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Analytical Determination of Lisinopril Using UV Spectrophotometer and HPLC: An Overview

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Abstract

Present review article determine the analytical methods for the quantitative determinations of lisinopril (ACE Inhibitor) by UV spectrophotometery and High-Performance Liquid chromatography. Pharmaceutical analysis of lisinopril requires effective analytical procedures for QC quality control analysis in Pharmaceuticals dosage formulations and human serum. An extensive survey for determination of LSP compiled from the research articles published in various pharmaceutical and analytical chemistry Journals. This appraisal illustrate that majority of the HPLC methods reviewed are based on the quantitative analysis of drug in Active Pharmaceutical ingredients (API), formulations, biological fluids such as serum and plasma and they are appropriate for therapeutic monitoring of drug, for pharmacokinetic purpose.

Keywords: Method development validation; High Pressure Liquid Chromatography (HPLC); Lisinopril

Introduction

Lisinopril

Lisinopril (S)-1-[N^2-(1-carboxy-3-phenyl propyl) -L- lysyl] -L- proline dihydrate a lysine analogue of enalaprilate, the colour of lisinopril is a white to off-white, state crystalline, no smell and powder having molecular weight of 441.52 and molecular formula $C_{21}H_{31}N_3O_5.2H_2O$. It is soluble in water and sparingly in methanol, differs from captopril by lacking the sulfhydryl group. It is indicated for the treatment of hypertension, heart failure and acute myocardial infraction. It is indicated as adjunctive therapy in the management of heart failure in patients who are not responding adequately to diuretics and digitalis. It is used to treat hypertension, Myocardial Infarction (MI), heart failure and diabetic nephropathy or retinopathy (Figure 1).

Analytical methods

Assay method for any drug is very significant for pharmaceutical industries and it is always desirable to select and develop simple, least time consuming, precise, accurate and economical method for the determination of drugs in API pharmaceutical dosage forms and pathological samples like blood and serum. Analytical data are used to screen the potential drugs in biological samples, support formulation studies, aid in the development of drug syntheses, monitor the (API) bulk pharmaceuticals and finished products and also test final products for release [1].

Methods of analysis for lisinopril

There are different methods of analysis for lisinopril drug described in literature as,

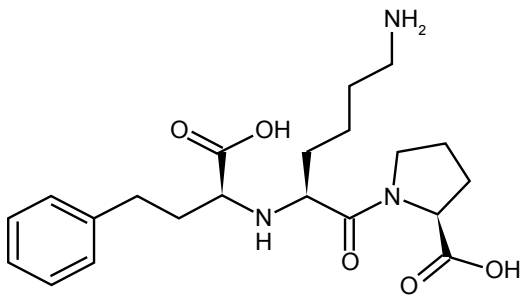

Figure 1: Structure of lisinopril.

- Combination of different methods or techniques
- Spectro fluorimetric methods for analysis by reaction modifications
- Electrophoresis /capillary electrophoresis methods
- (HPLC) High Performance Liquid Chromatographic methods
- UV-visible Spectroscopic methods
- Miscellaneous Methods

Reported methods of analysis

There are numerous methods available for lisinopril analysis in single component or multi component formulation using spectrophotometry [2-4], gas-liquid chromatography [5] capillary electrophoresis and polarography [6,7]. Several High pressure liquid chromatography HPLC methods have been used for the analysis of lisinopril in human plasma [8-10]. Sagirli et al. [11] developed HPLC method for analysis of lisinopril in human plasma and urine at 477 nm. Linear quantitative response was generated over a concentration range of 5-200 $ngmL^{-1}$ and 25-1000 $ngmL^{-1}$ for plasma and urine samples.

However, all these methods required laborious experimental work high consumption of organic solvents and these methods were developed on single column. Our research group has worked on HPLC methods for the quantitation of inhibitors as captopril, enalapril and lisinopril alone and in combination with fosinopril and diclofenac sodium [12-16] in bulk drug, pharmaceutical formulations and serum. Sultana et al. [15] have also reported simultaneous methods for the determination of various ACE inhibitors with co-administered drugs as lisinopril with H_2 antagonists [17], NSAIDs [18] and with statins [19].

Lisinopril belongs to ACE Inhibitor therefor several methods simultaneously discovered of these ACE Inhibitors including

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captopril with H_2-receptor antagonists [20] diuretics [21] and statins [22]. Enalapril maleate has been simultaneously determined with hydrochlorothiazide and furosemide commonly used diuretics [23], commonly used NSAIDs [24], anti diabetic drugs [25], cholesterol lowering agent statins [26] and with metformin, glibenclamide and glimepride [27] in bulk material, pharmaceutical formulations and human serum using RP-HPLC. Spectrophotometric methods after derivatization of lisinopril and other techniques has been describe previously [3,6,28-33].

