

FORMULATION, *IN-VITRO* EVALUATION AND ANALYTICAL QUANTIFICATION OF ZALTOPROFEN MICROCAPSULES**Biresh K Sarkar^{*1}, Manish Devgan², Y.Ankamma Chowdary³**¹National Institute of Ayurvedic Pharmaceutical Research, Moti Bagh Road, Patiala, India.²R.P. Educational Trust Group of Institutions Karnal, Haryana, India.³NRI College of Pharmacy, Pothavarappadu, Krishna, A.P, India.Article Received on
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Bagh Road, Patiala, India**ABSTRACT**

Zaltoprofen was formulated as novel enteric microcapsules for improved delivery using the polymer ethyl cellulose as the retardant material. Micro encapsulation of Zaltoprofen was done to achieve a controlled drug release profile suitable for per oral administration. Microcapsules were prepared by and emulsion solvent evaporation method. The prepared microcapsules were evaluated for different quality control parameter like; size analysis, drug content, encapsulation efficiency, and drug release characteristics etc. Results of study revealed that Zaltoprofen release from microcapsules greatly affected by the size of the microcapsules. A precise UV method also

developed for the estimation of zaltoprofen in prepared dosage form. Drug followed the Beer-Lambert's law in the concentration range of 5- 25µg/ml. Slope, intercept, correlation coefficient, detection and quantization limits were also calculated. Results of the analysis were validated statistically and were found to be satisfactory.

KEY WORDS: Zaltoprofen Micro Encapsulation, Formulation, Evaluation.**INTRODUCTION**

Zaltoprofen, 2-(10,11-dihydro-10-oxodibenzo[b, f]thiepin-2-yl) propionic acid is a potent Nonsteroidal Anti-Inflammatory Drug (NSAID) [1]. It possesses potent analgesic action on inflammatory pain [2, 3]. It inhibits preferentially cyclooxygenase (COX)-2 [4, 5]. It also selectively inhibits prostaglandin E2 (PGE2) production at inflammatory sites [6-10]. Microencapsulation is a common technique used in the production of sustained release

dosage forms. Microcapsule based drug delivery system has received considerable attention in recent years. Numbers of methods have been described by many researchers to prepare microcapsules [11] selection of polymer is important factor in preparation of microcapsules and these area have been studied extensively. [12, 13] The previous study on employed different solvents such as chloroform, dichloromethane and ethyl acetate to study the effect of solvent on formulation. The solvent employed in the preparation of microcapsules is likely to influence both the permeability and drug release from the microcapsules [14]. Present study involves formulation of Zaltoprofen microcapsules to prolong its action. Microcapsules were prepared by an emulsion solvent evaporation method, using chloroform as a solvent. After evaporation of solvent ethyl cellulose encapsulates the drug to form microcapsules of various size ranges.

MATERIALS AND METHODS

Materials

Zaltoprofen was obtained as a gift sample from Intas Pharmaceuticals Ltd. Ethyl cellulose obtained from Loba Chemie. All other ingredients used were of an analytical grade.

Preparation of Microcapsules

Zaltoprofen microcapsules were prepared by Emulsion Solvent Evaporation method. Chloroform was used as solvent. The polymer was dissolved in polymer solvent to form a homogenous polymer solution. Drug was added to the polymer solution and mixed thoroughly. The resulting mixture was added in continuous phase made up of 0.1N HCl and sodium carboxy methyl cellulose in a beaker with stirring. Then solvent let to evaporate. Microcapsules were obtained by decantation and washing with water. The product was then dried.

EVALUATION OF MICROCAPSULES

Particle size analysis

For size distribution analysis, different sizes in a batch were separated by sieving; using a set of standard sieves. The amounts retained on different sieves were weighed.

Encapsulation efficiency

Encapsulation efficiency was calculated in microcapsules the encapsulation efficiency of microcapsules of various size ranges was determined which is showed in **Table 1**.

