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Preparation and Evaluation of Famotidine Containing Chewing Gum

Yasir Mehmood*, Irfan Bashir, Imtiaz Majeed, Nadeem Alvi, Muhammad Jamshaid, Khalid Idrees Khan, Usama Jamshaid

Faculty of Pharmacy, University of Central Punjab, Lahore, Pakistan

*E-Mail: yasirmehmoodamjad@gmail.com

Subject: Pharmaceutics

Abstract

Most of the drugs are used by oral route. This is most convenient for the patient. Some time it is difficult for the children to take medicine by conventional form like tablets, syrup. Chewing gum form is most attractive form of dosage which can take by oral route and all, the people specially like to chew this type of dosage form. This system is convenient, easy to administer for anyone with pleasant taste. This is one of the novel drug delivery system containing different ingredients and this is very suitable for the drug which has great absorption in the buccal cavity .and this dosage form can be used for the local treatment of the buccal cavity. Chewing gum is the convenient and effective means of rapidly administering fomotidine, as it is readily soluble, permeable and used to relieve symptoms of acidity. In this study medicated chewing gum of famotidine has been developed by using of sorbitol, maganesium sterate, menthol, gum base and sugar. This chewing gum was formulated by the direct compression method. There are different concentrations of base gum and PEG 6000 used. In this formulation PEG 6000 is used as a plasticizer and gives great release profile of the drug.

Keywords: *Famotidine, Chewing Gum, PEG 6000*

Introduction

Medicated chewing gum is solid preparation of gum based dosage form and this is single dose prepration. This gum gives continuous release of medicine. They could contain the one or more active ingredients which can release their ingredients continuously. This medicated chewing gum can be used for the local treatment of the buccal cavity. Chewing gum have very well used in the children so it is very easy for the children to give medicine in form of chewing gum. The use of the chewing gum is very feasible for the treatment of the mouth disease and it also give pleasant taste and freshness to the mouth. Mostly chewing gum are used for the breath freshness. The first patent for the production of chewing gum was filed in 1869 and was issued to WF Simple in Ohio under US patent no. 98,304. A medicated chewing gum containing acetyl salicylic acid was 1st commercially introduced in the 1928. In 1991, chewing gum was used and approved as a part for pharmaceutical dosage form by the Commission of European Council.**1.**. It has also been used in veterinary applications.. Famotidine is a histamine H_2-receptor antagonist that inhibits acid production in stomach , and it is very commonly used in the treatment of peptic ulcer disease (PUD) and gastroesophageal reflux disease. Famotidine has been investigated as an adjunct in treatment-resistant schizophrenia. In one trial it caused a 10% reduction in schizophrenic symptom severity in treatment-resistant patients.

Materials and Methods:

The famotidine was obtained as a gift sample from Ameer & Adnan Pharma Pakistan. PEG6000 and other inactive ingredients were obtained as a gift sample from Ameer pharma Pakistan. All other chemicals and solvents used were of analytical grade.

A: Tablet Pictures

Table: 1 Formulation composition

Sr no	Ingredients	Formulation in mg				
		F1	F2	F3	F4	F5
1	Famotidine	20	20	20	20	20
2	Gum base	350	250	400	300	450
3	Sorbitol	250	300	300	200	400
4	PEG6000	10	15	20	15	10
5	Manitol	150	150	200	300	100
6	Maganesium sterate	10	10	15	10	5
7	Aerosol	5	5	5	5	5
8	Aspartem	10	15	10	15	10
9	Menthol	2	2	1.5	1.5	2
Total		807	767	97.15	86.15	1002

Preparation of the chewing gum tablet

Direct compression method was used to prepare the chewing gum tablet. This is easy method for the preparation of the chewing gum tablet. Weighed required quantity of gum base material and active ingredient were mixed in mixer. To it, accurately weighed PEG6000, sorbitol and menthol were added. The sorbitol in powder form was added as sweetening agent. After thorough mixing, the lubricant and glidant were also mixed. The powder was added into the compression machine hopper and compressed into tablets using round punches of 16 mm diameter by keeping hardness between 1-2.5 kg/cm2 using 17 station multitooling tablet compression machine (ZP17).

