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Research Article

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Development, validation and application of UV spectrophotometric method for the determination of roxithromycin in bulk and pharmaceutical dosage form

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ABSTRACT

Roxithromycin is a semi-synthetic macrolide antibiotic. It is used to treat respiratory tract, urinary and soft tissue infections. The present research work discussed the development of a simple, sensitive, rapid, accurate, precise and economical UV Spectrophotometric method for the evaluation of Roxithromycin in bulk and pharmaceutical dosage form which is based on the measurement of absorption maxima at 420 nm. A Shimadzu 1800 U.V visible spectrophotometer with 1cm matched quartz cells, and de-ionized water as solvent were used. Developed methods obeyed the Beer's law in the concentration range of 20-70µg/ml having line equation y = 0.020x + 0.168 with correlation coefficient of 0.999.Method was validated statistically. Percentage recovery of the drug for the proposed method ranged from (99.2280-99.5320 ±0.1670) indicating no interference of the capsule excipients. The developed method was validated with respect to precision, accuracy (recovery), linearity, limit of detection and limit of quantitation.

Key words: Roxithromycin, deionised water, Absorbance maxima. Validation

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INTRODUCTION

Roxithromycin is a semi-synthetic macrolide antibiotic.[1] Chemically is (3*R*,4*S*,5*S*,6*R*,7*R*,9*R*,11*S*,12*R*,13*S*,14*R*)-6-[(2*S*,3*R*,4*S*,6*R*)-4-d-3-hydroxy-6-methyloxan-2-yl]oxy-14-ethyl-7,12,13-trihydroxy-4-[(2*R*,4*R*,5*S*,6*S*)-5-hydroxy-4-methoxy-4,6-dimethyloxan-2-yl]oxy-10-(2-methoxy ethoxy methoxy imino)-3,5,7,9,11,13-hexamethyl-1-oxacyclo tetradecan-2-one. [1]

It acts on gram-positive bacteria and gram-negative bacteria. [2], [3]. It is used to treat respiratory tract, urinary and soft tissue infections. Roxithromycin is derived from erythromycin, containing the same 14-membered lactone ring. However, an N-oxime side chain is attached to the lactone ring. It is also currently undergoing clinical trials for the treatment of male-pattern hair loss.[4]

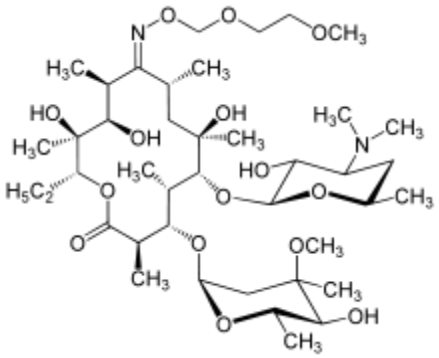
Roxithromycin is available under several brandnames, for example, Xthrocin, Roxl-150, Roxo, Surlid, Rulide, Biaxsig, Roxar, Roximycin, Roxomycin, Rulid, Tirabicin and Coroxin. Roxithromycin is not available in the United States. Roxithromycin has also been tested to possess antimalarial activity. Roxithromycin prevents bacteria from growing, by interfering with their protein synthesis. Roxithromycin binds to the subunit 50S of the bacterial ribosome, and thus inhibits the translocation of peptides. Roxithromycin has similar antimicrobial spectrum as erythromycin, but is more effective against certain gram-negative bacteria, particularly *Legionella pneumophila* Roxithromycin has fewer interactions than erythromycin as it has a lower affinity for cytochrome P450 Roxithromycin does not interact with hormonal contraceptives, prednisolone, carbamazepine, ranitidine or antacids.

When roxithromycin is administered with theophylline, some studies have shown an increase in the plasma concentration of theophylline. A change in dosage is usually not required but patients with high levels of theophylline at the start of the treatment should have their plasma levels monitored.

