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Simple Spectrophotometric Assay of Available Brands of Acetaminophen Tablets and their Comparative Study

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ABSTRACT

A rapid, simple, accurate, and economical acetaminophen spectrophotometric method has been developed and validated for the assay of and compare assay of brand available in the market. The analysis is based on the UV absorbance maxima at about 246 nm wavelength of acetaminophen using methanol as solvent. A sample of drug was dissolved in methanol to produce a solution containing acetaminophen. Similarly, a sample of ground tablets of different brand were extracted with methanol and diluted with the same methanol. The absorbance of sample preparation was measured at 246 nm against the solvent blank and the assay was determined by comparing with the absorbance of available brand. The method can be applied for the routine QC quantitation of acetaminophen in tablet formulation and active.

Keywords: acetaminophen,UV pectrophotometry

INTRODUCTION

Acetaminophen figure 1 is an active metabolite of acetanilide and phenacetin. Chemically, it is N-acetyl-p-aminophenol having molecular formula C8H9NO2[1]. Paracetamol white crystalline powder with melting point 169 – 172 OC and pH 5.5 – 6.5.It has sparingly soluble property in weter [2]. According to BCS Classification, it falls in Class III [1]. It's wide used over the counter analgesic and antipyretic activity [3]. Together with opoid analgesics, acetaminophen will be utilized in the management of additional severe pain like post-surgical pain [3]. Acetaminophen is an effective alternative of aspirin as an analgesic and antipyretic agent where aspirin is contraindicated due to gastric ulcer or a coagulation disorder such as prolongation of bleeding time but unlike aspirin paracetamol has weak anti inflammatory activity the failure towards anti-inflammatory activity is due to weak inhibitor of cyclooxygenase in the presence of high concentration of peroxides that are found in inflammatory lesions or does not inhibit production of thromboxanes pro-clotting factor [4]. Acetaminophen shows antipyretic and analgesic activity by inhibiting COX-I and COX-II but have no effect as anti-inflammatory agent [5]. It inhibit COX-I and COX-II in the periphery where as COX-III may be a product of same gene inhibited in central nervous system [5].There are more than two forms of COX enzyme are available because animal studies show that COX enzymes in homogenates of different tissues vary in sensitivity

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to the inhibitory action of acetaminophen [6].Acetaminophen does not inhibit neutrophil activation as do other NSAIDs [4].Acetaminophen has no effects on platelets, bleeding time or the excretion of acids such as uric acid [4].Adult Dose: Total daily dose should not be more than 4000mg per day [4].Children Dose: Depends on the age and weight and no more than five doses should be administered in 24hr. A 10mg/kg may be used and one single dose is 40 – 48mg [4].Therapeutic dose Paracetamol is safe in discomfortness and painfull conditions in children [7].In Malnutritioned children therapeutic dose causes hepatotoxicity [7].It does not show GI effect like aspirin but causes hepatic toxicity on overdose [6].Acetaminophen is quickly and completely absorbed from GIT and uniformly distributed throughout the body fluids [4].It almost show 100% bioavailability [1].Peak plasma concentration is 30 to 60 min [8][9].After therapeutic dose its half life is 2hours[8][9]. Metabolized and excreted through hepatic and renal routes respectively [1].Acetaminophen can cross placenta and is excreted in breast milk [10].

Useful in mild to moderate pain of postpartum and many parts of body like heachache,toothache, ear pain,menstrual pain,epistomy,osteoarthritis,back pain and neuralgia.Post vaccine reactions and fever as have antipyretic activity [6].It can be used in combination with other drugs to treat severe pain loke pain in cancer [11].Liver disease will be the important caution [8].Those person who are allergic to salicylates groups are also sensitive to paracetamol/acetaminophen and show allergic or skin reactions [8].Acetaminophen causes hepatic centrilobular necrosis .Acetaminophen is metabolized by Cytochrom P450 enzyme to a N-acetyl-p-benzoquinonimine [8],reactive metabolite which suppress the glutathione and leads to toxicity on overdose [8].Superoxide formation from unidentified source or may be due to NAPQI-mediated mitochondrial injury,leads to formation of Peroxynitrate which mediate the production of Nitrotyrosin [12].Overdose of acetaminophen trigger the adduction of it in necrotic cell because Peroxynitrate is detoxified by GSH [12].

