

Development of sustained release drug delivery system of Lithium carbonate and *in vitro* evaluation

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(Received: September 03, 2006; Accepted: November 28, 2006)

ABSTRACT

The purpose of this study was to investigate the effect of different proportions of HPMC polymer in the release of drug from the hydrophilic matrix tablets. Three formulations were made by wet granulation method 450mg Lithium carbonate and 10%, 20% & 30% HPMC were granulated with Ethanolic solution of Eudragit S100, dried and then compressed to formulate the tablets.

In vitro studies were conducted on the three formations. All the three formulations demonstrated relatively sustained release behavior but the matrix tables containing 30% HPMC exhibited suitable release kinetics.

Key words: Drug delivery system, lithium carbonate, *invitro* evaluation.

INTRODUCTION

Lithium Carbonate is widely used for the prophylaxis and treatment of manic depression and mania and in the maintenance treatment of recurrent depression. Lithium ion is readily absorbed from GIT and elimination takes place through the kidneys with a half-life of 20-24 hours. Immediate release from conventional tablets produces rapid and high peak blood levels resulting in adverse effects.

MATERIALS AND METHODS

Lithium Carbonate (Alkem Pharmaceutical, India), Aerosil (ODCI, India). HPMC (K100M), Eudragit and Magnesium stearate (Loba chemic, India).

Preparation of tables

Matrix tables were prepared by wet granulation technique, 450mg LC and HPMC (30%, 20% and 10%) were granulated with an ethanolic solution of Eudragit S100 (15.5 mg). Granules were passed through 18 mesh screen and dried at 40°C

for 2 hours. The dried granulate was mixed with other formulation components 3.3 mg magnesium stearate and 0.33 mg Aerosil and then compressed into flat tablets of 11mm diameter with a hardness of 7 Kg.

In vitro dissolution study

The dissolution of the tablets was performed with the paddle method using a dissolution tester (USP standard). The dissolution medium was 900ml of distilled water maintained at 37°C with a stirring rate of 100 rpm. At appropriate time intervals, 3ml of samples were obtained and an equal volume of medium was added to maintain the volume constant. Sample were filtered diluted and analyzed for LC concentration.

Kinetic analysis of dissolution data

The drug release data were fitted to the following simple exponential model $M_t/M_\infty = kt^n$, where M_t corresponds to the amount of drug release in time t , M_∞ is the total amount of drug released after an infinite time, K is a constant related to the drug delivery system, n is the release exponent related with drug release mechanism. When $n < 0.5$,

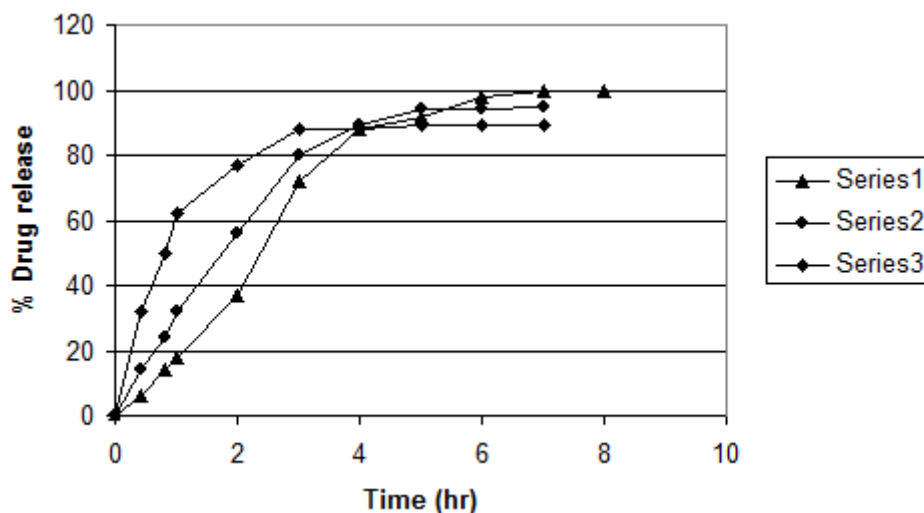


Fig. -1: Release profiles of lithium carbonate form matrix tablets using hydroxy propylmethyl cellulose.

the drug is released from the polymeric matrix with a quasi Fickian diffusion mechanism. For $0.5 < n < 1$, an anomalous (non-Fickian) drug diffusion occurs. When $n > 1$, a non-Fickian Case II or Zero order release kinetics could be observed.

RESULTS AND DISCUSSION

All the 3 formulation demonstrated relatively sustained release behavior. Initial burst release was observed with HPMC matrices containing 10% of the polymer. Matrix tablets

contains 30% HPMC has excellent retardant properties. An initial slow release of drug was achieved (10%-12% during 1st hour).

Conclusions

The drug release from matrices containing 10% and 20% HPMC was anomalous while matrices containing 30% of HPMC followed case II release. Therefore, HPMC can be used to modify release rate of lithium carbonate in hydrophilic matrix tablets.

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