Roxithromycin appears to interact with warfarin. This is shown by an increase in prothrombin time (international normalised ratio [INR]) in patients taking roxithromycin and warfarin concurrently. As a consequence, severe bleeding episodes have occurred . 150 mg twice in a day, 30 minutes before meals or 2 hours after. For children, it is 2.5 - 5.0 mg/kg of body weight, given in two divided doses per day.[5]

It is used in respiratory tract infections[6] like pharyngitis, pneumonia, chronic bronchitis and bronchopneumonia. Roxithromycin is official in British Pharmacopoeia[7] and European Pharmacopoeia[8] and it is assayed by high-performance liquid chromatographic method. Literature survey reveals that roxithromycin is estimated in pharmaceuticals and biological fluids by spectrophotometric[9],[10],[11],[12], HPLC[13],[14],[15],[16] and microbiological methods[17]. These methods are too expensive and time consuming. The present work describes a simple, economical, accurate and reproducible spectrophotometric method for estimation of roxithromycin in pharmaceutical formulations The proposed method was successfully applied for determination of roxithromycin in its pharmaceutical formulations

FIG : 1 The chemical structure of roxithromycin



EXPERIMENTAL SECTION

Instruments and materials:

A Shimadzu UV-1800 UV/VIS Spectrophotometer was used with 1 cm matched quartz cell. All the chemicals used were of analytical grade. Ananalytically pure sample of Roxithromycin was procured as gift sample from Cipla PharmaceuticalsLtd. (pune, India)

Preparation of standard stock solution and calibration curve:

Standard stock solution of Roxithromycin as prepared by dissolving 10 mg in 100 ml of deionised water to get concentration of 100µg/ml. The aliquots of 2 to7 ml of standard stock solution were transferred into series of 10ml volumetric flask and made up to mark with deionised water to reach the concentration range of 20µg/ml to 70µg/ml respectively. And calibration curve was taken at 420 nm.

Table no. 1 Optical characteristics of Roxithromycin

. Parameters	values
Absorption Maxima (nm)	420
Beer's range (µg/ml)	20-70
Molar absorptivity (L/mol.cm)	6.81445×10^3
Sandell's sensitivity (µg/cm2 x 0.001 absorbance unit)	0.060241
Regression equation (y)*	Y = mx+c
Slope (m)	0.020
Intercept (c)	0.168
Correlation coefficient(R2)	0.999
LOD (µg/ml)	0.165
LOQ (µg/ml)	0.500

**y= mx × c; where x is the concentration in µg/ml and y is absorbance.*

Preparation of sample solution

Twenty capsules were finely powdered and weighed.A portion of the powder equivalent to about 10 mg of Roxithromycin was weighed accurately,dissolved and diluted to 100 ml with deionised water.The sample solution was filtered. Further dilution was carried out with deionised water. The general procedures described under standard stock solution and calibrations were followed and the concentrations of Roxithromycin were calculated at 420 nm.

Table no.2 Result of Analysis of Roxithromycin in marketed tablet formulation

Sr. No.	Lable claim	Amount found*(mg)	%estimated	S.d.*(±)	%R.S.D
1	75	74.68	99 .5733	0.0023	0.2705

**indicates average of 6 readings*

Table no. 3 Recovery study data

Sr. No.	Amount of drug sample (µg)	Level of recovery (%)	Amount added* (µg)	Amount found* (µg)	Recovery* (%)	S.D(±)	%R.S.D
1	50	80	40	39.6912	99.2280	0.3249	0.3274
2	50	100	50	49.7660	99.5320	0.2930	0.2943
3	50	120	60	60.7000	99.5000	0.3832	0.3851

RESULTS AND DISCUSSION

Validation parameters:

The method was validated with respect to precision,accuracy, linearity, limit of detection (LOD) and limitof quantification (LOQ) [18]

Precision:

To determine the precision of the method, Roxithromycin concentrations were analysed six times in aday (intra-day precision) and for six continuous days (inter-day precision). SD and %RSD were 0.0026,0.4050 and 0.0030, 0.4630 respectively.

Accuracy (recovery study):

To ascertain the accuracy of proposed method,recovery studies were carried out by standard addition method at three different levels (80%, 100% and120%). Percent recovery for Roxithromycin was found to be as in table no. 2.

Linearity:

The linearity of measurement was evaluated by analyzing different concentrations of the standard solution of Roxithromycin. Beer-Lambert's concentration range was found to be 20-70µg/ml.

Limit of detection (LOD) and limit of quantitation (LOQ):

The LOD and LOQ of Roxithromycin were determined by using standard deviation of the response and slope approach as defined in International Conference on Harmonization (ICH) guidelines. The LOD and LOQ was found to be as in table no.1

Determination of active ingredients in capsule formulation:

The validated method was applied to the determination of Roxithromycin in capsules. Twenty capsules were assayed and results are shown in table no. 3 indicating that the amount of drug in capsule sample met with requirements.

CONCLUSION

The developed method was found to be simple,sensitive, accurate, precise, economic and can be used for routine quality control analysis of Roxithromycin in bulk as well as in pharmaceutical dosageform.

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