

17. Ahmed EM, Ibrahim ME, Magbool FF. *In vitro-in vivo* bio-equivalence correlation study of atenolol, and its brands of immediate release tablet under bio-waiver conditions. Universal Journal of Pharmaceutical Research 2019; 4(6):25-29.

18. Uhari M, Kontiokari T, Koskela M, Niemelä M. Xylitol chewing gum in prevention of acute otitis media: Double blind randomised trial. BMJ. 1996;313:1180–4.

19. Verma BK, Pandey S, Arya P. Tablet granulation: current scenario and recent advances. Universal Journal of Pharmaceutical Research 2017; 2(5): 30-35.

20. Pandey S, Goyani M, Devmurari V. Development, in-vitro evaluation and physical characterization of medicated chewing gum: Chlorhexidine gluconate. Pharm Lett. 2009;1:286–92.

21. Priyanka, Kumar K, Teotia D, A comprehensive review on pharmaceutical mini tablets, Journal of Drug Delivery and Therapeutics. 2018; 8(6):382-390.

22. Mochizuki K, Yokomichi F. Process for preparation of chewing gum. US Patent 1976; 000321.

23. Hughes, Lyn, Buccal, Dissolution of active substances 2003; US 2003; 0087457.

24. Aslani A, Ghannadi A, Mortazavi S, Torabi M. Design, formulation and evaluation of medicinal chewing gum by the extract of Salvadora persica L. Life Sci J. 2013;10:47–55.

25. Rindum JL, Holmstrup P, Pedersen M, Rassing MR, Stoltze K. Miconazole chewing gum for treatment of chronic oral candidosis. Eur J Oral Sci. 1993;101:386–90.

Article Citation:

Authors Name. Kapil Kumar. A comprehensive review on medicated chewing gums- a novel drug delivery system. JPR 2020;9(10): 117-121
DOI: doi.org/10.46978/jpr.20.9.10.1