Bull. Pharm. Sci., Assiut University,
Vol. 14, Parts 1&2, PP 1-5

THE USE OF HPLC-CYCLOBOND COLUMN FOR QUANTITATIVE DETERMINATION OF ANTICATARRHAL TABLETS

S. M. EL-Gizawy[*], A. N. Ahmed[**] and M. A. Makboul[+]

Department of Pharmaceutical Analytical Chemistry[*], Department of Organic Pharmaceutical Chemistry[**] and Department of Pharmacognosy[+], Faculty of Pharmacy Assiut University, Assiut, Egypt

ABSTRACT

The utility of high performance liquid chromatography cyclobond-I column for the separation and analysis of paracetamol, phenylpropanolamine HCl and chlorpheniramine maleate in synthetic mixture was clearly demonstrated using mobile-phase methanol: phosphate buffer pH 7.0(10:90), flow rate 0.8 ml min^{-1} and the detection was affected spectrophotometrically at 254 nm. Adequate sensitivity and an excellent precision were obtained for the determination of the commercial dosage form.

INTRODUCTION

Inclusion complex between medicinal agent and cyclodextrins (CyDs) present a great interest [1]. This phenomenon serves as the basis for the chromatographic separation of various biologically and pharmaceutically important compounds [2,3]. Several publications have been devoted for the application of B-cyclodextrin as additives to the mobile phase bonded to suitable supports [4,5].

Spectrophotometry [6-9], potentiometry [10], thin layer chromatography [11] and high performance liquid chromatography [12-14] have been applied to determine paracetamol, phenylpropanolamine HCl, caffeine and chlorpheniramine maleate individually. Each procedure requires different pretreatment steps for the determination of any drug.

Several HPLC and TLC procedures have been developed in recent years for the purpose of assaying paracetamol, phenylpropanolamine HCl, caffeine and chlorpheniramine maleate individually or in presence of each other [15,16].

The present method described the HPLC-cyclobond column for the separation and analysis of certain anticatarrhal tablets. Such tablets contain antipyretic analgesic; paracetamol; a potent vasoconstrictor; phenylpropanolamine HCl; CNS and respiratory stimulant; caffeine and antihistaminic; chlorpheniramine maleate.

EXPERIMENTAL

Materials:

ß-cyclodextrin was obtained from Nihon Shokuhin Kako Co., Ltd., Tokyo, Japan. Paracetamol, phenylpropanolamine HCl, caffeine and chlorpheniramine maleate were USP or BP grade. Sodium hydroxide and sodium acid phosphate (Fischer Scientific) were of analytical grade reagent. Methanol for HPLC, Merck, Darmstadt, FRG was used.

Apparatus:

a-A high performance liquid chromatograph with Spectra Physics 8100 pump model, equipped with a stainless steel column (100 X 4.6 mm id) packed with ß-cyclodextrin chemically bonded to

a high purity silica gel cyclobond I; (Advanced Separation Technologies USA) was used. Detection was effected spectrophotometrically at 254 nm using s DuPont variable wavelength UV detector. A servogar 310 recorder combined with an SP 4100 computing integrator was used to monitor the chromatographic characteristics.

b-APW 9418 pH meter (Pye Unicam Cambridge, UK) was used to adjust the pH.

Dosage Forms:

Flurest tablets each contains: paracetamol 400 mg, phenylpropanolamine HCl 24 mg, caffeine anhydrous 32 mg and chlorpheniramine maleate 3 mg were obtained from Advanced Biochemical Industries SAE (ABI), El-Salam City, Egypt.

Mobile Phase:

For HPLC: phosphate buffer pH 7: methanol (90:10) prepared by mixing 0.05M phosphate buffer pH 7 with methanol in proportion(90:10), filtered under vacuum and degassed using ultrasonic bath before use.

Chromatographic Conditions:

The solvent flow rate was 0.8 ml/min, the temperature was 25 ± 2°C, the chart speed was 0.25 cm/min and the attenuation was 1 mv.

Calibration Curve for HPLC:

From stock solutions containing each 1 mg/ml of paracetamol, phenylpropanolamine HCl and chlorpheniramine maleate; serial dilutions were prepared to give final concentrations of 100-500; 20-100 and 2.0-5.0 μg/ml. Inject 50 μl of each standard prepared drug solutions into the chromatograph and plot the concentrations of the drug versus peak area.

