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Formulation and Evaluation of Buccal Patch Containing Amlodipine Besylate

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ABSTRACT

Amlodipine is an oral dihydropyridine calcium channel blocker. Amlodipine works by blocking the voltage-dependent L-type calcium channels, thereby inhibiting the initial influx of calcium. This study aimed to prepare a buccal patch containing amlodipine besaylate by the means of solvent casting method. Formulations were prepared using different ratio of polymers including HPMC K4M, Ethanol, and PVP K30. The thickness of formulated patches varied from 0.48 to 0.52 mm. The average weight of patch from each batch ranges from 0.25 to 0.38. Percentage drug release for the formulations F1, F2, F3, and F4 was found to be 45, 61, 76, 93 respectively in the study of 12 hr. Study concludes that amlodipine besaylate can be delivered efficiently in mucoadhesive patches form. Based on different parameters buccal patches of batch F4 (HPMC K4M and PVP K30) was found to an optimum formulation.

INTRODUCTION: -

Buccal administration is a topical route of administration in which drugs held or applied in the buccal region diffuse through the oral mucosa and enter the systemic circulation directly. Intimate touch keeps the dosage form at the site of action. The buccal mucosa has a rich blood supply, is easily accessible, and is comparatively permeable, resulting in an affluent blood supply, improved bioavailability by avoiding first-pass metabolism of drugs, and a faster start of action. Bio adhesion is a phenomenon of interfacial molecular attractive forces in which two materials, one of which is natural in origin, are held together for extended periods by interfacial forces. The adhesion of two materials, at least one of which is a mucosal surface, is generally defined as mucoadhesion. Buccal drug delivery is well accepted by patients due to the possibility of self-medication, i.e., easy application and quick termination of dosage form when required.

Amlodipine is used to manage high blood pressure, either alone or in combination with other medications. Lowering blood pressure aids in the prevention of strokes, heart attacks, and kidney issues. Amlodipine refers to the calcium channel blocker class of drugs. It works by relaxing blood vessels, allowing blood to circulate more freely. Amlodipine is also used to treat and prevent some kinds of chest pain. (angina). It may improve your capacity to exercise and reduce the frequency of angina attacks. It should not be used to address acute attacks of chest pain. As instructed by your doctor, use other medications (such as sublingual nitro-glycerine) to relieve attacks of chest pain.

All these properties make it an ideal candidate to develop a novel dosage form. Keeping these factors, in the present study bioadhesive patches of amlodipine besylate were developed and evaluated to provide a controlled and predictable release, to avoid frequent administration and thus to increase patient compliance.

MATERIALS AND METHODS

HPMC K4 M, and PVP K30 was obtained from Ozone Pharmaceutical Limited, arranged from Solapur, Maharashtra state India. Propylene glycol, Ethanol and distilled water obtained from lab grade chemicals for formulation arranged from Solapur.

Preparation of patch

The Buccal patch was made using the solvent casting technique. Polymeric solution of different polymers, namely HPMC K4 M and PVP K30, was prepared by combining them in varying ratios with distilled water and stirring occasionally for 4 hours. To eliminate debris and suspended particulates, the viscous solution was filtered through nylon gauze. Constant stirring was used to introduce propylene glycol as a permeation enhancer. Add the medication solution to the polymeric solution. The resulting solution was left at room temperature overnight to guarantee a clear, bubble-free solution. A glass petri plate was filled with the solution. It was kept to dry and make films. Dried films were carefully removed from the petri dish and cut to size. Prepared film stored in a desiccator.

Table 1: Composition of buccal patch

Ingredients	**F1**	**F2**	**F3**	**F4**
Amlodipine besaylate {5mg}	5mg	5mg	5mg	5mg
HPMC K4 M	100	150	200	250
PVP K30	50	100	150	200
Propylene glycol	2.5ml	2.5ml	2.5ml	2.5ml
Ethanol	5ml	5ml	5ml	5ml
D.W.	Q.S.	Q.S.	Q.S.	Q. S

Evaluation of buccal patch

Measurement of weight variation and thickness

The thickness of the buccal patches was measured using thickness gauze at six distinct points on the patch. Three randomly chosen patches were used for each formulation, and the average weights were calculated.

