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SPECTROPHOTOMETRIC DETERMINATION OF ATORVASTATIN IN PHARMACEUTICAL FORMULATIONS

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ABSTRACT

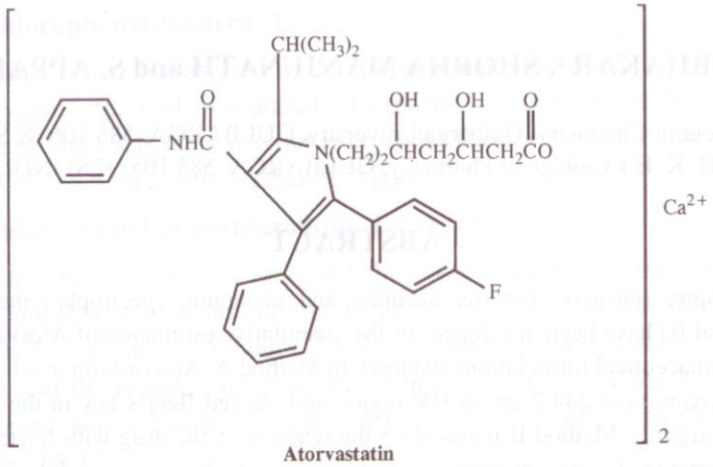
Two simple, sensitive, precise, accurate and economic spectrophotometric methods (Method A and B) have been developed for the quantitative estimation of Atorvastatin in bulk drug and pharmaceutical formulations (tablets). In Method A, Atorvastatin in ethanol exhibited absorption maximum at 244.2 nm in UV region and obeyed Beer's law in the concentration range of 2–10μg/mL. Method B is based on the reaction of the drug with ferric chloride and potassium ferricyanide, which forms a green coloured chromogen exhibiting absorption maximum at 760 nm and obeyed Beer's law in the concentration range of 2–10μg/mL. Spectrophotometric parameters were established for standardisation of the methods including statistical analysis of data. These methods have been successfully extended to the pharmaceutical preparations (tablets) containing Atorvastatin.

Keywords: Spectrophotometric determination, Atorvastatin calcium.

INTRODUCTION

Atorvastatin calcium, a synthetic lipid lowering agent, is chemically (βR–δR) 2–(4–fluorophenyl)–β,δ–dihydroxy–5–(1–methylethyl)–3–phenyl]–4–[(phenylamino) carbonyl)] – 1H–pyrrole–1–heptanoic acid calcium salt (2:1) trihydrate and used in the treatment of primary hypercholesterolemia and mixed dyslipidemia. It is a synthetic competitive inhibitor of HMG–CoA reductase. There is no analytical report found in literature for the quantitative estimation of Atorvastatin in bulk drug and pharmaceutical formulations. In the present investigation, two simple, sensitive, precise, accurate and economic spectrophotometric methods (Method A and B) have been developed for the quantitative estimation of Atorvastatin in bulk drug and pharmaceutical formulations (tablets). In Method A, Atorvastatin in ethanol exhibited absorption maximum at 244.2 nm in UV region and obeyed Beer's law in the concentration range of 2–10μg/mL. Method B is based on the reaction of the drug with ferric chloride and potassium ferricyanide, which forms a green coloured chromogen exhibiting absorption maximum at 760 nm and obeyed Beer's law in the concentration range of 2–10μg/mL. In this method, the drug reduces ferric chloride to ferrous form, which in turn forms complex with potassium ferricyanide to give a green coloured potassium ferroferrous complex. Spectrophotometric parameters were established for standardisation of the methods

including statistical analysis of data. These methods have been successfully extended to the pharmaceutical preparations (tablets) containing Atorvastatin.



Atorvastatin

EXPERIMENTAL

All spectral measurements were done on Systronics 119 UV/visible spectrophotometer.

Reagents

Analytical grade reagents were used. Commercially available samples were purified.