Estimation of Drug Content

Drug content in the microcapsules was calculated by UV spectrophotometric method. A sample of microcapsules was dissolved in ethanol and the volume was adjusted upto 100 ml using phosphate buffer of pH 6.8. The solution was filtered through Whatman No. 1 filter paper. Then the filtrate was assayed for drug content by measuring the absorbance at 243 nm after suitable dilution. The amount of drug estimated is mentioned in **Table 1**.

***In vitro* Drug release Studies**

Drug release was studied by using USP type II dissolution test apparatus in Phosphate buffer of pH 6.8 (900 ml). The paddle speed at 100 rpm and bath temperature at $37 \pm 0.5^{\circ}\text{C}$ were maintained throughout the experiment. A sample of microcapsules was used in each test. Aliquot equal to 5ml of dissolution medium was withdrawn at specific time interval and replaced with fresh medium to maintain sink condition. Sample was filtered through Whatman No. 1 filter paper and after suitable dilution with medium; the absorbance was determined by UV spectrophotometer at 243 nm. All studies were conducted in triplicate (n=3).

DEVELOPMENT OF ANALYTICAL METHOD

Method

A UV spectrophotometric method has been developed for the estimation of zaltoprofen in formulation. Different aliquots of standard solution of zaltoprofen (5-25 $\mu\text{g/ml}$) were prepared by dissolving in methanol (1ml) and made upto mark with distilled water. Absorbance of these solutions was noted at λ_{max} of 243 nm against a reagent blank.

Preparation of Standard Zaltoprofen Solution

Accurately weighed 10 mg of pure drug and transferred into clean, dry 10 ml volumetric flask and dissolved in small volume of methanol and adjusted volume with water up to mark. Then 1.0 ml of above solution was pipetted out into 10 ml volumetric flask and volume was made up with water.

Calibration curve of the zaltoprofen (5-25 $\mu\text{g/ml}$)

Appropriate volume of aliquots from standard zaltoprofen stock solution was transferred to different volumetric flasks. The final aliquots were prepared by appropriate dilution. Absorbance of each solution against water as blank was measured at λ_{max} of 243 nm for

zaltoprofen and the graph of absorbance against concentration was plotted. The regression equation and correlation coefficient were obtained from calibration curve.

Sample preparation for determination of zaltoprofen from dosage form

Accurately measured quantity of formulation equivalent to 10 mg was dissolved in little quantity of methanol (1ml) and volume was made up to 10 ml with water, sonicated for 20 min. The solution was filtered through whatmann filter paper no. 41 and aliquot portion of filtrate was diluted to produce solution having appropriate concentration. The absorbance of sample solution was measured at selected wavelength and the concentration of the drug was estimated.

RESULTS AND DISCUSSION

Ethyl cellulose microcapsules containing zaltoprofen were prepared by an emulsion solvent evaporation method employing chloroform as solvent. The microcapsules were obtained free flowing and spherical. Result of encapsulation efficiency was found to be satisfactory (**Table 1**). Release from microcapsules was studied in phosphate buffer pH 6.8. Drug release from microcapsules was slow and spread over an extended period of time (**Fig. 1**). The drug release from microcapsules depends on the size of the microcapsules. The chloroform employed as a solvent serves as a promising solvent for preparing ethyl cellulose microcapsules for controlled and complete release of drug over a period of time.

Table 1: Results of quality control parameters

	Parameters		
	Particle Size (μm)	Entrapment Efficiency (%)	Drug Content (%)
Value	1290	25.57%	98.23
	897	33.55%	
	788	42.44%	