N-acetylcysteine used as antidote [11][12]. Sulfhydryl compounds acts as antidote because it replenishing hepatic stores of glutathione [10].In market,according to patient fesibility Paracetamol is available in different dosage form like Tabet, Capsules, Drops, Elixirs, Suspension and Suppositories and the paracetamol drug is official in different pharmacopeias [13].Each Tablet contain:Paracetamol B.P 500mg. The aim of this study is to investigate the physico-chemical parameters of commercially available four brands of Paracetamol in Karachi,Pakistan.

EXPERIMENTAL

UV visible 1601 Shimadzu double beam spectrophotometer was used to record the spectra. The solvent used for the assay was spectroscopic-grade methanol.

Wavelength Selection

About 100 ppm of acetaminophen was accurately prepared in spectroscopic-grade methanol solvent. This preparation was then scanned in the 200-400 nm UV region. The wavelength maxima (?max) was observed at 246nm and this wavelength was adopted for absorbance measurement.

Standard Stock solution

Accurately weighed 10 mg of acetaminophen standard was transferred to a volumetric flask and add 5 ml water and add suffi-cient methanol to produce 100 ml. This was sonicated 5 min to dissolve it.

Sample Preparation

The four different brands were purchased from different Public medical store located in Karachi,Pakistan. All tablets of each brand have same batch number and were labeled to conatin Paracetamol B.P 500mg per tablet. All the four brands have 5 year shelf life.

The serial number as identification mark of purchased

brands are shown in Tabel 1.20 tablets of four different brand of acetaminophen from the marketed sample were weighed and crushed uniformly with the help of a mortar and pestle. Accurately weighed sample powder equivalent to 10 mg of acetaminophen was transferred into a volumetric flask containing 20mL methanol solvent. The contents were sonicated for about 5 min and than make up volume upto 100 ml with water than filter it, discard the first few ml and collect the clear filtrate.

Procedure

Transfer 1.0 ml each of standard preparation and sample prepara-tion and methanol to provide blank to separate 100ml volu-metric flasks. To each flask add 2.0 mlof phenoldisulfonic acid solu-tion, mix and allow to stand for 20 minutes. To each flask, add 50 ml of distilled water and make alkaline with ammonia solution (10-15)ml. Cool, dilute to volumewith distilled water and mix well con-comitantly determine the absorbance of the sample preparation and standard preparation in 1cm cell at the wavelength of maximum absorbance at about 246nm, using a spectrophotometer, using the blank solution. Calculate the quantity in mg, of isosorbide-5- mono-nitrate per tablet.

Table 1: General Table

No.	Brand Name	Serial No.	Code No.	Batch No.
1	Disprol	Para-1	1657	3146
2	Calpol	Para-2	1612	CCDHP
3	Febrol	Para-3	23530	A2695
4	Panadol	Para-4	817	AL65

Table 2: Results for Assay

S.No.	Code No.	Batch No.	Result	USP Spec.	Deviation
Para-1	1657	3146	100.09%	Between 90-110%	Within the limit
Para-2	1612	CCDHP	98.43%	Between 90-110%	Within the limit
Para-3	23530	A2695	99.63%	Between 90-110%	Within the limit
Para-4	817	AL65	100.44%	Between 90-110%	Within the limit

Table 3: Descriptive statistics of different brands of acetaminophen

	N	Mean	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
Para 1	5	100.09	0.0	100.1	100.1	100.09	100.09
para 2	5	98.546	0.1	98.3	98.8	98.43	98.9
para 3	5	99.706	0.0	99.6	99.8	99.63	99.8
para 4	5	100.446	0.1	100.2	100.7	100.03	100.6
Total	20	99.697	0.2	99.3	100.0	98.43	100.6

Table 4: ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.202	3	3.401	136.308	.000
Within Groups	.399	16	.025		
Total	10.601	19			

Table 5: Multiple Comparisons of different brands of acetaminophen

(I) brands	(J) brands	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Para 1	para 2	1.54400*	.09989	.000	1.3322	1.7558
	para 3	.38400*	.09989	.001	.1722	.5958
	para 4	-.35600*	.09989	.003	-.5678	-.1442
para 2	Para 1	-1.54400*	.09989	.000	-1.7558	-1.3322
	para 3	-1.16000*	.09989	.000	-1.3718	-.9482
	para 4	-1.90000*	.09989	.000	-2.1118	-1.6882
para 3	Para 1	-.38400*	.09989	.001	-.5958	-.1722
	para 2	1.16000*	.09989	.000	.9482	1.3718
	para 4	-.74000*	.09989	.000	-.9518	-.5282
para 4	Para 1	.35600*	.09989	.003	.1442	.5678
	para 2	1.90000*	.09989	.000	1.6882	2.1118
	para 3	.74000*	.09989	.000	.5282	.9518

