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NOTE

UV Spectrophotometric Methods for the Determination of Saquinavir Mesylate and Efavirenz

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Simple and sensitive UV spectrophotometric methods have been developed for the determination of two anti-HIV drugs, saquinavir mesylate and efavirenz in bulk and their formulations. Both the drugs were taken in methanol solution and maximum absorbance was observed at 239 nm or 247 nm respectively. Beer's law was obeyed in the concentration of 1.25 to 10 μg/mL for saquinavir mesylate and 2.5 to 12.5 μg/mL for efavirenz. There is no interference from any common pharmaceutical additives and diluents.

Key Words: UV spectrophotometric methods, Saquinavir mesylate, Efavirenz,

INTRODUCTION

Saquivavir mesylate (SM) and efavirenz (EFA) are anti-HIV drugs[1,2]. Chemically SM is butanediamide, N(1)-[3-[3-[[(l,l-dimethylethyl)amino] carbonyl]octahydro-2(1H)-isoquinolinyl] 2-hydroxy-1-(phenylinethyl)propyl]-2-[(2-quinolinyl carbonyl)amino]-[3S-[2[1R*(R*),2S*], 3-α,4a-β,8a-β]]-monomethanesulfonate and EFA is 6-chloro-4-(cyclopropylethynyl)-1,4-dihydro-4-(trifluoromethyl)-2H-3,1-benzoxazin-2-one. SM is a selective, competitive, reversible inhibitor of HIV protease, which plays an essential role in the replication cycle of HIV and the formation of infectious virus. EFA is a HIV-1 specific, non-nucleoside, reverse transcriptase. Few HPLC methods were reported for the estimation of SM[3–5] and EFA[6–8] in human plasma and no spectrophotometric methods have been reported for these drugs. The present investigation is undertaken to develop a UV spectrophotometric method for the determination of SM and EFA. SM exhibits absorption maximum at 239 nm and Beer's law is obeyed in the concentration range 1.25–10 μg/mL. EFA exhibits absorption maximum at 247 nm and Beer's law is obeyed in the concentration range 2.5–12.5 μg/mL.

Spectral and absorbance measurements were made on Systronics UV-Vis spectrophotometer-117 with 10 mm matched quartz cells.

Preparation of standard solutions

About 100 mg of SM or EFA was accurately weighed and dissolved in 100 mL of methanol. This solution was further diluted with methanol to get working standard solution of 25 μg/mL and 50 μg/mL respectively.

Preparation of sample solutions

The powder of 20 capsules (since the formulations for SM and EFA are not available in the Indian market, the authors prepared their own according to the literature method[9]) was taken, pulverized and the weight equivalent to 100 mg each of SM or EFA was dissolved in methanol and filtered, and the filtrate was diluted to 100 mL with methanol.

Method for SM and EFA

To a series of 10 mL volumetric flasks, aliquot samples of SM ranging from 0.5–4 mL (1 mL containing 25 μg) or EFA ranging from 0.5 to 2.5 mL (1 mL containing 50 μg), were transferred. Then the final volume was brought to 10 mL with methanol. The absorbance was measured at 239 nm for SM and 247 nm for EFA against methanol as blank. The amount of SM or EFA present in the sample solution was computed from its calibration curve.

The optical characteristics such as Beer's law limits, Sandell's sensitivity, molar extinction coefficient, per cent relative standard deviation (calculated from the eight measurements containing 3/4th of the amount of the upper Beer's law limits for all the drugs), per cent range of error (0.05 to 0.01 confidence limits) were calculated and the results are summarized in Table-1.

TABLE-1
OPTICAL CHARACTERISTICS AND PRECISION OF THE PROPOSED METHODS

Parameters	Saquinavir mesylate	Efavirenz
λ_{max} (nm)	239	247
Beer's law limit (μg/mL)	1.25–10.0	2.5–12.5
Sandell's sensitivity (μg/cm^2/0.001 absorbance unit)	0.00474	0.01491
Molar absorptivity (L mole^{-1} cm^{-1})	1.6182×10^5	2.1171×10^4
% Relative standard deviation	0.3331	0.2897
%Range of error		
0.05 confidence limits	±0.279	±0.242
0.01 confidence limits	±0.421	±0.358
Correlation coefficient	0.9999	0.9999
Regression equation (Y*)		
Slope (a)	0.0842	0.0672
Intercept (b)	0.0015	–0.0010

Y* = b + aC, where "C" is concentration in μg/mL and Y is absorbance unit.

Interference studies revealed that the common excipients and other additives usually present in the dosage form did not interfere in the proposed methods. The methods were applied for the analysis of the drugs in their pharmaceutical formulations. To evaluate the validity and reproducibility of the methods, known amounts of pure drug were added to the previously analyzed pharmaceutical preparations and the mixtures were analyzed by proposed methods and the results are presented in Table-2.

TABLE-2
ESTIMATION OF SM AND EFA IN PHARMACEUTICAL FORMULATIONS

Sample	Labelled amount (mg)	Amount found (mg) (proposed method)	% Recovery
SM capsules			
1	200	199.96	99.98
2	200	199.64	99.82
3	200	199.98	99.49
EFA capsules			
1	200	199.61	99.80
2	200	198.86	99.43
3	200	199.23	99.61

In conclusion the proposed methods are most economic, simple, sensitive and accurate and can be used for the routine determination of SM and EFA in bulk as well as in its pharmaceutical preparations.

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