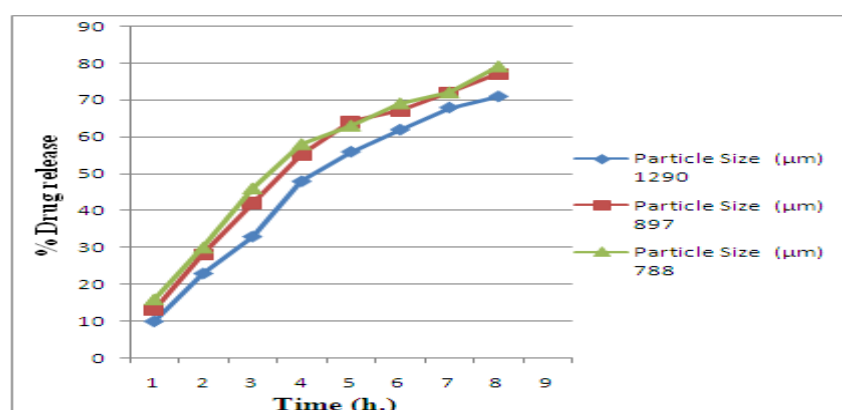


Figure 1. % Drug Release profiles of formulations having different size.

Development And Optimization Of Uv Spectrophotometric Method

The solubility of Zaltoprofen was checked in water, methanol, acetone, acetonitrile. Based upon the free solubility of Zaltoprofen in methanol (1ml) & water mixture, it was selected as solvent for method development Zaltoprofen estimation.

Validation

The summarize data of validation parameters mentioned in **Table 2**.

Linearity range

The linearity was determined for Zaltoprofen by plotting a calibration graph of concentration against absorbance. Zaltoprofen showed linearity in the range of 5-25 $\mu\text{g/mL}$. Calibration curve of Zaltoprofen was depicted in **Figure 2**.

Accuracy

Accuracy of developed method was determined by a recovery study at 3 concentration levels by replicate analysis ($n=3$). Standard drug solutions were added to a pre-analyzed sample solution and percentage of total drug content was calculated.

LOD and LOQ

The LOD and LOQ of Zaltoprofen were found to be 0.256 $\mu\text{g/mL}$ and 0.789 $\mu\text{g/mL}$ respectively.

Table 2. Results of Analytical parameter

Parameter	Range
Detection Wavelength (nm)	243
Linearity range ($\mu\text{g/ml}$)	5-25
LOD ($\mu\text{g/ml}$)	0.256
LOQ ($\mu\text{g/ml}$)	0.789
Correlation Coefficient (R^2)	0.999
Accuracy (% RSD)	0.11-0.19

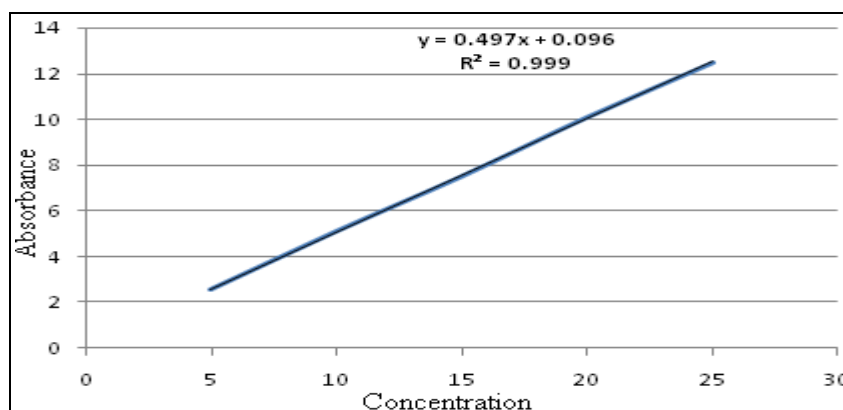


Fig 2 Calibration curve of zaltoprofen.

CONCLUSION

The present study illustrates the utility of microcapsules in extending the release of drug. Microcapsules provide sustained release in localized areas and can be employed to reduce medication doses and its frequency. The formulation also subjected for analysis by developed UV Spectrophotometric method; which was found to be simple, economic, and highly sensitive. Thus Microcapsules formulation can be utilized for the oral drug delivery system and can be analyzed easily by UV Spectrophotometric method qualitatively and quantitatively.

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