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ANALYTICAL TECHNIQUES FOR THE ASSAY OF ETORICOXIB - A REVIEW

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ABSTRACT

Etoricoxib is an oxicam-class nonsteroidal anti-inflammatory drug. An enzyme called cyclooxygenase-2 (COX-2) is responsible for pain and inflammation. Etoricoxib is the most recent selective (COX-2) inhibitor with more COX-2 selectivity than previous COX-2-selective NSAIDs, significantly improving its gastric safety profile. 5-Chloro-6'-methyl-3-[4-(methylsulfonyl)phenyl]-2,3'-bipyridine is the IUPAC name of Etoricoxib. Etoricoxib is water insoluble but rapidly soluble in alkaline aqueous solutions. The current therapeutic indications of etoricoxib include treating several painful conditions, such as osteoarthritis, acute gout, ankylosing spondylitis, and rheumatoid arthritis. The following review covers the analytical techniques for the analysis of Etoricoxib.

KEYWORD: Etoricoxib, Method development, Cyclooxygenase-2, Nonsteroidal anti-inflammatory drugs, pain.

INTRODUCTION

Selective cyclooxygenase (COX)-2 inhibitors are a class of nonsteroidal anti-inflammatory drugs (NSAIDs) that have become important in the pharmacological management of pain and arthritis.[1] Etoricoxib (ETX) chemically 5-chloro-2-(6-methylpyridin-3-yl)-3-(4-methylsulfonylphenyl) pyridine is a methyl sulphone derivative (Figure **1**).[2,3] Etoricoxib is also a bipyridine derivative. This newer COX-2 inhibitor has the highest COX-2 selectivity.[4]

Etoricoxib is generally administered through an oral route. Etoricoxib (Figure 1) has a molecular formula $C_{18}H_{15}ClN_2O_2S$ and a molecular weight 358.8419 g/mole, and it is a white or off-white powder with a bitter taste. The pKa values of Etoricoxib are found to be 3.9 and 4.6.[5,6]

Etoricoxib selectively inhibits isoform 2 of the enzyme cyclooxygenase (COX-2), it is mainly used in the management of[1]

- Osteoarthritis,
- Rheumatoid Arthritis,
- Acute Gouty Arthritis,
- Ankylosing Spondylitis
- Low Back Pain,
- Acute Postoperative Pain,
- Primary Dysmenorrhea

Side effects are[4]

- Dyspepsia,
- Abdominal Pain,
- Pedal Edema,
- Rise in Blood pressure
- Dry Mouth,
- Aphthous Ulcers,
- Taste Disturbance And
- Paresthesias

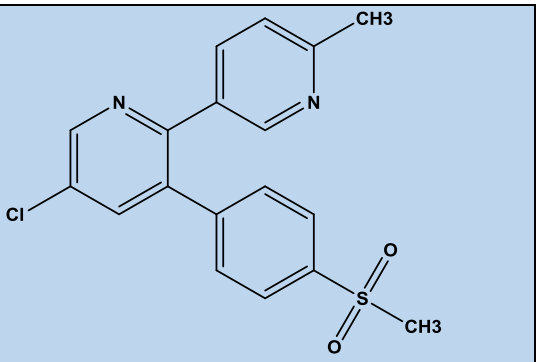

Figure 1: Chemical structure of Etoricoxib.

The present review article summarizes the analytical techniques so far developed, such as spectrophotometry[7-14] (Table 1), high performance thin layer chromatography[15-16] (Table 2), high-performance liquid chromatography[17-28] (Table 3), and Hyphenated techniques[29-30] (Table 4) for the determination of etoricoxib and some of the analytical parameters were highlighted.

1. Spectrophotometric method

Table 1: Determination of Etoricoxib (ETX) by UV Spectrophotometric Method.

