Simultaneous Determination of Sartans by High Performance Liquid Chromatography with Ultra Violet Detection

Vania Maslarska[1*], Vladimir Yankov[2], Danka Obreshkova[3], Stanislav Bozhanov[1]

[1]Department of Chemistry, Faculty of Pharmacy, Medical University-Sofia, BULGARIA.
[2]Pharmaceutical Company Berlin Chemie, BULGARIA.
[3]Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Medical University-Sofia, BULGARIA.

ABSTRACT

Objective: A high performance liquid chromatographic method with ultra violet detection for simultaneous analysis of three sartans (Valsartan, Irbesartan and Telmisartan) has been developed for quality control. **Method and Results:** Isocratic elution on a LiChrospher C18 column (250 × 4 mm, particle size 5 μm) at the temperature 30ºC with a mobile phase consisting of 10mM phosphate buffer: acetonitrile (65:35 v/v) at a flow rate 1.0 ml/min has been done. The column eluent was monitored with a UV detector at 225 nm. This allowed a rapid detection and identification as well as quantitation of the eluting peaks. **Method Validation:** Calibration curves for all drugs were in the range of 5- 40 μg/ml and the linear regression coefficients were more than 0.995. Recovery rates for the sartans were in the range 96.5% to 103.1%. The limits of detection were calculated between 0.04- 0.06 μg/ ml. Also, the limits of quantification were 0.12- 0.16 μg/ml. Within-day and between-day coefficient of variation for all sartans at all concentrations in the range of 0.83 - 3.79% was calculated. **Conclusion:** The procedure can provide a simple, sensitive and fast method for the quality control of the three sartans in bulk and tablets.

Key words: Drug analysis, Sartans, HPLC, Quality control, Hypertension, Heart failure.

INTRODUCTION

Nowadays hypertension is one of the major health problems worldwide. Angiotensin II is an octapeptide with strong hypertensive activity. It increases blood pressure as a result of shrinking effect on smooth muscular coat of vessels, releases aldosterone from an adrenal cortex and catecholamine from an adrenal medulla, which leads to retention of sodium ions and water in human body and an increase of circulating blood volume. Angiotensin II receptor antagonists (ARA II) selectively and specifically block the AT1 receptor of the renin angiotensin system by displacing angiotensin II from it.[1] Angiotensin antagonists are a major innovation for the treatment of hypertension and heart failure either alone or together with diuretics or recently with other antihypertensive drugs.[2] Medicines modifying renin-angiotensin system activity include: drugs reducing renin release (β-adrenolytic drugs), drugs blocking conversion of angiotensin I to angiotensin II - ACE (angiotensin converting enzyme) inhibitors and angiotensin receptor antagonists (ARB - angiotensin II receptor blockers), also known as sartans. They are better in preventing first occurrence of atrial fibrillation than beta-blocker (atenolol) or calcium antagonist (amlodipine) therapy.

Based on the recent literature, most of the publications deal with the determination of the following compounds in the ARB group – Valsartan, both for pharmaceutical

www.ijper.org

formulations[3-7] and biological material: plasma[5,8] and urine.[9] It is normally determined by HPLC method with C18 column and UV-VIS detector[3,6], mass spectrometry (MS) detector[5] or fluorescence detector.[4] It is also determined spectrophotometrically[9] and with TLC.[10-12] Telmisartan is determined in human plasma,[13,14] urine[15-19] and binary tablets.[20,21] It is determined by HPLC analysis using C18 column[17,18,22] with mass sensitive detector,[23,24] fluorescence,[25] UV[26,27] or DAD[28,29] detector. Telmisartan is also determined simultaneously with hydrochlorothiazide by a spectrophotometric, densitometric and spectrofluorimetric analysis.[30] Irbesartan in a biological material: plasma and urine[31-35] is determined by an HPLC analysis with C18 column and DAD[33,34], MS detector[35] or fluorescence detector,[31] Irbesartan and hydrochlorothiazide in tablets are analyzed spectrophotometrically.[36]

But no analytical method has been reported yet for the simultaneous separation of all the three drugs namely Valsartan (VAL), Telmisartan (TEL) and Irbesartan (IRB). There are reports to determine the ARB that use solid phase extraction or other more complex time-consuming processing of the samples.

