

CEFADROXIL:A REVIEW OF ANALYTICAL METHODS

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ABSTRACT

Cefadroxil, a first-generation cephalosporin antibiotic, is used to treat urinary tract infections, skin and skin structure infections, pharyngitis and tonsillitis. Like all beta-lactam antibiotics, cefadroxil binds to specific penicillin-binding proteins (PBPs) located inside the bacterial cell wall, causing the inhibition of the third and last stage of bacterial cell wall synthesis. This article examines published analytical techniques that are reported so far for determination of cefadroxil in bulk and pharmaceutical formulation. They include various techniques like spectroscopies first order, second order, colorimetry, high performance liquid chromatography, high performance thin layer chromatography, FT-IR.

Keywords: Cefadroxil, Analytical methods.

INTRODUCTION

Cefadroxil chemically a 7-[[2-amino-2-(4-hydroxyphenyl) acetyl] amino]-3-methyl-8-oxo-5-thia-1-azabicyclo [4.2.0] oct-2-ene-2- carboxylic acid Cefadroxil [1].

Cefadroxil, a first-generation cephalosporin antibiotic, is used to treat urinary tract infections, skin and skin structure infections, pharyngitis and tonsillitis. Like all beta-lactam antibiotics, cefadroxil binds to specific penicillin-binding proteins (PBPs) located inside the bacterial cell wall, causing the inhibition of the third and last stage of bacterial cell wall synthesis. Cell lysis is then mediated by bacterial cell wall autolytic enzymes such as autolysins; it is possible that cefadroxil interferes with an autolysin inhibitor. Literature survey revealed that cefadroxil was qualitatively assayed in biological fluids either individually or in presence of other antibacterial drugs using liquid chromatography, other new methods and using hydrotope are also there for the determination of cefadroxil [2-7].

Cephalosporin are derivatives of 7-aminocephalosporic acid and are closely related to penicillin in structure. Cephalosporin's have six membered sulfur containing ring adjoining a lactam ring. Cefadroxil is very active against gram positive *cocci*. Antibiotics

require constant drug level in body for therapeutic effect [8-11].

This article examines published analytical techniques that are reported so far for determination of cefadroxil in bulk and pharmaceutical formulation. They include various techniques like spectroscopies first order, second order, colorimetry, high performance liquid chromatography, high performance thin layer chromatography. overview of these methods for determination of cefadroxil is shown in figure 2 [12-15].

SOLUBILITY PREPARATION

Solubility

According to Biopharmaceutical Classification System (BCS) water solubility of cefadroxil is 0.399 mg/ml. sparingly soluble in methanol, ether, acetonitrile. The melting point 197⁰c.

Sample preparation strategies

Sample preparation is the integrated part of analytical methodology, and it was reported that approximately 30% errors contributed from sample analysis was due to sample preparation. Various diluents used for analysis of cefadroxil include. Methanol: Ethyl

acetate: Formic acid (1.5: 8: 0.8, v/v/v) 230 nm. The solvent used was methanol and distilled water (50:50) and the λ_{max} or the absorption maxima of the drug was found to be 264nm

Solubility of cefadroxil was determined in distilled water and 6M urea solution at 28 } 1°C. There was more than 10-fold enhancement in the solubility of drug in 6 M urea solution, as compared to the solubility in the distilled water. KH₂PO₄: acetonitrile in the ratio of 65:35 % v/v and the pH 3.5 adjusted with 0.2% orthophosphoric acid. The solvent used in the combination of water and methanol in the ratio of 75:25. Accurately 10 mg each of CEF transferred to two different 100ml volumetric flask .volume was made up to the mark with Methanol. Methanol: Triethylamine (85: 15: 0.1), adjusted pH-5.5 with 1% H₃PO₄ as the mobile phase. Phosphate buffer pH 5.0 and acetonitrile ratio (96:4) was used. Methanol: Phosphate buffer (10: 90)

ANALYTICAL METHODS

Spectrophotometry

In the literature,11 methods were spectrophotometry,8 methods are for determining cefadroxil alone, whereas remaining are for quantifying cefadroxil in combination with other drugs substance. Table 2 shows the summary of the reported spectroscopic methods indicating the basic principle, lamda max, solvent, limit of detection.

Colorimetry

In the literature,1 methods were colorimeter 1 methods are for determining cefadroxil alone, Table 3 shows the summary of the reported colorimeter methods indicating the basic principle, lamda max, solvent, limit of detection.

