Development and validation of spectroscopic method for estimation of valacyclovir in tablet dosage form

M. SUGUMARAN* and D. JOTHIESWARI

Adhiparasakthi College of Pharmacy, Melmaruvathur - 603 319 (India).

ABSTRACT

A simple, rapid and sensitive method has been developed for the quantitative estimation of valacyclovir hydrochloride in bulk and tablet. The wavelength 252 nm was selected for the concentration range 4-24µg/ml. The accuracy of the method was assessed by recovery studies and was found between 99.61-101.28%. The method was statistically validated for the linearly, precision, accuracy repetability. LOD, LOQ and ruggedness. The method was successfully applied for routine analysis of this drug in bulk and formulations.

Key words: Valacyclovir, UV-spectroscopy, validation and recovery.

INTRODUCTION

Valacyclovir hydrochloride is a hydrochloride salt of L-valyl ester of acyclovir[1]. It is chemically 2-[(2-amino-6-oxo-3, 9-dihydropurin-9-yl) methyxy] ethyl-2-amino-3-methylbutanoate[2]. It is an antiviral drug used in the treatment of herpes simplex and herpes zoster. It inhibits viral DNA synthesis[3-6]. It is prodrug intended to increase the bioavailability of acyclovir by increasing lipophilicity, valacyclovir converted by esterase to active drug acyclovir via hepatic first pass metabolism. Extensive literature survey reveals that only HPLC and LC-MS method for the determination of Valacyclovir in plasma samples has been reported[7-9]. So, in the present work, an attempt as being made to develop simple UV-spectrophotometric method for estimation of the drug in tablet dosage form.

EXPERIMENTAL

Apparatus

A shimazu-1700 Double beam UV-Visible Spectrophotometer with I cm matched Quartz cell was used for all spectral measurements.

Materials

All the chemicals used were of analytical grade. A gift sample of valacyclovir hydrochloride obtained from Dr. Reddy's Laboratories. Hyderabad, India was used as working standard. The formulation (valcivir-500 mg) was purchased from local pharmacy.

Preparation of standard stock solution

Standard stock solution was prepared by dissolving 10 mg of valacyclovir in the distilled water and the volume was adjusted to 100 ml with the same, to give a solution of concentration 100µg/ml. Different aliquots were transferred to series of 10ml volumetric flasks and volume was made up to the mark with distilled water to obtain series of concentrations. The absorbances of these solutions were measured at 252 nm and a calibration curve was constructed, by plotting the absorbance against the corresponding drug concentration.

Assay Procedure

To determine the content of Valacyclovir in solid dosage form, twenty tablets containing the drug were accurately weighed. Their average weight was determined and finely powdered. An amount

of powder, equivalent 250 mg of Valacyclovir was weighed, dissolved in distilled water and shaken mechanically for 20min. The solution was filtered and diluted to 250ml with distilled water. Aliquot of 1.2ml from this solution was further diluted ten times its volume with distilled water and scanned at 252nm. The procedure was repeated six times.

RESULTS AND DISCUSSION

The drug Valacyclovir hydrochloride was analyzed at 252nm in distilled water using UV-Visible spectrophotometer. Optical characteristics such as Beers law limits, sandel's sensitivity, intercept and slope have been calculated using regression equation which have been presented in Table 1.

Intra-day and inter-day precision: precision was determined by analyzing the drug at three different concentration and each concentration for three times, on the same day. Inter-day precision was determined similarly, analyzing the samples daily, for three consecutive days. The results are summarised in Table 2.

Table 1: Optical characteristics of valacyclovir

Parameters	Values
λ_{max} (nm)	254
Beers law limit (µg/ml)	4-24
Sandell's sensitivity (µg/cm^2/0.001 A.U.)	0.0282542
Correlation coefficient (r)	0.99984
Regression equation (y=mx+c)	Y=0.035392x+0.0082857
Slope (m)	0.0353928
Intercept(c)	0.0082857
LOD (µg/ml)	0.315585574
LOQ (µg/ml)	0.956319921
Standard error	0.005980922

Table 2: Results of assay, recovery, precision and ruggedness data

Parameters	Values
Amount found (mg/Tab)	499.28
% Recovery (n=3)	100.64
% RSD	0.8969
Precision [% RSD]	
Intra-day (n=3)	0.1195
Inter-day (n=3)	0.0602
Repeatability (n=5)	0.628
Ruggedness [% RSD]	
Analyst I (n=3)	0.5113
Analyst ii (n=3)	0.5059
Instrument (n=3)	0.4455
Instrument (n=3)	0.4706

To ensure the accuracy of method, recovery studies were performed by standard addition method at 50%, 75% and 100% levels of drug concentration, to the pre-analyzed samples and percent recovery values were calculated. Recovery experiment indicated the absence of interferences from the commonly encountered pharmaceutical additives and excipients.

Sensitivity of the method was determined in terms of limit of detection (LOD) and limit of quantification (LOQ). The LOD and LOQ were calculated by using the formula, LOD = 3.3 × σ/S and LOQ = 10 × σ/S, where σ is residual standard deviation of regression line and S is slope of corresponding regression line. The LOD and LOQ were found to be 0.315 µg/ml and 0.956 µg/ml. The results did not show any statistical difference

between operators and instruments suggesting that method developed was rugged.

The developed analytical method was validated[10] as per the guidelines laid by USP. The developed method was found to be simple, accurate, precise, sensitive and economical. The results of the validation tests were found to be satisfactory and therefore this method can be applied to routine analyze of drug in formulations.

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