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Review Article

Analytical Methods for the Assay of Efavirenz - A Review

Nallamilli Manoj Venkateswara Reddy and Mukthinuthalapati Mathrusri Annapurna*

Department of Pharmaceutical Analysis, GITAM School of Pharmacy, GITAM University, Visakhapatnam, India

***Corresponding Author:** Mukthinuthalapati Mathrusri Annapurna, Department of Pharmaceutical Analysis, GITAM School of Pharmacy, GITAM University, Visakhapatnam, India.

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Abstract

Efavirenz is a non-nucleoside reverse transcriptase inhibitor of human immunodeficiency virus type 1 (HIV-1). In the present study the authors have summarised the analytical techniques so far developed for the estimation of Efavirenz in pharmaceutical formulations as well as the biological fluids.

Keywords: Efavirenz; Spectrophotometry; HPLC

Introduction

Efavirenz (Figure 1) is chemically ((4S)-6-Chloro-4-(2-cyclopropylethy-nyl) -1,4-dihydro-4-(trifluoro methyl)-2H-3,1-benzoxazin-2-one) ($C_{14}H_9ClF_3NO_2$) with molecular weight 315.67 gm/mole. Efavirenz (CAS Number: 154598-52-4) is a non-nucleoside reverse transcriptase inhibitor (1) of human immunodeficiency virus type 1 (HIV-1).

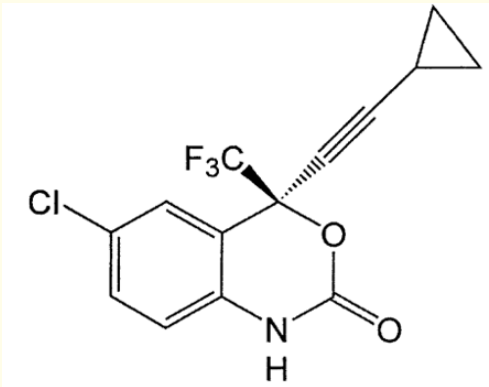

Figure 1: Chemical structure of Efavirenz.

Efavirenz was estimated by different analytical techniques such as spectrophotometry [2-6] and HPLC [7-17], in pharmaceutical formulations as well as biological fluids. Table 1 represents the details of spectrophotometric methods and Table 2 represents the details of liquid chromatographic methods

Table 1: Spectrophotometric Methods.

Reagent	Linearity (µg/ml)	λ_{max} (nm)	Reference
Methanol: Water (30: 70)	1-4	320	2
Naphthol reagent	10-20	561	3
Methanol: Water (60: 40)	10-50	291	4
0.1N NaOH	14-70	218	5
Methanol	5-40	243-253	6

Table 2: Liquid Chromatographic Methods.

Mobile Phase (v/v)	λ (nm)	Linearity (µg/ml)	Reference
Phosphate buffer (pH 3.5): Acetonitrile (50:50) Plasma (Gradient mode) (Tenofovir disoproxil fumarate: Internal standard)	260	1-300	7
Acetonitrile	247	1-50	8
Acetonitrile: Phosphate buffer (pH: 4.04) (51.17: 48.83)	254	36.3-145	9
Methanol: 10 mM Ammonium acetate buffer (70:30)	247	5-25	10
Acetonitrile: 20 mM phosphate buffer (pH 3.0) (Human plasma) (Methyl prednisolone: Internal standard)	247	0.43 – 8.60	11
Acetonitrile: Water: Orthophosphoric acid (70: 30: 0.1)	252	40	12
Ammonium formate buffer (pH 5): Acetonitrile (28:72) (QbD)	292	0.9998	13
10 mM Phosphate buffer (pH-3.0 adjusted with triethylamine): Acetonitrile (50:50)	246	2-10	14
Methanol: Isopropanol (80:20)	245	2-10	15
Formic acid and Acetonitrile	247	10	16
Acetonitrile: 25 mM Phosphate buffer (pH 2.9) (60:40)	220-390	12-20	17

Conclusion

The present review represents the various analytical techniques developed for the estimation of Tamsulosin used for the treatment of prostate in men.

