

homogeneity of the solid phases. Pure rofecoxib is characterized by the presence of crystalline particles of regular size. Pure DiMEB also appears as crystalline particles without any definite shape. The photomicrographs of PM of rofecoxib-DiMEB system shows the crystalline structure. The features of both crystals in the KD were not easily detectable. Furthermore, the micrograph of the SD system showed an amorphous product with the presence of small size particles tending to aggregation. (SEM photomicrographs not shown)

The dissolution profile of the inclusion complexes prepared by different methods is shown in fig. 4 and 5. It can be seen that after 5 min only 9.8% of the pure drug and is dissolved, and even after 120 min only 54.3 % of the drug goes into solution whereas in case of rofecoxib-DiMEB inclusion complex prepared by KN and SD method, 69.2 % and 50.8 % drug was released within 5 min and almost complete release (99.3% and 96.4%, respectively) was seen after 45 min in pH 1.2. The release of the drug from the marketed formulation was 49.3% after 5 min and 79% after 120 min. In phosphate buffer (pH 7.4) 8.5% of pure rofecoxib was released after 5 min and at the end of 2 hours 55.6 % drug went into the solution whereas in case of rofecoxib-DiMEB inclusion complex prepared by KN and SD method 91.4 % and 76.9 % of the drug was released after 5 min and almost complete release was observed at 45 min. In case of the marketed formulation, the percentage release was 52.7%

after 5 min. and 88.5% after 120 min. It can be concluded that an inclusion complex of rofecoxib with DiMEB could be prepared successfully by kneading method in a molar ratio of 1:1 and this was confirmed by solubility studies, DSC, XRD, FT-IR and SEM. Dissolution studies of the KD complex exhibited almost complete *in vitro* dissolution profile.

#### ACKNOWLEDGEMENTS

The authors wish to thank University Grants Commission (UGC) for financial support (F. 7-7/2002 (SR-1)).

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## Spectrophotometric Estimation of Repaglinide in Bulk Drug and Tablet Formulations

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Accepted 26 March 2005

Revised 28 September 2004

Received 27 April 2004

**Ion-pair extractive spectrophotometric method was developed for the estimation of repaglinide. This method is based on the formation of a yellow colored ion-pair complex with bromothymol blue in presence of acid phthalate buffer (pH 2.4). This complex was then extracted with chloroform. The color of resulting solution was determined at  $\lambda_{max}$  438 nm. The calibration curve was found to be linear in the range of 5 to 25  $\mu\text{g/ml}$ . The recovery study values range from 98 to 100%**

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and % RSD was found to be 1.183. The LOD and LOQ were found to be 0.97  $\mu\text{g/ml}$  and 3.25  $\mu\text{g/ml}$ , respectively. The method was found to be precise, accurate and sensitive. The method can be successfully applied for its tablet formulation.

Repaglinide<sup>1</sup> is a newer investigated oral hypoglycemic agent for the treatment of non-insulin-dependent diabetes mellitus<sup>2</sup>. Chemically it is (S)-2-ethoxy-4-{2-[3-methyl-1-[2-(1-piperidinyl)phenyl]butyl]amino}-2-oxoethyl]benzoic acid. Reports are available for the estimation of Repaglinide form plasma by HPLC<sup>3,4</sup>.

We report here the development of a spectrophotometric method for the estimation of repaglinide in bulk drug and tablet formulations. The method has been validated by employing suitable statistical methods. The method is based on the formation of a yellow colored ion-pair complex with bromothymol blue in presence of acid phthalate buffer (pH 2.4). This complex was then extracted with chloroform. The concentration of resulting solution was determined at  $\lambda_{\text{max}}$  438 nm.

All the reagents used were of analytical grade. Bromothymol blue (0.1% w/v) and Acid phthalate buffer (pH 2.4) were used<sup>5,6</sup> for the analysis. Acid phthalate buffer was prepared by placing 50 ml of 0.2 M potassium hydrogen phthalate in a 200 ml volumetric flask, then 42.2 ml of 0.2 M hydrochloric acid was added and volume was made with water. All spectral measurements were done on Hitachi U-2000 UV/Vis Spectrophotometer with 1 cm matched quartz cell.

