

# Pharmacophore

(An International Research Journal)

Available online at <http://www.pharmacophorejournal.com/>

Original Research Paper

## SPECTROPHOTOMETRIC QUANTIFICATION OF ETORICOXIB IN BULK DRUG AND TABLETS USING HYDROTROPIC AGENT

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### ABSTRACT

Hydrotropic solubilization technique is used to increase aqueous solubilities of poorly water soluble drugs using hydrotropic agents. In the present investigation hydrotropic solution of sodium benzoate (2M) has been used as a solubilizing agent to solubilize poorly water soluble drug. Etoricoxib shows maximum absorbance at 282 nm. Beer's law was obeyed in the concentration range of 5-20 µg/ml. Results of analysis were validated statistically and by recovery studies. The proposed method is now simple, new, environmentally friendly, and accurate, cost-effective and successfully employed in routine analysis of etoricoxib bulk drug and tablet dosage forms. Hydrotropic agent sodium benzoate did not interfere in spectrophotometric determination.

**Keywords:** Etoricoxib, Hydrotropy, Sodium benzoate, absorbance, Spectrophotometer.

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### INTRODUCTION

Hydrotropic solubilization phenomenon is useful to increase the water solubility of many poorly water soluble drugs. A huge number of poorly water-soluble drugs have been solubilized by use of various hydrotropic solutions. Sodium benzoate, sodium salicylate, nicotinamide, urea, sodium ascorbate, sodium acetate and sodium citrate are the most commonly used hydrotropic

agents. Maheshwari has analyzed various poorly water-soluble drugs viz., frusemide<sup>1</sup>, cefixime<sup>2</sup>, salicylic acid<sup>3</sup>, ketoprofen<sup>4</sup>, tinidazole<sup>5</sup>, aceclofenac<sup>6</sup> and amoxicillin<sup>7</sup>. Review of literature shows that a large number of poorly water-soluble drugs have been analyzed viz. ofloxacin<sup>8</sup>, hydrochlorthiazide<sup>9</sup>, metronidazole<sup>10</sup>, nalidixic acid, ibuprofen, naproxen, flurbiprofen<sup>11</sup>, aspirin<sup>12</sup>, cephalixin<sup>13</sup>, paracetamol<sup>14</sup>, norfloxacin<sup>15</sup> and piroxicam<sup>16</sup>

using hydrotropic solubilizing agents. Using hydrotrophy etoricoxib<sup>17</sup> have been analyzed in bulk drug and tablets dosage forms.

Etoricoxib [5-chloro -6' -methyl -3-[4-(methylsulfonyl) phenyl]-2,3'-bipyridine] is a widely used selective COX-2 inhibitor and used in the treatment of rheumatoid arthritis, osteoarthritis, ankylosing spondylitis, chronic low back pain, acute pain and gout. Solubility of etoricoxib in 2M sodium benzoate solution was increased by hydrotropic solubilization (more than 18-20 fold enhancement in aqueous solubility as compared to solubility in distilled water). Thus, it could be used to

## MATERIALS AND METHODS

**Instrument:** Systronic UV-visible recording spectrophotometer (model 2101) with 1 cm matched silica cells was employed.

**Chemicals:** Etoricoxib drug sample was supplied as gift sample by Sun Pharma Labs. Ltd., Jammu. Commercial tablets of etoricoxib were procured from the market (KINGCOX-60mg from Cadila Pharma., ETROBAX-90 mg from Ranbaxy Ltd., RETOZ-120mg from Dr. Reddy's Lab) All other chemicals used were of analytical grade.

**Preliminary solubility studies of Etoricoxib:** solubilities of Etoricoxib were determined in 2 M sodium benzoate solution, distilled water sufficient excess amount of drug was added to screw-capped glass vials of 20 ml capacity, containing distilled water, and 2 M sodium benzoate solution. The vials were shaken mechanically for 12 hours at in orbital shaker (Khera Instrument Pvt. Ltd., India). The solutions were allowed to equilibrate for next 24 hours and then centrifuged for 5 min at 2000 rpm. The supernatant of each vial was filtered through Whatman filter paper # 41. Filtrates were

solubilize the poorly water-soluble Etoricoxib, from fine powder of its crushed tablets by 2M Sodium benzoate solution to carry out spectrophotometric estimations. In most of the hydrotropic solubilization studies it was assumed that the enhancement in solubility of drugs was due to "salting in" effect or due to change in solvent character.

The proposed investigation is undertaken with the aim of developing UV Spectrophotometric technique for the analysis of water insoluble drug from single component formulations.

diluted suitably and analyzed against corresponding solvent blanks.

**Analysis of etoricoxib in tablets using 2 M sodium benzoate solution:** Twenty tablets of formulation-I (KINGCOX) were weighed and powdered. Powder equivalent to 60 mg Etoricoxib was transferred to a 50 ml volumetric flask containing 40 ml of 2 M sodium benzoate solution. The flask was shaken for about 5 min to solubilize the drug.

