e-ISSN:2321-0812
p-ISSN:2347-2340
Research and Reviews: Journal of Pharmaceutical Analysis

Development and Validation of UV/ Visible Spectrophotometric Method for the Estimation of Oxcarbazepine in Bulk and Pharmaceutical Formulations.

Arti Mohan[1]*, and SK Ghosh[2]

[1]Malla Reddy Institute of Pharmaceutical Sciences, Secunderabad 500015, Andhra Pradesh, India.
[2]Department of Pharmaceutical Sciences, Dibrugarh university, Dibrugarh, Assam-786004, India.

Research Article

Received: 28/08/2013
Revised: 10/09/2013
Accepted: 17/09/2013

***For Correspondence**

Malla reddy Institute of Pharmaceutical Sciences, Secunderabad 500015, Andhra Pradesh, India.
Mobile: +91 9492173605

Keywords: Oxcarbazepine, Spectroscope, Absorbance, Wavelength.

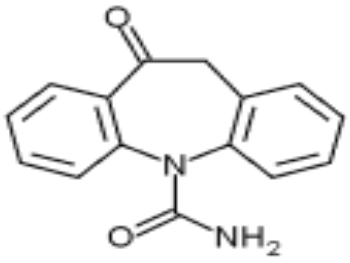
ABSTRACT

Oxcarbazepine is an anticonvulsant drug used in the treatment of epilepsy and bipolar disorder A simple, sensitive, accurate and reproducible UV/visible spectrophotometric method was developed for the determination of Oxcarbazepine in bulk and pharmaceutical dosage forms. The solvent used was distilled water and wavelength corresponding to maximum absorbance for the drug was found at 256 nm. Drug obeyed Beer's law in the concentration range of 10 - 80 µg/ml. with a correlation coefficient of 0.9995. The linear regression equation obtained was y=0.0093x+0.0064,where y is the absorbance and x is the concentration of the pure drug solution. The method was validated for several parameters such as Linearity, Accuracy, Precision and Robustness as per the ICH guidelines. The % recovery value which is close to 100% indicates reproducibility of the method and absence of interference of the excepients present in the formulation. The authors conclude that the proposed spectrophotometric method for the estimation of Oxcarbazepine can be used for routine analysis of Oxcarbazepine in bulk as well as in tablet dosage form.

INTRODUCTION

Oxcarbazepine is chemically 10,11-Dihydro-10-oxo-5 H – dibenz (b,f) azepine -5-carboxamide [1]. Oxcarbazepine is an anticonvulsant drug used in the treatment of epilepsy and bipolar disorder. Oxcarbazepine is structurally a derivative of carbamazepine [2], adding an extra oxygen atom on the dibenzazepine ring. This difference helps to reduce the impact on the liver of metabolizing the drug, and also prevents the serious forms of anaemia occasionally associated with carbamazepine [3]. After single dose administration of Oxcarbazepine to healthy male volunteers under fasted conditions, the median tmax was 4.5 hr (range 3 to 13 hours). Aside from this reduction in side effects, it is thought to have the same mechanism as carbamazepine - sodium channel inhibition - and is generally used to treat the same conditions. Oxcarbazepine has recently been found associated with a greater enhancement in mood and reduction in anxiety symptoms than other drugs employed to treat epilepsy [4].

Considering the biological importance of Oxcarbazepine and also the limitations associated with the methods reported in the literature survey ,an attempt was made here to develop a simple, rapid, economical and sensitive spectrophotometric method using analytical reagent grade acetonitrile in distilled water as a co solvent for its determination either in pure or in dosage form.



Oxcarbazepine Structural Formula

e-ISSN:2321-0812
p-ISSN:2347-2340

MATERIALS AND METHODS

Instrumentation

A visible double beam spectrophotometer with a matched pair of 1 centimetre quartz cell was employed for measuring the absorbance of all the solutions.

Chemicals and Reagents

Oxcarbazepine was obtained as a gift sample from Organosis Ltd, Noida. (U.P.) and Analytical reagent grade Acetonitrile in distilled water was used as a cosolvent .

Preparation of Standard Stock Solution

Standard stock solution was prepared by dissolving 10 mg of Oxcarbazepine in 20 ml of AR grade acetonitrile and the volume was made up to100 ml with distilled water. The final concentration of this stock solution being 100 µg/ml.

Determination of λmax

By appropriate dilution of standard stock solutions of Oxcarbazepine in distilled water containing 20µg/ml of Oxcarbazepine ,dilutions were made and scanned on Shimadzu 160A a visible double beam spectrophotometer in the range of 200- 800 nm against distilled water as blank. Wavelength of maximum absorption was determined for drug. Oxcarbazepine showed maximum absorbance at 256 nm.