That is why the aim of this research work was to develop a simple, rapid, precise, accurate, and economical RP-HPLC method, with a simple mobile phase for the simultaneous separation, identification and determination of the three compounds of the ARB group in bulk and pharmaceutical formulations. The proposed method was validated as per International Conference on Harmonization (ICH Q2, 2005) guidelines.[37]

MATERIAL AND METHODS

Reagents and Chemicals

HPLC grade acetonitrile, methanol, potassium dihydrogen phosphate and orto-phosphoric acid (Analytical grade) were obtained from Merck, Germany. Valsartan RS, Irbesartan RS and Telmisartan RS were used as standards and were purchased from Sigma-Aldrich (St. Louis, MO, USA).

Apparatus and analytical conditions

A Shimadzu HPLC system consisting of pump LC – 20 AD, vacuum degasser unit DGU – 20 A$_5$, column oven CTO-10AD and a UV/VIS variable detector SPD – 20 A was utilized for the analysis. The separation under reversed phase partition chromatographic conditions was carried out on a LiChrospher C18 column (250×4 mm, particle size 5 μm). The equipment was controlled by a PC with installed Lab Solution software. The mobile phase was a 35:65 % v/v mixture of acetonitrile:phosphate buffer (10 mM, pH 6 ± 0.1, adjusted with ortho-phosphoric acid). The flow rate was 1.0 ml/min and the run time was 10 min. Before analysis both the mobile phase and sample solutions were degassed by the use of a sonicator and filtered through a 0.45 μm filter. The column temperature was maintained at 30°C and injection volume was 20 μl. The detection of the drug was monitored at 225 nm. The identity of the compounds was established by comparing the retention times of compounds in the sample solution with those in the standard solutions.

Preparation of Stock Standard Solutions of VAL, IRB and TEL

Individual stock standard solutions of the three drugs (200 μg/ml) were prepared by dissolving 10 mg of each drug in 50 ml of solvent A (methanol: water – 60:40). The methanol stock standards containing mixture of VAL (I), IRB (II) and TEL (III) were prepared by appropriately diluting the standard solutions in the range of 5–40 μg/ml using solvent A.

Sample Preparation

From formulations containing Valsartan (80 mg), Irbesartan (150 mg) and Telmisartan (80mg) was prepared a mixture of sample solutions. Twenty tablets of the three formulations were weighed, crushed separately to a fine homogenous powder and their mean mass was determined. Quantity equivalent to 80 mg of each formulation was accurately weighed and taken individually in a 20 ml volumetric flask. The powdered mixtures were dissolved in the methanol. The contents were sonicated for 15 min and the mixture was made up to 20 ml with methanol. It was filtered through 0.45 mm membrane syringe filter. The supernatants of the solutions were taken, mixed thoroughly and diluted with the solvent A. The final concentrations were 20 μg/ml for VAL, IRB and TEL, respectively. For the HPLC analysis was injected 20 μL of this solution and the peak areas were measured for the determination of VAL, IRB and TEL in tablet formulation.

Method Validation

The proposed method was validated under the established optimal chromatographic conditions. The validation as per ICH guidelines[37] was carried out with respect to specificity, linearity, intra-day and inter-day precision, accuracy, and sensitivity (limit of quantitation (LOQ) and limit of detection (LOD)).

Linearity

The calibration graphs were obtained by injecting a series of standard solutions of each sartan separately

into the HPLC system. The plotting mean chromatographic peak area against the concentration of each compound was made. Each solution was injected in triplicate and the mean peak area value was observed within the concentration range of 5 - 40 μg/ ml for all sartans.

Precision

The system precision of the assays was investigated by performing five replicate analyses of the added standard samples at three different concentrations (10, 20 and 30 μg/ml) for each of the sartans on the same day and on three separate days. They were evaluated by relative standard deviations (RSD) of the peak areas of each analyte.

Accuracy (recovery method)

The accuracy of HPLC method was tested by calculating the recovery of certain amounts of each of the sartans added separately at three different concentrations (10, 20 and 30 μg/ml) to samples representing the average weight of the corresponding sartans concentrations. The recoveries were also confirmed by determination of these drugs in samples containing 50, 100 and 150 % of sartans.