Characterization of famotidine Melting Point of Drug

Melting point of famotidine was determined by micro controlled based melting point apparatus (MPA-100). The temperature at which the famotidine started melting was noted. Average of three results was noted as the melting point of drug.

λmax Determination

UV-spectrum of pure famotidine was taken in phosphate buffer solution of pH 6.4 The UV spectrum of famotidine (5 mg/ml) in methanol. The spectrum was recorded using a Shimadzu UV–Vis Spectrophotometer1602 PC. Famotidine exhibited three maxima wavelengths.

λmax (nm)	A (1%, 1 cm)	Absorptivity
280.0	4.94	166.7
211.0	6.52	220.0
205.0	5.98	201.08

Table 1A: λmax and absorptivity

Calibration Curve of famotidine

25 milligrams of pure famotidine was dissolved in 10ml water and heated to 37.5º C till it dissolved, then diluted to 25 ml with water. This stock solution was further diluted to get the desirable working concentration of 100 µg /ml.

The following procedure has been adopted for obtaining the standard curve (Fig. 1). An aliquot each of 1.0, 2.0, 3.0, 4.0, and 5.0 ml of the drug solution was transferred into a series of 10 ml standard flasks. To each flask, 3.0 ml of distilled water was added and sonicated and volume was made up with distilled water. The solution formed was measured at 280 nm against distilled water as blank.

Infrared (IR) Spectroscopy

IR study was carried out to check purity of famotidine. It was determined by Fourier Transform Infrared spectrophotometer (FTIR Alpha E Bruker, Germany). The baseline correction was done by blank background measurement. The scanning range was 400-4000 cm-1.

Differential Scanning Calorimetry (DSC)

Thermograms of pure famotidine, physical mixture and developed formulation were recorded using Mettler-Toledo DSC 823e instrument equipped with an intra cooler (Mettler- Toledo, Switzerland). Samples were sealed in aluminum small cups and heated at the rate of 20oC/min from 10oC to 300oC under nitrogen atmosphere of flow rate 10 ml/min.

Results and Discussion

Melting Point

Melting point of famotidine was checked using capillary method. That was found to be in the range of 160-1630C which is accurate to the actual melting point of the drug (163oC).

λmax Determination

The standard stock solution of famotdine of concentration 10 mcg/ml showed maximum absorbance at 280 nm wavelength in methanol.

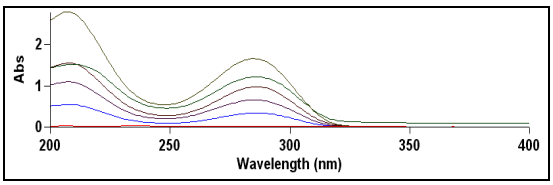

Figure No: 1 Calibration Curve of famotidine

FTIR Spectroscopy

The FTIR spectrum of pure famotidine, formulated mixtures and optimized formulation are shown in figure . In order to determine possible interaction between drugs with carrier, FTIR was used.