Then volume was made upto the mark with distilled water. Solution was filtered through Whatman filter paper # 41. Filtrate was divided in two parts, A and B. part A was kept at room temperature for 48 hours to check the effect on stability of drug in presence of urea and also to note precipitation, if any, during this period.

Part B filtrate was appropriately diluted with distilled water and absorbance was noted at 282 nm ( $\lambda_{max}$ ) against solvent blank and the drug content was calculated (Table-I). After 48 hours, filtrate of part B was also appropriately diluted with distilled water and analyzed for drug content. There was no precipitation in the filtrate in 48 hours. Similar procedures were adopted in cases of formulation-II (ETROBAX) and formulation-III (RETOZ).

**Recovery Studies:** Recovery studies are performed by adding extra bulk drug nearly forty percent of formulations.

For recovery studies, tablet powder of formulation I ((KINGCOX) equivalent to 60 mg drug was taken in a 25 ml volumetric flask. In this flask 20 mg of pure drug (corresponding spiked drug) was transferred and 20 ml of 2.0 M sodium benzoate solution

## RESULTS

First of all, bulk drug was analyzed by using 2M sodium benzoate. The drug etoricoxib follows the Beer and Lambert law in the concentration 5-20  $\mu\text{g}$  as shown in figure 1. Then formulations were analyzed and results are obtained. From Table 1, it is evident that there is good agreement between the amounts estimated and those claimed by the

## DISCUSSION

Results of solubility studies indicated that an enhancement in aqueous solubility in 2.0 M sodium benzoate solution as compared to solubility in distilled water was more than eighteen fold. The pH of 2.0 M sodium benzoate solution was 8.2. Therefore, in order to study the influence of pH on solubilities, buffer solution of pH 8.2 was made and the solubility of the drug was determined. There was negligible effect on solubility in buffer solution as compared to solubility in water. This study proves that increase in solubility of drug in hydrotropic solution (2.0 M sodium benzoate) is not due to alteration in pH but is due to hydrotropic phenomenon. The solubilities of etoricoxib in distilled water and buffer of pH 8.2 were nearly same. This indicates that the enhancement in the aqueous solubility of etoricoxib in 2.0 M sodium benzoate solution was largely due to hydrotrophy.

was added and the flask was shaken for about 10 min. Then volume was made upto the mark with distilled water and filtered through Whatman filter paper # 41. The solution was diluted appropriately with distilled water and analyzed for drug content. Similar procedures were adopted for formulation II (ETROBAX) and formulation III (RETOZ). The results of analysis of recovery studies are presented in (Table 2).

manufacturers. Percent label claims are very close to 100 with low values of standard deviation, % coefficient of variation and standard error.

Accuracy, reproducibility and precision of the proposed methods were further confirmed by percent recovery values, which were close to 100 with low values of standard deviation, Percent coefficient of variation and standard error (Table 2).

Part A solution of drug was kept at room temperature for 48 h. There was no precipitation of drugs in Part A solutions within 48 h. In addition, drug contents of Part A solution (after 48 h) were same as those of Part B solution (fresh solutions). This study reveals that the estimations can be done within 48 h at least, without having any detrimental effect on drug stability.

From this study it is obvious that there was no interference of sodium benzoate at 282. Sodium benzoate solution is cheaper than most of the organic solvents and can thus substitute expensive methanol, dimethyl formamide, chloroform and carbon tetrachloride. Drawbacks of organic solvents include toxicity, error due to volatility, pollution and cost. Thus 2.0 M solutions of sodium benzoate may be better substitutes for organic solvents.

## CONCLUSION

It is thus concluded that the proposed method is new, simple, cost effective, accurate, safe, free from pollution and precise and can be successfully employed in the routine analysis

## ACKNOWLEDGEMENT

Authors are grateful to Suresh Kalwania (Senior Chemist) and M/s. Sun Pharma Lab, Jammu for providing the gift samples of drugs. Authors are also thankful to Dr. R.K. Maheshwari for valuable suggestions.

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**Table-I:** Results of analysis of commercial tablets of Etoricoxib

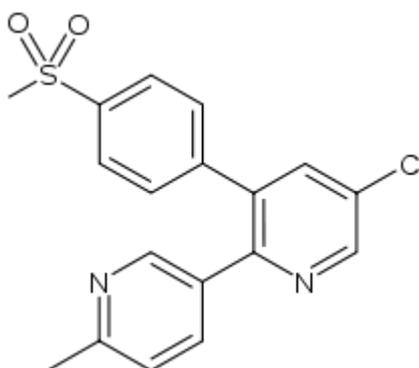
Tablet formulation	Label claim (mg)	% Label claim estimated* (Mean $\pm$ S.D.)	% Coff. Of variation	Standard error
I (KINGCOX)	60	99.370 $\pm$ 1.228	1.356	0.501
II (ETROBAX)	90	98.614 $\pm$ 1.495	1.516	0.641
III (RETOZ)	120	97.856 $\pm$ 1.327	1.236	0.595

