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# DEVELOPMENT AND VALIDATION OF SPECTROPHOTOMETRIC METHOD FOR DETERMINATION OF METOPROLOL SUCCINATE

Moreshwar N.Kulkarni<sup>1\*</sup>, Rajeshwar V.Kshirsagar<sup>1</sup>, and Dinesh M.Sakarkar<sup>2</sup>

<sup>1</sup>School of Pharmacy, S.R.T.M.U. University, Nanded, Maharashtra. <sup>2</sup>S.N.Institute of Pharmacy, Pusad, Dist.Yavatmal, Maharashtra.

<sup>\*</sup>E-mail: moharsh\_99@rediffmail.com

**ABSTRACT:** Validated Spectrophotometric method for the estimation of Metoprolol in bulk drug has been developed. In method Distilled water, 0.1NHcl, Phosphate Buffer6.8 were used as solvent and shows absorption maximum at 224 nm. The Beer's law range for Distilled water, Phosphate buffer was in 5-30  $\mu$ g/ml and 10-50  $\mu$ g/ml for 0.1 NHCL. The method was found to be linear, accurate and precise.

Keyword: Metoprolol succinate, UV.

## INTRODUCTION AND EXPERIMENTAL

Chemically Metoprolol succinate is (+-)-1-(Isopropylamino)-3-[p-(2-methoxyethyl) phenoxy]-2propanol succinate.<sup>1</sup>

Metoprolol succinate is a selective beta-adrenergic antagonist, which is used in the treatment of cardiovascular disorders such as hypertension, angina pectoris, cardiac arrhythmias, congestive heart failure and myocardial infarction.<sup>2,3,4</sup> The drug is quite sensitive, even a small dose of the drug giving a sufficient blockade of the beta-adrenergic receptors. Thus the quantitative determination of the drug is important and a simple method such as the UV-VIS absorption for the assay would be of a great interest. Metoprolol succinate is official in United States Pharmacopoeia, European Pharmacopoeia. A survey of literature revealed that a few HPLC methods were reported for the estimation of Metoprolol in biological fluids<sup>5,6</sup>. In the present report, the paper describes simple, economical and sensitive Spectrophotometric method for the determination of metoprolol Succinate in bulk Sample.

Preparation of stock solution: Aqueous solutions of phosphate buffer of pH 6.8, 0.1N hydrochloric acid were prepared as per USP25. Standard drug solution was prepared (1mg/ml) in Distilled water, 0.1NHcl, Phosphate Buffer6.8. The  $\lambda$ max was determined in respective solvent and found to be 224nm.

Metoprolol (100mg) was dissolved in10ml of Distilled water, 0.1NHcl, Phosphate Buffer6.8 and the total volume was brought to 100 ml with Distilled water,

0.1NHcl and Phosphate Buffer 6.8 to obtain stock solution in respective solvent.

Stock solution was further diluted to obtain 5-30  $\mu$ g/ml with Distilled water, Phosphate Buffer6.8 respectively. standard solutions of Metoprolol succinate (10 $\mu$ g/ml) in distilled water, 0.1N HCl and in Phosphate buffer were scanned in the 200-700 nm range to determine the maximum absorbance( $\lambda$ max)

The absorbance was measured at 224 nm against Distilled water, Phosphate Buffer 6.8 as blank respectively. The calibration curve was plotted in the concentration range of 5-30  $\mu$ g/ml of Metoprolol succinate in distilled water, Phosphate buffer 6.8.

Similarly From stock solution of drug in 0.1N HCL dilutions were made with 0.1N HCL to get 10-50  $\mu$ g/ml solutions. The calibration curve was plotted in the concentration range of 10-50  $\mu$ g/ml of Metoprolol succinate in 0.1N HCL.

Accuracy study was carried out by determining percentage relative error<sup>7</sup> in standard solution in water, 0.1N HCL and in Phosphate buffer6.8. The percentage of drug recovered was calculated by a mathematical relation followed by Dulescu  $M.^{8}$ 

Reproducibility of method that is Precision study was carried out in Intraday and Interday manner for concentrations 10, 20, 30  $\mu$ g/ml in all three solvents.

Sensitivity studies were carried out where limit of detection (LOD) and Limit of quantification (LOQ) were determined using following equation<sup>8</sup>.

$$LOD = \frac{3.3 * \sigma_A}{B}$$
$$LOQ = \frac{10 * \sigma_A}{B}$$

Where,

 $\sigma_A$  is the standard deviation of the intercept, and B- the slope of the calibration line.

