EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 11
Issue: 10
126-131
Year: 2024

A CONCISED REVIEW ON DIFFERENT ANALYTICAL TECHNIQUES USED ON LOSARTAN POTASSIUM

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Article Received on 19/08/2024 **Article Revised on 01/09/2024** **Article Accepted on 20/09/2024**

ABSTRACT

The FDA authorized losartan, the first AT1 receptor blocker (ARB), was approved fifteen years ago. Over those years, physicians and researchers have amassed a significant body of evidence regarding the advantages of losartan, especially with regard to hypertension and kidney disease. These advantages include lowering the risk of stroke in individuals with left ventricular hypertrophy, reducing proteinuria, and delaying the development of diabetic nephropathy. In this review article various analytical techniques are mentioned for estimation of losartan individually and in combination with other drugs. There are number of articles available but to gather all the information in this article is not possible but in contrast this article provides information available on analytical methods on this drug for future research.

KEYWORDS: losartan, UV spectroscopy, HPLC, RP-HPLC, HPTLC, hypertension.

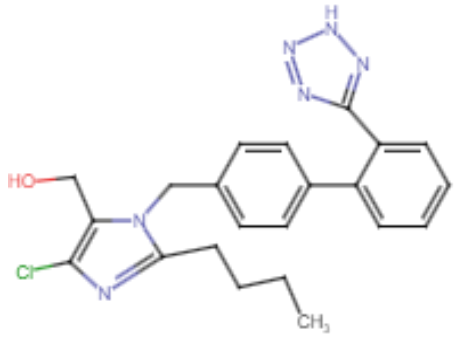
INTRODUCTION

Introduction to disease

A recently published article confirmed that in 2019, around 523 million people suffered from cardiovascular disease (including 18.6 million deaths) worldwide. Losartan, a drug, was patented 35 years ago and approved for medical use in the United States in 1995 (28 years ago). As an effective treatment for hypertension, losartan blocks the interaction of angiotensin II with its receptor by inhibiting the renin-angiotensin system.[1] Chronic renal illnesses are mostly attributed to hypertension, which is found in all cases of hypertensive nephrosclerosis and most patients with progressive renal disease. Practical Not simply elderly individuals experience the development of high blood pressure. (Introduction in hyperbole) there are two effective ways to treat hypertension Lifestyle Modifications: Educate patients about lifestyle changes that can help lower blood pressure, such as adopting a healthy diet rich in fruits, vegetables, and whole grains, and low in sodium, saturated fats, and added sugars.Medication management: to administer the different types of antihypertensive medications and emphasize on regular monitoring of hypertension.[2]

Introduction to drug

Losartan was first approved by Food and Drug Administration (FDA) in 1995 as an antihypertensive and is scheduled for generic release in April 2010.1 During the past 15 years, there has been great progress in understanding the effects of angiotensin II (AII) in the kidney and the benefits of blockade of AII at the AT1 receptor. Losartan is a nonpeptide molecule, which is a competitive antagonist with selective binding to AT1 receptors. Losartan has an oral bioavailability of 33% and has significant first-pass metabolism using the cytochrome P450 system.[3] The recommended dosage of losartan is 50mg/day, with no significant effect of age, sex, food, or race on the pharmacokinetics of losartan. Losartan is metabolized by cytochrome P450 (CYP) 3A4, CYP2C9, and CYP2C10 isoenzymes in the liver. By an elimination half-life of 1.5-2 hours, 13-25% is excreted by the kidney and 50-60% through the biliary excretion. There is a major first-pass metabolism that results in noncompetitive EXP3174 (an angiotensin II type 1 receptor antagonist). In fact, it is the dynamic 5-carboxylic acid metabolite. However, the amount of metabolite EX3174 in the blood is about 14%, but reported to be 10- to 40-fold more potent than its parent compound. Its estimated terminal half life ranges from 6 to 9 hours.[1]



Chemical Formula	$C_{22}H_{23}ClN_6O$
IUPAC	[2-butyl-5-chloro-3-[[4-[2-(2*H*-tetrazol-5-yl)phenyl]phenyl]methyl]imidazol-4-yl]methanol
PKa (strongest acidic)	14.22
Pka (strongest basic)	3.89
Log p	5.37
Melting point	178-184

