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A Simple UV Spectroscopic Method for the Determination of Metaprolol in Bulk and Tablets

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A B S T R A C T

A simple, economic, accurate UV method was developed for the estimation of Metaprolol in bulk and tablet dosage form. Water isused as a diluent to dissolve metaprolol. The drug mixture was sonicated for 3 mins for the enhanced solubility. The absorptions were observed at 223.0 nm, which was selected for the further analysis of metaprolol in bulk and its tablet dosage forms. The proposed method was validated according to ICH guidelines. The method showed high sensitivity with linearity range from 3 to 18 µg/mL (r^2=0.999). The limit of detection (LOD) was found to be 0.29 µg/mL and the limit of quantization (LOQ) was determined as the lowest concentration was found to be 0.97 µg/mL. The reports expressed that the proposed method was found to be simple, precise, accurate and rapid for the estimation of metaprolol in bulk and tablet dosage form using UV spectroscopy.

Keywords: Metaprolol, water, UV spectroscopy, ICH guidelines.

A R T I C L E I N F O

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1. Introduction

Metaprolol (MTP) is chemically (2S)-1-[4-(2-Methoxy ethyl)phenoxy]-3-[(1-methyl ethyl) amino]-2-propanol succinate (Figure 1).[1] It is a cardioselective β1-adrenergic blocking agent used for acute myocardial infarction (MI), heart failure, angina pectoris and mild to moderate hypertension. It may also be used for supraventricular and tachyarrhythmia and prophylaxis for migraine headaches. It is structurally similar to bisoprolol, acebutolol and atenolol in that it has two substituents in the para position of the benzene ring. At low doses, metaprolol selectively blocks cardiac β1-adrenergic receptors with little activity against β2-adrenergic receptors of the lungs and vascular smooth muscle. Receptor selectivity decreases with higher doses. Metaprolol possesses a single chiral center and is administered. From the literature survey, it was found that MTP estimated by analytical methods such as spectrophotometric methods [2-4], reversed-phase high-performance liquid chromatographic (RP-HPLC) method [5] and GC-MS method [6]. The aim of this study was to develop and validate a simple UV method, to quantify MTP in pure form and pharmaceutical formulation (tablets). The proposed method was validated according to ICH guidelines [7-10]. The validated method was applied to the analysis of tablets containing metaprolol.

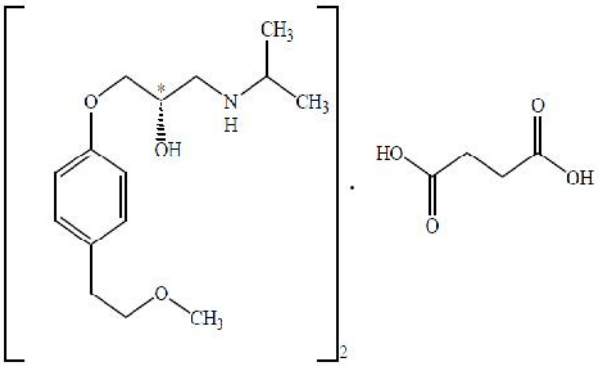

Figure 1: Chemical structure of Metaprolol

2. Materials and Methods

Instruments and reagents

An analytically pure sample of MTP was procured as gift sample from Aurobindo laboratories (Hyderabad, India).Distilled water was prepared in house. A PG Instruments T-60 UV/VIS spectrophotometer was used with 1 cm matched quartz cell. Tablet formulation [Selokeen XL, Astragenica Pharma Ltd, India]was procured from a local pharmacy with labeled amount 25 mg per tablet. Water was used as a diluent to dissolve MTP.

Preparation of working standard drug solution

50 mgof standard MTPwas weighed accurately and transferred to a 50 mlvolumetric flask. It was dissolved properly and diluted up to the mark with diluent to obtain final concentration of1000 µg/ml. 9 µg/ml solution was prepared from the stock solution which was used as working standard.

Analysis of marketed formulations

For the estimation of Metaprolol in tablets formulations, 20 tablets were weighed and triturate to fine powder. Tablet powder equivalent to 50 mg of Metaprolol was weighed and transfer into 50 ml volumetric flask than dissolved in diluent. It was kept for sonication for 3 min; this was filtered through Whatman filter paper No. 41 and then final dilution was made with diluent to get the final stock solution of 1000 µg/ml. From this stock solution, 9 µg/ml sample solution were prepared and analysed.

Validation

Method validation was performed in terms of specificity and selectivity, precision and accuracy, linearity, LOD & LOQ.

