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Derivative Spectrophotometric Estimation of Levofloxacin hemihydrate and Ornidazole

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Abstract: The use of first order derivative spectrophotometry allowed simultaneous determination of Levofloxacin hemihydrate and Ornidazole in fixed dose combination products. The absorbance values at 277.5nm and 319nm of first derivative spectrum were used for the estimation of Levofloxacin hemihydrate and Ornidazole, respectively without mutual interference. This method obeyed Beer's law in the concentration range of 10-50µg/ml for Levofloxacin hemihydrate and 20-80 µg/ml for Ornidazole respectively. The results of analysis have been validated statistically and recovery studies confirmed the accuracy of the proposed method.
Key words: Levofloxacin hemihydrate, Ornidazole, Ultraviolet Spectrophotometry, Derivative Spectrophotometry.

INTRODUCTION

Levofloxacin(LFH),(-)-(S)-9-fluoro-2,3-dihydro-3-methyl-10-(4-methyl-1-piperazinyl]-7-oxo-7H-Pyridol[1,2,3-di]-1,4-benzoxazine-6-carboxylic acid hemihydrate(LFH),is chemically, a chiral fluorinated carboxy quinolone, is the pure (-)-(S)-enantiomer of the racemic drug substance ofloxacin [1].It is used mainly as an antibacterial agent. Literature survey revealed few methods are reported for the spectrophotometric methods for estimation of levofloxacin hemihydrate, alone or in combination with other drugs or pharmaceutical formulations[3] . Ornidazole (ORN), [1-chloro-3-(2-methyl-5-nitroimidazole-1-yl) 2-propanol] is 5-nitroimidazole derivative[2] with antiprotozoal properties against anaerobic bacteria. Spectrophotometry [4-7] and HPLC [8-10] methods have been reported for the estimation of 'ORN' in biological fluids and in plasma. The review of literature revealed that no method is reported for the simultaneous estimation of LFH and ORN in fixed dose combination products by UV spectrophotometry. The present paper describes a simple, rapid, accurate and reproducible method for the simultaneous estimation of LFH and ORN in tablet formulation by first order derivative spectrophotometry.

EXPERIMENTAL

Materials

LFH and ORN were gift samples from Glenmark Research Centre, Mumbai. The commercial fixed dose combination product (LOXOF-OZ® containing 250mg LFH and 500mg ORN) was procured from the local market. Hydrochloric acid of analytical grade was used as solvent was procured from Qualigens Fine chemicals, Mumbai.

Instruments

A shimadzu Uv-1700., Uv-visible spectrophotometer with 1cm matched quartz cell used

for the measurement of aborbance.Shimadzu-AX-200 electronic balance was used for weighing the samples. Class 'A' volumetric glassware were used.

PROCEDURE

Preparation of standard stock solution

Standard stock solution was prepared by dissolving 100mg of each standard drug samples in 100 mL volumetric flask separately and the volume was made up with 0.1M Hcl to get a concentration of 1mg/mL .From this suitable dilution were made with 0.1M Hcl to get working standard solutions of 10-50µg/mL for LFH and 20-80µg/mL for ORN separately. The absorbance of derivatised spectra was measured at 277.5nm and 319nm for LFH and ORN, respectively against 0.1M Hcl.Fig.1 represents the overlain spectra of both the drugs. Both the drugs obeyed linearity individually.

Preparation of sample stock solution

Sample stock solution was prepared by crushing 20 tablets to give powder. Powder equivalent to 250mg of ORN was dissolved in 100mL of 0.1M Hcl solution by thorough shaking. This was transferred to 100mL volumetric flask and the volume was made up to the mark with 0.1M Hcl solution. This solution was then filtered through whattman paper (#41).This is sample stock solution. Further dilutions were made form this stock solution to get the required concentration.

Method

The standard solution of 20 mcg/mL of both the drugs were scanned in the spectrum mode from 400-200nm, the absorption spectra, thus, obtained were derivatised to remove the interference of absorbing species. After examining all the overlain derivative order spectra, wavelengths were selected where the first drug shows zero crossing and other drug shows substantial absorbance, Fig.2.

Both the drug were estimated in first order with key entry (n=6), at the sampling derivatised wavelengths 293 for 'LFH' which is the zero crossing for 'ORN' and 277 for 'ORN' which is zero crossing for 'LFH'. The selection of derivatised wavelength was based upon the rational experimentation with mixed standard of the two components in fixed concentration. Therefore these two wavelengths can be employed for the estimation of Levofloxacin hemihydrate and Ornidazole without any interference.From the derivatised spectra of mixed standards the aborbances were measured at 293 for 'LFH' and a 277 for 'ORN'. These absorbances Vs concentration were plotted in the quantitative mode to obtain the working curves from which by extrapolating the value of absorbances of the sample solution, the concentration of the corresponding drugs were determined. Both the drugs obey Beer's Law.

For LFH and ORN the filtrate was taken and solution was appropriately diluted to final concentration with 0.1M HCl which contains 10 mcg/mL for both LFH and ORN respectively.

Recovery studies:

The results of analysis by the proposed method are given in Table 1 and Table 2. The recovery studies were carried out by adding known amount of standard drug solution was added to a preanalysed tablet sample at four different levels namely 50%,75%,100% and125%.The resulting solution were then analysed by proposed method. The results of recovery studies were found to be satisfactory and the results are presented in Table 3.