High performance layer chromatography

In the literature,04 methods were High performance layer chromatography 02methods are for determining cefadroxil alone, where remaining are for quantifying cefadroxil in combination with other drugs substance. Table 4 shows the summary of the reported spectroscopic methods indicating the basic principle, lamda max, solvent, limit of detection

High performance thin layer chromatography

In the literature, 01 methods were High performance thin layer chromatography 01methods are are for quantifying cefadroxil in combination with other drugs substance. Table 5 shows the summary of the reported spectroscopic methods indicating the basic principle, lamda max, solvent, limit of detection

FT-IR

This paper describes the development and validation of an innovative method using Fourier Transform Infrared (FT-IR) transmission spectroscopy for the determination and quantification of cefadroxil monohydrate in capsules (table 2).

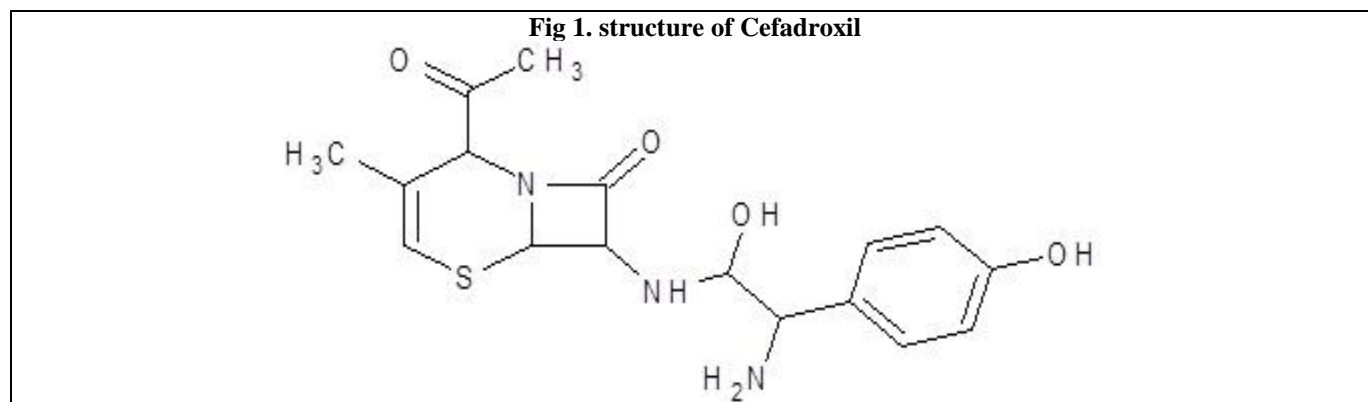


Table 1. Overview of analytical methods for determination of cefadroxil in pharmaceutical formulation

SR NO	Analytical methods	No of methods
1	Spectroscopic	09
2	First order spectroscopic	01
3	Second order spectroscopic	01
4	colorimetry	01
5	High performance thin layer chromatography	01
6	High performance layer chromatography	04
7	FT-IR	01

Table 2. Representative Spectroscopic methods for analysis of cefadroxil

Compounds	Methods	λ_{\max}	Solvent	LOD	Ref
Cefadroxil	UV-Spectroscopy	224nm	water and methanol in the ratio of 75:25	---	[1,2]
Cefadroxil	Spectrophotometric Determination of Cefadroxil in Bulk and Dosage Forms using 2,4-Dinitrophenylhydrazine	515 nm.	2,4-dinitrophenylhydrazine, distilled water	0.89 and 2.7 $\mu\text{g/ml}$,	[3]
Cefadroxil	Spectrophotometric Determination of Cefadroxil in Bulk and Dosage Forms	587 nm	Ninhydrin, methanol	1.08 $\mu\text{g/ml}$,	[3]
Cefadroxil	Spectrophotometric Determination of Cefadroxil in Bulk and Dosage Forms	264nm.	solvent used was methanol and distilled water (50:50)	0.25 $\mu\text{g/ml}$	[5]
Cefadroxil	Quantitative spectrophotometric estimation of cefadroxil using hydrotropic solubilization technique	263 nm	hydrotropic solution of urea (6 M), water	---	[6]
Cefadroxil	Spectrophotometric Determination of Cefadroxil in Bulk and Dosage Form Using Sodium Hydroxide	342 nm	mixture of 4 volumes of acetonitrile and 96 volumes of a 2.72 g/L solution of potassium dihydrogen phosphate	2.31 $\mu\text{g/mL}$.	[8]
Compounds	Methods	λ_{\max}	Solvent	LOD	Ref
Cefadroxil and probencid	Derivative Spectrophotometric Determination of Cefadroxil and probencid	260 nm and 237.8 nm	Methanol and 0.1 N HCL	0.393 $\mu\text{g/ml}$	
Cefadroxil and probencid	Simultaneous UV Spectrophotometric Methods For Estimation Of Cefadroxil And Probenecid In Tablet Dosage Form	233 nm and 247 nm.	Methanol.	----	[9]
Cefadroxil And Clavulanic Acid	Analytical Method Development And Validation For Simultaneous Estimation Of Cefadroxil And Clavulanic Acid In Pharmaceutical Dosage Form	231 nm and 288 nm	Water:Methanol: Triethylamine (85: 15: 0.1), adjusted pH-5.5 with 1% H ₃ PO ₄ as	0.27 $\mu\text{g/ml}$	-
Cefadroxil	Development and validation of spectrophotometric	257 nm	methanol.	0.088749 $\mu\text{g/ml}$	[10]

