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New spectrophotometric methods for estimation of Ethacridine lactate in pharmaceutical formulations

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ABSTRACT

Ethacridine lactate is an antiseptic in solutions of 0.1%; it is also used as an agent for second trimester abortion. Upto 150ml of 0.1% solution is instilled extra amniotically using a foley catheter. Three simple and sensitive spectrophotometric methods (Method A, Method B and Method C) were developed for the estimation of Ethacridine lactate in pharmaceutical formulations. These methods are based on the oxidative coupling of Eathacridine Lactate with 2,2'-bipyridyl, Bathophenanthroline and 2,4,6-tripyridyl-s-triazine in the presence of Fe(III) to form coloured chromophores which can be estimated at absorption maximums of 450nm, 600 and 540 respectively.. Method A, Method B and Method C obey the beers law in the concentration range of 5-25µg/ml, 4-24 µg/ml and 6-26µg/ml respectively. The methods were validated for use in routine quality control of Ethacridine lactate in pharmaceutical formulations. Interference studies were conducted and it was found that the common excipients usually present in dosage forms do not interfere in the proposed methods. The optical characteristics, regression analysis data and precision of the methods were calculated. The accuracy of the methods was evaluated by estimating the amount of Ethacridine Lactate in previously analyzed samples to which known amounts of Ethacridine Lactate was spiked. The accuracy of the methods was also conformed by comparison of the results obtained by proposed and reference methods. The methods were validated for use in routine quality control of Ethacridine Lactate in pharmaceutical formulations.

Key Words: Ethacridine Lactate, 2, 2'-bipyridyl, Bathophenanthroline and 2, 4, 6-tripyridyl-s-triazine.

INTRODUCTION

Ethacridine lactate [1-5] is an antiseptic in solutions of 0.1%; it is also used as an agent for second trimester abortion. Upto 150ml of 0.1% solution is instilled extra amniotically using a foley catheter. Ethacredine as an abortificeant is found to be safer and better tolerated then 20% hypertonic saline. The chemical name of Ethacridine Lactate is 2-ethoxy-6,9- diamino acridine

monolactate monohydrate.it is official in BP,USP and EP. For the estimation of Ethacridine Lactate few analytical methods by as HPLC [6-9] were reported. In the present investigation, we developed two spectrophotometric methods based on oxidative coupling reactions of Ethacridine Lacteate with 2,2-bipyridyl/BPN [10] (Method A), Bathophenanthroline/BPTL [11] (Method B) and 2,4,6-tripyridyl-s-triazine /TPTZ [12] (Method A) in the presence of Fe(III).

MATERIALS AND METHODS

Instrumentation

Systronics double beam UV/Visible spectrophotometer 2201 with matched quartz cells were used for the present investigation.

Reagents preparation

BPN solution (Qualigens, 0.198% w/v, 1.0 x 10^{-2} M): Prepared by dissolving 156 mg of 2,2'-bipyridyl in 100 ml of 0.1N hydrochloric acid. BPTL solution (CDH,0.332% w/v,1.0 x 10^{-2} M): About 332 mg of bathophenanthroline was accurately weighed and dissolved in 100 ml of accurately weighed and dissolved in 100 ml of ethanol.

TPTZ solution (CDH, 0.33% w/v, 1.0 x 10^{-2} M): About 330 mg of 2, 4, 6-tripyridyl-s-triazine was accurately weighed and dissolved in 100 ml of ethanol.

$FeCl_3$ stock solution (CDH, 0.162 % w/v, 1M) (3.3 x 10^{-3} M): About 162 mg of anhydrous ferric chloride was accurately weighed and dissolved in 100 ml of distilled water. 33.3 ml of above stock solution was further diluted to 100 ml with water. 50 ml of above stock solution was further diluted to 100 ml with water. OPA solution (CDH, 2.0 x 10^{-1} M): 1.3 ml of orthophosphoric acid was diluted 100 ml with distilled water.

Standard preparation

About 100 mg of Ethacridine was accurately weighed and dissolved in 100 ml of water to get 1000 µg/ml stock solutions. This stock solution was further diluted with the same solvent to get working standard solution of 100 µg/ml.

Sample preparation

The content of five vials was taken, thoroughly mixed. From this an accurately measured portion of the liquid content equivalent to 100 mg of the drug was dissolved in 70 ml of water and filtered. The filtrate was diluted to 100 ml with double distilled water. Later this solution was further diluted to get absorbance values within the calibration curve range.