A standard solution of repaglinide (1 mg/ml) was prepared in methanol and further suitable dilutions were made with the methanol to get working standard solution of 100  $\mu\text{g/ml}$ . An aliquot of standard solution (0.1 to 3.0 ml) were transferred to 60 ml separating funnel and to it 4.0 ml of acid phthalate buffer (pH 2.4) and 3.0 ml of bromothymol blue (0.1%) was added. The yellow colored complex was extracted with two portion (5, 3 ml) of chloroform. The extract was dried over anhydrous sodium sulphate and col-

TABLE 1 : OPTICAL CHARACTERISTICS AND PRECISION

Parameters	Proposed Method
Absorption Maxima	438 nm
Beer's law limit ( $\mu\text{g/ml}$ )	5 to 25
Correlation Coefficient (r)	0.9969
Molar Extinction Coefficient (l/mol.cm)	$9.463 \times 10^3$
Sandell's Sensitivity ( $\mu\text{g/cm}^2/0.001$ )	0.04693
Regression equation (Y=mx+C)	
Slope (m)	0.0113
Intercept (C)	0.1057
% Relative Standard Deviation	1.183
% Range of Error	
0.05 confidence limits	0.1112
0.01 confidence limits	0.1840

lected in 10 ml volumetric flask, volume made up to mark with chloroform. Absorbance of resulting solution were measured at 438 nm against the reagent blank prepared simultaneously in a similar manner without drug. The calibration curve was prepared by plotting absorbance v/s concentration of repaglinide in  $\mu\text{g/ml}$ . Same procedure was followed for the estimation of repaglinide in marketed tablet formulations.

The optical characteristics such as Beer's law limits, Sandell's sensitivity, molar extinction coefficient, % relative

TABLE 2: ANALYSIS OF REPAGLINIDE TABLETS BY PROPOSED METHODS

Formulations	Labeled amount (mg)	Amount estimated (mg)	%Recovery*
1	2.00	1.99	99.5 $\pm$ 0.34
2	2.00	1.97	98.5 $\pm$ 0.47

\*Values are Mean $\pm$ SEM of five determinations. Formulation 1 is Eureka tablets 2 mg of Torrent Pharmaceuticals Ltd, Ahmedabad and formulation 2 is Rapilin tablets, 2 mg strength by Aztec, Sun Pharmaceuticals Ltd, Mumbai.

standard deviation and % range of error for the proposed method is summarized in Table 1. Recovery experiments were performed by adding known amount of drug to previously analyzed pharmaceutical formulations. The results obtained by the proposed methods were in good agreement with the labeled amounts (Table 2).

#### ACKNOWLEDGEMENTS

The authors are thankful to Torrent Research Center, Gandhinagar, for providing standard drug and to the Head, Pharmacy Department, Faculty of Technology and Engineering, M. S. University of Baroda for providing facilities to carry out the work.

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## Development and Evaluation of Cosmeceutical Hair Styling Gels of Ketoconazole

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Accepted 27 March 2005

Revised 30 September 2004

Received 19 April 2004

**Cosmeceutical antidandruff hair styling gel formulations containing 0.5 to 1.5% of ketoconazole were developed using Carbopol 940, PEG-400, ethanol and water. All the formulations were characterized for viscosity, rheology, spreadability, pH, texture, drug content and antimicrobial activity against *Malassezia furfur*. Optimized gel formulation was tested for stability at varying temperature. Formulation containing 1% ketoconazole showed promising performance with respect to stability and antimicrobial activity. Thus, formulation containing 1% ketoconazole could be used as an effective antidandruff hair styling gel.**

Ketoconazole<sup>1,2</sup> is an antifungal agent used in shampoos for the treatment of dandruff (*Pityriasis capitis*). The cause of dandruff<sup>3</sup> is still debatable but it is suspected that *Pityrosporon orbiculare* may be involved which assume pathogenic form under appropriate environmental condition and is called *Malassezia furfur*. Hair styling gel (HSG) are used to impart wet look, to hold ends of strands of long hair together, and to keep some loose strands of hair in place. Shampoos produce temporary antidandruff effect for short span of time. Hence, attempt has been made to develop

ketoconazole HSG to provide antidandruff action for long duration with style to hair which may not be possible with shampoos.

HSG formulations containing 0.5% (F1), 1% (F2) and 1.5% (F3) of ketoconazole were developed using Carbopol 940 (0.40%), PEG 400 (30%), ethanol (30%) and water (40%). HSG were prepared by sprinkling Carbopol 940 slowly in water with stirring and kept overnight for hydration. Tri-ethanolamine (0.5%) was added to induce gelation. Ethanolic solution of ketoconazole and PEG 400 were added with stirring to obtain desired formulations.

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All the formulations were characterized for viscosity