Solvent/Reagent	λ_{max} (nm)	Linearity (µg/ml)	Reference
0.1N HCl	233	2-24	[7]
0.1N HCl	234	3-15	[8]
Methanol and phosphate buffer (pH 7.2)	284	4-24	[9]
0.1 N HCl	233	0.1-0.5	[10]
Methanol	248	1-8	[11]
Chloroform	247	1-40	[12]
Methanol	234	1-11	[13]
Methanol	284	5-50	[14]

2. High Performance Thin Layer Chromatography (HPTLC)

Table 2: Determination of etoricoxib (ETX) by HPTLC Method.

Mobile Phase	λ (nm)	Stationary Phase	Linearity Range (ng/band)	LOD (ng/band)	LOQ (ng/band)	Reference
toluene: ethyl acetate: methanol (6: 4: 1)	258	silica gel 60 F	50-300	-	-	[15]
ethyl acetate-methanol (8:2)	290	silica gel 60F254	50-250	10.993	33.314	[16]

3. High Performance Liquid Chromatography (HPLC)

Table 3: Determination of etoricoxib (ETX) by HPLC Method.

Technique	Mobile Phase	Flow rate	LOD (µg/ml)	LOQ (µg/ml)	References
RP-HPLC	Acetonitrile: pH 3 phosphate buffer (70:30% v/v)	1.0 ml/min	3.3172	8.132	[17]
RP-HPLC	Acetonitrile: Water (55:45 %v/v)	0.8 ml/min	0.0837	0.253	[18]
RP-HPLC	mixture of solution (1 ml TFA in 2-liter milli-Q water) and acetonitrile (75:25 v/v).	1.5 ml/min	0.5273	1.598	[19]
RP-HPLC	mixture of phosphate buffer (PH6, adjusted with orthophosphoric acid) and methanol (30:70 v/v)	1.2 ml/min	0.0115	0.0348	[20]

RP-HPLC	acetonitrile and potassium dihydrogen phosphate buffer (pH 4.2) (46:54 % v/v)	1.2 ml/min	0.0704	0.2134	[21]
RP-HPLC	acetonitrile: (0.05M) KH2PO4 buffer (50:50)	1.8 ml/min	0.193	0.450	[22]
HPLC	mixture of acetonitrile: methanol: 10mM potassium dihydrogen phosphate (pH 3.0 adjusted with orthophosphoric acid)	1 ml/min	-	-	[23]
HPLC	ammonium acetate buffer: acetonitrile (65:35 v/v)	1 ml/min	10	20	[24]
HPLC	Methanol	1 ml/min	250	650	[25]
RP-UFLC	Acetonitrile: water (50: 50)	0.8 ml/min	0.0291	0.0894	[26]
RP-HPLC	methanol, and phosphate buffer of pH 6 in a ratio of 70:30 (v/v)	0.8 ml/min	5.08	16.94	[27]
RP-HPLC	acetonitrile, methanol and water in the proportion of 60:15:25 (v/v/v)	1 ml/min	-	-	[28]

4. Hyphenation Techniques

Table 4: Determination of etoricoxib (ETX) by hyphenated Method.

Mobile Phase	Column	Method	Flow Rate	LOQ (ng/ml)	Reference
component A, 5mM KH_2PO_4 adjusted to pH 2.5 with 5mM H_3PO_4, and component B, acetonitrile.	LC-MS AQ-ODS	isocratic elution	1 ml/min	0.04	[29]
0.01M acetate buffer pH 5.0 -acetonitrile (60 : 40, v/v)	UPLC™ BEH C18	gradient elution	0.3 ml/min	-	[30]

CONCLUSION

Various analytical techniques for estimating Etoricoxib in bulk, pharmaceutical formulations, and biological samples were reported, including UV, HPTLC, HPLC, UPLC and LC-MS methods. This review will help readers in understanding the analytical methodologies presented for quantifying Etoricoxib.

CONFLICT OF INTEREST: There isn't any potential for a conflict of interest.

