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Spectrophotometric determination of ziprasidone hydrochloride in pharmaceutical formulations

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ABSTRACT

Two simple, sensitive, rapid and economical spectrophotometric methods (A&B) have been developed for the determination of ziprasidone hydrochloride in pharmaceutical bulk and tablet dosage form. Method A is based on the reaction of ziprasidone with ferric chloride and 1,10- phenanthroline to form blood red colored chromogen. Method B is based on the formation of blood red colored chromogen with ferric chloride and 2, 2'- bipyridyl. The absorbances of the chromogens were measured at their respective wavelength of maximum absorbance against the corresponding reagent blank. The proposed methods have been successfully applied to the analysis of the bulk drug and its tablet dosage form. The methods have been statistically evaluated and were found to be precise and accurate.

Key words: Ziprasidone hydrochloride, 1,10-phenanthroline, 2,2'- bipyridyl.

INTRODUCTION

Ziprasidone is chemically known as 5-[2-[4-(1,2-Benzisothiazol-3yl)-1-piperazinyl]ethyl]-6-chloro-1,3-dihydro-2H-indol-2-one. Ziprasidone hydocholride is a novel antipsychotic with a unique pharmacological profile. Ziprasidone exhibits a potent and highly selective antagonistic activity on the D_2 and $5HT_{2A}$ receptors[1]. The drug has been determined by spectrophotometry [2]HPLC[3-11], HPLC-MS/MS [12-15]and Capillary zone electrophoresis[16] techniques. In the present study the author had developed two simple and sensitve spectrophotometric methods for the determination of ZPD in pharmaceutical formulations.

EXPERIMENTAL

Instrument

Elico UV Visible spectrophotometer SL 164 with 1.00 cm matched quartz cells were used for all spectral measurements.

Reagents

All the reagents used were of analytical grade and the solutions were freshly prepared. The reagents used in Method A were Ferric chloride (0.003M) and 1,10-phenanthroline (0.01M) and in method B were Ferric chloride (0.003M) and 2,2'- bipyridyl(0.03N).

Procedure

Standard Stock Solution:

A standard stock solution containing 1mg/ml was prepared by dissolving accurately 100mg of Ziprasidone Hydrochloride in 100ml methanol and this solution was used for method A and B.

Method A

In a series of 10ml volumetric flasks, 0.5-2.5ml (1ml=1mg/ml) of working standard solution was pipetted and 0.4ml of 0.003M ferric chloride solution and 1ml of 0.01M 1,10-phenanthroline were added. The flasks were then heated on water

bath for 10minutes, cooled to room temperature and the total volume was made upto 10ml with water. The absorbance of the blood red colored chromogen was measured at 509nm against reagent blank. The amount of Ziprasidone Hydrochloride present in the sample solution was computed from its calibration curve.

Method B

In to a series of 10ml volumetric flasks, 0.5-2.5ml (1ml=1mg/ml) of working standard solution was pipetted separately and 2.5ml of 0.003M ferric chloride solution and 2ml of 0.03N 2,2'- bipyridyl was added and heated on water bath for 10minutes, cooled to room temperature and the total volume was made upto 10ml with double distilled water. The absorbance of the blood red colored chromogen was measured at 521nm against blank. The amount of drug in the sample was computed from Beer's-Law plot.

Preparation of sample solution

Tablets containing Ziprasidone Hydrochloride were successfully analyzed by the proposed methods. Twenty tablets of commercial samples of Ziprasidone Hydrochloride were accurately weighed and powdered. Tablet powder equivalent to 100mg of Ziprasidone was dissolved in 50ml methanol ,filtered and washed with methanol. The filterate and washings were combined and the final volume was made upto 100ml with methanol. The solution was suitably diluted and analyzed as given under the assay procedure for bulk samples. The results were represented in Table 1. None of the excipients usually employed in the formulation of tablets interfered in the analysis of Ziprasidone Hydrochloride by the proposed methods.

Recovery studies

To ensure the accuracy and reproducibility of the results obtained, recovery experiments were performed by adding known amounts of pure drug to the previously analyzed formulated samples and these samples were reanalyzed by the proposed method. The percentage recovered were depicted in Table 1.

RESULTS AND DISCUSSION

The optimum conditions were established by varying one parameter at a time and keeping the others fixed and observing the effect on absorbance. The effect of temperature onthe reaction, quantity, concentration and addition of various reagents were studied, optimized after several experiments and incorporated in the procedure. The color developed in method A and method B was stable for 2 h. The reaction involved in method A and method B may be due to the fact that the unshared pair of electrons on each of the two nitrogen atoms of 1, 10-phenanthroline as well as 2,2'- bipyridyl complexes with Fe^{2+} ion formed by the reaction between Ziprasidone and Fe^{3+} ion.

Table 1: Optical characteristics of the proposed methods

Parameters	Method A	Method B
λmax (nanometers)	509	521
Beer's law limits (mg/ml)	0.25-2mg/ml	0.5-2.5mg/ml
Molar extinction coefficient (L/mol. cm)	1.2×106	3.12×105
Sandell's sensitivity(μg/cm^2/0.001 absorbance Unit)	0.5	1.5
Regression equation *(Y)		
Slope (m)	0.0092	0.301
Intercept (c)	0.014	0.0015
Correlation coefficient (r)	0.9987	0.9999

*Y=mX+c, where X is the concentration in mg/ml and Y is absorbance unit.

Table 2: Assay of Ziprasidone Hydrochloride capsules

Sample (capsule)	Labeled amount	Amount obtained mg*		**%Recovery by the proposed method	
	mg	Method A	Method B	Method A	Method B
1	20	19.98	19.96	99.98	99.96
2	20	19.99	19.98	99.97	99.95

*****Average of three determinations.

**After spiking the sample

The optical characteristics such as absorption maximum, Beer's law limits, molar absorptivity and Sandell's sensitivity are presented in Table 2. The regression analysis using the method of least squares was made for slope (m), intercept(c) and correlation obtained from different concentrations and the results are summarized in Table 2.

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