

## NOTE

## Visible Spectrophotometric Methods for the Determination of Venlafaxine Hydrochloride and Ritodrine Hydrochloride in Pharmaceutical Formulations

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Simple and sensitive visible spectrophotometric methods have been developed for the estimation of venlafaxine hydrochloride and ritodrine hydrochloride. In the proposed methods the drugs react with Folin-Ciocalteu reagent under alkaline conditions, which form blue-coloured chromogens having absorption maxima at 740 nm and 675 nm and obey Beer's law in the concentration ranges of 10–50 µg/mL and 2.5 to 12.5 µg/mL respectively. These methods are extended to pharmaceutical preparations and there is no interference from any common pharmaceutical additives and diluents.

**Key Words:** Spectrophotometric determination, Venlafaxine hydrochloride, Ritodrine hydrochloride.

Venlafaxine hydrochloride<sup>1,2</sup> (VNH) is an anti-depressant agent and chemically it is cyclohexanol, 1-[(2dimethyl amino)-1-(4-methoxy phenyl) ethyl]-hydrochloride. Ritodrine hydrochloride<sup>3,4</sup> (RTH) is a sympathomimetic agent and chemically it is benzene methanol, 4-hydroxy- $\alpha$ -[1-[[2-(4-hydroxy-phenyl) ethyl] amino] ethyl]-hydrochloride. Literature survey reveals that spectrophotometric, fluorimetric, HPLC and GC methods were reported for the determination of VNH<sup>5,6</sup> and RTH<sup>7-12</sup> in its formulation and in biological fluids. The present investigation has been undertaken to develop visible spectrophotometric methods for the determination of VNH and RTH with Folin-Ciocalteu (FC) reagent under alkaline conditions, which exhibit absorption maxima at 740 nm and 675 nm respectively.

Spectral and absorbance measurements were made on Systronics UV-Vis spectrophotometer 117 with 10 mm matched quartz cells. Freshly prepared aqueous solutions of FC reagent (1 N) and NaOH (1 N) were used.

Accurately weighed 100 mg of VNH or RTH were dissolved in distilled water and the volume was made up to 100 mL with water. The above stock solutions were further diluted with water to get the working standard solutions of 100 µg/mL for VNH and 50 µg/mL for RTH.

The sample (tablet powder or capsule powder) equivalent to 100 mg of drug

was dissolved in distilled water; if necessary the solutions were filtered and diluted to 100 mL with water.

### Method for VNH and RTH

To a series of 10 mL volumetric flasks aliquot samples of VNH ranging from 1.0 to 5.0 mL (1 mL containing 100  $\mu\text{g}$ ) or RTH ranging from 0.5 to 2.5 mL (1 mL containing 50  $\mu\text{g}$ ) were transferred. Then 1 mL of FC reagent (1 N) and 2 mL of NaOH (1 N) (3 mL for RTH) were added and the final volume was brought to 10 mL with distilled water. The absorbance was measured at 740 nm for VNH and 675 nm for RTH against corresponding reagent blank. The amounts of VNH or RTH present in the sample solutions were computed from their respective calibration curves.

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 upper Beer's law limits for the drugs), per cent range of error (0.05 to 0.01 confidence limits) were calculated for both the drugs and the results are summarized in Table-1. 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. The methods were extended to the pharmaceutical formulations. The common excipients and other additives usually present in the dosage forms did not interfere in the proposed methods.

TABLE-1  
OPTICAL CHARACTERISTICS AND PRECISION

Parameters	VNH	RTH
Beer's law limit ( $\mu\text{g/mL}$ )	10–50	2.5–12.5
Sandell's sensitivity ( $\mu\text{g/cm}^2/0.001$ absorbance unit)	0.05825	0.01494
Molar extinction coefficient (L/mol-cm)	$0.5388 \times 10^4$	$2.1673 \times 10^4$
%Relative standard deviation	0.5511	0.3354
% Range of error:		
0.05 confidence limits	0.461	0.280
0.01 confidence limits	0.682	0.415
Correlation coefficient	0.99969	0.99985
Regression equation ( $Y^*$ ):		
Slope (a)	0.016825	0.0665
Intercept (b)	0.0019	0.0025

$Y^* = b + aC$ , where "C" is concentration in  $\mu\text{g/mL}$  and Y is absorbance unit.

TABLE-2  
ESTIMATION OF VNH AND RTH IN PHARMACEUTICAL FORMULATIONS

Sample	Labeled amount (mg)	Amount found (mg) by proposed method	% Recovery
VNH capsules			
1	75	75.28	99.97
2	75	75.04	99.88
3	75	74.96	100.22
RTH tablets			
1	10	9.963	100.43
2	10	9.981	100.32
3	10	9.950	100.65

### Chemistry of coloured species

VNH and RTH probably effect a reduction of 1, 2 or 3 oxygen atoms from the tungstate and molybdate in FC reagent thereby producing one or more of the possible reduced species, which have a characteristic intense blue color. In conclusion the proposed methods are simple, sensitive, accurate and useful for the determination of VNH and RTH in pure samples and in pharmaceutical formulations.

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