Linearity and range

Calibration standards of MTP, covering the range 3-18 µg/mL were prepared with the suitable dilution made from MTP stock solution. The calibration curves were obtained by plotting the intensity of absorbance against of concentration of MTP. The slope and intercept of the calibration line were determined by linear regression using the least squares method.

Specificity and selectivity

The interference from endogenous compounds was investigated by the analysis of tablets of various concentrations.

Precision

The intra& inter-day precision was evaluated by analyzing six sample solutions (n = 6), at the final concentration of analyses (9 µg/ml) of MTP. The MTP concentrations were determined and the % relative standard deviations (% RSD) were calculated.

Accuracy

MTP reference standards were accurately weighed and added to a mixture of the tablets excipients, at three different concentration levels (4.5, 9 and 13.5 µg/ml of metaprolol). At each level, samples were prepared in triplicate and the recovery percentage was determined.

Detection and quantitation limits

Limit of detection LOD and limit of quantification LOQ were calculated by using the standard deviation from the precision and the slope of linearity.

3. Results and Discussion

MTP has the zero order absorbance spectra maxima (figure 2 and 3) at 223.0 nm. The polynomial regression data for the calibration plots showed good linear relationship in the concentration range of 3-18 µg/ml with correlation coefficient (r^2) was found to be higher than 0.999 and the linearity curve was shown in figure 4. Recovery studies were carried out at three different levels i.e. 50 %, 100 %, and 150 % by adding the pure drug to the previously

analysed tablet powder sample. Percentage recovery for Metaprolol was determined by the method and it was found to be under acceptance criteria (98% to 101%) according to ICH guidelines [10]. The results of accuracy wereshown in table 2. The percentage recovery value indicates noninterference from excipients used in formulation. The precision was carried out as described in method and the results were presented in table 1. The values obtained in the repeatability (precision) shows that there is no significant difference in the precision values; hence the developed method can be used to analyze the MTP in tablet formulation. The mean assay of the precision value is 99.47%. The LOD determined as the amount drug was found to be 0.29µg/mL and the LOQ was determined as the lowest concentration was found to be 0.97 µg/mL in formulation. The summary of all the optical characterizes were shown in table 2.