Limiting values

The limit of detection (LOD) was considered the lowest concentration of the analytes corresponding to three times the background noise or relationship signal-to-noise ratio 3:1.

The limit of quantification (LOQ) was defined as the lowest point of the calibration curve and fulfilled the requirement of LOQ signal-to-noise ratio of 10:1.[37,38]

RESULTS AND DISCUSSION

Selection of Mobile phase

Different combinations of acetonitrile and phosphate buffer were tested and the optimum condition at acetonitrile-phosphate buffer 0.010 M (35:65 V/V) was reached.

Effect of pH of mobile phase

We studied the effect of varying the pH (5.5 - 6.5). Moreover, the stability of sartans is low in the alkaline media. We found out that the best separation results were achieved at pH 6.

Selection of flow rate and column temperature

Increasing of the column temperature from 25°C to 40°C led to a decrease in the total time required for the separation process with decrease of peak broadening

and increase in sensitivity. The optimum column temperature was at 30°C. Also, increasing the flow rate from 1 ml/min to 1.5 ml/min showed a similar decrease in the retention time. The optimum flow rate was 1.0 ml/min. The obtained chromatogram of the selected sartans with a rapid separation at different retention times is shown in Figure 1. The proposed chromatographic conditions indicate that the method is selective and could be applied for simultaneous identification and quantification of the sartans.

Method validation

Specificity and selectivity

The specificity of the HPLC method was established by analyzing standard drug and sample solutions. The retention times of VAL, IRB and TEL were confirmed by comparing the retention time with that of the standard (Figure 1). The selectivity of the method there is no interference between the matrix of blank sample and the drug sample.

Linearity

The linear calibration curves for VAL, IRB and TEL were constructed with five concentration levels each under the experimental conditions described above. The calibration curves of each drug substance were subject to regression analysis to calculate the regression equations and the correlation coefficients. Table 1 shows the regression equations of the selected sartans. In the regression equation; $y = ax + b$, "x" is for the concentration of the standard sartans, "y" is for the peak area, "a" is the intercept of the straight line with y-axis and "b" is the slope of the line. The R^2 in Table 1 refers to the correlation coefficient of the equation. All the standard sartans showed good linearity ($R^2 > 0.995$) in a relatively wide concentration range, adequate for the analytical method. Calibration plot data slope (a), intercept (b), and correlation coefficients (R^2) are given in Table 1.
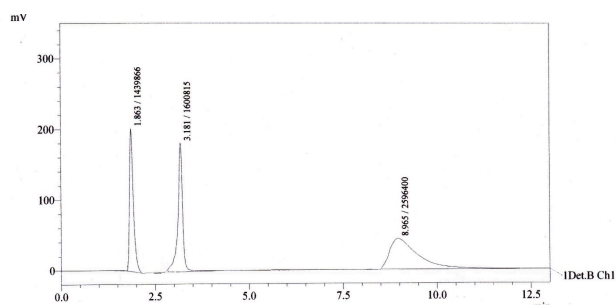
Figure 1: Chromatogram referring to the separation of selected sartans. Peak 1: Valsartan (1.86 min), Peak 2: Irbesartan (3.18 min), Peak 3: Telmisartan (8.96 min).

Table 1: Calibration data for the standard curves of the selected sartans (n = 5)			
Drugs	VAL	IRB	TEL
Concentration range (µg/ml)	5-40	5-40	5-40
Slope	404517.5	112611.7	249642.0
Intercept	16120.5	753.1	1152.3
Correlation coefficient (R^2)	0.998	0.995	0.997

Table 2: Detection (LOD) and quantification limits (LOQ) of the selected sartans			
Drugs	VAL	IRB	TEL
LOQ (µg/ml)	0.12	0.16	0.12
LOD (µg/ml)	0.04	0.06	0.04