Conclusion

Patients diagnosed with hypertension are prescribed multiple medications for therapy which increasing the risk of drug interactions and side effects [34-36]. In this article UV spectrophotometry and HPLC methods for the estimation of lisinopril in (API) active material, formulations and biological samples are reviewed alone or in combination with other drugs [37,38]. High pressure liquid chromatography HPLC methods required expensive equipment, labor-intensive sample preparation procedure and the personal skilled in chromatographic techniques [39]. Most of the HPLC methods reviewed have the potential application to clinical research of multi-drug pharmacokinetics, drug combination studies and also for interactions studies.

References

1. Okeke CC (2007) Update on the Proposed Revision Process for United States Phamacopeia Chapter 797 Pharmacuetical Compounding-Sterile Preparations. Int J Pharm Compd 11: 302-305.
2. El-Gindy A, Ashour A, Abdel-Fattah L, Shabana MM (2001) Spectrophotometric, septrofluorimetric and LC determination of lisinopril. J Pharm Biomed Anal 25: 913-922.
3. Paraskevas G, Atta-Politou J, Koupparis M (2002) Spectrophotometric determination of lisinopril in tablets using 1-fluoro-2,4-dinitrobenzene reagent. J Pharm Biomed Anal 29: 865-872.
4. El-Yazbi FA, Abdine HH, Shaalan RA (1999) Spectrophotometric and spectrofluorometric methods for the assay of lisinopril in single and multicomponent pharmaceutical dosage forms. J Pharm Biomed Anal 19: 819-827.
5. Avadhamulu AB, Pantulu AR (1993) Gas liquid chromatographic estimation of lisinopril in its pharmaceutical dosage forms. Indian Drugs30: 646-649.
6. Hillaert S, De Grauwe K, Van den Bossche W (2001) Simultaneous determination of hydrochlorothiazide and several inhibitors of angiotensin-converting enzyme by capillary electrophoresis. J Chromatogr A 924: 439-449.
7. El-Enany N, Belal F, Al-Ghannam S (2003)Polarographic determination of lisinopril in pharmaceuticals and biological fluids through treatment with nitrous acid. Microchimica Acta 141: 55-61.
8. Sane RT, Valiyare GR, Deshmukh UM, Singh SR, Sodhi R (1992) Simultaneous HPLC determination of lisinopril and hydrochlorothiazide from its pharmaceutical preparations. Indian Drugs 29: 558-560.
9. Aytan F, Alpdogan G,Sungur S (2007) High pressure liquid chromatographic investigation of the pH and temperature effect on the solution stability of lisinopril. Reviews in Analytical Chemistry26: 55-64.
10. El-Emam AA, Hansen SH, Moustafa MA, El-Ashry SM, El-Sherbiny DT (2004) Determination of lisinopril in dosage forms and spiked human plasma through derivatization with 7-chloro-4-nitrobenzo-2-oxa-1,3-diazole (NBD-Cl) followed by spectrophotometry or HPLC with fluorimetric detection. J Pharm Biomed Anal 34: 35-44.
11. Sagirli O, Ersoy L (2004) An HPLC method for the determination of lisinopril in human plasma and urine with fluorescence detection. J Chromatogr B Analyt Technol Biomed Life Sci 809: 159-165.
12. Safila N, Najma S, Arayne MS (2013) Method for the Determination of Captopril in Bulk, Pharmaceutical Formulations and Serum by HPLC using two differentSystem. ABRJ 2: 8-14.
13. Safila N, Najma S, Arayne MS (2012) HPLC-UV method for the determination of enalapril in bulk, pharmaceutical formulations and serum.J Anal Bioanal Tech 3: 130.
14. Arayne MS, Naveed S, Sultana N (2013) RP-HPLC Method for the Determination of Lisinopril in Active Pharmaceutical Ingredients, Dosage Forms and Human Serum. Mod Chem Appl 3: 832.
15. Sultana N, Naveed Safila, Arayne MS (2013) Direct Determination of Four ACE-Inhibitors Lisinopril, Enalapril, Captopril and Fosinopril in Pharmaceuticals and Serum by HPLC. J Chromat Separation Techniq 4: 179.
16. Naveed S, Sultana N,Arayne MS (2014) Facile and Manifest RPHPLC Method for the Determination of Captpril, Lisiopril, Enalpril and Diclofenac sodium: Its Applications in Dosage formulations and in human serum. Can J App Sci 4: 40-50.
17. Naveed S, SultanaN, Arayne MS (2012) Simultaneous determination of lisinopril and H_2 antagonists in API, formulations and human serum by using two different HPLC systems. Med Chem Res 21: 4037-4042.
18. Sultana N, Arayne MS, Siddiqui R, Naveed S(2012) RP-HPLC method for the simultaneous determination of lisinopril and NSAIDs in API, pharmaceutical formulations and human serum. AJAC 3: 147-152.
19. Najma S, Arayne MS, Safila N (2011) Validated Method for the Simultaneous Determination of Lisinopril, Pravastatin, Atorvastatin and Rosuvastatin in API, Formulations and Human Serum by RP-HPLC. Chinese Journal of Chemistry 29: 1216-1220.
20. Najma S, Safila N, Arayne MS (2013) RP-HPLC method for simultaneous determination of captopril and H2-receptor antagonist: Application to interaction studies. Med chem3: 183-187.
21. Naveed S, Sultana N, Arayne MS (2011) RP-HPLC Method for SimultaneousDetermination of Captopril and Diuretics: Application in Pharmaceutical Dosage Forms and Human Serum. J Chromatograph SeparatTechniq 2: 109.
22. Naveed S, Sultana N, Arayne MS (2010) Simultaneous Determination of Captopril and Statins in API, Pharmaceutical Formulations and in Human Serum by RP-HPLC. Journal of the Chinese Chemical Society 57: 378-383.
23. Naveed S, Sultana N, Arayne MS (2013) A validated reversed phase liquid chromatographic method for simultaneous analysis of enalapril maleate, hydrochlorothiazide and furosemide in active pharmaceutical ingredients, pharmaceutical dosage forms and human serum. Pharm Anal Acta 4:244.
24. Naveed S, Sultana N, Arayne MS (2013) Facile and manifest liquid chromatographic method for the simultaneous determination of enalpril maleate and NSAIDs in API and pharmaceutical formulations. Pharm Anal Acta S2: 004.
25. Naveed S, Sultana N, Arayne MS (2013) Monitoring of invitro interaction studies of enalapril with hypoglycemic agents by LC-UV. Dove Press Journal. Res Rep Med Chem 3: 1-7.
26. Naveed S, Sultana N, Arayne MS (2011) Simultaneous determination of enalapril and statins in pharmaceutical formulations by RP-HPLC. J Chil Chem Soc 56: 734-737.
27. Naveed S, Sultana N, Arayne MS (2011) Simultaneous quantitation of enalapril, metformin, glibenclamide and glimepride in bulk material, pharmaceutical formulations and human serum using RP-HPLC. International Journal Pharma Research and Development 3: 24.
28. El-Gindy A, Ashour A, Abdel-Fattah L,Shabana M (2001) Spectrophotometric, septrofluorimetric and LC determination of lisinopril.Journal of Pharmaceutical and Biomedical Analysis 25: 913-922.
29. El-Gindy A, Ashour A, Abdel-Fattah L, Shabana MM (2001) Spectrophotometric and HPTLC-densitometric determination of lisinopril and hydrochlorothiazide in binary mixtures. J Pharm Biomed Anal 25: 923-931.
30. Aktas ES, Ersoy L, Sagirli O (2003) A new spectrofluorimetric method for the determination of lisinopril in tablets. Farmaco 58: 165-168.
31. Zacharis CK, Tzanavaras PD, Themelis DG, Theodoridis GA, Economou A, et al. (2004) Rapid spectrofluorimetric determination of lisinopril in pharmaceutical tablets using sequential injection analysis. Anal Bioanal Chem 379: 759-763.
32. El-Yazbi FA, Abdine HH, Shaalan RA (1999) Spectrophotometric and spectrofluorometric methods for the assay of lisinopril in single and multicomponent pharmaceutical dosage forms. J Pharm Biomed Anal 19: 819-827.
33. Ozer D, Senel H (1999) Determination of lisinopril from pharmaceutical preparations by derivative UV spectrophotometry. J Pharm Biomed Anal 21: 691-695.

