Chromatographic Analysis of General Otc Anti-Allergic Drug: Cetirizine

Kaur Loveleen[1], Kaur Ridamjeet[2], Sharma Tina[3]

[1]Student, [2]Assistant Professor, [3]Assistant Professor, Department of Forensic Science and Toxicology, Chandigarh University, Mohali Punjab, India

Abstract

Cetirizine as general OTC anti-allergic drug was evaluated through paper chromatography. Twelve cetirizine compositions were analysed wherein each tablet and syrups were six in number. Seven solvent systems were experimented from which chloroform and methanol in ratio 50:50 proved to be best solvent system for both cetirizine tablet and syrup compositions. Other solvent system that showed clear separation of spots were n-hexane, toluene and diethyl ether in ratio 65:25:10 and acetone and methanol in ratio 90:10 for tablet and syrup preparations respectively. Iodine fuming technique and UV radiations were also utilized for visualising some unidentified and invisible spots during the examination procedures.

Keywords: *Cetirizine, OTC drug, Paper chromatography, Iodine fuming, UV radiations.*

Introduction

OTC medications are as opposed to professionally prescribed medications that do not require a specialist's order and can be straightforwardly taken from any therapeutic shop [1-2]. There are an expected 350,000 OTC medications which can be acquired from drug stores, supermarkets and comfort stores with no prescription. They incorporate analgesics, cold and hack drugs, stomach settling agents, antihistamines, narcotics and so on. The majorly abused OTC drugs included dextromethorphan, acetaminophen, ibuprofen, diet pills, sexual performance medicines, herbal ecstasy, cetirizine etc. in light of their simple accessibility, they can be used to ease assortment of day by day medical issues[3]. Some OTC medications, when taken with liquor cause sleepiness, tipsiness, elation, anxiety, obscured vision, ringing in ears and so on. At a higher portion, these impacts are escalated alongside different side effects, for example, disarray, muscle jerking, sporadic heartbeat, tremors, seizures and so forth. They may weaken the capacity to securely drive a vehicle since they can cause laziness or edginess. Cases may incorporate mishaps because of the abuse of medications or conscious overdose or they could add to vehicle mishaps etc[4]. The misuse of these medications is a genuine and developing general medical issue everywhere throughout the world. Enormous portions of OTC medications can be destructive. At the point when taken in overabundance sum reliance can be created. Maltreatment of OTC medications causes physiological reliance, mentally reliance or both. Cases had been reported in which death occurred due to toxic effects induced by ingestion of high amounts of cough–cold preparations[5].

Cetirizine is also a OTC drug that reduces brain activity and produces sleepiness, dizziness and low body activity when taken in prescribed amount. It will work as depressant for CNS if taken in excessive amount. A study demonstrated that 38 percent of illegal medication use among young people and kids from 1990 to 1999 included OTC medications. Studies suggest that teenagers and youthful grown-ups are at most serious danger of OTC medication misuse [6-11].

Number of studies for detection and quantification of active components in OTC cough and cold preparations using thin layer chromatography, high performance thin layer chromatography, reverse phase high performance liquid chromatography have been discussed in literature

Corresponding Author:
Ridamjeet Kaur,
Assistant Professor, Department of Forensic Science and Toxicology, Chandigarh University, Mohali Punjab, India.
e-.mail address: ridamjeet.kaur@cumail.in

[12-15]. So far ultraviolet spectrophotometer for estimating the combined dosage of levocetrizine hydrochloride and phenylephrine hydrochloride has been used [16]. Gas chromatography–mass spectrometry, liquid chromatography–tandem mass spectrometry and ultra-performance liquid chromatography– tandem mass spectrometry has been also mentioned to be used in identification of active components and their metabolites in toxicological samples using [17-19].Therefore, the present work has been attempted to analyse the Cetirizine as OTC drug by paper chromatography in both powder form as well as syrup form.