Table 3: Accuracy/ Recovery of VAL, IRB, TEL								
	10 (µg/ ml)		20 (µg/ ml)		30 (µg/ ml)		Mean	
Drugs	Recovery (%)	CV (%)	Recovery (%)	CV (%)	Recovery (%)	CV (%)	Recovery (%)	CV (%)
Valsartan	101.5	1.85	100.4	1.21	99.35	1.04	100.4	2.16
Irbesartan	98.65	4.21	99.13	0.78	96.50	1.31	98.09	1.54
Telmisartan	103.1	3.11	98.97	1.08	100.8	1.29	100.9	1.35

Table 4: Intra-day and inter-day variations of the HPLC method for determination of the selected sartans						
	Intra-day			Inter-day		
Added concentration (µg/ml)	Measured concentration (µg/ml)	Accuracy (SE %)[*]	Precision (CV %)	Measured concentration (µg/ml)	Accuracy (SE %)[*]	Precision (CV %)
Valsartan						
10	9.89±0.077	-1.1	1.69	10.29±0.032	2.9	2.09
20	20.08±0.05	0.40	1.84	20.18±0.049	0.9	1.98
30	29.85±0.079	-0.50	0.83	30.65±0.112	2.17	2.04
Irbesartan						
10	9.79±0.077	-2.1	1.39	10.19±0.022	1.9	2.69
20	20.18±0.05	0.90	1.04	20.08±0.191	0.4	1.78
30	29.95±0.079	-0.17	0.83	30.15±0.128	0.5	1.48
Telmisartan						
10	10.09±0.027	0.90	1.99	10.29±0.022	2.9	3.79
20	20.08±0.04	0.40	1.72	20.12±0.191	0.6	1.38
30	30.05±0.039	0.17	0.93	30.25±0.128	0.83	0.88

* SE = 100 × (measured concentration - added concentration) / added concentration

Limits of quantitation and Limits of detection

The determined values of LOD and LOQ for the selected sartans in the proposed method are shown in Table 2. In this method, LOD for VAL and TEL was 0.04 µg/ml and for IRB was 0.06µg/ ml. LOQ for VAL and TEL was 0.12 µg/ml and for IRB was 0.16 µg/ ml.

Accuracy /Recovery

Accuracy of the proposed method was determined using recovery studies. The recovery study results of the selected sartans ranged from 96.5% to 103.1% using solution of sample preparation. The coefficients of variation for this technique were lower than 5 %. Results are reported in Table 3.

Precision

The precision of the quantitative method is the degree of agreement among the individual test results, of the repeated procedure to multiple samplings. It is measured by repeatedly injecting a ready-made sample and is expressed as coefficient of variation of the results. Within-day (n = 5) and between-day (n = 3) precision presented coefficients of variation and relative errors lower than 5%. These results are presented in Table 4.

CONCLUSION

A simple isocratic RP-HPLC method with UV detection has been developed for simultaneous determination of VAL, TEL and IRB. The method was validated for accuracy, precision, specificity and linearity. The run time was relatively short (10 min), which enabled rapid quantification of many samples in routine and quality control analysis of tablets. It is suitable for analysis of antihypertensive agents in their formulations in a single isocratic run. HPLC with UV detection becomes the

most available apparatus and is a low cost instrument in comparison with HPLC coupling with mass spectroscopy and capillary electrophoresis.

ACKNOWLEDGMENT

CONFLICT OF INTEREST

Authors have no conflicts of interest to declare.

ABBREVIATIONS USED

ARA II: angiotensin II receptor antagonist; **ACE:** Angiotensin converting enzyme; **ARB:** Angiotensin II receptor blocker; **HPLC:** High performance liquid chromatography; **UV:** ultraviolet; **MS:** Mass spectrometry; **TLC:** Thin layer chromatography; **DAD:** Diode array detector; **VAL:** Valsartan; **IRB:** Irbesartan; **TEL:** Telmisartan; **ICH:** International Conference on Harmonization; **LOQ:** Limit of quantitation; **LOD:** Limit of detection; **RSD:** Relative standard deviation.

REFERENCES

1. Gonzalez L, Lopez JA, Alonso RM, Jimenez RM. Fast screening method for the determination of angiotensin II receptor antagonists in human plasma by high performance liquid chromatography with fluorimetric detection. J Chromatogr A. 2002;949(1):49-60. https://doi.org/10.1016/S0021-9673(01)01496-0.