Sample preparation strategies

In analytical chemistry, sample preparation is crucial for ensuring accurate and reliable results. When analyzing pharmaceuticals, such as losartan, the resolution and accuracy of the analysis can significantly depend on the preparation and handling of the sample. Losartan is soluble in de ionized water. This property makes deionized water a suitable solvent for preparing losartan solutions. By dissolving losartan in deionized water, analysts can create solutions of specific concentrations that are necessary for various analytical techniques. Commonly used solvents for detecting other drugs alongside losartan are acetonitrile and methanol. They are chosen for their ability to dissolve a wide range of compounds and their compatibility with the analytical equipment.[5-31]

Analytical techniques used

This review briefly elaborates on various estimation approaches for losartan, presenting them in a tabular format for clarity and ease of comparison.

Table 2: Summary of a spectrometric method for the analysis of losartan.

Compounds	Methods	Solvent /Procedure	Lod µg/ml	λ max(nm)	Ref
LTN	Quantitative analysis by UV spectroscopy (assay of two different brands of losartan)	Distilled water	-	234 nm	5
LTN	Spectroscopic and cytotoxic studies	Methanol and dimethyl sulfoxide	-	230 nm	17
LTN	Development, Validation, and Concentration Determination by using 1D UV visible spectrometry	de-ionized water	0.489	234 nm	18
LTN	Degradation highlighted by Studies of Photoluminescence, Infrared Absorption Spectroscopy and Dielectric Spectroscopy	Phosphate buffer and alkaline medium	-	Multiple band widths are used in different methods	19
LTN	Derivative Spectrophotometric Method	Distilled water	0.4	232.5	20
LTN	Quantitative analysis by UV spectroscopy	Water and alcohol	-	234 nm	21

Table 3: Report of RP-HPLC and HPLC method for determination of losartan either single or in a combination with other drugs.

Compounds	Column	Mobile phase	Detection	λ max (nm)	Flow rate ml/min	LOD µg/m	Ref.
ATV and LTN Potassium (tablet formulation)	Phenomenex Luna C18 column (250 mm, 4.6 mm i.d., 5 µm)	0.05 M potassium dihydrogen phosphate buffer (pH 5.4)–acetonitrile 45:55	PDA	250 nm	1 mL min−1	0.0056a, 0.0051b	6
ATV and LTN (pure tablet)	LUNA C18 column	Methanol and phosphate buffer 80:20	UV/Visible detector	238 nm	1ml/min	ATV:- 0.053 LTN:-	8