Procedure for estimation

Aliquots of standard Ethacridine Lacteate solution (100 µg/ml) containing 50 to 250 µg for Method A, 40 to 240 µg for Method B and 60 to 260 µg for M_{5c} were transferred into a series of 10 ml volumetric flasks and 1.0 ml of 0.003 M ferric chloride was added to each flask. Then 1.0 ml of BPN solution for Method A, 1.0 ml of BPTL solution for Method B and 1.0 ml of TPTZ solution for M_{5c} were added to all flasks and the volume in all volumetric flasks were equalized with double distilled water. The contents were gently boiled for 35 min for Method A, 20 min for Method B and 15 min for M_{5d}.. The flasks were cooled to room temperature and 2.0 ml of OPA

was added to all and final volume of all volumetric flasks was brought to 10 ml with water. The absorbance was measured at 450 nm for Method A, 600 nm for Method B and 540 nm for Method C against corresponding reagent blanks. The amount of EAL in sample was estimated from corresponding calibration graph.

RESULTS AND DISCUSSION

Method A:

Ethacridine lactate exhibits reducing property due to the presence of functional moieties vulnerable to oxidation selectively with oxidizing agents such as Fe (III) under controlled experimental conditions. When treated with known excess of oxidant, Ethacridine lactate undergoes oxidation, giving products of oxidation (inclusive of reduced form of oxidant, Fe (II) from Fe (III), besides unreacted oxidant. It is possible to estimate the drug content colorimetrically, which is equivalent to either the reacted oxidant or reduced form of oxidant formed. The reduced form of Fe III (Fe II) has a tendency to give colored complex on treatment with BPN, BPTL and TPTZ.

The first step in the methods mentioned above is the oxidation of Ethacridine lactate with the oxidant.

LLD + Fe (III) (Excess) → Oxidation products + Fe (II) (Reduced form of Oxidant) + Fe (III) unreacted

In this method, as Fe (III) interferes, even though to a little extent in the determination of Fe (II), the reactivity of the interfering entity has to be made insignificant by complexing it with o-phosphoric acid.

Fe (III) + o-phosphoric acid → Complex (unreactive)

The second step concerns with the estimation of the reduced form of oxidant with appropriate chromogenic agent as described in method A. The complex formation for these methods is shown in scheme no. 1, 2 and 3 respectively.