2. Ferreirósa N, Iriartea G, Alonso RM, Jiméneza RM. Development of a solid phase extraction procedure for HPLC–DAD determination of several angiotensin II receptor antagonists in human urine using mixture design. Talanta. 2007;73(4):748-56. https://doi.org/10.1016/j.talanta.2007.04.062 PMid:19073097.

3. Maslarska V, Peikova L, Tsvetkova B. Method Development and Validation of Valsartan and Hydrochlorothiazide in Pharmaceutical Dosage Form. Int J Pharm Bio Sci. 2014;5:205-11.

4. Rosario BM, Contreras Y, Clavijo S, Torres D, Delgado Y, Ovalles F *et al*, Gallignani M, Estela JM, Martin VC. Determination of losartan, telmisartan, and valsartan by direct injection of human urine into a column-switching liquid chromatographic system with fluorescence detection. J Pharm Biomed Anal. 2009;50(2):194-99. https://doi.org/10.1016/j.jpba.2009.04.015 PMid:19446420.

5. Koseki N, Kawashita H, Hara H, Niina M, Tanaka M, Kawai R, *et al*. Development and validation of a method for quantitative determination of valsartan in human plasma by liquid chromatography-tandem mass spectrometry. J Pharm Biomed Anal. 2007;43(5):1769-74. https://doi.org/10.1016/j.jpba.2006.12.030 PMid:17289324.

6. Ferreiros N, Iriarte G, Alonso RM, Jimenez RM, Ortiz E. Separation and quantification of several angiotensin II receptor antagonist drugs in human urine by a SPE-HPLC-DAD method. J Sep Sci. 2008;31(4):667-76. https://doi.org/10.1002/jssc.200700442 PMid:18307163.

7. Krishnaiah C, Raghupathi RA, Kumar R, Mukkanti K. Stability-indicating UPLC method for determination of Valsartan and their degradation products in active pharmaceutical ingredient and pharmaceutical dosage forms. J Pharm and Biomed Anal. 2010;53(3):483-89. https://doi.org/10.1016/j.jpba.2010.05.022. PMid:20646890.

8. Zarghi A, Shafaati A, Foroutan SM, Movahed H. Rapid Quantification of Valsartan in Human Plasma by Liquid Chromatography using a Monolithic Column and a Fluorescence Detection: Application for Pharmacokinetic Studies. Sci Pharm. 2008;76:439-50. https://doi.org/10.3797/scipharm.0808-01.

9. Cagigal E, González L, Alonso RM, Jiménez RM. Experimental design methodologies to optimise the spectrofluorimetric determination of Losartan and Valsartan in human urine. Talanta. 2001;54(6):1121-33. https://doi.org/10.1016/S0039-9140(01)00379-4.

10. Tsvetkova D, Obreshkova D, Ognjanov S. Validation of TLC densitometry for simultaneous quality and quantity analysis of angiotensin II receptor antagonists Losartan, Telmisartan and Valsartan. Compt Rend Acad Bulg Sci. 2011;64(1):39-44.

11. Tsvetkova D, Obreshkova D. Application of validated TLC – densitometric method for simultaneous identification and determination of Losartan Potassium, Telmisartan and Valsartan in tablets. J Planar Chromatogr – Modern TLC. 2012;25(4):326-30. https://doi.org/10.1556/JPC.25.2012.4.8.

12. Tsvetkova D, Obreshkova D, Petkova V, Pankova St, Atanasov P, Kasnakova P. Simultaneous determination of Valsartan and Hydrochlorothiazide in tablets by thin-layer chromatography-densitometric method. World J Pharm Pharm Sci. 2015;4:1-11.

13. Salama I. Simultaneous HPLC–UV analysis of telmisartan and hydrochlorothiazide in human plasma. Bull Fac Pharm, Cairo University. 2011;49(1):19-24. https://doi.org/10.1016/j.bfopcu.2011.07.005.

14. Babu Ravi VB, Inamadugu JK, Pilli NR, Sreenivasulu V, Ponneri V. Simultaneous determination of telmisartan and amlodipine in human plasma by LC–MS/MS and its application in a human pharmacokinetic study. J Pharm Anal. 2012;5:319-26. https://doi.org/10.1016/j.jpha.2012.03.008.