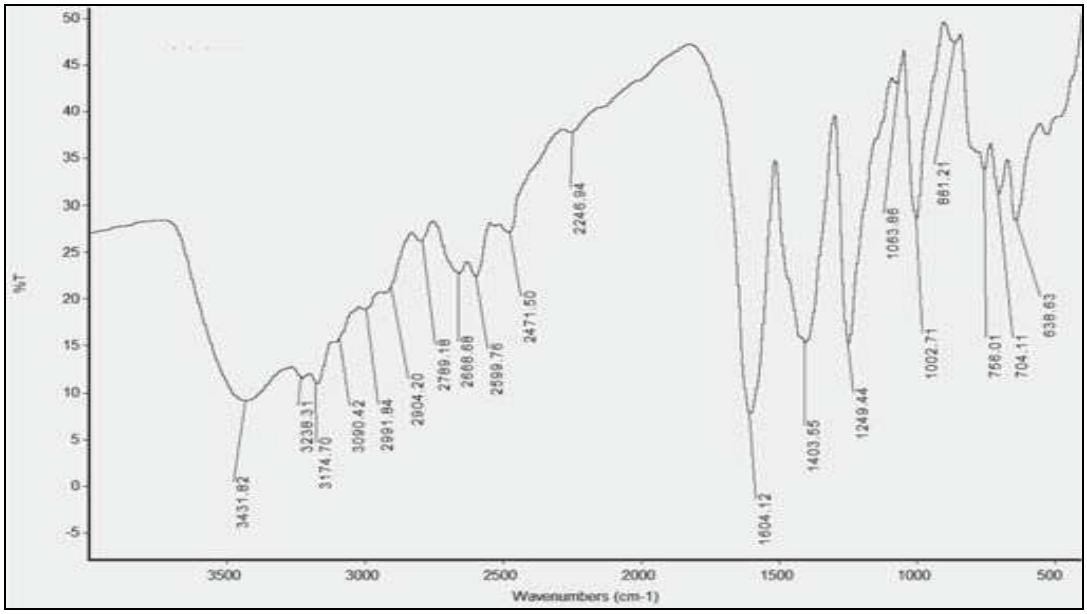

Figure No 2: Pure famotidine

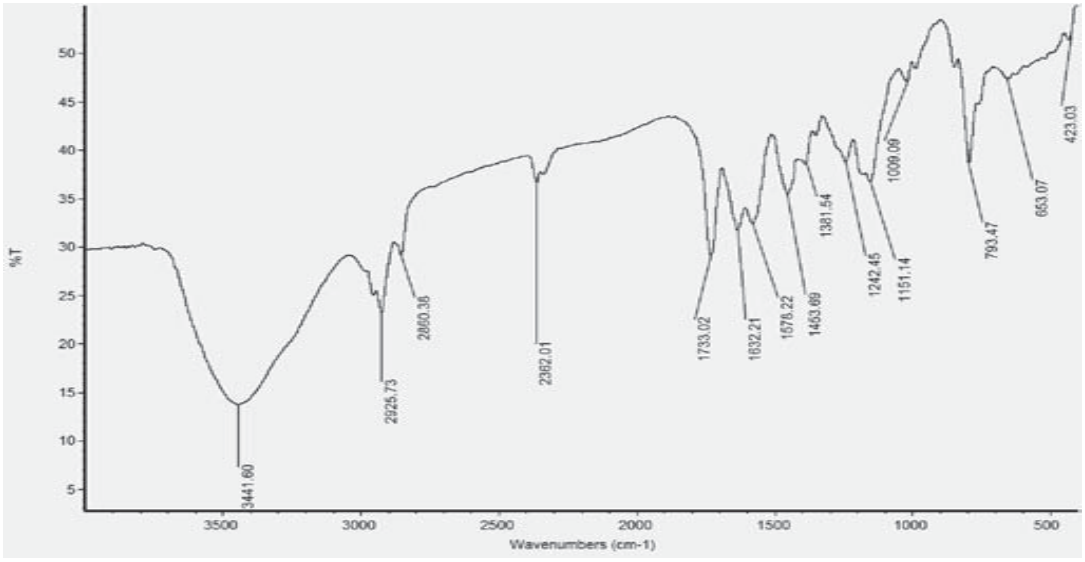

Figure No3: Mixture blend of formulation of famotidine

Evaluation of Powder mixture

Bulk densities of powder mixture were found between 0.56-0.75 g/ml. Tap densities of the powder mixture were found between 0.59-0.79 g/ml. The angle of repose of the powder was varied from 20.650 -28.770. Carr's Index of the powder blend was varied from 12.06 % to 16.02 %. From these all values we assume that the blends had good flow properties.

Table 2: Evaluation of powder blend (F1-F5)

Formulation	Bulk density g/cc	Tap density g/cc	Carr's index %	Angle response (θo)
F1	0.587	0.764	23.16	24.84
F2	0.598	0.689	13.20	23.68
F3	0.579	0.786	26.33	21.54
F4	0.577	0.699	17.45	23.61
F5	0.487	0.648	24.84	25.04

Wight Variation, Friability, Hardness and Drug Content Determination

All the developed formulation which are in the tablet form was evaluated by different parameters.1st test was weight variation test which was found within USP specification .the average Wight of the tablet was 950-1000mg.hardness is not the official test but we found this within range .the hardness of the tablet was 3-4kg/cm2.the thickness of the chewing gum tablet was 10-13mm.fribility of all the formulation was in the range but we found formulation F4 very best which was 0.57-0.76.drug content for all the developed formulation was in 95-100%.