Measurement of Folding Endurance

The folding endurance of buccal patches was determined by folding one film at the same location up to 200 times until it broke or folded, which was deemed sufficient to show good patch properties.

Content Uniformity

Buccal patches were taken at various places on the prepared film to determine content uniformity, and these patches were dissolved in 100mL of pH 6.8 phosphate buffer solution. For 15 minutes, the fluid was centrifuged at 3000 rpm. The supernatant was collected, and the absorption at 366 nm was measured spectrophotometrically.

Moisture content

The buccal patches were weighed accurately and kept in desiccators containing anhydrous calcium chloride. After three days, the patches were taken out and weighed. The moisture content (%) was determined by calculating moisture loss using the formula-

$$\text{Moisture content (\%)} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

Percentage Moisture Absorption (PMA)

The percentage moisture absorption study of Pregabalin buccal patches was carried out to check the physical stability of the buccal films at high humid conditions. Three 1cm diameter films were cut out and weighed accurately. The films were placed in a desiccator containing saturated solution of aluminum chloride, keeping the humidity inside the desiccator at 79.5%. After 3 days the films were removed, weighed and the percentage moisture absorption was calculated.

Percent drug content

Drug content uniformity was determined by dissolving the amlodipine besylate buccal patch (10 mm in diameter) from each batch by homogenization in 100 ml of an isotonic phosphate buffer (pH 6.8) for 6 h under occasional shaking. The 5ml solution was taken and diluted with isotonic phosphate buffer pH 6.8 up to 20 ml, and the resulting solution was filtered through a 0.45 mm Whatman filter paper. Drug content was then determined after proper dilution at 366 nm using a UV spectrophotometer.

Surface pH

Amlodipine besylate buccal patches were allowed to swell for 1 hour on the surface of the agar plate, which was prepared by dissolving 2% (w/v) agar in warmed isotonic phosphate

buffer of pH 6.6 under stirring and pouring the solution into the petri dish, where it solidified to form a gel at room temperature. The surface pH was determined by placing pH paper on the swollen's surface.

RESULTS AND DISCUSSION

Formulation	Thickness [mm]	Weight [mg]	Folding Endurance	% Drug content	% Moisture absorption	% Moisture Loss	WVTR [g/cm^2/h]	Surface pH
F1	0.48	0.31	211	97.41	12.5	4.3	0.358	6.8
F2	0.49	0.38	232	96.53	11.31	3.8	0.423	6.9
F3	0.52	0.37	225	95.42	13.27	5.2	0.485	7.0
F4	0.57	0.28	244	98.32	9.72	3.7	0.511	7.2

DISCUSSION

Amlodipine besylate buccal patches in polymers were prepared by solvent casting method. Formulated patches were subjected to preliminary evaluation tests. Patches with any imperfections or differing in thickness, weight (or) content uniformity were excluded from further studies. The thickness of formulated patches varied from 0.48±0.25 to 0.52±0.09 mm. Group F4 have the highest thickness while group (F1 HPMC K4 M and PVP K 30) has shown least among all formulations. The average weight of patch from each batch ranges from 0.25±0.42 to 0.38±0.09 (Table 1). Results indicate that formulations of batch F4 (HPMC K4M) have the least and of batch F4 have the highest mass among the different formulations.

CONCLUSION

Nowadays, many researchers are working for the progress of the innovative approach of the delivery of drug to improve safety, effectiveness and patient compliance. The buccal mucosa has a rich blood supply and easily accessible, and suitable for the application of a dosage form to the required site. The present study aimed to develop a novel unit dosage form of Amlodipine besylate. A satisfactory attempt was made to develop buccal patches of Amlodipine besylate with different ratio of polymers including HPMC K100 M, and PVP K 30 by solvent casting method. Based on different parameters i.e. folding endurance, drug

content, moisture absorption, moisture loss, *in-vitro* release study buccal patches of batch F2 were found to an optimum formulation.

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