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COMPREHENSIVE ANALYSIS OF EPERISONE HYDROCHLORIDE: A REVIEW ON UV, HPLC, AND HPTLC METHODS ALONE AND IN COMBINATION WITH OTHER DRUGS

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ABSTRACT

This review article provides a comprehensive analysis of the various analytical methods utilized for the determination of eperisone hydrochloride, a muscle relaxant drug. The methods discussed include UV spectrophotometry, high performance liquid chromatography (HPLC), and high-performance thin layer chromatography (HPTLC). These techniques are employed to measure the levels of eperisone hydrochloride in pharmaceutical formulations, both as a standalone drug and in combination with other pharmaceutical substances. The article highlights the principles, advantages, and limitations of each method, as well as their linearity and detection wavelength. The review aims to provide researchers and analysts in the pharmaceutical field with a comprehensive overview of the available methods for the analysis of eperisone hydrochloride.

KEYWORDS: Eperisone Hydrochloride, UV, HPLC, HPTLC, Validation.

INTRODUCTION

Eperisone HCl

Eperisone hydrochloride, chemically described as 1-(4-ethylphenyl)-2-methyl-3-(1-piperidyl)propan-1-one hydrochloride, functions as an antispasmodic medication. Its mechanism of action involves inducing relaxation in both skeletal and vascular smooth muscles. Eperisone exhibits diverse effects, including diminishing myotonia, enhancing circulation, and suppressing the pain reflex. By interrupting the harmful cycle of myotonia, the drug reduces pain, ischaemia, and hypertonia in skeletal muscles. This process alleviates stiffness and spasticity while promoting smoother muscle movement.

The relative bioavailability of Eperisone osmotic tablet was 109.7%. The osmotic controlled release drug formulation was found to release Eperisone for an extended period with less inter individual fluctuation in pharmacokinetic variables.

Literature survey reveled that various analytical techniques,such as Spectrophotometry, High Performance Liquid Chromatography (HPLC), and High-Performance Thin Layer Chromatography (HPTLC), have been reported for assessing Eperisone hydrochloride levels in pharmaceutical formulations. These methods are employed to determine the presence of Eperisone hydrochloride, whether as a standalone drug or in combination with other pharmaceutical substances.

Drug profile

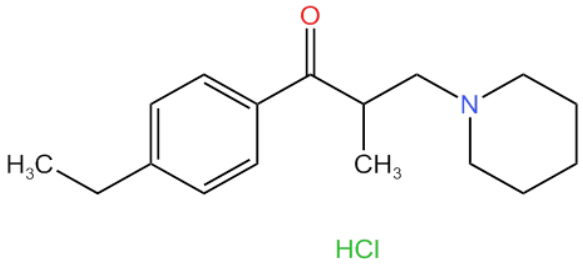

Fig. 1: Structure of Eperisone HCl.

IUPAC name

1-(4-Ethylphenyl)-2-methyl-3-(1-piperidyl)propan-1-one hydrochloride.

Molecular formula: C17H26NOCl

Molecular weight: 295.89

Category: Muscle relaxant.

Description: White crystalline powder.

Storage: Eperisone hydrochloride should be stored at temperatures not exceeding 30ºC, and should be protected from moisture after opening package.

Table 1: Solubility of Eperisone hydrochloride in different solvents.

Solvents	Solubility
Methanol	Freely soluble
Acetic acid	Freely soluble
Ethanol	Freely soluble
Chloroform	Soluble
Distilled water	Freely soluble
6.8 pH phosphate buffer	Slightly soluble
0.1 N Hcl	Soluble
0.1 N NaOH	Slightly soluble

Table 2: Information of drugs.

Sr. no.	Drug name	Information of drug
1	Paracetamol	Category: analgesic Molecular formula: $C_8H_9NO_2$ Molecular weight: 151.165 g·mol^{-1} IUPAC Name: N-(4-hydroxyphenyl)ethanamide Pka value: 9.5
2	Aceclofenac	Category: non-steroidal anti-inflammatory drug Molecular formula: C16H13Cl2NO4 Molecular weight: 354.1847 g/mol IUPAC Name: 2-[2-[2-[(2,6-dichlorophenyl)amino]phenyl]acetyl]oxyacetic acid pka value: 4.7
3	Diclofenac	Category: non-steroidal anti-inflammatory drug Molecular formula: C14H11Cl2NO2 Molecular weight: 296.148 g/mol IUPAC Name: 2-[2-(2,6-dichloroanilino)phenyl]acetic acid pka value: 4.0
4	Lornoxicam	Category: non-steroidal anti-inflammatory drug Molecular formula: C13H10ClN3O4S2 Molecular weight: 371.8192 g/mol IUPAC Name: 6-chloro-4-hydroxy-2-methyl-N-2-pyridinyl-2H-thieno[2,3-e]-1,2-thiazine-3-carboxamide 1,1-dioxide pka value: 4.7

Chromatographic methods

Literature survey revealed that various UV, HPLC and HPTLC methods have reported for estimation of Eperisone with other drugs. The methods have been found to be simple, accurate, robust and suitable for routine analysis of drug samples in their formulations. The conditions for HPLC analyse of Eperisone HCl in its combined dosage form listed in table 4.