(i) Double distilled ethanol

(ii) Aqueous $FeCl_3$ (0.1 M)

(iii) Aqueous potassium ferricyanide (0.1% w/v).

Standard and sample solutions

About 100 mg of Atorvastatin (pure or equivalent formulation) was accurately weighed and dissolved in 20 mL of double distilled ethanol in a 100 mL volumetric flask and diluted upto the mark with ethanol (1mg/mL). The final concentration of Atorvastatin was brought to 100µg/mL with alcohol.

Assay

Method A : Aliquots of Atorvastatin ranging from 0.2–1.0 mL (1 mL=100µg) were transferred into a series of 10 mL volumetric flasks and volumes were made upto 10 mL with double distilled ethanol. The absorbance of the solutions was measured at 244.2 nm against solvent blank. The amount of Atorvastatin present in sample was computed from calibration curve.

Method B : Aliquots of Atorvastatin ranging from 0.2–1.0 mL (1 mL = 100µg) were transferred into a series of 10 mL volumetric flasks. To each flask 2 mL ferric chloride reagent

and 3 mL of potassium ferricyanide reagent were added. After 20 minutes at room temperature, the volumes were made upto 10 mL with distilled water. The absorbance of green coloured complex formed was measured at 760 nm against a reagent blank. The amount of the drug present in the sample solution was computed from the calibration curve.

RESULTS AND DISCUSSION

The optical characteristics such as absorption maxima, Beer's law limits, molar absorptivity and Sandell's sensitivity are presented in Table 1. The regression analysis using the method of least squares was made for the slope (b), intercept (a) and correlation (r) obtained from different concentrations and the results are summarised in Table 1. The per cent relative standard deviation and per cent range of error (0.05 and 0.01 level of confidence limits) calculated from the eight measurements, 3/4 of the upper Beer's law limits of Atorvastatin are given in Table 1. The results showed that these methods have reasonable precision. The results obtained in both the methods (Table 2) confirm the suitability of these methods for pharmaceutical dosage forms. In order to justify the reliability and suitability of the proposed methods, known quantities of pure Atorvastatin was added to its various preanalysed formulations and the mixtures were analyzed by the proposed methods. The results of recovery experiments are also summarised in Table 2. The other active ingradients and excipients usually present in pharmaceutical dosage forms did not interfere.

Table 1. Optical characteristics and precision

	Method A	Method B
λ_{max}(nm)	244.2	760
Beer's law limits (µg/mL (C))	2–10	2–10
Molar absorptivity (lit. mole^{-1} cm^{-1})	4.372 x 10^4	8.254 x 10^4
Sandell's sensitivity (µg/cm^2 0.001 absorption units)	0.012	0.023
Regression equation (Y*) Slope (b)	0.363 x 10^{-1}	0.702 x 10^{-1}
Intercept (a)	0.82 x 10^{-2}	0.04 x 10^{-2}
Correlation coefficient (r)	1.002	1.0011
% RSD	0.7537	0.4133
Range of errors**		
Confidence limits with 0.05 level	± 0.0013	± 0.0014
Confidence limits with 0.01 level	± 0.0020	± 0.0021

*Y = bC + a where C is the concentration of Atorvastatin in µg/mL and Y is the absorbance at the respective λ_{max}; ** = For eight measurements.

Table 2. Evaluation of Atorvastatin in pharmaceutical preparations

Sample (Tablets)*	Labelled amount (mg)	Amount obtained (mg)		Percentage recovery**	
		Proposed Method			
		A	B	A	B
T_1	10.0	9.98	9.96	99.62	99.23
T_2	10.0	9.97	9.95	99.57	99.31
T_3	10.0	9.99	9.96	99.71	99.42

* Tables from different manufacturers; ** Average of eight determinations.

The proposed methods are found to be simple, sensitive, selective and accurate and can be used in the determination of Atorvastatin in bulk drug and its pharmaceutical dosage forms in a routine manner.

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