# **RESULTS AND DISCUSSION**

The maximum absorption for metoprolol succinate in distilled water, Phosphate buffer 6.8, and in 0.1N HCL were observed at 224nm .Hence  $\lambda$ max for metoprolol succinate is 224nm.

The high values of correlation coefficient in distilled water, Phosphate buffer and in 0.1N HCL indicates linearity for metoprolol succinate in all three solvents. Beer's law was obeyed for distilled water, Phosphate buffer in the range of 5-30  $\mu$ g/ml and in 0.1N HCL was

in the range of 10-50  $\mu$ g/ml.

The accuracy of method was determined by calculating mean percentage recovery and %relative error<sup>7</sup>. It was determined at 80,100 and 120 % level of standard dilution 10  $\mu$ g/ml. The Percentage recovery ranges from 99.00 to 101.00 and %relative error was within 2% for all the three solvents and are presented in Table 4.Precision was calculated as repeatability, inter and intraday variations for metoprolol succinate, %RSD was found to be less than 1.

The repeatability data are presented in Table 2 and 3.

LOD was found to be 0.77  $\mu$ g/ml for detection of Metoprolol succinate in water, 2.97  $\mu$ g/ml in 0.1 N HCl and 0.515  $\mu$ g/ml in phosphate buffer 6.8.

LOQ was found to be 0.247  $\mu$ g/ml in water and 0.302  $\mu$ g/ml in 0.1 N HCl and 1.562 in phosphate buffer 6.8.

The proposed methods were found to be simple, accurate, precise and rapid for the routine determination of Metoprolol succinate.

Table: 1

Data	Result				
	Distilled Water	Phosphate buffer6.8	0.1NHCL		
$\lambda max(nm)$	224	224	224		
Slope	0.3	0.32	0.3		
Intercept	0.007	0.005	0.027		
Correlation coefficient	0.999	0.999	0.997		
LOD (µg/ml)	0.77	0.515	2.97		
LOQ (µg/ml)	0.247	1.562	0.302		

#### Precision Table 2: Intraday variability

Conc.( µg/ml)	Absorbance		Mean	Standard deviation	% RSD	
µg/ml	Trial I	Trial II	Trial III			
10 (Water)	0.328	0327	0.329	0.3280	0.0007	0.2156
10 (0.1 N HCl)	0.334	0.33	0.333	0.3332	0.0021	0.6247
10(Phosphate buffer6.8)	0.328	0.326	0.331	0.3283	0.0025	0.7666
20 (Water)	0.613	0.615	0.614	0.6140	0.001	0.1629
20 (0.1 N HCl)	0.632	0.635	0.636	0.6343	0.00055	0.0867
20(Phosphate buffer6.8)	0.662	0.663	0.665	0.6633	0.0015	0.2303
30 (Water)	0.934	0.936	0.936	0.9353	0.0012	0.1235
30 (0.1 N HCl)	0.975	0.976	0975	0.9753	0.0007	0.0725
30(Phosphate buffer6.8)	0.969	0.965	0.972	0.9686	0.0035	0.3626

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# Table 3: Interday Variability

## Accuracy:

# Table 4. Recovery studies in (a) distilled water and (b) 0.1 N HCl (C) Phosphate buffer 6.8

Parameters	Leve	el of recov	very	Paran
Conc. used µg/ml	08	10	12	Conc. use
Conc. found	7.93	9.9	11.933	Conc. for
%recovery coefficient <sup>a</sup>	99.16	99	99.44	%recover
%Relative error <sup>b</sup>	0.88	1.010	0.561	%Relativ

	· ·	<b>(a)</b>	
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Parameters	Level of recovery					
Conc. used µg/ml	08	10	12			
Conc. found	7.96	9.93	11.93			
%recovery coefficient <sup>a</sup>	99.58	99.33	99.44			
<b>%Relative</b> error	0.502	0.704	0.586			

**(b)** 

Parameters	Level of recovery		
Conc. used µg/ml	nc. used μg/ml 08 10 12		12
Conc. found	7.93	9.93	12.03
%recovery coefficient <sup>a</sup>	99.21	99.37	100.26
%Relative error <sup>b</sup>	0.882	0.704	-0.249

(c)

a recovery coefficient =100 x (amount found)/(amount known)<sup>8</sup> b % relative error [=100 × (predicted concentration – nominal concentration)/ nominal concentration].<sup>7</sup>







20

10

30

conc. of met . Succi. in mcg/ml

40

50

60

0

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