HPLC Analysis of Known Synthetic Mixture:

Standard solution of a known mixture containing various concentrations of paracetamol (400 μg/ml), phenylpropanolamine HCl (24 μg/ml), caffiene (32 μg/ml) and chlorpheniramine maleate (3 μg/ml) were determined using HPLC-cyclobond column.

HPLC Analysis of Dosage Forms:

Ten tablets were individually dissolved in 50 ml of methanol and sonicated for 20 minutes and the solution was completed to 100 ml with methanol in volumertic flask. A portion of the solution was centrifuged for 20 minutes, and 1 ml of the clear supernatant was completed to 10 ml in a volumetric flask with methanol: phosphate buffer pH 7 (90:10). The final concentrations were 400, 24, 32 and 3 μg/ml for paracetamol, phenylpropanolamine HCl, caffeine and chlorpheniramine maleate in the prepared solution respectively. Volumes of 50 μl of the sample preparation were injected into the column, the peak area was determined and the amounts of the active components were determined by comparing the peak area for the sample to that for the standard of the known concentration.

RESULTS AND DISCUSSION

The utility of the cyclobond column for the separation and quantitative determination of paracetamol, phenylpropanolamine HCl and chlorpheniramine maleate was clearly demonstrated using mobile phase phosphate buffer pH 7.0: methanol (90:10).

Decreasing the methanol content of the mobile phase, the resolution of paracetamol and phenylpropanolamine HCl, peaks can be in-

creased to the desired degree of separation. The value of pH 7.0 was essential for the separation of chlorpheniramine maleate because changing the pH to 4 or 6 led to overlapping of maleic acid peak with that of paracetamol.

It was not possible to separate caffeine from solvent front using HPLC-cyclobond I column even by using different ratios of the mobile phase of phosphate buffer pH 7.0: methanol (60:40, 70:30, and 80:20 v/v). Also, change the flow rate 1-0.5 ml min^{-1} the separation of caffeine from solvent front was unsuccessful.

Linearity of the concentration versus peak area was studied for the three compounds. All standard curves were found to be linear in the concentration range studied and passed close to the origin. Their correlation coefficients were nearly ideal = (0.996). Table 1.

The chromatogram was as expected with respect to the shape of the peak and complete baseline resolution was achieved between the solvent front phenylpropanolamine HCl, paracetamol and chlorpheniramine maleate, Figure (1).

Table (2) shows the accuracy of the procedure for the analysis of the commercial dosage form. Recovery was 101 % for paracetamol, 100.2 % for phenylpropanolamine HCl and 98.9 % for chlorpheniramine maleate, and reproducibility was excellent (RSD < 2.0).

The analytical procedures outlined in this paper afford a specific, quick and accurate assay for the determination of the commonly used anticatrrhal tablets.

Table 1: Calibration Data for Standard Drug Solution

Compound	HPLC			
	conc. µg/ml	Correlation Coefficient ±S.D*	Slope	Interecpt
Paracetamol	100-500	1.00 ± 0.02	0.16	0.014
Phenylpropanolamine HCl	20-80	0.997 ± 0.01	0.12	0.002
Caffeine				
Chlorpheniramine Maleate	2-6	0.998 ± 0.04	0.10	0.031

* Average of five determinations.

Table 2: Analysis of Dosage form

Tablet	HPLC		
Preparation	Label Claim mg / tablet	Recovery %	RSD %
Paracetamol	400	101.0	0.07
Phenylpropanolamine HCl	24	100.2	0.42
Caffeine	32		
Chlorpheniramine Maleate	3	98.9	1.68

* Average of five determinations.