15. Virkar PS, Pingale SG, Mangaonkar KV. Development and Validation of a High Performance Liquid Chromatography Method for Determination of Telmisartan in Rabbit Plasma and its Application to a Pharmacokinetic Study. J Anal Bioanal Techn. 2012;3:2-5. https://doi.org/10.4172/2155-9872.1000133.

16. Kumbhar TS, Chougule GK, Gajeli GB, Tegeli VS, Thorat YS, Shivsharan US. Visible Spectrophotometric determination of Telmisartan from urine. Int J Pharm Sci Res. 2011;2(5):1254-58.

17. Elshanawane AA , Abdelaziz LM , Kamal MM, Hafez HM. Quantitative determination of Telmisartan, Ramipril, Amlodipine Besylate, and Atorvastatin Calcium by HPLC. J Liq Chrom Rel Techn. 2014;37(2):195-206. https://doi.org/10.1080/10826076.2012.738622.

18. Patel N, Patel JK. Analytical Methodologies for Determination of Telmisartan: An Overview. Int J Pharm Pharm Sci. 2013;5(1):17-22.

19. Nie J, Zhang M, Fan Y, Wen Y, Xiang B. Biocompatible in-tube solid-phase microextraction coupled to HPLC for the determination of angiotensin II receptor antagonists in human plasma and urine. J Chromatogr B Analyt Technol Biomed Life Sci. 2005;828(1):62-9. https://doi.org/10.1016/j.jchromb.2005.09.015 PMid:16203184.

20. Yankov V, Tsvetkova D, Obreshkova D, Ivanova S, Petkova V. Recent applications of spectrophotometric and thin layer chromatographic methods for quality control of fixed dosage combinations of sartans with Hydrochlorthiazide. World J Pharm Pharm Sci. 2016;5:18-43.

21. Tsvetkova D, Obreshkova D, Ivanova S, Yankov V, Atanasov P. Quality control of impurities and comparison of pharmacokinetic parameters of angiotensin receptor antagonists. J Multidiscipl Eng Sci Stud. 2016; 2:647-61.

22. Feng Y, Yan Y, Yin Q, Liu L, Shi A. Studies on plasma level determination of telmisartan by HPLC. Yaowu Fenxi Zazhi. 2005;25(6):618-20.

23. Wu J, Feng F, Jiang J, Tian Y. Determination of telmisartan in human plasma by HPLC-MS and study of its pharmacokinetics. Zhongguo Yaoke Daxue Xuebao. 2004;35:545-48.

24. Zhang H, Fang Y. HPLC/APCI-MS Determination of telmisartan in Human Plasma. Yaowu Fenxi Zazhi. 2004;24(5):497-99.

25. Kuang R, Zhang H, Xiong Y. HPLC determination with fluorescent detection of telmisartan concentration in plasma and its application. Yaowu Fenxi Zazhi. 2005;25(6):629-32.

26. Tsvetkova D, Obreshkova D, Ivanova S, Yankov V, Atanasov P, Hadjieva B. Telmisartan quality control by validation of UV-spectrophotometric method. Int J Innov Res Med Sci. 2016;1:113-23.

27. Zhang H, Jiang Y, Wen J, Zhou T, Fan G. Rapid determination of telmisartan in human plasma by HPLC using a monolithic column with fluorescence detection and its application to a bioequivalence study. J chromatograph

B Analyt Technol Biomed Life Sci. 2009;877(29):3729-33. https://doi.org/10.1016/j.jchromb.2009.08.028 PMid:19744898.

28. Nie J, Zhang M, Fan Y, Wen Y, Xiang B. Biocompatible in-tube solid-phase microextraction coupled to HPLC for the determination of angiotensin II receptor antagonists in human plasma and urine. J Chromatogr B Analyt Technol Biomed Life Sci. 2005;828(1):62-9. https://doi.org/10.1016/j.jchromb.2005.09.015 PMid:16203184.

29. Richards MP, Kumar DB, Mohammad Y, Reddy K, Siddhartha B. Simultaneous Estimation of Telmisartan and Amlodipine Besylate in Pharmaceutical Dosage Form By RP – HPLC. Int J Pharma. 2011;1(2):105-9.