RESULTS AND DISCUSSIONS

Pharmaceutical assay was carried out by using

spectrophotometer on all brands of acetaminophen tablets during the study. Table-2 shows potencies in accordance of required specification. Table-3 to Table-5 are showing the descriptive analysis at 95% confidence interval, test of hypothesis i-e ANOVA and multiple comparison of different brands of acetaminophen respectively.

The proposed method for the assay of commercially available acetaminophen tablet formulationis simple, economical, accurate and rapid. It can be easily adopted for routine quality control for monitoring the assay in the API, in-process samples and tablet formulation. ANOVA shows between and within group df value 3 and 16 and p value 0.00 which shows significant results.

REFERENCES

1. A.R.Chandrasekaran,Chen Yi Han, Alex Chin Yang Chung, Lim Wei Cheang, and Low Sing Ping 2011 Past-Market In-Vitro Equivalency Evaluation of Paracetamol Tablet International Journal Of Pharmaceutical Sciences and Nanotechnology. 4 (2) 1404 (2011).

2. Adeyemi Lawurence UV-Spectrophotometry Ans RP-HPLC Methods For The Simultaneous Estimation Of Acetaminophen; Validation, Comparision and Application for Marketed Tablet Analysis Journal Of Chemical And Pharmaceutical Research. 5 (5)1–11 (2013).

3. Bertram G. Katzung Nonsteroidal Anti-in flammatory Drugs, Disease-Modifying Antirheumatic Drugs, Nonopioid Analgesics & Drugs used in Gout 'Basic and Clinical Pharmacology' Edition 10 page # 591(2007).

4. Fiona M.Russell, Frank Shann, Nigel Curtis: Kim Mulholland Paracetamol Is An Effective Drug To Use For Pain Following Oral Surgery Bull World Health Organ. 81 (5) (2003).

5. Joel G. Hardman, Lee E. Limbrird, Alfred Goodman Gillman Analgesic-Antipyretic and Antiinflammatory Agents and Drug employed in the treatment of Gout The Pharmacological basis of Therapeutics. 10, 703 & 704.

6. Joel G. Hardman, Lee E. Limbrird, Alfred Goodman Gillman Analgesic-Antipyretic and Antiinflammatory Agents and drug employed in the treatment of Gout 'The Pharmacologycal basis of Therapeutics' Edition 10 Page# 704.

7. Kalakuntla, R. Veerlapati, U. Chepuri, M. Raparla, R. Effect of various super disintegrants on hardness, disinte-gration and dissolution of drug from dosage form J. Adv. Sci. Res Edition 1 Issuance # 1 Page # 15-19 (2010).

8. Laura P. James, Philip R. Mayeux and Jack A. Hinson Acetaminophen-Induced Hepatotoxicity 'Drug Metabolism & Disposition' Volume 31 Issue No.12 Page # 1499 (2003).

9. M. E. M Hassouna, Y. M. Issa and A. G. Zayed A Comparative Study Of The In-Vitro Dissolution Profiles Of Paracetamol And Caffine Combination In Different Formulations Using HPLC "Journal Of Applied Pharmaceutical Science" Edition 2 Issuance # 05 Page 52 – 59 (2012).

10. Macintyre, Pamela; Rowbotham, David; Walker, Suellen Clinical Pharmacology; Paracetamol and Compound Analgesic 'Clinical Pain Management' Volume 2 Page # 85 (2008).

11. Macintyre, Pamela, Rowbotham, David, Walker, Suellen Suellen Clinical Pharmacology; Paracetamol and Compound Analgesic 'Clinical Pain Management' Volume 2 Page # 86 Page #103-109 (2008).

12. Palash Karmakar, Md. Golam Kibria In-vitro comparative evaluation of quality control parameters between paracetamol and paracetamol/caffeine tablets available in Bangladesh 'International Current Pharmaceutical Journal' Volume 1 Issuance # 5 (2012).

13. Regina M. Botting Mechanism of action of acetaminophen 'Oxford Journal' Volume 31, Issue supplement 5 Pp. S202-S210 (2000).