Current World Environment Vol. **4**(1), 133-136 (2009)

Polarographic reduction of pralidoxime and obidoxime at hanging mercury drop electrode

C. NARASIMHA RAO[1], K. BALAJI[1], C. NARASIMHA RAO[2] and P. VENKATESWARLU[1]*

[1]Department of Chemistry, Sri Venkateswara University, Tirupati - 517 502 (India).
[2]Department of Zoology, Sri Venkateswara University, Tirupati - 517 502 (India).

(Received: February 10, 2009; Accepted: April 13, 2009)

ABSTRACT

The polarographic reduction behavior of Pralidoxime (PRL) and Obidoxime (OBD) at a Hanging Mercury Drop Electrode (HMDE) was exploited for their determination in different samples. Based on the obtained differential pulse polarograms, standard addition method was used to determine these drugs in pharmaceutical formulations and biological fluid samples. Linearity in the peak currents was achieved in the concentration ranges of 5.4×10^{-8} to 4.0×10^{-5} M and 2.8×10^{-8} to 1.4×10^{-5} M for OBD and PRL respectively. The detection Limit was found to be 2.5×10^{-8} M (PRL) and 1.8×10^{-8} M (OBD) with correlation coefficients of 0.9980 (PRL) and 0.9965 (OBD). The repeatability and reproducibility of the method were checked by recovery studies.

Key words: Polarography, Pralidoxime, Obidoxime, Hanging Mercury Drop Electrode and Biological fluid samples.

INTRODUCTION

Pralidoxime (2-[(hydroxyimino) methyl]-1-methylpyridin-1-ium) (PRL) and Obidoxime (1, 1'-[oxybis (methylene)]bis{4-[(E)- (hydroxyimino) methyl] pyridinium) (OBD) are used to combat poisioning by organophosphates. Azomethine group containing drugs have been in wide use because of their pharmacokinetic properties (1-3). Several researchers have reported the determination of azomethine group containing drugs. (4-10). Determination of PRL was carried out by HPLC (26). Spectrophotometric (29) and Potentiometric (30) methods.Determination of OBD was carried out by HPLC (32, 33) and Spectrophotometric (35) methods. In the present method, a simple, accurate and cheaper method has been described for the determination of PRL and OBD.

EXPERIMENTAL

Voltammograms were recorded with Metrohm 757 VA computrace (Herisau, Switzerland).Pralidoxime and obidoxime were purchased from Cipla labs India Ltd., (Mumbai). Standard stock solutions ($1.0X10^{-3}$ mol l^{-1}) are prepared by dissolving an appropriate amount of electroactive species in deionised triple distilled water.

Recommended analytical procedure

Ten milli liters of BR buffer solution was deoxygenated in the cell with nitrogen gas. An aliquot of standard solution of the electroactive species was added to the buffer present in the cell. After recording the polarograms small increments (0.2 mL) of standard solution were added and polarograms were recorded after each addition under the same conditions.

Table 1: Experimental data of PRL and OBD

Parameters	PRL	OBD
Linearity range (M)	5.4 x 10^{-8} to 4.0 x 10^{-5}	2.8×10^{-8} to 1.4×10^{-5}
Calibration curve equation	Y(μA) = 0.4558X + 0.0620	Y(μA)=0.4416X+0.0698
Correlation coefficient	0.9980	0.9965
L.O.D (M)	2.5×10^{-8}	1.8×10^{-8}
L.O.Q (M)	0.433×10^{-7}	0.6×10^{-7}
Repeatability of peak currents %RSD)	4.12	6.26
Repeatability of peak potentials %RSD)	0.48	0.62
Reproducibility of peak currents %RSD)	4.19	5.12
Reproducibility of potentials %RSD)	0.26	0.41
Numbers of assays	12	12

Table 2: Determination of PRL and OBD in Pharmaceutical formulations

Name of the drug	Amount labelled (mg/L)	*Average amount found (mg/L)	Recovery percentage (%)	+ S.D	RSD
PRL	2	1.97	98.50	0.004	0.2030
	4	3.91	97.50	0.0021	0.0537
	6	5.75	95.83	0.0031	0.0539
OBD	2	1.912	95.00	0.002	0.1047
	4	3.92	98.00	0.022	0.5612
	6	5.80	96.67	0.0031	0.0534

