Asian Journal of Chemistry Vol. 17, No. 3 (2005), 2049–2051

NOTE

Spectrophotometric Determination of Cefepime

D. GOWRI SANKAR*, P.V. MADHAVI LATHA and M. VAMSI KRISHNA
Department of Pharmaceutical Sciences, Andhra University, Visakhapatnam-530 003, India

Two simple and sensitive spectrophotometric methods (A and B) have been developed for the estimation of Cefepime in pure as well as in pharmaceutical formulations. Method A is based on the formation of blue coloured species with Folin-Ciocalteu reagent under alkaline conditions exhibiting maximum absorbance at 700 nm, Method B is based on the oxidative coupling reaction with 3-methyl-2-benzothiazolinone hydrazone and ferric chloride to form a coloured species with λ_{max} at 630 nm. Beer's law is obeyed at the concentration range of 10–40 μg/mL for method A and 2.5–12.5 μg/mL for method B. These methods have been statistically evaluated and are found to be precise and accurate.

Key Words: Spectrophotometric estimation, Cefepime.

Cefepime (CFM) is III generation cephelosporin and is chemically 1-[[6R, 7R)-7-[(2Z)-(2-amino-4-thiazolyl) (methoxyimino) acetyl] amino]-2-carboxy-8-oxo-5-thia-1-azabicyclo[4.2.0]oct-2-en-3-yl]methyl]-1-methyl pyrrolidinium. Literature survey reveals that a few methods have been reported for the determination of CFM[1-3] which includes HPLC and colorimetry. In method A, CFM reacts with Folin-Ciocatteu reagent in alkaline medium to form a blue coloured species having absorption maxima at 700 nm. In method B, the drug reacts with 3-methyl-2-benzothiazolin-one (MBTH) and ferric chloride to form a coloured complex of absorption maxima at 630 nm.

Spectral and absorbance measurements were made on Systronics UV-Visible spectrophotometer 117 with 10 mm matched quartz cells. 50 mL of Folin-Ciocalteu reagent (2N) diluted to 100 mL with distilled water. 4.0 g of sodium hydroxide dissolved in 100 mL of distilled water. 200 mg of 3-methyl-2-benzothiazolinone hydrazone dissolved in 100 mL of distilled water. Fresh solution of ferric chloride was prepared by dissolving 500 mg of $FeCl_3$ in 100 mL of distilled water.

Preparation of Standard and Sample Solutions

Accurately weighed 100 mg of CFM was dissolved and diluted with distilled water stepwise so as to obtain a concentration of 100 μg/mL (method A) or 50 μg/mL (method B).

Sample solution was prepared by taking an amount equivalent to 100 mg of injection powder, dissolved in 100 mL of water and diluted stepwise so as to obtain a concentration of 100 μg/mL (Method A) or 50 μg/mL (Method B).

Assay Procedures

Method A: Aliquots of standard drug solution ranging from 0.5 to 2.5 mL (100 μg/mL) were transferred to a series of 10 mL volumetric flasks. To each of the flasks, 1.0 mL of Folin-Ciocatteu reagent and 1.5 mL NaOH were added and kept aside for 5 min at room temperature. The solutions were made up to volume with distilled water. The absorbance of the blue colour (stable for 2 h) was measured at 700 nm against a reagent blank. The amount of the drug in the sample was computed from the Beer-Lambert plot.

Method B: Aliquots of standard drug solution ranging from 0.5 to 2.5 mL (50 μg/mL) were transferred to a series of 10 mL volumetric flasks. To each of the flasks, 1.5 mL MBTH and 2.0 mL of $FeCl_3$ were added and kept aside for 15 min at room temperature. The solutions were made up to volume with distilled water. The absorbance of the coloured species (stable for 1 h) was measured at 630 nm against a reagent blank. The amount of the drug in the sample was computed from the Beer-Lambert plot.

The optical characteristics such as Beer's law limits, Sandell's sensitivity, molar extinction coefficient, per cent relative standard deviation (calculated from the eight measurements containing 3/4th of the amount of the upper Beer's law limits), regression equation, correlation coefficients, detection limits, % range of error (0.05 and 0.01 confidence limits) were calculated and are shown in Table-1.

TABLE-1
OPTICAL CHARACTERISTICS AND PRECISION OF THE PROPOSED METHODS FOR CFM

Parameter	Method A	Method B
λ_{max} (nm)	700	630
Beer's law limit (μg/mL)	10–40	2.5–12.5
Molar absorptivity (1 mol^{-1} cm^{-1})	1.064×10^4	2.77×10^4
Sandell's sensitivity (μg cm^{-2}/0.001 absorbance unit)	0.0465	0.0173
Regression equation (Y = a + bC)		
Slope (b)	2.13×10^{-2}	5.68×10^{-2}
Intercept (a)	8.0×10^{-3}	2.8×10^{-3}
Correlation coefficient (r)	0.9996	0.9998
Relative standard deviation (%)*	0.295	0.299
%Range of error (confidence limits)*		
0.05 level	0.247	0.155
0.01 level	0.365	0.230

Y = a + bC, where C is concentration in μg/mL and Y is absorbance unit.
*Average of eight determinations

Pharmaceutical formulation of CFM was successfully analyzed by the proposed and reference methods. The results obtained by the proposed and reference method are presented in Table-2. To evaluate validity and reproducibility of the method, known amount of pure drug was added to previously analyzed samples and the mixtures were analyzed by the proposed method. There is no interference of other ingredients present in formulations. These results indicate that the method is simple, rapid with reasonable precision and accuracy and applicable to various formulations of CFM.

TABLE-2
ASSAY AND RECOVERY OF CFM IN DOSAGE FORMS

Name of the dosage form	Labelled amount (mg)	Content of drug found			% Recovery by proposed methods**	
		Proposed method (mg)		Reported method[R] (mg)		
		A	B		A	B
Injection I	500	499.0	500.3	500.12	99.8	100.06
Injection II	500	500.5	500.0	500.45	100.1	100.00

*Recovery amount was the average of five determinations.
[R]Reference was UV method developed in the laboratory.

ACKNOWLEDGEMENTS

Thanks are due to Aristo for the generous gift sample of Cefepime and also to Andhra University authorities for providing facilities.

REFERENCES

1. Xiano Yan Yan; Xin Hu, Guo-ying Cao and Xiao-rong He, *Zhongguo Xinyao Zazhi*, **13**, 47 (2004).
2. V. Evagelou, A. Tsantili-Kakoulidou and M. Koupparis, *J. Pharma. Biomed. Anal.*, **31**, 1119 (2003).
3. M.S. Elazazy, A. Shalaby, M.N. Elboikiny, Khalil and M. Hawa, *Scientia Pharmaceutica* **71**, 211 (2003).

(*Received*: 23 November 2004; *Accepted:* 18 March 2005) AJC-4214