Material and Method

For evaluating the potentiality utility of chromatography in assessing cetirizine through chromatography twelve preparations of OTC drug was purchased in the form of tablets and syrups were purchased from the local market (Table No. 1). The standard sample of cetirizine hydrochloride was procured from the local chemical supplier. The samples were prepared from each six tablets by crushing them in pestle-mortar individually to powdered form. 0.5 mg powder from each tablet was taken and dissolved in 4-5 drops of acetone thoroughly in six different test tubes and kept for a few minutes. The contents were then filtered through Whatman filter paper no. 1. The filtrate was collected and centrifuged. The supernatant was transferred to another clean test tube for TLC analysis. Therefore, six test tubes were ready with tablet samples. Similarly, six Cetirizine hydrochloride syrup preparations were taken and two drops from each was dissolved in 10-15 drops of acetone in six different test tubes. Similarly, the standard Cetirizine hydrochloride powder of 0.5 mg was taken in a test tube and dissolved in 4-5 drops of acetone and dissolved thoroughly. Hence, total 12 test tubes were ready to develop the each samples in each seven different solvent systems. Seven solvent systems were selected for the study and were prepared in different ratios to assess their potentiality in chromatographic analysis of cetirizine preparations (Table no. 2). The Whatman filter strips with 150 GSM were selected as stationary phase and cut into different sizes such as 3 X 8 cm, 6X 12 cm and 8 X 12 cm. Then TLC chamber of 300 ml was taken and was rinsed with acetone to remove dirt or oil. The solvent systems chosen were poured in twelve different chambers and kept aside for few minutes. In the mean time, spotting of samples was carried with micro capillary tube at the height of 1.5 cm above the base of paper. After that, strip was kept aside for a minute. Later on, each strip carrying the samples was placed in the TLC chambers vertically till completely run. The strips were taken out and allowed to dry and then examined physically, under UV light and with iodine fuming technique.

Result and Discussion

The results of chromatographic development of 12 samples of OTC cetirizine drugs have been tabulated Table no. 3-6. The samples were developed in seven different solvent systems. The developed strips were then examined physically, with UV light as well as by iodine fuming method too. The results were obtained in terms of number of spots and their respective hRf values were calculated and found to be different with different solvent system.

FOR TABLETS: It was noticed from table no.3 that solvent systems A was most suitable in developing and separating the cetirizine from all the five tablets and some spots were clearly visible physically and some were developed with iodine fuming techniques (Figure 1). The hRf were calculated for all the samples developed with mobile phase of chloroform and methanol with ratios 50:50. No spot developed under UV light in strips developed with solvent system A. Other mobile phases that showed positive results were D and E in tablet no 2 and 1 respectively whereas solvent system G had separated out the component in tablet no. 1,2 and 4. No spot was developed with solvent system B,C and F with any tablet. The hRf values were came to be 32, 49, 47,66, 79 for the 1-5 no. Tablets with A solvent system. The rest hRf values were 24 and 54 of tablet no 1 with E and G, 34 and 38 with tablet no 2 with D and G solvents system and 47 and 49 of tablet no 4 with E and G mobile phases.

FOR SYRUPS: : It is apparent from table no.4 that solvent systems A and E was most suitable in developing and separating the cetirizine from all the six syrup preparations whereas mobile phases C,D and F showed positive results in few tablets [Figure 2]. No spot was developed with solvent system B,C and F with any syrup. The hRf were calculated for all the samples developed with mobile phase of chloroform and methanol with ratios 50:50 and n-hexane: toluene: diethyl ether in ratio 65:25: 10. No spot developed under UV light in strips developed with solvent system A. Other mobile phases that showed positive results were D and E in tablet no 2 and 1 respectively whereas solvent

system G had separated out the component in tablet no. 1,2 and 4. The hRf values were came to be 76, 50, 79, 35, 34 and 15 for the 1-6 no. syrups with A solvent system and 23, 54, 79, 29, 28 and 42 with E solvent system. The rest hRf values were 54 and 46 of tablet no 1 and 4 with F , 42 with tablet no 1 with C and 51 and 29 with tablet no. 2 and 5 respectively with D solvents system.

Rest all the solvent systems showed no results under UV or with treatment to iodine fuming. Similar studies have reported where chloroform: ethanol (90:10) was found to be most suitable for cough cold tablets and syrups medications[20]. Another studied and found the ethyl acetate, methanol and concentrated ammonia in the ratio of 85:5:10 is a suitable mobile phase to separate different components analyzed dextromethorphan hydro bromide using TLC[21].

Likewise, dextromethorphan hydro bromide was successfully examined under short UV radiation in toluene: methanol: chloroform: glacial acetic acid (65:1.5:1.5:0.5) as the best solvent[22].

Therefore, in the present study chloroform: ethanol (70:30) was found to be the best solvent system for syrups as well as tablets. Iodine fuming was non-destructive method of visualization of invisible spots for the subsequent instrumental analysis of the eluted active components. Each sample of Cetirizine medicines showed a different number of spots. The prospective of the paper chromatography for separation of active ingredients of cetirizine medication in the study were found to be exceptional good. Hence, it can be utilised with great confidence for the analysis of citrezine components in syrups and tablets.

Table 1 showing description of cetirizine used used in study.

Code of sample	Sample name	Color	Form
1	Cizine	White	Tablet
2	Cetrizine dihydrochloride	White	Tablet
3	Citraclor	White	Tablet
4	Cetzine	White	Tablet
5	Cold M	White	Tablet
6	Allercet	White	Tablet
7	Cetrizine drops	Transparent	Liquid
8	Okacet	Yellow	Liquid
9	Klavin	Light pink	Liquid
10	Zyrtec	Transparent	Liquid
11	Relent plus	Transparent	Liquid
12	Montair	Transparent	Liquid

Table 2 showing ratios of solvent systems chosen for the study.