REFERENCE

1. Brooks P, Kubler P. Etoricoxib for arthritis and pain management. Ther Clin Risk Manag, Mar, 2006; 2(1): 45-57. PMID: 18360581; PMCID: PMC1661646.
2. Leclercq P and Malaise MG. “Etoricoxib (Arcoxia)”. Revue Medicale de Liege, 2004; 59.5: 345-349.

3. Duncan MR and Capell HA. "Etoricoxib in the treatment of chronic pain". International Journal of Clinical Practice, 2003; 57.4: 315-318.
4. Tripathi, K. D. Essentials of medical pharmacology (8th ed.). Jaypee Brothers Medical, 2018; 206.
5. Matsumoto AK., et al. "A randomized, controlled, clinical trial of Etoricoxib in the treatment of rheumatoid arthritis". Journal of Rheumatology, 2002; 29.8: 1623-1630.
6. Cochrane DJ., et al. "Etoricoxib Drugs", 2002; 62.18: 2637-2651.
7. Shahi, Sadhana & Agrawal, G & Rathi, Pavan & Shinde, N & Somani, V & Mahamuni, S & Padalkar, Dr.Abhay. (2008). Development and validation of UV spectrophotometric method for the determination of etoricoxib in bulk and tablet formulation. Rasayan Journal of Chemistry, 2008; 1.2: 390-394.
8. Sciences, W. J. o P. a P. (2021, January 22). Method Development and Validation of Pregabalin and Etoricoxib in Bulk and Pharmaceutical Dosage form by UV Spectroscopy (Standard Addition) Method. https://doi.org/10.17605/OSF.IO/4XDC2
9. Koshti N, Mashru R, Development and Validation of UV Spectrophotometric Method for Simultaneous Estimation of Pregabalin and Etoricoxib in Bulk and Pharmaceutical Dosage Form and the Extension of the Developed Colorimetric Method for Estimation of Pregabalin using Smartphone Application, June, 2021; 8(6): 387-398. DOI: https://doi.org/10.52403/ijrr.20210649
10. Singh S, Mishra A, Verma A, Ghosh AK, Mishra AK. A simple Ultraviolet spectrophotometric method for the determination of etoricoxib in dosage formulations. J Adv Pharm Technol Res., Oct, 2012; 3(4): 237-40. doi: 10.4103/2231-4040.104715. PMID: 23378945; PMCID: PMC3560130.
11. Patel Ashok B *et al.* Spectrophotometric first order derivative method for simultaneous determination of etoricoxib and paracetamol in tablet dosage form. Journal of Medicinal and Chemical Sciences, 2020; 3: 300-307. doi- 10.26655/JMCHE MSCI.2020.3.91
12. Rao Venkat *et al.* Determination of Etoricoxib in Bulk and Pharmaceutical Dosage Forms by UV Spectrophotometric Method. International Journal of PharmTech Research, April-June, 2012; 4(2): 860-865.
13. Garlapati Manideep, Nazare Lobo John Shane, Girish Pai, Muddukrishna Badamane Sathyanarayana. Development and Validation of A UV Spectroscopic Method to Estimate Etoricoxib in Bulk and Tablet Formulation. Research J. Pharm. and Tech., 2018; 11(2): 758-760. doi: 10.5958/0974-360X.2018.00142.7