TABLE- 1: Result of Commercial Sample Analysis

Tablet sample	S.NO	Levofloxacin Hemihydrate Amount of drug estimated in(mg	Label claim in(mg)	Amount Found in %	Ornidazole Amount of drug estimated in(mg)	Label claim in(mg)	Amount Found in %
LOXOF-OZ	1	249.89	250	99.96	497.98	500	99.59
Tablet	2	249.56	250	99.82	498.71	500	99.74
	3	249.63	250	98.85	499.26	500	99.85

TABLE- 2: Result of Statistical Validation of Tablet Formulation

Tablet sample	S. No	Drug	Mean%	±Standard deviation	%Coefficient Variation	Standard Error
LOXOF-OZ tablet	1	LFH	99.84	2.48	2.4	1.43
	2	ORN	99.16	2.84	2.84	1.63

TABLE -3: Results of Recovery Studies for Estimation of LFH and ORN in Combination

Drug	Amount present in formulation (µg/ml)	Amount added (%)	*Mean %recovery ±SD
LFH	248.9	50%	99.62±0.788
		75%	98.89±0.207
		100%	100.39±0.353
		125%	99.85±0.469
ORN	499.3	50%	100.43±0.821
		75%	99.39±0.643
		100%	100.81±0.652
		125%	99.57±0.784

Asterisk (*) denotes mean three analysis.

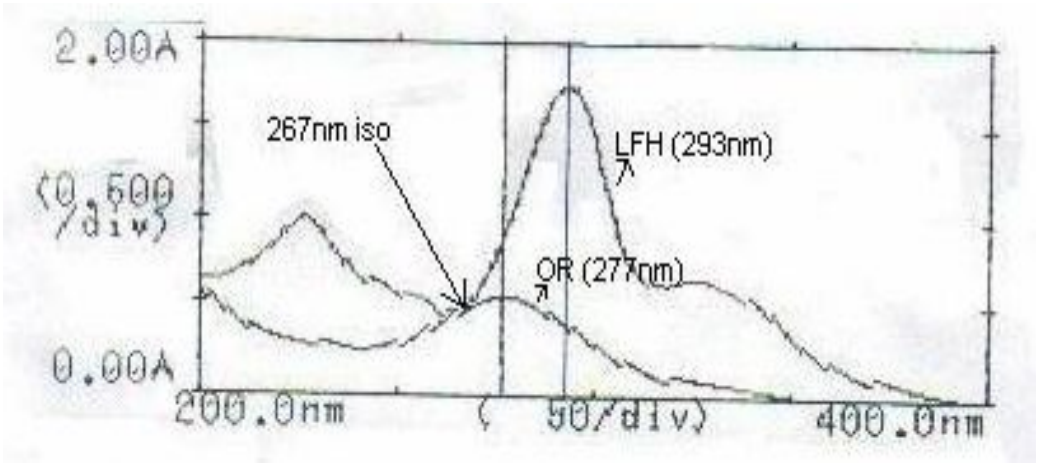

Fig.1: Overlain spectra of LFH and ORN.UV absorption spectra of LFH (20 mcg/mL) and ORN (20mcg/mL) in 0.1M Hcl

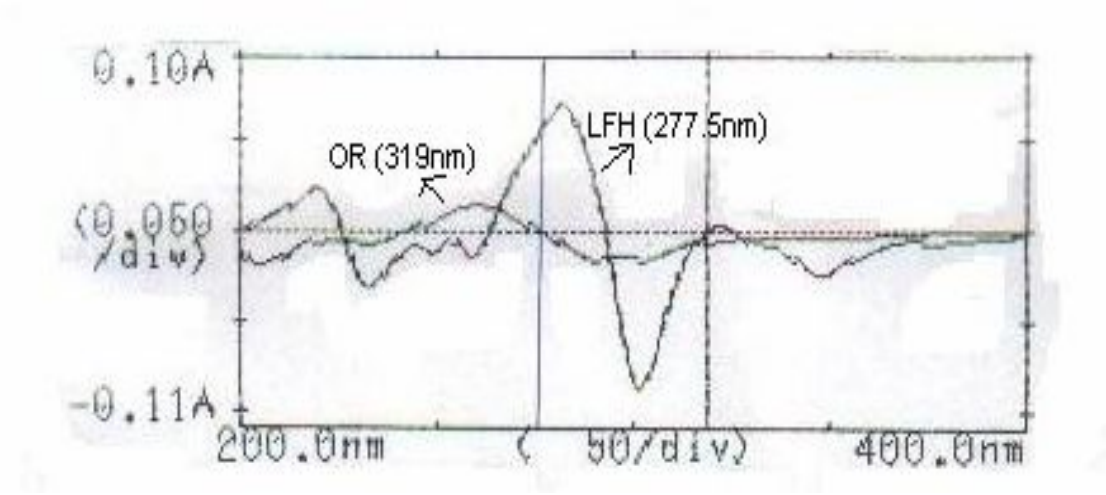

Fig.2: Overlain first derivative spectra of LFH and ORN.UV absorption first order derivative spectra of LFH (20mcg/mL) and ORN (20mcg/mL) in 0.1M Hcl.

RESULT AND DISCUSSION

The method developed for derivative spectrophotometric determination of Levofloxacin hemihydrate and Ornidazole in tablet formulation was found to be simple and convenient for routine simultaneous analysis of two drugs. Practically no interference from the tablet excipients was observed in this method. The method is used to eliminate the spectral interference from one of the two drugs while estimating the other drug by selecting the zero crossing point on the derivative spectra of each drug as the selected wavelength. The method is accurate, rapid, precise, reliable, simple, sensitive, reproducible and economical. The values of standard deviation, coefficient of variation and standard error were satisfactory and recovery studies ranging between 98-100% (for levofloxacin hemihydrate) and 99-100% (for ornidazole) were indicative of accuracy and precision of the proposed method.

The method may be employed for the routine pharmaceutical analysis for in process quality control as well as for finished formulation.

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The method may be suitably modified and may be used for estimation of drugs in biological fluids**.**

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