Table 3: UV methods for analysis of Eperisone either alone or in combination with other drugs in pharmaceutical dosage form.

Sr. no	Drug	Method	Description	Detection wavelength	Linearity	Sample matrix	Reference
1	Eperisone HCl +Paracetamol	Q-Absorbance ratio method	**Solvent:** Methanol	**Eperisone HCl:**260 nm **Paracetamol :**249 nm	**Eperisone HCl:** 5-25 µg/mL **Paracetamol :** 2-10 µg/mL	tablet	[1]
2	Eperisone HCl +Paracetamol	Vierodt's method	**Solvent:** Distilled Water	**Eperisone HCl:**261.88 nm **Paracetamol :**243.77nm	**Eperisone HCl**: 1-5 µg/mL **Paracetamol :**2-10 µg/mL	tablet	[2]

3	Eperisone HCl +Aceclofenac	Area under curve	**Solvent:** Methanol	**Eperisone HCl:**255nm **Aceclofenac:** 277nm	**Eperisone HCl:** 2-10 µg/mL **Aceclofenac:** 2-10 µg/mL	Laboratory mixture	[3]
4	Eperisone HCl +Diclofenac	Vierodt's method	**Solvent:** Distilled water	**Eperisone HCl:**255nm **Diclofenac Sodium:**277 nm	**Eperisone HCl:** 3-18µg/mL **Diclofenac Sodium:**2-12 µg/mL	capsule	[4]
5	Eperisone Hydrochloride and Lornoxicam In Synthetic Mixture	Dual Wavelength Method	**Solvent:** Distilled water	**Eperisone HCl:**262nm **Lornoxicam :**363.20 nm	**Eperisone HCl:** 4-20 µg/mL **Lornoxicam :**4-28 µg/mL	Synthetic mixture	[5]
6	Paracetamol+ Aceclofenac +Eperisone Hydrochloride	Simultaneous equation method and multivariate chemometric method	**Solvent:** phosphate buffer pH 7.80	**Eperisone HCl:**262nm **Aceclofenac:** 272 nm **Paracetamol :**243nm	**Eperisone HCl:** 2.76–4.15µg/mL **Aceclofenac:** 3.69–5.53 µg/mL **Paracetamol :** 12–18 µg/mL	tablet	[6]
7	Eperisone Hydrochloride	Two Spectroscopic Methods: Initial rate method and Fixed time method	**Solvent:** Double distilled water	**Eperisone HCl:**261.40nm	**Eperisone HCl:** 2-20 µg/mL	tablet	[7]
8	Eperisone Hydrochloride	Area Under Curve Method	**Solvent:** Double Distilled water	**Eperisone HCl:**260nm	**Eperisone HCl:** 2-20 µg/mL	tablet	[8]

Table 4: HPLC methods for analysis of Eperisone either alone or in combination with other drugs in pharmaceutical dosage form.

Sr. no	Drug for simultaneous estimation	Mobile phase	Column	Wavelength	Injection volume	Flow rate	Pump mode	Reference
1	Paracetamol	Methanol: 0.05 mM Ammonium acetate buffer: Acetonitrile (60:30:10)	HiQsil C-18HS column having 250 mm× 4.6 mm	264nm	20µl	1.0 ml/min		[9]