Preparation of Standard Solution

Different aliquots were taken from stock solution and diluted with distilled water to prepare a series of concentration of 10 – 100 µg/ml. The solutions were scanned on spectrophotometer and their absorbencies were measured at about 256 nm using acetonitrile in distilled water as blank. The calibration curve was found to be linear in the range of 10 – 80 µg/ml. All estimations were done in triplicate and the average values were reported.

Method Validation

The method was validated for several parameters like Linearity, Accuracy, Precision, Robustness according to ICH guidelines [5,6].

RESULT AND DISCUSSION

Linearity

The linearity of the analytical method was its ability to elicit test results which are directly proportional to analyte concentration in samples within a given range. To establish the linearity of the proposed method, various aliquots of the standard solution of the drug were prepared from stock solution and analysed. The calibration graphs were obtained by plotting the absorbance versus the concentration data and were treated by linear regression analysis. The drug showed linearity in the range of 10-80 µg/ml. with a correlation coefficient of 0.9995. The slope, intercept, correlation-coefficient and optical characteristics are summarized in Table 1and 2 and Figure 1.

Table 1: Concentration and absorbance obtained for standard plot of Oxcarbazepine in distilled water.

Sr.No.	Concentration in µg/ml	Absorbance
1	0	0
2	10	0.096
3	20	0.203
4	30	0.285
5	40	0.383
6	50	0.467
7	60	0.559
8	70	0.650
9	80	0.751

e-ISSN:2321-0812
p-ISSN:2347-2340

Table 2: Optimum conditions, optical characteristics and statistical data of the regression equation for Oxcarbazepine.

Parameters	Value
Absorption maximum (nm)	256
Beer's Law limit (mcg/ml)	10-80
Correlation coefficient	0.9995
Regression equation	Y=Ax-b
Slope(A)	0.0093
Intercept (b)	0.0064

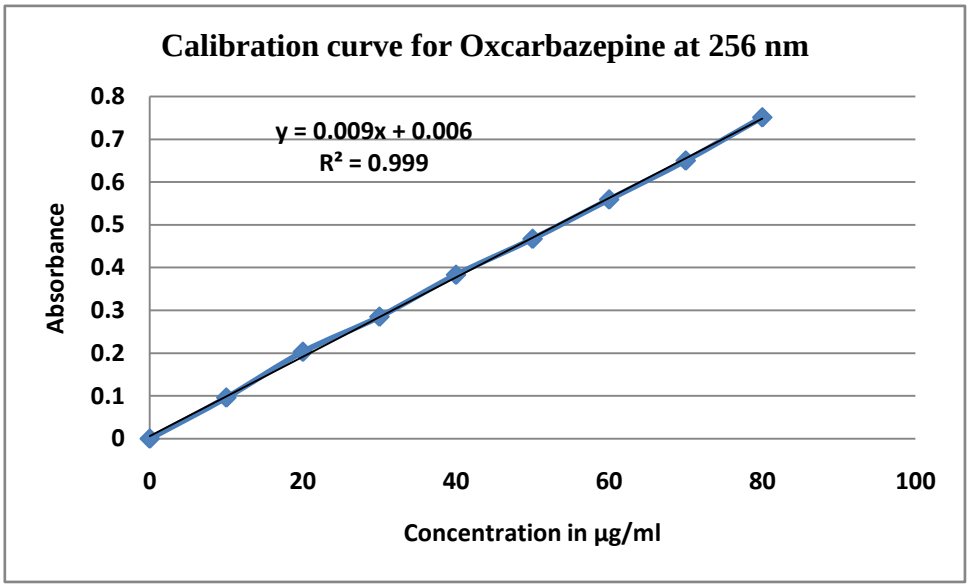


Figure 1: Calibration curve for Oxcarbazepine at 256 nm.

Accuracy

Accuracy of the proposed method was determined using recovery studies. Accuracy was determined by spiking known amounts of the analyte into the placebo formulation (F1, F2 and F3) across the specified range of the analytical procedure to obtain 40, 50 and 60 µg/ml (80, 100 and 120%). At each level, solutions were prepared in triplicate and the accuracy was evaluated in terms of percent recovery. (Table 3)

Percent Recovery was calculated using the formula

[%Recovery = 100 x Mean Experimental Concentration/ Theoretical Concentration].

