

A Boon in Drug Delivery System: Medicated Chewing Gums

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ABSTRACT

Background: A decisive factor which governs the accomplishment of any drug in today's modern scenario is the method of its delivery. Oral route of drug consumption offers easy administration along with patient compliance. One such advancement in the field of oral drug delivery systems includes medicated chewing gums that provide additional advantages of being attractive, rapid, easy, feasible and a non invasive method of drug delivery. Being useful for both local and systemic treatment protocols, this recent method is a blessing to the field of medicine which corresponds with the quality standards of the traditional oral medication methods and now slowly gaining recognition amongst the clinicians.

Keywords: Medicated chewing gums, chewing gums, drug delivery.

INTRODUCTION

Using chewing gums as medicinal agents is a recently developed and innovative field for the purpose of drug distribution. These are highly effective in treating disorders of oral cavity by acting locally and can also be used for the purpose of intrinsic absorption via oral mucous membrane. MCG's amalgamate the dynamic fundamentals for the enhancement of both health as well as nutrition.(1)

A wide range of dosage arrays like tablets, capsules etc are available for medicinal chewing gums depending upon various pharmacological guidelines that can be used for pharmaceutical, nutraceutical as well as confectionary purposes. They work more efficiently in children when compared to the traditional drug delivery systems being useful in both local as well as systemic treatment protocols.(1)

MCG's are principally single dose compositions comprised of gum which is designed to be chewed and not swallowed. On chewing them, there is a

release of its active ingredients which are responsible for its mode of action.(2)

MEDICATED CHEWING GUMS AND THEIR CONSTITUENTS:

The principle ingredient of medicated chewing gums is extracted from sapodilla tree, known as chicle. This is a naturally occurring gum is often tedious to extract and is also not economically feasible so it has now been replaced by some artificial agents like polyvinyl acetate and other synthetic polymers. Apart from these synthetic gums, varying amounts of sweeteners, colouring and flavoring agents are also present. Broadly, chewing gums can be divided into two components (3):

- 1) A chewable gum base which is water soluble.
- 2) A bulk fraction which is also water soluble.

PRODUCTION OF MCG:

The methods of manufacturing these medicinal agents can be classified as (4,5):

- 1) Melting or the traditional method.

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- 2) Freezing, grinding and tableting.
- 3) Direct compression.

DETERMINANTS OF RELEASE OF ACTIVE INGREDIENTS:

- 1) Time of contact: Clinical trials have indicated a chewing time of minimum 30 minutes for effective action and quite similar to the conventional methods.
- 2) Physical and chemical property of the active element: Release of drug is governed by this property as the elements which are easily soluble in saliva will be released more rapidly as compared to the ones which are lipid soluble.
- 3) Individual variables: The intensity and frequency of chewing is different between different individuals that in turn governs the effectivity and release of active drugs.
- 4) Composition: The portion of gum base governs the release depending upon its lipophilic or lipophobic concentrations.

DISCUSSION

Medicated chewing gums offer increased number of benefits to the traditional drug delivery systems, like the ability of medicated chewing gums to resist the spread of carious lesions by enhancement of salivary secretion (6), fluoride additives in gums offer further prevention of caries even in younger population (7), gums with chlorhexidine formulations are available for treating gingivitis and other oral infections along with better taste (7). Apart from local effects confined to the field of dentistry, they have also been increasingly used now for treating systemic conditions like nutritional deficiencies, antifungal and antibacterial infections, obesity and even maintenance of blood-glucose levels (8,9). Additionally such formulations have also been effectively used for the treatment of motion sickness and as a substitute for quitting the habit of cigarette smoking among the addicts(10,11).

ADVANTAGES AND DISADVANTAGES:

MCG's provide ample amount of advantages ranging from efficient choice of drug for acute cases, can be consumed without water, swallowing is not

required, increased bioavailability, to rapid mode of action, compatibility in children and reduced irritation to gastrointestinal epithelium.(1,12)

Discontinuation of cigarette smoking : A combination of ingredients present in chewing gums like nicotine, lobeline and silver acetate have been successfully tested clinically as habit breaking ingredients in chronic smokers and also to reduce the withdrawal symptoms associated with the cessation of habit. Such sugar free, nicotine gums are usually prescribed upto a period of 3 months with sequential decrease in the frequency and amounts of dosage slowly.

Treating Oral Candidiasis: The traditional medicine systems used for the treatment of this opportunistic fungal infections include topical as well as systemic antifungal drugs which are somehow now becoming less effective due to the development of increased resistance (13). Thus more and more number of investigations are under progress to judge the effectiveness of medicated chewing gums as an essential aid in the treatment of oral candidiasis.

Other Oral Lesions and Conditions: These set of conditions include burning mouth syndrome, lichen planus, stomatitis, xerostomia, toothaches, psychosomatic conditions, mucositis and aphthous ulcers etc. and other secondary changes as a result of chemotherapy and radiotherapy (14). Researches are still ongoing to know about the effectivity of medicated chewing gums in this field.