Table 3: Physical evaluation

Formulation	Color	Thickness mm	Friability %	Hardness kg/cm2	Stickiness	Uniformity contents %	Weight mg
F1	Orange	12	0.54	3.2	Non	96.92	805
F2	Orange	13	0.75	3.5	Non	96.78	765
F3	orange	12.6	0.59	4.1	Non	97.87	970
F4	orange	13.6	0.71	3.6	Non	99.34	865
F5	Orange	12.9	0.69	4.2	Non	95.78	1000
F6	Orange	12.3	0.74	3.8	None	94.82	867

In-vitro Drug Release

The femotidine medicated chewing gum tablet consisted of gum base, active ingredient, sweetening agent, plasticizer, flavoring agent and coloring agents. In this developed formulations, we have different concentrations of the Gum base and other inactive ingredients which act as a base and plasticizer. All developed formulations were non sticky in nature. But, the formulation F4 released the drug more than 89 %. This was due to the softness of the formulation F4 developed during the in-vitro dissolution study. Formulation F4 contained highest amount of PEG6000 and less amount of base. The drug release from the various formulations was found to be in the range of 63.43 % - 89.67 %. It was found F1 having the least concentration of release during dissolution test. From the in-vitro drug release data, it was observed that an increase in the concentration of plasticizer may reduce the hardness of the chewing gum tablet also it was observed that the increase in the concentration of plasticizer and decrease in the concentration of base may increases drug release from formulation.

Table 4: Cumulative % drug release of formulations F1-F5

Time	F1	F2	F3	F4	F5	F6
0	0	0	0	0	0	0
5	10.6	13.8	12.7	13.9	13.3	17.8
10	23.6	27.8	29.7	27.9	26.5	28.6
20	34.6	38.9	41.7	43.5	35.9	37.7
25	42.8	48.5	52.5	57.9	47.8	51.8
30	56.65	62.67	60.67	71.78	65.8	72.9
35	63.43	72.65	79.65	89.67	79.97	83.7

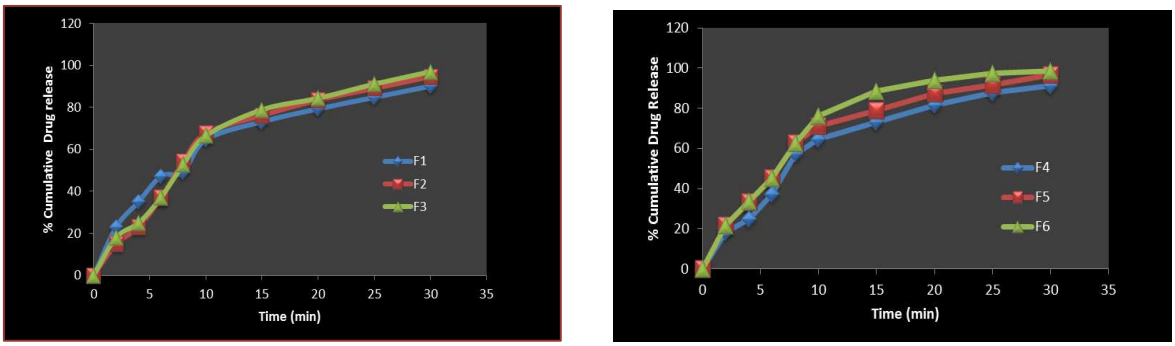

Fig.3: In vitro drug release

Conclusion

In this work famotidine chewing gum developed formulation was converted in the tablet form by using the gum base and other inactive ingredients. For making chewing gum the gum base is essential and it dissolves in saliva. We have got conclusion from the developed formulation that this synthetic gum is good agent for the formulation of chewing gum. For this tablet we have performed all the conventional test of tablet was performed and all test give good result. All the test result complies with USP. In-vitro release test was performed using modified disintegration USP apparatus for tablet. From the in vitro drug release data it was concluded that drug release from the chewing gum tablet was satisfactory. In the formulation PEG6000 was used as a plasticizer and it was found that it acted on the drug release to some extent.

"Cite this article"

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