14. Ashok K. Shakya and Nooman A. Khalaf. High Performance Liquid Chromatographic and Ultra Violet Spectroscopic Determination of Etoricoxib in Pharmaceutical Formulations. Asian Journal of Chemistry, 2007; 19(3): 2059-2069.
15. Baheti, Kamalkishor & Shaikh, Shamim & Shah, Nishil & Dehghan, Mohamed Hassan. Validated Simultaneous Estimation of Paracetamol and Etoricoxib in Bulk and Tablet by HPTLC Method. International Journal of Research in Pharmaceutical and Biomedical Sciences, 2010; 2: 672.
16. Rajmane VS, Gandhi SV, Patil UP, Sengar MR. High-performance thin-layer chromatographic determination of etoricoxib and thiocolchicoside in combined tablet dosage form. J AOAC Int., May-Jun, 2010; 93(3): 783-6. PMID: 20629376.
17. Kalwala Saritha Rani and Dr. Pabba Parameshwar. Method Development for Simultaneous Estimation Of Etoricoxib and Thiocolchicoside in Tablet Formulation by RP-HPLC, December: 2021; 10: 12(5). DOI: http://ijmer.in.doi./20 21/10.12.89.
18. Karanjkar M. B. Development and Validation of RP-HPLC For Simultaneous Estimation of Pregabalin and Etoricoxib in Pharmaceutical Tablet Dosage Form. IJPSR, 2022; 13(2): 872-879.
19. Goyal, Navin & Anil, Bhandari & Jain, Suresh & Patel, Rikesh. (2011). Method development and validation of Etoricoxib and Thiocolchicoside in combined pharmaceutical solid dosage form by RP-HPLC method. International Journal of Pharmaceutical Studies and Research. IJPSR, January- March, 2011; II(I): 106-109.
20. Kumar et al. Development and Validation Of RP-HPLC Method for Simultaneous Estimation of Etoricoxib and Thiocolchicoside in Pharmaceutical Dosage Forms. IJRPC, 2011; 1(3).
21. Topalli Srinivasu *et al.* Validated RP-HPLC Method for the Assay of Etoricoxib (A Non-Steroidal Anti-Inflammatory Drug) in Pharmaceutical Dosage Forms. E-Journal of Chemistry, 2012; 9(2): 832-838. https://doi.org/10.1155/2012/264567.
22. Thimmaraju Manish Kumar *et al.* RP HPLC method for the determination of Etoricoxib in bulk and pharmaceutical formulations. Der Pharmacia Lettre, 2011; 3(5): 224-231.
23. Patel H. M. Determination of etoricoxib in pharmaceutical formulations by HPLC method. Indian J Pharm Sci., 2007; 69(5): 703-705. DOI: 10.4103/0250-474X.38485
24. Mandal, Uttam & Dharmalingam, Senthil & Bose, Anirbandeep & Gowda, Karthik & Ghosh, Animesh & Pal, Tapan. Development and validation of an HPLC method for analysis of etoricoxib in human plasma. Indian Journal of Pharmaceutical Sciences, 2006; 68. 10.4103/0250-474X.27823.

25. Gangane P.S *et al*. Development and Validation of HPLC Assay Method for Etoricoxib in Bulk Drug and Tablet Formulation. Indian Journal of Natural Sciences, June 2014; 4: 24.
26. Sai Gnaneswari Aluri, Annapurna Mukthinuthalapati Mathrusri. A new stability indicating RP-UFLC method for the estimation of Etoricoxib in pharmaceutical dosage forms. Research Journal of Pharmacy and Technology__PID__2022-15-3-46.
27. Alzweiri, M.; Sallam, M.; Al-Zyoud, W.; Aiedeh, K. Stability Study of Etoricoxib a Selective Cyclooxygenase-2 Inhibitor by a New Single and Rapid Reversed Phase HPLC Method. Symmetry, 2018; 10: 288. https://doi.org/10.3390/sym10070288
28. Likhar, A.; Wadodkar, S.G.; Gupta, K.R. Application of Stability Indicating HPLC Method for Quantitative Determination of Etoricoxib and Paracetamol in Pharmaceutical Dosage Form. Eurasian J. Anal. Chem., 2010; 5: 218–226.
29. Robert Hartman *et al*. Development and Validation of an HPLC Method for the Impurity and Quantitative Analysis of Etoricoxib. Journal of Liquid Chromatography & Related Technologies, 2003; 26(15): 2551-2566.
30. Vora, Dinesh N. and Arun A. Kadav. "Separation of Etoricoxib and Its Degradation Products in Drug Substance Using UPLCTM." Eurasian Journal of Analytical Chemistry, 2009; 2: 151-158.