Code of Mobile phase	Solvent systems	Ratio
A.	Chloroform:methanol	80:20
B.	Chloroform: acetone	60:40
C.	Chloroform: Methanol	50:50
D.	Cyclohexane: toluene	30:70
E.	n-hexane: toluene: diethyl ether	65:25:10
F.	Petroleum ether: liquid paraffin	85:15
G.	Acetone: methanol	90:10

Table 3: showing the Rf values calculated for the tablets developed in different mobile phases.

Solvent system	Cizine	Citrazine dihydrochloride	Citraclor	Cetzine	Cold –M	Allercet
Chloroform: methanol (A)	32	49	47	66	79	-
Chloroform: acetone (B)	-	-	-	-	-	-
Chloroform: ethanol (C)	-	-	-	-	-	-
Cyclohexane: toluene (D)	-	34	-	-	-	-
n-hexane: toulene: diethyl ether (E)	24	-	-	47	-	-
Petroleum ether: liquid paraffin (F)	-	-	-	-	-	-
Acetone: methanol (G)	54	38	-	49	-	-

Table 4: showing the Rf values calculated for the syrups developed in different mobile phases.

Solvent system	Citrazine drops	Okacet	Klavin	Zyrtec	Relent plus	Montair
Chloroform: methanol	76	50	79	35	34	15
Chloroform: acetone	-	-	-	-	-	-
Chloroform: ethanol	42	-	-	-	-	-
Cyclohexane: toluene	-	51	--	-	29	-
n-hexane: toulene: diethyl ether	23	54	79	29	28	42
Petroleum ether: liquid paraffin	54	-	-	46	-	-
Acetone: methanol	-	-	-	-	-	-

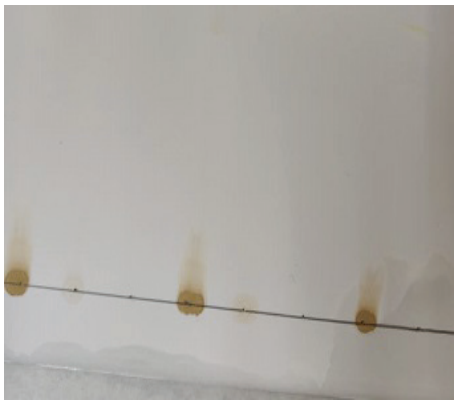

Figure 1 showing developments of spots for tablets with cetirizine composition in Acetone: methanol (90:10) solvent.

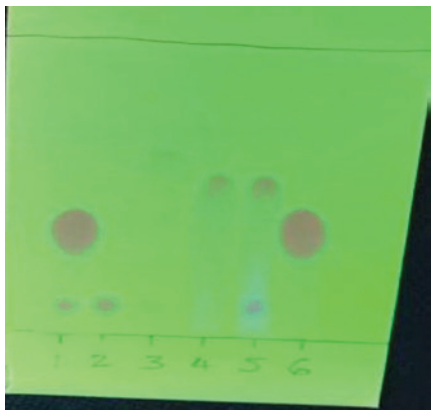

Figure 2 showing developments of six spots for six syrups with cetirizine composition in chloroform: methanol (70:30) solvent.

Conclusion

The complexity of OTC medication arrangements makes the distinguishing proof of their dynamic components very troublesome sometimes. Paper chromatography system is fast and economical strategy for the breaking up of dynamic segments in complex OTC medication. From this study, it has been established that chloroform and methanol in ratio 50:50 proved to be best solvent system for both cetirizine tablet and syrup compositions. Along with this, n-hexane, toluene and diethyl ether in ratio 65:25:10 and acetone and methanol in ratio 90:10 for tablet and syrup preparations respectively were the solvent systems that demonstrated unambiguous separation of spots. Iodine fuming technique was considered to be best for visualising some unidentified and invisible spots during the examination procedures than the UV radiations.

Ethical Clearance- Not required.

Source of Funding- Self.

Conflict of Interest – Nil.

References

1. Borkar N, Sawant S. Review of simultaneous determination of analytes by high performance liquid chromatography (HPLC) in multicomponent cough and cold oral drug products. Int J Pharm Tech Res 2011;3:1339–45.

2. NSDUH. Misuse of over the counter cough and cold medications among persons aged 12 to 25. Research Triangle Park, NC: U.S. Dept. of Health and Human Services, Substance Abuse and Mental Health Services Administration; 2006.

3. Chahal M K, Yadav P K, Bumbrah G S, Sharma R K. Thin layer chromatographic analysis of some common over the counter (OTC) cough-cold preparations. Egyptian J forensic sciences 2016;6:351-360.