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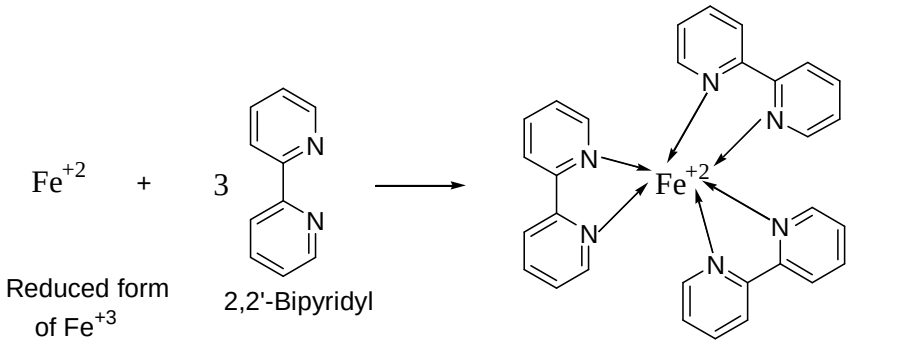
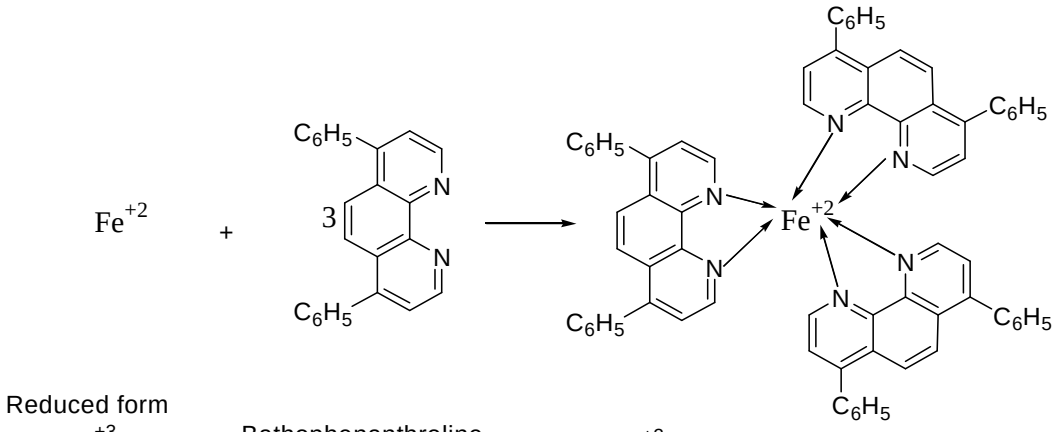
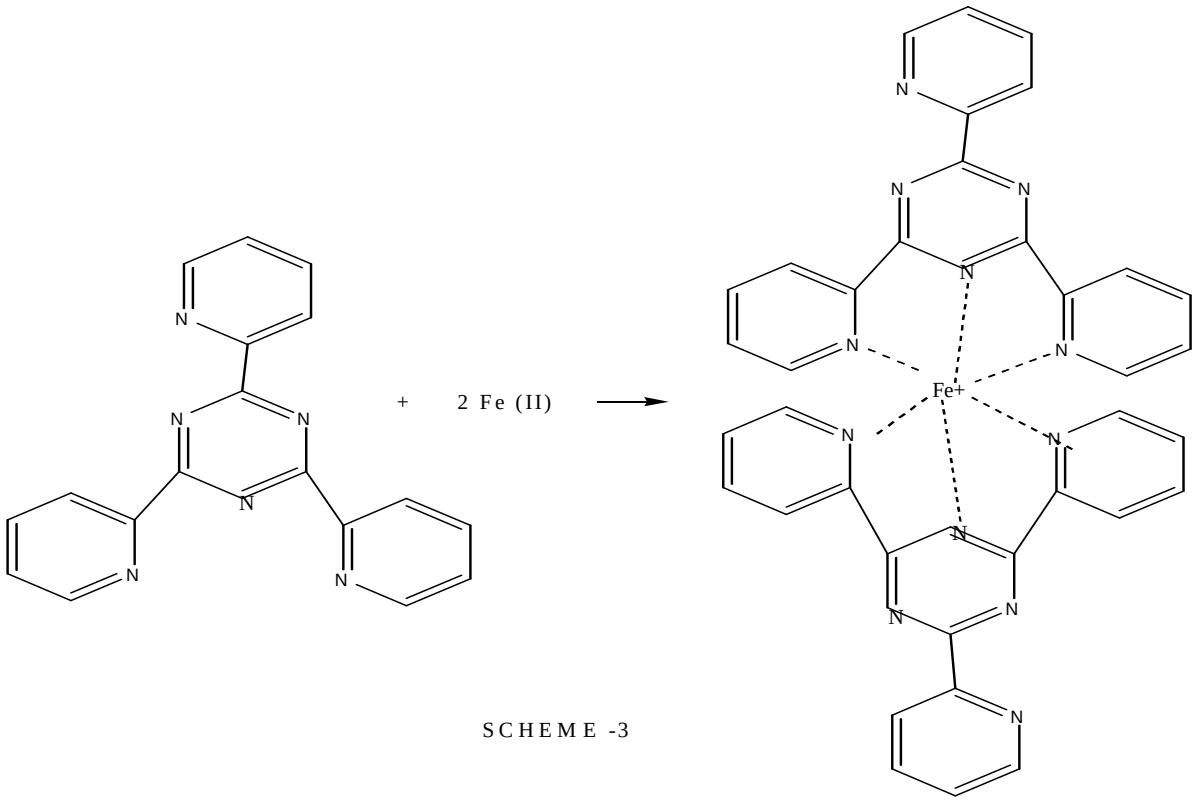


Scheme no-1



Scheme no-2



SCHEME -3

The accuracy of the methods was evaluated by estimating the amount of Ethacridine Lactate in previously analyzed samples to which known amounts of Ethacridine Lactate was spiked and was also conformed by comparison of the results obtained by proposed and reference methods. The results of accuracy and precision are given in table-1. Some of the commercially available formulations were procured from the local market and analyzed by the developed methods and the results comply with the labeled claim. Interference studies were conducted to see the influence of excipients with the proposed methods. The common excipients usually present in

dosage forms do not interfere in the proposed Method A, Method B and Method C. The optical characteristics, regression analysis data and precision of the methods are presented in table no 2.