34. Stanisz B (2004) Estimation of the applicability of differential spectroscopic method for the determination of lisinopril in tablets and for the evaluation of its stability. Acta Pol Pharm 61: 327-334.

35. Erk N (1998) Comparative Study of the Ratio Spectra Derivative Spectrophotometry, Derivative Spectrophotometry and Vierordt's Method Appued to the Analysis of Lisinopril and Hydrochlorothiazide in Tablets. Spectroscopy Letters: An International Journal for Rapid Communication 31: 633-645.

36. Prasad CVN, Saha RN, Parimoo P (1999) Simultaneous determination of amlodipine-enalapril maleate and amlodipine-lisinopril in combined tablet preparations by derivative spectrophotometry. Pharmacy and Pharmacology Communications 5: 383-388.

37. Jain HK, Agrawal RK (2000) Spectrophotometric methods for simultaneous determination of amlodipinebesylate and lisinopril in tablets. Indian Drugs37: 196-199.

38. Ozer D, Senel H (1999) Determination of lisinopril from pharmaceutical preparations by derivative UV spectrophotometry. J Pharm Biomed Anal 21: 691-695.

39. Mashru RC (2000) Development ofa method for simultaneous determination of amlodipinebesylate and lisinopril in their combined dosage forms.Eastern Pharmacist 43: 111-112.

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