4. Lyman MD. Practical drug enforcement: procedures and administration. New Delhi: CRC Press; 1992.

5. Levine DA. Pharming: the abuse of prescription and over the counter drugs in teens. Curr Opin Pediatr 2007;19(3):270–4.

6. Babu K, Boyer EW, Hernon C, Brush DE. Emerging drugs of abuse. Clin Ped Emerg Med 2005;6(2):81–4.

7. Murray S, Brewerton T. Abuse of over the counter dextromethorphan by teenagers. South Med J 1993;86(10):1151–3.

8. Logan BK, Goldfogel G, Hamilton R, Kuhlman J. Five deaths resulting from abuse of dextromethorphan sold over the internet. J Anal Toxicol 2009;33:99–103.

9. Blake KV, Bailey Z, Zientek GM, Hendeles L. Death of a child associated with multiple overdoses of acetaminophen. Clin Pharm1998;7(5):391–7.

10. Murao S, Manabe H, Yamashita T, Sekikawa T. Intoxication with over the counter antitussive medication containing dihydrocodeine and chlorpheniramine causes generalized convulsion and mixed acidosis. Intern Med 2008;47(11):1013–5.

11. Shafi H, Imran M, Usman HF, Sarwar M, Tahir MA, Naveed R, Ashiq MZ, Tahir AM. Deaths due to abuse of dextromethorphan sold over-the-counter in Pakistan. Egypt J Forensic Sci 2015.

12. Roy J, Saha P, Sultana S, Kenyon AS. Rapid screening of marketed paracetamol tablets: use of thin layer chromatography and a semi-quantitative

spot test. Bull World Health Organ 1997;75(1):19–22.

13. Digregorio DM, Harnett HD, Sherma J. Quantification of dextromethorphan hydrobromide and clemastine fumarate in pharmaceutical caplets, gelcaps and tablets by HPTLC with ultraviolet absorption densitometry. Acta Chromatogr 1999;9:72–8.
14. Chitlange SS, Sakarkar DM, Wankhede SB, Wadodkar SG. High performance thin layer chromatographic method for simultaneous estimation of ibuprofen and pseudoephedrine hydrochloride. Indian J Pharm Sci 2008;70(3):398–400.
15. Sagathiya K, Bagada H. Development and validation of RP-HPLC and HPTLC method of analysis for simultaneous estimation of ambroxol HCl, dextromethorphan HBr and guaifenesin in pharmaceutical cough cold preparation and statistical comparison of developed methods. Int J Pharm Pharm Sci 2014;6(2):312–6.
16. Deshmukh VV, Wagh DD, Vassa SP, Gujar KN. Development of first order derivative ultraviolet spectrophotometric method for simultaneous estimation of levocetirizine hydrochloride and phenylephrine hydrochloride in bulk and combined dosages form. Int Res J Pharm 2013;4(5):115–9.
17. Juhascik M, Le NL, Tomlinson K, Moore C, Gaensslen RE, Negrusz A. Development of an analytical approach to the specimens collected from victims of sexual assault. J Anal Toxicol 2004;28:400–6.
18. Ptacek P, Klima J, Macek J. Development and validation of a liquid chromatography- tandem mass spectrometry method for the determination of phenylephrine in human plasma and its application to a pharmacokinetic study. J Chromatogr B 2007;858:263–268.
19. Feng S, Zhao Q, Jiang J, Hu P. Determination of phenylephrine in human plasma using ultra performance liquid chromatography tandem mass spectrometry. J Chromatogr B 2013;915–916:28–32
20. Chahal M K, Yadav PK, Bumbrah G S, Sharma RM. (2016) Thin layer chromatographic analysis of some common over the counter (OTC) cough–cold preparations. Egyptian Journal of Forensic Sciences; 6: 351–360.
21. Digregorio DM, Harnett HD, Sherma J.(1999) Quantification of dextromethorphan hydrobromide and clemastine fumarate in pharmaceutical caplets, gelcaps and tablets by HPTLC with ultraviolet absorption densitometry. ActaChromatogr;9:72–8.
22. Sagathiya K, Bagada H.(2014) Development and validation of RPHPLC and HPTLC method of analysis for simultaneous estimation of ambroxol HCl,dextromethorphan HBr and guaifenesin in pharmaceutical cough cold preparation and statistical comparison of developed methods. Int J Pharm Pharm Sci 2014;6(2):312–6.
23. Darwish HW, Metwally FH, Bayoumi AEI.(2015) Development of three methods for simultaneous quantitative determination of chlorpheniramine maleate and dexamethasone in the presence of parabens in oral liquids. Trop J Pharm Res 14(1):153–61.