ScienceDirect

Journal of Chromatography B
Date: 5 November 2005
Show more

Research article Get rights and content ↗

Determination of atorvastatin in human serum by reversed-phase high-performance liquid chromatography with UV detection

Gholamreza Bahrami [a b], Bahareh Mohammadi [a], Shahla Mirzaeei [b], Amir Kiani [a] Show more

Cite Add to Mendeley Share 10.1016/j.jchromb.2005.08.008 ↗

Access through your organi... Purchase PDF

Article preview Recommended articles Cited by (131) Metrics

Abstract

A rapid and sensitive high-performance liquid chromatographic method was validated and described for determination of atorvastatin in human serum. Following liquid–liquid extraction of the drug and an internal standard (sodium diclofenac), chromatographic separation was accomplished using C18 analytical column with a mobile phase consisting of sodium phosphate buffer (0.05 M, pH 4.0) and methanol (33:67, v/v). Atorvastatin and the internal standard were detected by ultraviolet absorbance at 247 nm. The average recoveries of the drug and internal standard were 95 and 80%, respectively. The lower limits of detection and quantification were 1 and 4 ng/ml, respectively, and the calibration curves were linear over a concentration range of 4–256 ng/ml of atorvastatin in human serum. The analysis performance was studied and the method was applied in a randomized cross-over bioequivalence study of two different atorvastatin preparations in 12 healthy volunteers.

Keywords

Chromatography; HPLC; Atorvastatin; Serum; Bioequivalence study; Statins

Previous article in this issue Next article in this issue

Introduction

Atorvastatin (AT) [*R*-(*R**,*R**)]-2-(4-fluorophenyl)-β,δ-dihydroxy-5-(1-methylethyl)-3-phenyl-4[(phenylamino)carbonyl]-1*H*-pyrrole-1-heptanoic acid, is a member of the class of lipid-lowering agents called statins. The drug is potent inhibitor of HMG-CoA reductase, the rate limiting enzyme in cholesterol biosynthesis and has been demonstrated to be effective in reducing both cholesterol and triglyceride. AT is rapidly absorbed after oral administration however, due to presystematic clearance in the gastro-intestinal mucosa and metabolism in the liver, its absolute bioavailability is approximately 12% and low plasma concentration is achieved following administration of the drug [1], [2]. Thus, quantification methods of the drug in pharmacokinetic studies need to be sensitive and specific. Several analytical methods for analysis of statins [3], [4], [5], [6] including levostatin [7], [8], simvastatin [9], [10],

Article preview
Abstract
Introduction
Section snippets
References (26)

[11], fluvastatin [12], [13], pravastatin [14], [15], [16], [17], [18], [19], [20], [21] and cerivastatin [22] in biological fluids have been published. However, there is noticeable shortage of methods described in the literature for determination of AT in the biological samples. Existing analytical methods for AT included an enzyme immunoassay [23], gas chromatography/mass spectrometry (GC/MS) [24] and high-performance liquid chromatography (HPLC) equipped with mass spectrometry detection (HPLC/MS) [25], [26]. GC/MS and HPLC/MS methods are sensitive and specific with LOQ of 0.25 ng/ml, but these devices may not be available in many pharmaceutical laboratories and need highly trained persons. In addition extraction of the drug in the published HPLC/MS method [25] involved multi steps and time consuming procedures, while for large scale single dose pharmacokinetic studies a simple procedure is required. Several HPLC methods using UV detection have been reported for analysis of pravastatin [14], [17], [20], simvastatin [9] and lovastatin [8] in human serum, however, the present paper describes simple, fast and accurate first report of analysis of AT in human blood samples using HPLC with ultraviolet detection. This method was applied in a randomized cross-over bioequivalence study, following oral administration of 40 mg of two different atorvastatin preparations in 12 healthy volunteers.

Organizational access

Get full-text access by signing in with your organisation

Access through **your organization**

Other access options

Purchase PDF

Need help with access? ↗

Section snippets

Chemicals

The calcium salt of AT was from Parke–Davis (Ann Arbor, MI) and kindly provided by Arya pharmaceutical company (Tehran, Iran). The HPLC grade methanol, ethyl acetate, sodium dihydrogen phosphate, di-sodium hydrogen phosphate, sodium hydroxide and *o*-phosphoric acid were purchased from Merck (Darmstadt, Germany). Sodium diclofenac was used as internal standard (I.S.) and obtained from Sigma (St. Louis, MO, USA). All reagents used were of analytical grade except methanol which was HPLC grade. …

Specificity and selectivity

Adequate chromatographic separation was obtained using the system described above. Representative chromatograms of human blank serum and human blank serum spiked with the I.S. and AT at the concentration of 4 ng/ml are shown in Fig. 1A and B, respectively. Under the chromatographic conditions described, AT and the I.S. were eluted with retention times of 3.4 and 4.1 min, respectively. No endogenous components from serum were found to interfere with the elution of the drug or I.S. Fig. 1C shows …