However, considerable amount of disadvantages also exist in association with the consumption of medicated chewing gums which include overdose(15), diarrhoea due to sorbitol content, ulceration due to cinnamon and other additives, chlorhexidine associated staining and alteration of taste(16), hypertension due to licorice and increased pain in facial musculature due to prolonged chewing.(17)

CONCLUSION

Chewing gum is an integrated form of drug delivery system which would help us in treating more and more diseases as well as offer clinical benefits to patients. Apart from clinical applications such systems are attractive, feasible, easy to administer and it is just a matter of time that they are put to

routine clinical practice providing a great amount of pharmacotherapeutic applications. Though slowly gaining importance it is a much more convenient method due to its variety of formulations and direct consumption without the use of water. Chewing gums are therefore a better substitute to the conventional and contemporary drug forms. They hold a wide variety of local applications in the field of dentistry ranging from oral microbial infections, odontalgias, disorders of the peridontium, to oral carcinomas, autoimmune diseases and nutritional deficiency states. Considering their pleasant taste, ease of availability, high specificity & rapid mode of action, the future holds great promise for them in the field of clinical industry.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Morjaria Y, Irwin WJ, Barnett PX, Chan RS, Conway BR. In vitro release of nicotine from chewing gum formulations. *Dissolution Technologies*. 2004 May 1;11(2):12–5.
2. Thombre N. A review on medicated chewing gum as a novel drug delivery system. *Journal of Pharmacy Research*. 2011;(3):4.
3. Zyck D, Greenberg MJ, Barkalow DG, Marske SW, Schnell PG, Mazzone P. Coated chewing gum products containing antacids [Internet]. WO2002017731A1, 2002 [cited 2020 Jul 26]. Available from: <https://patents.google.com/patent/WO2002017731A1/en>
4. Athanikar NK, Gubler SA. Process for manufacturing a pharmaceutical chewing gum [Internet]. US6322828B1, 2001 [cited 2020 Jul 26]. Available from: <https://patents.google.com/patent/US6322828B1/en>
5. Kumar R, Solanki P, Chandra A. Medicated Chewing Gum- A Novel Drug Delivery System: An Updated Review. :17.
6. Rømer Rassing M. Chewing gum as a drug delivery system. *Advanced Drug Delivery Reviews*. 1994 Jan 1;13(1):89–121.
7. Effect of Salivary Flow Rate on Salivary Fluoride Clearance after Use of a Fluoride-Containing Chewing Gum - Abstract - *Caries Research* 1987, Vol. 21, No. 5 - Karger Publishers [Internet]. [cited 2020 Jul 27]. Available from: <https://www.karger.com/Article/Abstract/261045>
8. Woodford DW, Lesko LJ. Relative bioavailability of aspirin gum. *J Pharm Sci*. 1981 Dec;70(12):1341–3.
9. Imfeld T. Chewing gum--facts and fiction: a review of gum-chewing and oral health. *Crit Rev Oral Biol Med*. 1999;10(3):405–19.
10. A Randomised, Placebo-controlled Study Comparing Two Formulations of Dimenhydrinate with Respect to Efficacy in Motion Sickness and Sedation | Request PDF [Internet]. ResearchGate. [cited 2020 Jul 27]. Available from: https://www.researchgate.net/publication/11197478_A_Randomised_Placebo-controlled_Study_Comparing_Two_Formulations_of_Dimenhydrinate_with_Respect_to_Efficacy_in_Motion_Sickness_and_Sedation
11. Silagy C, Lancaster T, Stead L, Mant D, Fowler G. Nicotine replacement therapy for smoking cessation. *Cochrane Database Syst Rev*. 2004;(3):CD000146.
12. Chewing gum: A modern era of drug delivery [Internet]. ResearchGate. [cited 2020 Jul 27]. Available from: https://www.researchgate.net/publication/216621755_Chewing_gum_A_modern_era_of_drug_delivery
13. Ughade MA, Wasankar SR, Deshmukh AD, Burghate RM, Makeshwar KB. Medicated Chewing Gum: Modern Approach to Mucosal Drug Delivery. *Asian Journal of Research in Pharmaceutical Sciences*. 2012 Dec 28;2(4):150–9.
14. Aslani A, Ghannadi A, Raddanipour R. Design, formulation and evaluation of Aloe vera chewing gum. *Adv Biomed Res*. 2015;4:175.
15. Medicated Chewing Gum-A Novel Drug Delivery System: An Updated Review [Internet]. [cited 2020

Jul 27]. Available from:
https://www.researchgate.net/publication/321018732_Medicated_Chewing_Gum-A_Novel_Drug_Delivery_System_An_Updated_Review

16. Addy M, Roberts WR. Comparison of the bisbiguanide antiseptics alexidine and

chlorhexidine. II. Clinical and in vitro staining properties. J Clin Periodontol. 1981 Jun;8(3):220-30.

17. Weil AT. Coca leaf as a therapeutic agent. Am J Drug Alcohol Abuse. 1978;5(1):75-86.