*Each value is an average of three determinations

Table 3: Determination of PRL and OBD in human urine samples

Name of the drug	Amount labelled (mg/L)	*Average amount found (mg/L)	Recovery percentage (%)	+ S.D	RSD
PRL	2	1.97	98.5	0.025	1.269
	4	3.88	97.0	0.03	0.773
	6	5.71	95.0	0.032	0.824
OBD	2	1.96	98.0	0.0003	0.0153
	4	3.90	97.5	0.0015	0.038
	6	5.81	96.66	0.0032	0.055

* Each value is an average of three determinations

Table 4: Determination of PRL and OBD in human serum samples

Name of the drug	Amount labelled (mg/L)	*Average amount found (mg/L)	Recovery percentage (%)	+ S.D	RSD
PRL	2	1.96	98.00	0.002	0.1020
	4	3.93	98.25	0.046	1.17
	6	5.89	98.16	0.0346	0.587
OBD	2	1.96	98.0	0.002	0.1020
	4	3.98	99.50	0.017	0.427
	6	5.98	99.66	0.0519	0.868

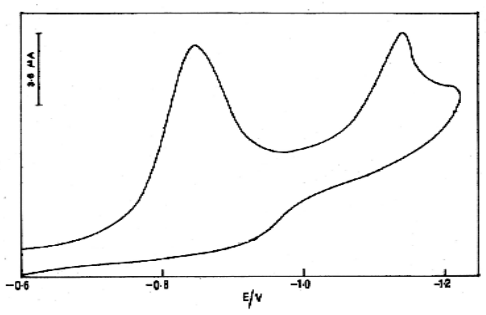

Fig. 1: Typical cyclic voltammogram of PRL

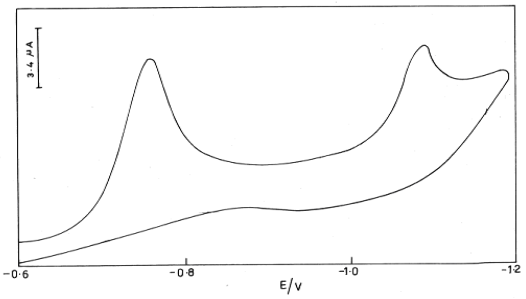

Fig. 2: Typical cyclic voltammogram of OBD

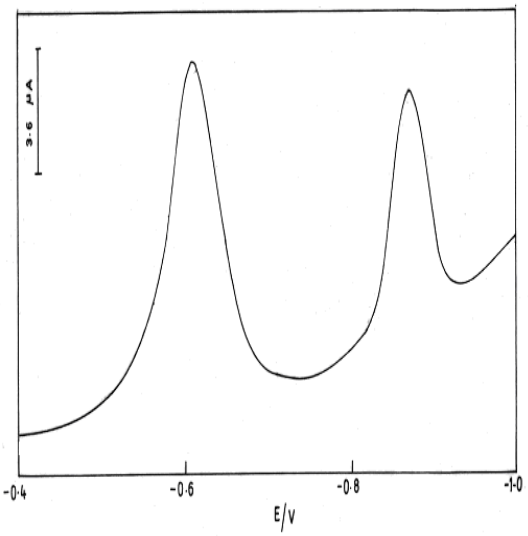

Fig. 3: Typical DPP of PRL

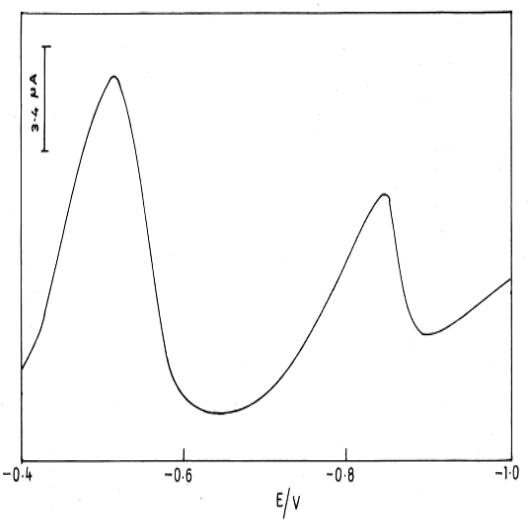

Fig. 4: Typical DPP of OBD

RESULTS AND DISCUSSION

Cyclic voltammetry

Fig.1 and 2 Illustrate cyclic voltammograms (CV) of 1.6×10^{-8} M pralidoxime and obidoxime in 0.04M BR buffer solution of p^H 2.0 at HMDE. On scanning from -0.4 to -1.4 v towards a negative potential two cathodic peaks are observed which are attributed to the reduction of azomethine group.

Differential pulse polarography

Fig. 3 and 4 explain the differential pulse polarogramms for 1.6×10^{-8} M PRL and OBD in 0.04M BR buffer solution of p^H 2.0 at HMDE. While scanning towards cathodic direction two peaks were observed and no peak in anodic direction indicating the irreversible nature of reduction process. The peaks are attributed to the reduction of azomethine group.

CONCLUSION