Table 3: Percentage recovery for Oxcarbazepine according to the proposed method

S.No.	Initial Amount (mg)	Add of known qty of pure drug (to 100 ml of placebo formulation)	Total Theoretical drug concentration in µg/ ml	Mean Experimental drug concentration found in µg/ ml ± S.D.	% Recovery (±.S.D)
1	0 mg	4 mg	40	40.0 ± 0.03	100.00± 0.00
2	0 mg	5 mg	50	47.8 ± 0.02	96.00 ± 0.01
3	0 mg	6 mg	60	59.9 ± 0.01	99.00 ± 0.00

Precision

Precision studies were carried out to ascertain the reproducibility of the proposed method. The precision of the assay method was determined by repeatability (intra-day) and intermediate precision (inter-day).The intraday precision was evaluated by analyzing six samples of 50 µg/ml of the test concentration (n=6) at an interval of half

an hour each. Similarly interday precision was evaluated on two consecutive days (*n* = 12). Interday precision was evaluated by 3 samples at an interval of 1 hour on day 1 and 3 samples at an interval of 1 hour on day 2.The concentration of the drug was determined and the value of relative standard deviation (%R.S.D) of the assay method was calculated. The precision result showed a good repeatability with percent relative standard deviation less than 2. (Table 4 and 5)

Table 4: Intraday Precision for Lamotrigine

Time in mins	Absorbance N=3	Total Theoretical drug concentration in µg/ ml	Total Experimental drug concentration found in µg/ ml
30	0.4714,0.4712,0.4714	50	49.99± 0.01
90	0.4710,0.4714,0.4710	50	49.97 ± 0.02
150	0.4712,0.4710,0.4714	50	49.98 ± 0.02

Table 5: Interday Precision for Oxcarbazepine

Time in mins	Absorbance N=3	Total Theoretical drug concentration in µg/ ml	Total Experimental drug concentration found in µg/ ml ± S.D.
30	0.4712,0.4712,0.4710	50	49.97± 0.01
90	0.4714,0.4714,0.4714	50	50 ± 0.000
150	0.4714,0.4712,0.4714	50	49.99± 0.01

Robustness

Robustness was determined by carrying out analysis by two different analyst and also by carrying out the analysis on two different instruments and the respective absorbance was noted and the results was indicated as SD. Four sample solutions each containing 50 µg/ml were prepared and analyzed in two different U.V. visible spectrophotometers (Hewlett Packard 8453 and Shimadzu 160A) immediately after preparation. (Table 6).

Table 6 Robustness data for Oxcarbazepine

Sr.No.	Spectrophotometer 1 (Perkin Elmer Lambda 25 UV/VIS spectrometer)		Spectrophotometer 2 (Shimadzu 160A)	
	Abs	Conc	Abs	Conc
1	0.4677	49.6	0.4636	49.16
2	0.4640	49.2	0.4636	49.16

CONCLUSION

The linear calibration curve was obtained at concentration range 10-80 µg/ml. with a correlation coefficient (0.9995), Slope (0.0093) and Intercept (0.0064).

The proposed method was reproducible because results obtained with in inter-day and intra-day were in acceptable limit. The results of assay and % recovery were found to be satisfactory, indicating that the proposed method is precise and accurate and hence can be used for the routine analysis of La,motrigine in bulk and pharmaceutical formulation.

ACKNOWLEDGEMENT

I express my most cordial and humble thanks to my eminent guide respected guide Dr S.K. Ghosh, HOD, Dept of Pharmaceutical Sciences, Dibrugarh University,Dibrugarh, Assam, for his constructive and meticulous guidance. And I am immensely thankful to Organosis Ltd, Noida. (U.P.) for providing me the bulk drug as gift sample for my Research work.

REFERENCES

1. O'Neil MJ. 2001, Merck Index, An Encyclopedia of Chemicals,Drugs, and Biologicals. 13th ed. Whitehouse Station, NJ; Merck & Co., Inc.
2. Murray L. 2002, Physician's Desk Reference. 56th ed. Thomson Health Care; P. 2407.
3. Dulsat C, Mealy N, Castaner R, Bolos J. Eslicarbazepine acetate. Drugs of the Future. 2009;34(3):189.
4. OXCARBAZEPINE DAILY MED*dailymed.nlm.nih.gov/dailymed/archives/fdaDrugInfo.cfm?archiveid...*
5. ICH, Q2A validation of analytical procedure, Methodology International Conference on Harmonization, Geneva, October 1994
6. ICH, Q2B Validation of analytical procedure, Methodology International Conference on Harmonization, Geneva, March 1996.