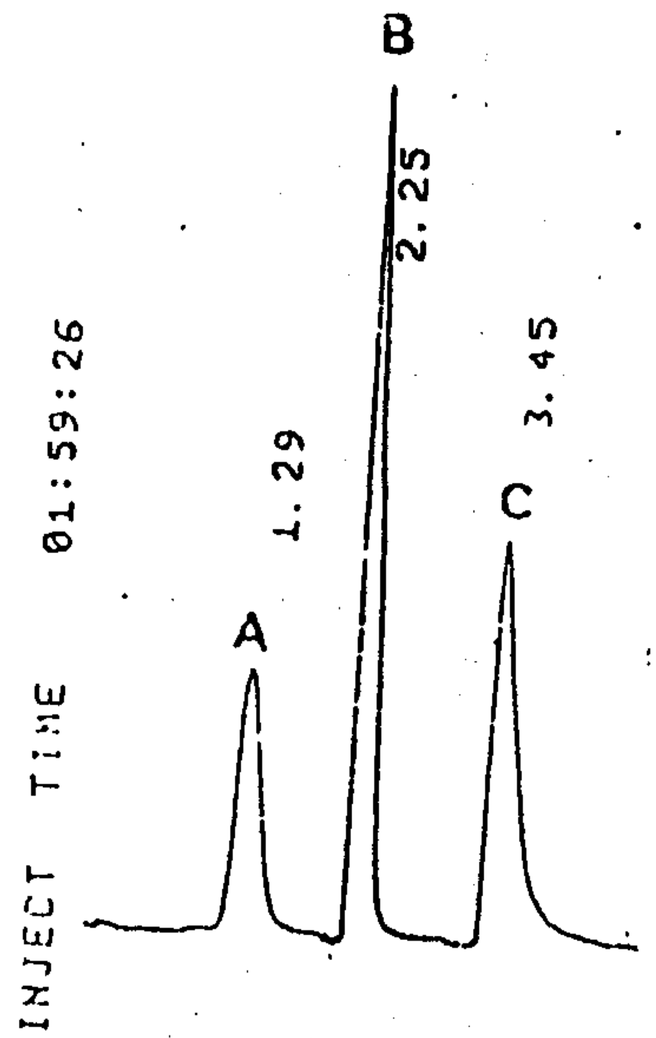

Fig.1: Chromatogram of 50 µl Aliquot of Dissolved Tablets Containing (A) Phenylpropanolamine HCl; (B) Paracetamol and (C) Chlorpheniramine Maleate.

REFERENCES

1-K.Uekama, The Japanese Journal of Antibiotics, XXXII Suppl. 5, 103 (1979).

2-S.M.El-Gizaway and A.N.Ahmed, Analyst 112(6), 867 (1987).

3-N.A.Ahmed and S.M.El-Gizawy Analyst 114(6), 571 (1988).

4-W.L.Hinze, Sep. Purif. Method 10, 159 (1981).

5-S.keulemansova, E.J.Chromatography 251, 17 (1982).

6-C.P.Leung and C.K.Analyst 114(2), 241 (1989).

7-M.Carmona, M.Silva and D.Preze-Bendito, Anal. Chim. Acta., 218(2), 313 (1989).

8-B.Morli, J. Pharm. Biomed. Anal., 7(5), 577 (1989).

9-X.Weng, Yaowu Fenxi Zazhi, 8(3), 187, through Anal. Abstr., 51(2), 2E9 (1989).

10-P.N.Vyas and P.B.Kharat, Indian J. Pharm. Sci., 50(5), 279 (1988).

11-X.Zhang and Z.Zhao, Yaowu Fenxi Zazhi., 8(3) 177, (1988) through Anal. Abstr., 51(2), 2E60 (1989).

12-P.Taylor, P.D.Braddock and S.Ross, Analyst 109(5), 619 (1984).

13-J.Araujo J.F.Boyer and M.L.Probecker, S.T.P. Pharma., 4(7), 598 (1988).

14-A.A.Fatmi and G.V.Williams, J. American Association of Pharmaceutical Sciences 9(6), 181 (1989).

15-S.S.Yang and R.K.Gilipin, J.Chromatoger. Sci., 26(8), 416 (1988).

16-M.A.Abuirjeie, M.E.Abdel-Hamid and E.A.Ibrahim, Anal. Lett., 22(2), 365 (1989).

استخدام كروماتوجرافيا السوائل تحت الضغط العالى فى فصل وتحليل الاقراص المضادة للرشح

سامية محمود على الجيزاوى - عبد الحميد نجيب احمد - مقبول احمد مقبول

كلية الصيدلة - جامعة اسيوط

تم استخدام كروماتوجرافيا السوائل ذات الضغط العالى بمساعدة عمود بيتا - الدكستران الحلقى فى فصل وتحليل السارستيامول - فنيلبروبانول امين هيدروكلوريد وكلورفنيرامين ماليات فى صورتهم الصيدلية والتخليقية وذلك باستخدام مذيب - ميثانول - فوسفات ذات الاس الهيدروجينى ٧ (٩٠ : ١٠)٠

تمت محاولات عديدة لفصل الكافيين بواسطة كروماتوجرافيا الضغط العالى ولكن لم تنجح هذه المحاولات ٠ وقد اثبتت الطريقة المستخدمة دقة عالية فى فصل وتحليل هذه المركبات فى صورتها الصيدلية ٠

received in 14/11/1990 - accepted in 30/6/1991