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NOTE

Visible Spectrophotometric Determination of Cefuroxime Sodium

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Two simple spectrophotometric methods (A and B) have been developed for the determination of cefuroxime sodium in pure and in its pharmaceutical formulations. Method A is based on the formation of green coloured complex with ferric chloride and postassium ferricyanide exhibiting maximum aborption at 765 nm, whereas method B is based on the formation of blood red coloured complex with ferric chloride and 1,10-phenanthroline having absorption maximum at 510 nm. The results obtained are reproducible and are statistically validated.

Cefuroxime sodium (CFS) is chemically sodium-(2)-(6R,7R)-3-(carbamoyloxymethyl)-7-[2-(2-furyl)-2(methoxy-imino) acetamide]-8-oxo-5-thia-1-azabicyclo[4.2.0]oct-2-ene-2-carboxylate which is official in BP[1] and used as an antibacterial agent. Very few analytical methods have been reported for the determination of CFS which include HPLC[2–4], spectrofluorimetry[5], voltammetry[6], polarography[7] and spectrophotometry[8, 9]. The authors have developed two new spectrophotometric methods (A and B) for the determination of CFS in pure form and its pharmaceutical formulations. Method A is based on the formation of green coloured complex with ferric chloride and potassium ferricyanide and method B is based on the formation of blood red coloured complex with ferric chloride and 1,10-phenanthroline having absorption maxima at 765 nm and 510 nm respectively.

All the chemicals used were of analytical grade. Ferric chloride (0.033 M), potassium ferricyanide (0.1%) and 1,10-phenanthroline (0.1 M) in distilled water were prepared. The commercially available injections were procured from the local market. Spectral and absorbance measurements were made on Systronics UV-Visible spectrophotometer model 117 with 10 mm-matched quartz cells.

Standard and sample solutions

About 100 mg of CFS (pure or formulation) was accurately weighed and

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dissolved in 100 mL of distilled water. The above stock solution was further diluted with the same to get a working standard solution of 100 μg/mL for method A and 50 μg/mL for method B.

Method A: To a series of 10 mL graduated test tubes aliquot samples of working standard solutions of CFS ranging from 1.0 to 5.0 mL (1 mL = 100 μg) were transferred, then 1.5 mL of ferric chloride (0.033 M) and 1.5 mL of potassium ferricyanide (0.1%) were added and kept aside at room temperature for 30 min for complete colour development. Appropriate quantity of distilled water was added to all the test tubes to make the volume up to 10 mL in each. The absorbance of green coloured chromogen formed was measured at 765 nm against reagent blank. The amount of CFS present in the sample solution was computed from its calibration curve.

Method B: Aliquots of working standard solution of CFS ranging from 0.25 to 1.5 mL (1 mL = 50 μg) were transferred into a series of 10 mL volumetric flasks. To that 0.5 mL of $FeCl_3$ (0.033 M) and 2.0 mL of 1,10-phenanthroline (0.1 M) were successively added and heated on a water bath at 70°C for five minutes. The tubes were cooled to room temperature and the final volume was brought to 10 mL with distilled water. The absorbance of the blood red coloured species formed was measured at 510 nm against reagent blank and the amount of CFS present in the sample solution was computed from its calibratin curve.

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 ¾th of the amount of the upper Beer's law limits of CFS), % range of error (0.05 confidence limits) were found to be 10–50 μg/mL, 0.05464, 8.1685×10^3, 0.1935, ±0.1625 for method A and 2.5–15 μg/mL, 0.0191, 2.3389×10^4, 0.3335, ±0.2793 for method B respectively. The values obtained for the determination of CFS in several pharmaceutical formulations (injections) by the proposed and reported methods are compared in Table-1.

TABLE-1
ESTIMATION OF CEFUROXIME SODIUM IN PHARMACEUTICAL FORMULATIONS

Sample	Labelled amount (mg)	Amount obtained (mg)		Per cent recovery of the proposed method	
		Proposed methods			
		A	B	A	B
1.	250	249.3	250.4	99.72	100.16
2.	250	250.6	249.2	100.24	99.68
3.	500	498.4	501.2	99.68	100.24

To evaluate the validity and reproducibility of the methods, known amount of pure drug was added to the previously analysed pharmaceutical preparations and the mixtures were analysed by proposed methods and the per cent recoveries are given in Table-2. Interference studies revealed that the common excipients and other additives usually present in the dosage form did not interfere in the proposed methods. In conclusion, the proposed methods are simple, sensitive and accurate

and can be used for the routine determination of CFS in bulk as well as in its pharmaceutical preparations.

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