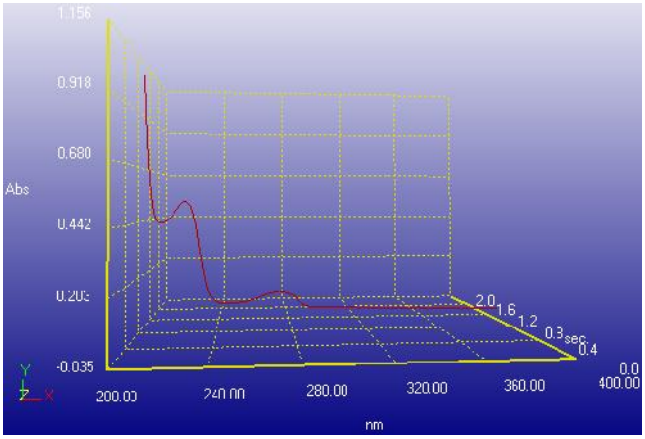

Figure 3: λ max (3-D view) curve of Metaprolol

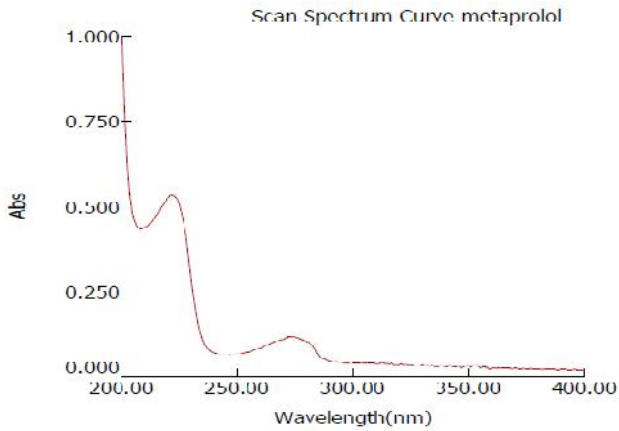

Figure 4: λ max curve of Metaprolol

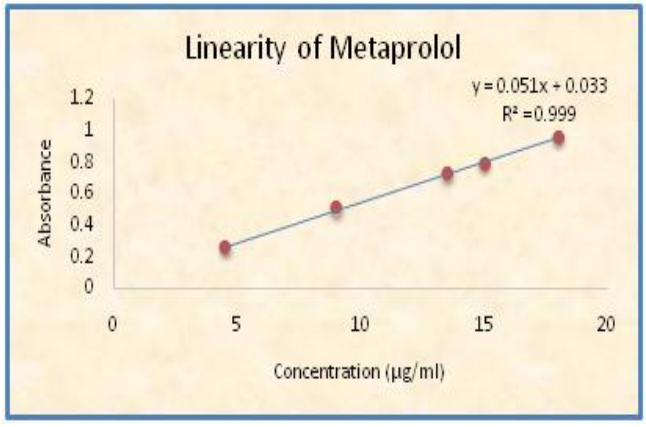

Figure 4: Linearity curve of Metaprolol

Table1: Results of Precision

Sample No.	Sample Abs - 1	% Assay - 1
1	0.503	99.05
2	0.511	100.62
3	0.502	98.85
4	0.505	99.44
5	0.498	98.06
6	0.512	100.82
Avarage Assay:		99.47
STD		1.07
% RSD		**1.07**

Table 2: Summary of Optical characteristics and Other Parameters

S No.	PARAMETERS	RESULTS
1	Absorption Maxima (nm)	223
2	Beer's-Lambert's range (µg/ml)	3-18
3	Regression equation (y)*	y = 0.0514x + 0.0335
4	Slope (b)	0.0514
5	Intercept (a)	0.0335
6	Correlation coefficient (r^2)	0.9991
7	Intraday precision (% RSD)**	1.07
8	Interday precision (% RSD)**	1.11
9	Accuracy (% mean recovery)	99.47
10	Limit of detection (µg / ml)	0.29
11	Limit of quantification (µg / ml)	0.97
12	Assay of tablets (%Purity)	100

*y = a + bx; when x is the concentration in mg/ml and y is absorbance unit.
**Average of six determinations.

4. Conclusion

The most striking features of the method was its simplicity and rapidity, non- requiring consuming sample preparations such as extraction of solvents, heating, degassing which are needed for HPLC or other procedures. It can be concluded that the proposed methods was fully validated and found to be simple, sensitive, accurate, precise, reproducible, rugged and robust and relatively inexpensive. So, the developed method can be easily applied for the routine Quality Control analysis of MTP in pharmaceutical preparations.

5. Acknowledgement

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6. References:

1. www.rxlist.com browsed on 20th Dec 2014.
2. Mustafa Cesme, DeryaTarinc and AysegulGolcu. Spectrophotometric Determination of Metoprolol Tartrate in Pharmaceutical Dosage Forms on Complex Formation with Cu(II). J. Pharm, **2011**, 4: 964-975
3. B. Yilmaz. Determination of MetoprololIn Pharmaceutical Preparations By Zero-, First-, Second- And Third-Order Derivative Spectrophotometric Method. Int J Pharma Bio Sci., **2010**, 1(1): 1-15
4. Jadhav A. S, Tarkase K. N. and Deshpande. Quantitative Determination of Metoprolol Succinate in bulk and tablet Dosage form through comparative study of UV and derivative Spectroscopy. Der Pharmacia Lettre, **2012**, 4(3): 763-767
5. CH.M.M.Prasada Rao, Y.Ragjendra Prasad, S.A.Rahaman, P. Gangi Reddy. Rp-Hplc Method of Simultaneous Estimation of Amlodipine BesylateAndMetoprolol in Combined Dosage Form. Int. J. Pharma Res Dev, **2010**, 2(9): 69-76
6. Bilal Yilmaz and SakirArslan. Development and Validation of GC–MS Method for Determination of Metoprolol in Human Urine. J. ChromSci, **2010**, 48: 613-617.
7. S. Muneer, C. Jose GnanaBabu, Ruksana Hakeem, K. Sai Sumanth. Development And Validation of Rp-Hplc Method for Estimation of Rufinamide in Bulk and its Pharmaceutical Dosage form.Int J Pharm Res Anal, **2012**, 2(1): 9-13.
8. S. Muneer, B. Mohammed Ishaq, H. Ruksana, Dr. Hindustan Abdul Ahad, Dr. K. Vanitha Prakash. A Simple UV Spectroscopic Method for the Determination of Ritonavir in Bulk and Tablets. J Pharm Biomed Ana Letters, **2014**, 2(2):118-122
9. S. Muneer, B. Gopi Krishna, A Maruthi, B. Mohammed Ishaq, H. Ruksana, Dr. Hindustan Abdul Ahad. A Simple UV Spectroscopic Method for the Determination of Sertraline Hydrochloride in Bulk and Tablets. Int J Med Pharm Res, **2014**, 2(4): 622-626.
10. ICH Q2B: Validation of Analytical Procedures: Methodology, **1997**, pp. 1-8.