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Research/Review

Analytical Methods for an Antihypertensive Agent Telmisartan-A Review

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Abstract

Telmisartan, a crucial long-acting antihypertensive medication, plays a vital role in managing blood pressure levels. Hypertension, commonly known as high blood pressure, is a prevalent condition, especially among individuals beyond middle age. Telmisartan functions as an angiotensin-II receptor blocker. This comprehensive analysis discusses various analytical techniques for quantifying telmisartan, including UV spectrophotometry, HPTLC, HPLC, and chromatographic methods. All the methods mentioned are proven to be straightforward, precise, cost-effective, and reproducible. The focus of this review is on the recent advancements in analytical method development for telmisartan, including a stability-indicating method for its determination.

Keywords: Telmisartan, validation, hypertension, angiotensin-II receptor blocker.

INTRODUCTION

Hypertension is a very common chronic condition characterized by persistently elevated arterial pressure. In cases of hypertension, blood pressure rises, with systolic pressure equal to or greater than 130 mmHg and diastolic pressure greater than 80 mmHg [1]. Telmisartan is part of a new class of orally active and highly selective ARBs (Angiotensin Receptor Blocker) that was approved and introduced to the European and US markets in the late 1990s for treating hypertension[2]. It is a benzimidazole derivative with a chemical structure of 2- {4- [[4-methyl-6-(1-methyl benzimidazole-2yl)-2-propyl benzimidazole-1-yl] methyl] biphenyl)-benzoic acid. Telmisartan has a molecular formula of $C_{33}H_{30}N_4O_2$ and a molecular weight of 514.6 g/mol. It is insoluble in water, sparingly soluble in dichloromethane, strong acid, and organic solvents, but soluble in strong base and methanol[3].

By blocking the effects of angiotensin II, a vasoconstrictor that stimulates the synthesis and release of aldosterone, Telmisartan reduces systemic vascular resistance. Telmisartan does not inhibit angiotensin

converting enzyme, other hormone receptors, or ion channels [4]. Recent research indicates that Telmisartan may also have PPAR-gamma agonistic properties [5]. Uncontrolled hypertension affects over 50% of individuals and is a major risk factor for cardiovascular disease. Complications of hypertension can include coronary heart disease, stroke, heart failure, chronic kidney disease, retinal damage, and peripheral vascular disease [6].

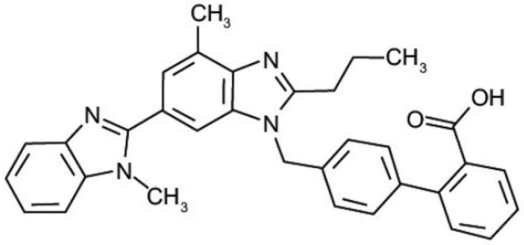

Fig 1: Chemical structure of telmisartan

Table 1: Analytical methods fortelmisartan

S.No	Author name	Journal name	Title name	Analytical conditions
1	Niranjan D chivate et al 2013[5]	Journal of pharmacy research	The current study presents a novel UV estimation and validation technique for telmisartan	Solvent: mixture of 60% ethanol (95%) and 40% 0.1 N NaHCO3. λ max: 240 nm Linearity: 2-14µg/ml. Correlation coefficient: 0.9995. % RSD: Less than one.
2	AjitPandeyet al 2011[6]	International Journal of ChemTech Research	Anaccurate and precise UV Spectrophotometric methodwasdeveloped and validated to determine the amount of Telmisartan in bulk and tablet form	Solvent:0.1N NaOH λmax: 234.0 nm. Linearity:4-24 µg/mL r2=0.999
3	Chaudhari et al.2021[7]	Journal of Biomedical andPharmaceutical sciences	A UV spectroscopic method was developed for the simultaneous estimation of CIL and TEL in bulk and tablet forms using the simultaneous equation method	λmax:295nm Linearity: 8-40 µg/ml
4	Kishanta Kumar Pradhanet al. 2011[8]	Int. J. Res. Pharm. Sci.	This document outlines the analytical approach for validating Telmisartan using UV Spectrophotometry.	Solvent: Methanol:water90:10 ratio λmax:298 nm Linearity: 5-45 mg/m
5	Manish Kumar et al.2018[9]	Journal of Chemical and Pharmaceutical Research	Dissolution Method Development and Validation for Tablet Dosage form of Telmisartan Using UV Spectrophotometric Method	λmax:296 nm concentration range: of 2-12µg/ml Linearity r2= 0.999 RSD:0.687%and0.460%
6	Eswarudu et al. 2022[10]	Asian Journal of Pharmaceutical Research and Development	An Updated Review on Analytical Methods for Estimation of Azelnidipine and Telmisartan	-
7	M.Haripriyaet al. 2013[11]	International Journal of Pharmacy and Biological Sciences	Development and validation of UVSpectrophotometric method for the simultaneous estimation of Cilnidipine and Telmisartan in tablet dosage form utilizing simultaneous equation and absorbance ratio method	λmax :297nm Correlation coefficient: 0.9998 and 0.9991. Linearity:6-18 µg/ml
8	Patel, et al.2011[12]		Stress degradation studies on Telmisartan and development of a validated method by UV	λmax: 296 nm

			spectrophotometry in bulk and pharmaceutical dosage forms	
9	Pinakesty et al. 2023[13]		The Current Update on the Efficacy of Telmisartan in Patients with Hypertension: A Systematic Review	-
10	Barge et al. 2018[14]	International Journal of Pharmaceutical and Clinical Research	Development and Validation of Analytical Method for Simultaneous Estimation of Bisoprolol Fumarate and Telmisartan by Using RPHPLC Method.	Solvent: methanol and water (75:25 v/v). Linearity: 40-200 µg/ml Retention time;7.6 min
11	S.V. Londhe et al. 2010[15]	ActaChromatographic	Stability-Indicating RP-HPLC Method for Analysis of Telmisartan in the Bulk Drug and in Formulations	Solvent: methanol-water 80:20 (v/v). λmax:225nm Retention time was 4.85 ± 0.05 min
12	Jayram V. Gholaveet al. 2020[16]	Analytical chemistry letters	Development and Validation of a Stability-indicating RP-HPLC Methodfor the Simultaneous Determination of Telmisartan and its Related Substances in Telmisartan Bulk Drug Substance	Solvent: Acetonitrile: methanol (80:20) λmax:230 flow rate of 1.0 mL/min
13	L. Kanaka Lakshmi et al. 2016[17]	Journal of pharmaceutical and biomedical analysis letters	Analytical method development and validation for the simultaneous estimation of Telmisartan and Hydrochlorothiazide By RP-HPLC method in bulk and tablet dosage form	Solvent:(70:30 v/v) methanol: ACN λmax:274nm Retention times were 1.866 min and 2.496 min.
14	Bavishi et al. 2023[18]	International journal of pharmaceutical sciences and research	An updated review on analytical methods for the Azelnidipine and Telmisartan in pharmaceutical dosage form.	

CONCLUSION

According to this review spectroscopic and chromatographic methods for Telmisartanare available for single and combination analysis. Methanol is the typical solvent used in the majority of spectroscopic techniques. The majority of the techniques used were UV absorbance detection and RP-HPLC because they provide the highest levels of precision, repeatability, reliability, and also it is simple, rapid and robust quantitative analytical method.

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