						0.028	
LTN (in plasma)	cyano reversed-phase	phosphate buffer (pH 4.3), acetonitrile (750:250, v/v)	480 UV detector	225 nm	0.9 mL/min	-	9
LTN, AML and HYDCL (tablet formulation)	C18 reverse-phase column	phosphate buffer (pH 7.0), methanol and acetonitrile in ratio of 60:20:20% v/v	SPD-10A vp UV-Visible detector	238nm	1ml/min	LTN:- 1.522 µg/ml AML:- 0.051 µg/ml HYDCL:- 0.139 µg/ml	10
LTN (tablet formulation)	C18	buffer and acetonitrile (65:35)	-	254 nm	1.5 ml/m	-	11
AML, LTN and HYDCL	Kromasil C18	0.025 M phosphate buffer (pH 3.7):acetonitrile (57:43 v/v)	UV/Visible detector	236.5, 254 and 271 nm	1.0 ml/min	-	12
LTN and PRN	LUNA C18 column	Methanol and phosphate buffer in the ratio of 85:15	UV/Visible detector	210 nm	0.8 ml/min	0.053	14
LTN and HYDCL (combined dosage form)	Reverse phase C18 column	Buffer and Acetonitrile	PDA detection	254 nm	1.0 ml/min	1.779 ug/ml and 0.375 ug/ml	15
HYDCL, AML and LTN	C18 column	(A) Acetonitrile, methanol (65:35) (B) 0.4% triethylamine in 10 mM sodium dihydrogen phosphate monohydrate (NaH2PO4.H2O) buffer of the ratio of A:B is 60:40	Uv detector	230 nm	1.5 ml/min	Hctz- 0.014 Aml- 0,100 Los- 0.009	16
LTN (solid dosage form)	through octadecyl silyl (C18) column	potassium dihydrogen phosphate buffe and methanol (40:60)	DAD Detector	230 nm	1 ml/min.	0.0364	22
LTN	Chromachemi (Puritas) C-18, 125 mm × 4.6 mm, 10 µm	60:40 v/v acetonitrile and buffer	UV-visible detector (Ultimate 3000)	250 nm	1 ml/min.	-	23
LTN	Chromami (Puritas) C-18, 125 mm × 4.6 mm, 10 µm	60:40 v/v acetonitrile and buffer	UV-visible detector (Ultimate 3000)	250 nm	1.0 mL/minutes	-	25
LTN and HYDCL	Altima C18 (4.6×150mm, 5.0 µm) column)	Methanol and TEA Buffer pH 4.5:Acetonitrile taken in the ratio of 50:25:25% v/v/v	996 PDA Detector	225nm	1.0 mL/minutes	-	26
LTN and LTN carboxalic acid (in human)	repacked 5 µm, 250 x 4.6 mm CN column	0.015M phosphoric acid (pH 2.3): acetonitrile in a ratio of 72:28.	UV detector V 7057-3	excitation wavelength of 250nm and an emission wavelength of 370nm.	1.25 ml/min	-	30

LTN (in human plasma)	CN (250*4.6 mm) analytical column	phosphate buffer - acetonitrile - tetrahydrofurane - methanol and phosphoric acid (0.1:5 :4 :21 :69.9)	Ultraviolet detector	254 nm	0.6 ml/min	-	31

Table 4: Other analytical methods used on Losartan.

Compound and methodology	column	Mobile phase	detector	λmax (nm)	Lod	Ref
LTN and AML(spectr of luorimetric technique and LC)	MN-C18	acetonitrile with 0.02 M phosphate buffer in a proportion of 45 : 55, pH 4.0,	luminescence spectrometer of Perkin-Elmer model LS 45	lem ¼ 440 nm for AML (0.0–7.5 min) and at lem ¼ 400 nm for LOS	-	7
LTN (LC/MS)	C18 column	e A was 5% aqueous ACN (v/v) and mobile phase B was 95% aqueous ACN (v/v)	UV detector	250 nm and 280 nm	-	13
HYDCL, LTN and Potassium (capillary electrophoresis)	-	acetonitrile/phosphate buffer (35:65)	UV-Vis detector	230 nm	4.0-potassium3.0-losartan and 10.0-hydrochlorothiazide	24
LTN (LC-MS/MS)	C18 column	acetonitrile and 0.1% (v/v) CF3COOH	PDA detector	220 nm	-	27
LTN and PRN (HPTLC)	TLC plates,	toluene: acetonitrile: formic acid (5:5:0.3 v/v/v).	-	254	-	28
LTN and RMP (HPTLC)	TLC aluminium plates pre-coated with silica gel 60	toluene: methanol: ethyl acetate (6: 3: 2, v/v/v)	-	210nm		29

CONCLUSION

This review geared toward specializing in numerous analytical strategies according for the assay of Losartan. A broad vary of techniques is out there for the estimation of Losartan in biological samples, and pharmaceutical indefinite quantity type. This review will be instrumental for future research involving losartan and its combinations with other drugs. Notably, the combinations under investigation include losartan with perindopril, which is currently in Phase III clinical trials; losartan with amlodipine, which is in Phase II trials; and losartan with ramipril, also in Phase III trials. Analyzing these combinations provides valuable insights into their efficacy and safety profiles, potentially guiding therapeutic strategies and optimizing treatment regimens additionally this review will be instrumental in guiding the selection of appropriate diluents, optimizing the wavelength parameters, and refining both the mobile and stationary phases. Additionally, it will provide valuable insights into effective sample preparation techniques.

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