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Spectrophotometric Method for the Determination of Non- Steroidal Anti-Inflammatory Drugs

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ABSTRACT
Non-steroidal anti-inflammatory drugs (NSAIDs) are the group most often used in human and veterinary medicine, since they are available without prescription for treatment of fever and minor pain. The clinical and pharmaceutical analysis of these drugs requires effective analytical procedures for quality control and pharmacodynamic and pharmacokinetic studies. An extensive survey of the literature published in various analytical and pharmaceutical chemistry related journals has been conducted and instrumental analytical methods which were developed and used for determination of some non- steroidal anti-inflammatory, coxibs in bulk drugs, formulations and biological fluids have been reviewed.

Keywords : Spectrophotometry, Non-steroidal anti-inflammator

I. INTRODUCTION

Non-steroidal anti-inflammatory drugs (NSAIDs) are a group of drugs of diverse chemical composition and different therapeutic potentials having a minimum of three common features identical basic pharmacological properties, similar basic mechanism of action as well as similar adverse effects. Furthermore, all drugs in this group exhibit acidic character. Most of NSAIDs are weak acids, with a p*Ka* values in range of 3.0 to 5.0 (medium strong acids).

Development and validation of analytical methods are of basic importance to optimize the analysis of drugs in the pharmaceutical industry and to guarantee quality of the commercialized product. Several techniques like AAS (Khuhawar et al., 2001; Salem et al., 2000, 2001; Alpdogan and Sungur, 1999), HPLC (Hassan et al., 2008; Vinci et al., 2006; Sun et al., 2003), SPE-LC (Hirai et al., 1997), LC (Rouini et al., 2004), GC (Thomas and Foster, 2004; El Haj et al., 1999; Gonzalez et al., 1996), CE (Makino et al., 2004; Ahrer et al., 2001; Perez-Ruiz et al., 1998), potentiometric (Santini et al., 2007), Conductometric (Aly and Belal, 1994) and voltammetric methods (Liu and Song, 2006) have been used for the determination of NASIDs. Chromatographic methods have been extensively used and recomanded however, these methods generally require complex and expensive equipment, provision for use and disposal of solvents, labour-intensive sample preparation procedures and personal skill in chromatographic techniques.

Spectrophotometric method for the determination of drugs can be used in laboratories where morden and expensive apparatuses such as that required for GLC or HPLCare not available. In the last few years, there was no review published covering all different spectrophotometric techniques like(ion pair, charge transfer, metal complexes, flow injection, derivative) used for the determination of NSAIDs.

Spectrophotometric method for determination of coxibs:

The official method of celecoxib and valdecoxib was potentiometric titration method with *perchioric acid* (Pharmacopia, 2004)

A spectrophotometric method has been developed for the determination of valdecoxib in pure and pharmaceutical dosage forms. The method is based on the reaction of valdecoxib with potassium permanganate to form a bluish green coloured chromogenwith an absorption maximum at 610nm. Beer's law was obeyed in the range of 5.0-25 μg mL^{-1}. The molar absoptivity is 7.1437 × 10^{-3} L mol^{-1} cm^{-1} (Suganthi et al., 2006).

Table 1. Comparision between the spectrophotometric methods for determination of coxibs.

Drug	Method	λ_{max}(cm)	Linear range (μg mL^{-1})
Celecoxib	UV methods	251.2	--
		--	--
		253.1	8 – 22
		253.2	5.0 – 15
	1,10-Phenanthroline /ferric chloride Spectrofluoromet ric method	509.2 λ_{em} = 355 ± 5 λ_{em} = 272	50 – 400 --
Valdecoxib	UV methods	243	5.0 – 30
		239.6	--
		241	--
	Potassium permanganate	284 244 239 241 610	-- 1.0 – 6.0 2 – 18 3 – 17 5.0 – 25

II. APPLICATIONS

The above mentioned methods have applications in the determination of the studied drugs in various pharmaceutical formulations of tablets, suppositories, injections, capsules and oral solutions. These methods give results which are comparable with the official pharmacopeial methods used for the determination of the studied non – steroidal anti – inflammatory; hense, these methods can be successfully used for routine analysis and quality control on non – steroidal anti – inflammatory drugs. The methods have been used for the quantitative determination of the drug in pure form and commercial preparations. Human urine samples and serum samples have also been successfully analyzed for the studied non – steroidal anti – inflammatory drugs by these methods. The commonly occurring exicipients do not interfere in the determination of the drug in the case of

commercial samples. The methods have been validated statistically compared with the official methods by applying student's t-test and F-value. The results have been found to be accurate, precise and comparable to the official methods.

III. CONCLUSION

The review presents spectrophotometric analytical methods applied for the determination of some non – steroidal anti – inflammatory drugs coxibs (Celecoxib, Valdecoxib) between 1985 and 2008. Comparing validation parameters of already researched methods, it can be concluded which one of them is more sensitive (low LOD and LOQ values).

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