Bibliography

1. Ruiz N. "Clinical history of Efavirenz". *International Journal of Clinical Practice* 103 (1999): 3-7.
2. Muni Bhaskar Reddy CR and Venkata Subbareddy GG. "UV-spectrophotometric method for estimation of Efavirenz in bulk and tablet dosage form". *International Journal of Pharmacal Sciences and Research* 3.12 (2012): 5033-5037.
3. Srilatha P., *et al*. "Quantitative determination of Efavirenz in bulk drug and formulation by colorimetry". *Advances in Applied Science Research* 5.4 (2014): 176-180.
4. Narasimha Rao BV., *et al*. "Method development and validation of Efavirenz by UV spectrophotometer". *IOSR Journal of Pharmacy and Biological Sciences* 15.1 (2020): 15-18.
5. Deepan T., *et al*. "Spectroscopic determination of Efavirenz in bulk and pharmaceutical dosage form". *International Journal of Pharmacy and Medical Sciences* 5.1 (2015): 9-14.
6. Ajit KN., *et al*. "Development and validation of UV spectrophotometric methods for estimation of Efavirenz in bulk and tablet dosage form". *Asian Journal of Pharmaceutical Analysis and Medicinal Chemistry* 2.3 (2014): 134-144.
7. Shweta Gupta., *et al*. "Development and validation of reversed phase HPLC gradient method for the estimation of Efavirenz in plasma". *PLoS ONE* 12.5 (2017): e0174777.
8. Oksana IS., *et al*. "Development and validation of HPLC/UV-procedure for Efavirenz quantitative determination". *Journal of Pharmaceutical Sciences and Research* 10.11 (2018): 2829-2835.
9. Paramita Saha and Murali Monohar Pandey. "Design of Experiment (DoE)-Approach based RP-HPLC analytical method development and validation for estimation of Efavirenz in bulk and formulations". *Journal of Chromatographic Science* 60.1 (2022): 35-44.
10. Vishal CG and Sanjaykumar BB. "Quantification and validation of stability-indicating RP-HPLC method for Efavirenz in bulk and tablet dosage form using Quality by Design (QbD): A Shifting Paradigm". *Journal of Chromatographic Science* 60.2 (2022): 143-156.

11. Sumanth KS., *et al*. "A new and precise bio-analytical method development and validation for the estimation of Efavirenz in human plasma by RP-HPLC". *International Journal of Pharmaceutical, Chemical and Biological Sciences* 9.3 (2019): 106-122.

12. Osnir de Sá Viana., *et al*. "Development and validation of a HPLC analytical assay method for Efavirenz tablets: a medicine for HIV infections". *Brazilian Journal of Pharmaceutical Sciences* 47.1 (2011): 97-102.

13. Waghmare Santosh A and Kashid Arun M. "Reverse Phase-High Performance Liquid Chromatography method development and validation for estimation of Efavirenz by Quality by Design approach". *Journal of Drug Delivery and Therapeutics* 9. (1-s) (2019): 319-330.

14. Ravisankar P., *et al*. "Novel analytical method development and validation for the quantitative analysis of Efavirenz in bulk and pharmaceutical dosage forms by RP-HPLC". *The Pharma Innovation Journal* 3.9 (2014): 32-39.

15. Punam SD. "Development and validation of high-performance liquid chromatographic method for analysis of Efavirenz in capsule dosage form". *International Journal of Scientific Research in Science and Technology* 6.5 (2019): 307-322.

16. Emile Bienvenua., *et al*. "A rapid and selective HPLC-UV method for the quantitation of efavirenz in plasma from patients on concurrent HIV/AIDS and tuberculosis treatments". *Biomedical Chromatography* 27.11 (2013): 1554-1559.

17. Purnima DH., *et al*. "Optimization and validation of RP-HPLC stability-indicating method for determination of Efavirenz and its degradation products". *International Journal of Applied Science and Engineering* 8.2 (2010): 155-165.