30. Yan T, Li H, Deng L, Guo Y, Yu W. Liquid chromatographic-tandem mass spectrometric method for the simultaneous quantitation of telmisartan and hydrochlorothiazide in human plasma. J Pharm Biomed Anal. 2008;48(4):1225-29. https://doi.org/10.1016/j.jpba.2008.08.021 PMid:18838240.

31. Bae SK, Kim MJ, Shim EJ and Shin JG. HPLC determination of Irbesartan in human plasma: its application to pharmacokinetic studies. Biomed Chrom. 2009;23(6):568-72. https://doi.org/10.1002/bmc.1154 PMid:19277953.

32. Praveen KM. Development and validation of a stability indicating RP-HPLC method for assay of Irbesartan in pure pharmaceutical dosage. Int J Pharm Sci Chem Rev Res. 2011;6(1):100-4.

33. Ashok KS. Simultaneous determination of Irbesartan and Hydrochlorothiazide in human plasma by liquid chromatography. J Chromatogr B. 2003;784(1):195-201. https://doi.org/10.1016/S1570-0232(02)00759-6.

34. Sultana N, Arayne MS, Ali SS, Sajid S. Simultaneous determination of Olmesartan Medoxomil and Irbesartan and Hydrochlorothiazide in pharmaceutical formulations and human serum using high performance liquid chromatography. Chinese J Chromatogr. 2008;26(5):544-49. https://doi.org/10.1016/S1872-2059(08)60029-2.

35. Ganesan M. Method development and validation of Irbesartan using LCMS/MS: Application to pharmacokinetic studies. J Chem Pharm Res. 2010;2:740-46.

36. Rani GT, Shankar DG, Shireesha M, Satyanarayana B. Spectrophotometric method for determination of Angiotensin –II Receptor Antagonist in bulk and pharmaceutical dosage forms. Int J Pharm Pharm Sci. 2012;4:198-202.

37. ICH Q2B, International Conference on Harmonisation, Validation of Analytical Procedures. Methodology, 2005.

38. United States Pharmacopoeia 29. National Formulary 24, United States Pharmacopoeial Convention, Rockville 2006.

PICTORIAL ABSTRACT
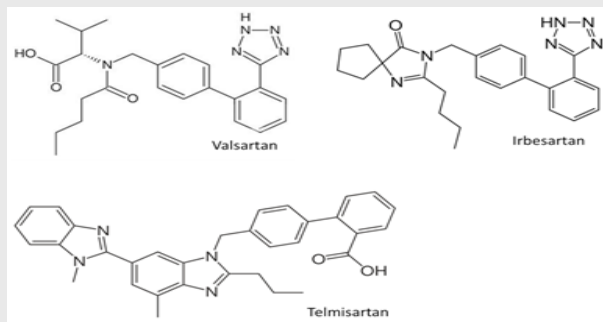
About Authors

Vania Maslarska: Dr. Vania Maslarska is an associate professor at Department of Chemistry, Faculty of Pharmacy, Medical University-Sofia, BULGARIA.

Vladimir Yankov: Vladimir Yankov is a PhD student at Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Medical University-Sofia, BULGARIA.

Danka Obreshkova: Dr. Danka Obreshkova is a full professor at Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Medical University-Sofia, BULGARIA.

Stanislav Bozhanov: Dr. Stanislav Bozhanov is an assistant professor at Department of Chemistry, Faculty of Pharmacy, Medical University-Sofia, BULGARIA.

SUMMARY

- A validated method was developed for simultaneous analysis of three sartans (Valsartan, Irbesartan and Telmisartan) in tablet dosage form by RP-HPLC method.
- A mixture of acetonitrile: phosphate buffer 10mM, pH 6 adjusted using 0.1 mol/l o-H3PO4 in 35:65 v/v ratio was used as mobile phase.
- The retention times of Valsartan, Irbesartan and Telmisartan were found to be Peak 1: Valsartan (1.86 min), Peak 2: Irbesartan (3.18 min), Peak 3: Telmisartan (8.96 min).
- The developed method was validated as per ICH guidelines.
- The procedure can provide a simple, sensitive and fast method for the quality control of the three sartans in bulk and tablets.