From the experimental results obtained, PRL and OBD are found to give two well-defined peaks in the BR buffer solution of pH 2.0 which are attributed to the reduction of azomethine group .Standard addition method is employed for the estimation of these pharmacologically important drugs in their pharmaceutical formulations, serum samples and urine samples.

REFERENCES

1. P. Garzone, J.A. Lyon and V.L. Yu, *Drug Intell. IN. Pharm.,* **17**: 507 (1983).
2. P. Garzone, J.A. Lyon and V.L. Yu, Drug *Intell. Clin. Pharm*., **17**: 615 (1983).
3. B. Van Klingeren, L. J. Van Wijngaarden and A. Rutgers, *J. Antimicrob. Chemother,* **674**(6): 676 (1980).
4. G.V. Subba Reddy and S. Jayarama Reddy, *Talanta*, **44**: 627 (1997).
5. T. Madhusudana Reddy, M. Sreedhar and S. Jayarama DDY, *j. Pharm. Biomed. Anal*. **31**: 811 (2003).
6. B. Ogorevc, M.R. Symth, V. Hudnik and S. Gomiscek, *Anal. Chem. Ser.,* **25**: 403 (1986).
7. I.F. Jones, J.E. Page and C.T. Rhodes, *J. Phar. Parmacol*., **20**: 455 (1968).
8. G.Dusinksky and P. Antolik, *Cesk. Farm*., **16**: 120 (1967).
9. G. Dusinsky and P. Antolik, *Cesk. Farm.,* **16**: 461 (1967).
10. D.A. Hall, *J. Pharm. Sci*., **62**: 980 (173).
11. Chadi Abbara, Isabelle Bardot, Annie Cailleux, Guy Lallement, Anne Le Bouil, Alain Turcant, Pascal Clair, Bertrand Diquet, *J. Chrom.* B, **874**: 42-50 (2008).
12. M. Bodiroga, D. Agbaba, D. Zivanov-Stakic, R. Popovic, *J. Pharm. Biomed. Anal*., **12**: 127-129 (1994).
13. Katarina, D. Karljikovic-Rajic, Branislava, S. Stankovic, *Clin. Chim. Acta.*, **193**: 119-124 (1990).
14. Ahmet C. Goren, Gokhan Bilsel, Mine Bilsel, Serpil Yenisoy-Karakas, Duran Karakas, *J. Chrom*. A, **1057**: 237-239 (2004).
15. C. Grasshoff, H. Thiermann, T. Gillessen, T. Zilker, L. Szinicz, *J. Chrom. B: Biomed. Sci. Appli.,* **753**: 203-208 (2001).
16. K. Karljikovic-Rajic, B. Stankovic, Z. Binenfeld, *J. Pharm. Biomed. Anal*., **5**: 141-149 (1987).