		and adjusted to pH 5.8 using Glacial acetic acid for RP-HPLC system						
2	Paracetamol	ammonium acetate buffer (10 mM, pH 3), Acetonitrile, and methanol	Gemini C18 column (4.6 mm × 250 mm; 5 µm particle size)	262nm	20µl	1.2ml/ min		[10]
3	Paracetamol	Methanol: Ortho phosphoric acid (55: 45, v/v)	Phenomenex Column (150mm×4.6m m, 5µm)	270nm	20µl	1.0ml/ min		[11]
4	Diclofenac Sodium	Methanol, Phosphate Buffer(0.1M, pH 6) and Acetonitrile in the ratio of 30:40:30 (v/v/v)	Thermo Hypersil C-8 column (250×4.6mm, 5µm)	261nm	10 µL	1.0 mL/ min	gradient	[12]
5	Diclofenac Sodium	30mM phosphate buffer (pH 2.5): methanol (20:80 v/v)	Phenomenex C18 column (250 × 4.6mm)	268 nm	10 µL	1.0 ml/min	Isocratic	[13]
6	Diclofenac Sodium	ammonium acetate buffer (pH=6.0 adjusted with glacial acetic acid) and acetonitrile (50:50 v/v)	C18 column (150 x 4.6 mm, 5 µ)	256 nm	20 µL	1.0 ml/min	isocratic mode	[14]
7	Diclofenac Sodium	Acetonitrile: Phosphate buffer pH-5.8 in the ratio 55:45 v/v	C18 column (150 x 4.6 mm, 5 µ)	225 nm	-	-	isocratic mode	[15]
8	Diclofenac Sodium	Methanol: Acetonitrile: Triethylamine (50:50:2.0 ml v/v)	Nucleosil C18 (250 x 4.0 mm, 3 µm) column	255 nm	20 µL	1.0 ml/min	-	[16]

9	Diclofenac Sodium	Acetonitrile and 0.05% TEA pH 3.5 (75:25% v/v	Waters -ODS 5 µ C18 column (250 X 4.6mm)	273 nm	20 µL	1.0 ml/min	-	[17]
10	Lornoxicam	Methanol: Water (55:45) with 0.1% v/v Ammonium Hydroxide, pH 7.4	Phenomenex C18 Analytical Column (25×0.46 cm, 5 µm)	274 nm	20 µL	1.0 ml/min	isocratic system	[18]
11	Eperisone Hydrochloride	Acetonitrile: 0.01M Ammonium acetate buffer (30:70 v/v), (pH -3.5)	Waters C18, 5um (4.6×250mm) column	256 nm	20 µL	1.0 mL/min	isocratic mode	[19]

Table 5: HPTLC methods for analysis of Eperisone either alone or in combination with other drugs in pharmaceutical dosage form.

Sr. no.	Drug	Description	Detection wavelength	Rf value	Reference
1	Eperisone Hydrochloride and Paracetamol	**Mobile phase:** Toluene: methanol : ethyl acetate : glacial acetic acid (4 : 3.5 : 2.5 : 0.05) (v/v/v/v) **Plate:**100 mm × 100 mm on precoated silica gel G60-F254 aluminum sheet	248nm	**Eperisone HCl:** 0.26 **Paracetamol:** 0.79	[20]
2	Eperisone Hydrochloride and Paracetamol	**Mobile phase**- ethyl acetate: toluene: methanol (2:2:1 v/v/v) **Plate:** TLC aluminum plate, pre-coated with silica gel 60F-254 (10 × 10 cm)	260nm	**Eperisone HCl:** 0.60 ± 0.02 **Paracetamol:** 0.42 ± 0.04	[21]
3	Eperisone HCl and Diclofenac sodium	**Mobile phase-** Toluene: Ethyl acetate: Methanol (7: 3: 1, v/v/v) **Plate:** TLC aluminum plate, pre-coated with silica gel 60F-254 (10 × 10 cm)	268nm	**Eperisone HCl:** 0.25±0.04 **Diclofenac Sodium:** 0.59±0.07	[22]
4	Eperisone HCl and Lornoxicam	**Mobile phase-** toluene: ethyl acetate: methanol: triethylamine (5: 3.5: 1.5: 0.2 v/v/v/v) **Plate:** TLC aluminum plate, pre-coated with silica gel 60F-254 (10 × 10 cm)	278nm	**Eperisone HCl:** 0.55 ± 0.02 **Lornoxicam:** 0.3 ± 0.02	[23]

CONCLUSION

In this systematic review we investigated diverse analytical methods employed for the determination of eperisone HCl and its combined pharmaceutical dosage forms a wide array of instrumental methods was successfully developed to quantitatively estimate eperisone nevertheless the reported methods were characterized by complexity and a time consuming nature specifically a significant number of uv, hplc and hptlc methods were established for the analysis of eperisone HCl both as an individual entity and in combination with other drugs these methodologies demonstrated success in achieving accurate quantitative results however the observed complexity and time consuming aspects of these methods highlight a potential limitation in their practical application within routine pharmaceutical analysis future research endeavors may aim to streamline these techniques ensuring a balance between precision and practical feasibility this systematic review underscores the importance of continuous improvement in analytical methodologies for eperisone hcl ultimately contributing to the enhanced quality control of pharmaceutical formulations

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