Table-2: Estimation of Ethacridine lactate in pharmaceutical formulations

sample	Labeled amount (mg/ml)	Amount found by proposed methods* (mg)±SD			Amount found by reference method (mg)±SD	% Recovery by roposed methods** ±SD		
		Method A	Method B	Method B		Method A	Method B	Method B
1	1	0.95±0.14	0.95±0.14	0.97±0.18	0.99±0.008	99.42±0.011	99.56±0.011	99.56±0.011
2	1	1.05±0.13	1.07±0.14	1.04±0.14	1.02±0.012	100.04±0.018	100.07±0.011	100.01±0.012

* *Average of six determinations.;* ** *Average of three determinations*

Table-1: Optical characteristics and regression analysis parameters
Parameter Method-A, Method-B and Method C

PARAMETER	M_A	M_B	M_C
λ_{max} (nm)	450	600	540
Beer's law limits (µg ml^{-1})	5-25	4-24	6-26
Molar absorptivity (l $mole^{-1}$ cm^{-1})	$1.105*10^4$	1.07×10^4	6.408×10^3
Detection limits (µg ml^{-1})	0.553	0.462	0.1104
Sandell's sensitivity (µg cm^{-2} / 0.001 absorbance unit)	0.032	0.0337	0.040
Optimum photometric range (µg ml^{-1})	6-24	6-22	8-24
Regression equation (Y = a + bC)*Slope (b)	0.030	0.029	0.0245
Standard deviation of slope (S_b)	2.23×10^{-4}	2.71×10^{-4}	5.09×10^{-5}
Intercept (a)	0.0085	0.0076	0.00048
Standard deviation of intercept (S_a)	4.89×10^{-3}	4.11×10^{-3}	8.21×10^{-4}
Standard error of estimation (S_e)	$6.75*10^{-3}$	5.68×10^{-3}	1.13×10^{-3}
Correlation coefficient (r)	0.9997	0.9996	0.9998
Relative standard deviation (%)*	0.469	0.821	0.756
% Range of error (Confidence limits)**			
0.05 level	0.47	0.6	0.793
0.01 level	0.24	0.42	1.244
% Error in bulk samples***	0.46	0.83	-0.19

**y=a+bx, where 'x'is the concentration of ethacridine lactate in µg/ml and y is the absorbance value*
*** average of six determinations; *** average of three determinations*

CONCLUSION

The proposed methods are economic, simple, sensitive, reproducible and accurate and can be used for the routine analysis of Ethacridine lactate in bulk as well as in its pharmaceutical preparations.

REFERENCES

[1] S. Gupta, L. Sachdeva, R. Gupta, *Indian J Matern Child Health*., **1993**, 4, 59.
[2] B. K. Bhathena, N. K Sheriar, V. R. Walvekar, et al. *Br J Obstet Gynaecol*., **1990**, 97, 1026.
[3] R. M. Laul, A. R. Mahale, P.R. Bhattacharya, *Asia Oceania J Obstet Gynaecol*., **1984**, 10, 185.

[4] S. Shukla, S. Sapre, P. Olyai, *J Indian Med Assoc*., **1984**, 82, 432.Merck Index, 11th Ed., 3668.
[5] Zhi-Yong Guo, Dan-Yi Wei, Yuan-Yuan Wang, Kun-Fei Xuan, Xu-Fei Yu, Qiu-Luan Yu, Yun Chu, *Biomedical Chromatography*., **2007**, 21, 480 .
[6] Z. Guo, D. Wei, N. Gan, et al. *J Chromatogr Sci*., **2007**, 45, 325.
[7] Y. Akada, S. Kawano, Y. Tanase. *Yakugaku Zasshi*., **1980**, 100, 766.
[8] Y. Akada, H. Morishita, S. Kono, et al. *Yakugaku Zasshi*., **1977**, 97, 455.
[9] A. Emmerie, C. Engel, *Rec. Trav. Chim*., **1939**, 58, 283.
[10] C. C. Tsen, *Anal chem*., **1961**, 33, 849.
[11] R. Foster, *J. Phys. Chem*., **1980**, 84, 2135.