	methods for the estimation of Cefadroxil in tablet dosage forms				
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Table 3. Representative Colorimetry methods for analysis of cefadroxil

Compounds	Methods	□□max	Solvent	LOD	Ref
Cefadroxil and Ceftriazone	Colorimetric Determination of Cefadroxil and Ceftriazone in Pharmaceutical Dosage Forms	475 nm	<i>1, 2- naphthaquinone-4-sulfonic acid sodium.</i>	10 µg/ml	[11]

Table 4. Representative High performance layer chromatography methods for analysis of cefadroxil

Compounds	Methods	□□max	Solvent	LOD	Ref
Cefadroxil	Determination of Cefadroxil in Tablet/Capsule formulations by a validated Reverse Phase High Performance Liquid Chromatographic method	---	methanol: Phosphate buffer (10: 90)	0.5 µg/ml	[12]
Cefadroxil	Noval estimation of cefadroxil in tablet dosage forms by RP-HPLC	254 nm	phosphate buffer pH 5.0 and acetonitrile ratio (96:4) was used.	0.4 µg/ml	[13]
Cefadroxil and Clavulanic acid	RP-HPLC methods have been developed for the simultaneous estimation of Cefadroxil and Clavulanic acid in pharmaceutical DF	285 nm	Methanol: Triethylamine (85: 15: 0.1), adjusted pH-5.5 with 1% H3PO4 as the mobile phase at a	0.06 µg/ml	[13]
Compounds	Methods	□□max	Solvent	LOD	Ref
Cefadroxil And Probenecid	Rp-Hplc Method Development And Validation For Simultaneous Estimation Of Cefadroxil And Probenecid In Synthetic Mixture	226 NM	phosphate buffer (pH adjusted to 6.0±0.1 using orthophosphoric acid): acetonitrile in the proportion of 20:80 (v/v).	0.542 µg/ml	[14]
Cefadroxil Monohydrate	Development and validation of RP-HPLC method for the estimation of Cefadroxil Monohydrate in bulk and its tablet dosage form	220 nm	KH2PO4: acetonitrile in the ratio of 65:35 % v/v and the pH 3.5 adjusted with 0.2% orthophosphoric acid.	0.0085 µg/ml	-

Table 5. High performance thin layer chromatography

Compounds	Methods	□□max	Solvent	LOD	Ref
Clavulanate	High Performance Thin	230 nm	Methanol: Ethyl acetate:	47.44 µg/ml	[15]

and Cefadroxil	Layer Chromatographic Determination of Potassium Clavulanate and Cefadroxil in Combined Tablet Dosage Form		Formic acid (1.5: 8: 0.8, v/v/v)		
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Table 6. FT-IR

Compounds	Methods	□□max	Solvent	LOD	Ref
Cefadroxil	Development and Validation of an Innovative Method for the Determination of Cefadroxil Monohydrate in Capsules using FT IR	-	KBR	-	[15]

CONCLUSION

A large number of techniques are available for the estimation of cefadroxil in pharmaceutical formulation. The survey of analytical method data revealed that HPLC, UV, COLORIMETRY, IR, HPTLC Methods are predominant for the estimation of drug alone or in combination with other drug in various formulation type. This article examines published analytical techniques that

are reported so far for determination of cefadroxil in bulk and pharmaceutical formulation.

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Nil

CONFLICT OF INTEREST

No interest

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