Conclusion

In conclusion a simple, accurate, rapid and specific reversed-phase HPLC method using UV detection has been described for the determination of AT in serum. In this new method which has been demonstrated to be suitable for use in pharmacokinetic studies, although less sensitivity is obtained comparing to previously published LC/MS and GC/MS procedures; however, the resulted LOQ is sufficient for human pharmacokinetic studies. …

Acknowledgments

This work was supported by Arya Pharmaceutical Company and in part by Kermanshah University of Medical Sciences. …

References (26)

X.S. Miao *et al.*
J. Chromatogr. A (2003)

E.J. Park *et al.*
J. Chromatogr. Biomed. Sci. Appl. (2001)

T.K. Majumdar *et al.*
J. Pharm. Biomed. Anal. (2004)

S. Erturk *et al.*
J. Chromatogr. B (2003)

H. Yang *et al.*
J. Chromatogr. B (2003)

H. Ochiai *et al.*
J. Chromatogr. B (1997)

K. Otter *et al.*
J. Chromatogr. Biomed. Sci. Appl. (1998)

C. Dumousseaux *et al.*
J. Pharm. Sci. (1994)

Z. Zhu *et al.*
J. Chromatogr. Anal. Technol. Biomed. Life Sci. (2003)

K. Kawabata *et al.*
J. Chromatogr. Anal. Technol. Biomed. Life Sci. (2005)

View more references

View full text

Recommended articles

Based on reading popularity

Research article

Simplification of pharmacopoeial liquid chromatography methods for related substances of statins by hyphenated ultraviolet and charged aerosol detection

Rasmus Walther, Ulrike Holzgrabe

Journal of Pharmaceutical and Biomedical Analysis • Volume 225 • 2023 • Article 115218

Research article

Simultaneous LC–MS/MS analysis of simvastatin, atorvastatin, rosuvastatin and their active metabolites for plasma samples of obese patients underwent gastric bypass surgery

Asma El-Zailik, ..., Diana S.-L. Chow

Journal of Pharmaceutical and Biomedical Analysis • Volume 164 • 2019 • Pages 258-267

Cited by (131)

Research article

Three different spectrophotometric methods manipulating ratio spectra for determination of binary mixture of Amlodipine and Atorvastatin

Darwish H.W., ..., El-Zeiny B.A.

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy • Volume 83 • 2011

> *Citation Excerpt:*
>
> …Literature survey revealed that Amlodipine besylate is official in British Pharmacopoeia [7]. There are many reported methods for the determination of either AM [8–10] or AT [11–13] alone, or in combination with other drugs in pharmaceutical dosage forms [14–20] or individually in biological fluids [21–24]. Different LC methods [25–30], spectrophotometric methods [31–33], chemometric methods [34], capillary electrophoresis [35], HPTLC [36], have been reported for the estimation of AM and AT in their mixture.…

Show abstract

Research article

Effect of statins on cholesterol crystallization and atherosclerotic plaque stabilization

Abela G.S., ..., Tamhane U.

American Journal of Cardiology • Volume 107 • 2011

> *Citation Excerpt:*
>
> …Doses of statins used in these experiments were comparable to those that arterial plaques are usually exposed to in humans. This was calculated from the concentration of statin in the human circulation after a single dose of atorvastatin 40 mg and a maximum serum concentration (Cmax) (nanograms per milliliter) of 50.1 ng/ml.5 Because the average amount of free cholesterol present in a disrupted plaque is 30 mg/g6 and a cardiac output of 5 L/min, 0.3 mg of atorvastatin comes into contact with free cholesterol at 30 mg/min.…

Show abstract

Research article

Simultaneous determination of rosuvastatin and atorvastatin in human serum using RP-HPLC/UV detection: Method development, validation and optimization of various experimental parameters

Shah Y., ..., Nasir F.

Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences • Volume 879 • 2011

Show abstract

Research article

HPLC methods for the determination of simvastatin and atorvastatin

Nováková L., ..., Solich P.

TrAC - Trends in Analytical Chemistry • Volume 27 • 2008

Show abstract

Research article

A stability-indicating high performance liquid chromatographic (HPLC) assay for the simultaneous determination of atorvastatin and amlodipine in commercial tablets

Mohammadi A., ..., Walker R.B.

Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences • Volume 846 • 2007

Show abstract

Stability indicating RP-HPLC method for simultaneous determination of atorvastatin and amlodipine from their combination drug products ↗

Chaudhari B.G., ..., Shah P.B.

Chemical and Pharmaceutical Bulletin • Volume 55 • 2007

View all citing articles on Scopus ↗

Metrics

Citations

Citation Indexes	131

Captures

Mendeley Readers	54

PLUMX View details ↗

Copyright © 2005 Elsevier B.V. All rights reserved.

ELSEVIER

All content on this site: Copyright © 2026 Elsevier B.V., its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the relevant licensing terms apply.

RELX™