\*Average of six determinations

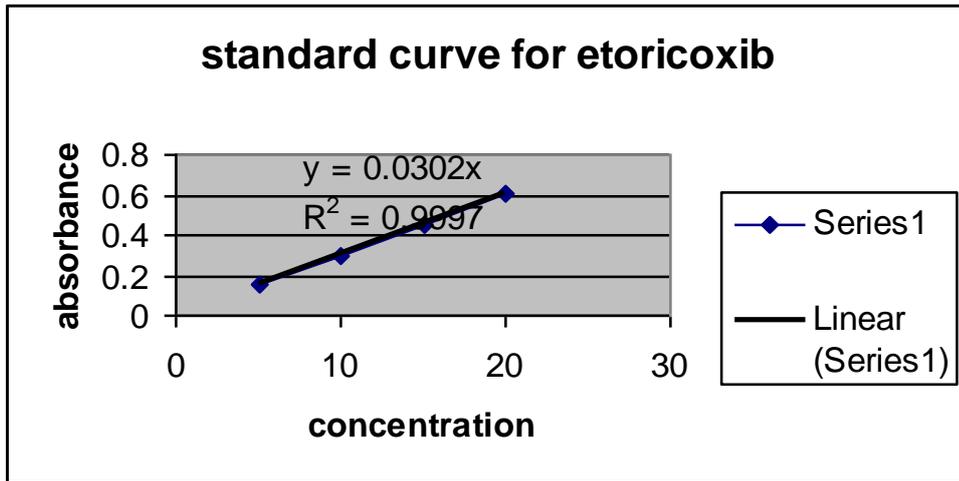
**Table-II:** Recovery studies of commercial tablets of Etoricoxib

Tablet formulation	Label claim (mg)	Drug added (mg)	% Label claim estimated* (Mean $\pm$ S.D.)	% Coff. Of variation	Standard error
I (KINGCOX)	60	15	99.316 $\pm$ 1.484	1.494	0.665
II (ETROBAX)	90	30	100.514 $\pm$ 1.445	1.437	0.647
III (RETOZ)	120	40	98.288 $\pm$ 0.863	0.878	0.386

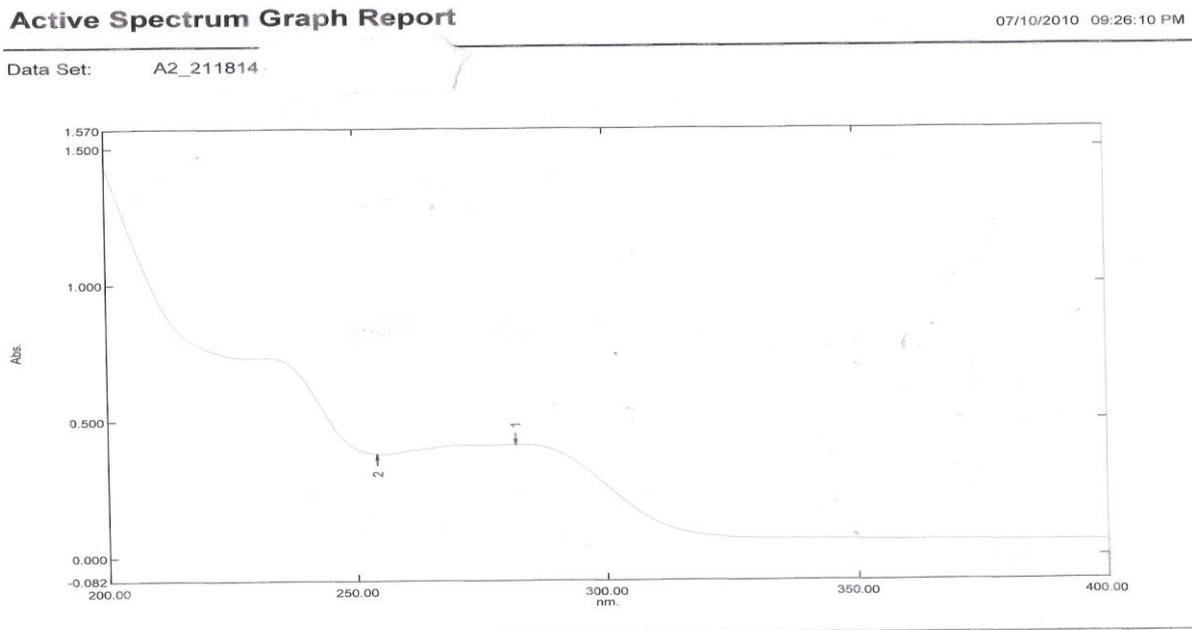
\*Average of six determinations



**Figure1:** 5-chloro-6'-methyl-3-[4-(methylsulfonyl) phenyl]-2,3'-bipyridine



**Figure2:** Graph that follows Beer and Lambert law for bulk drug



**Figure3:** Wavelength maxima of Etoricoxib