

## Effect of Acidic and Basic Medium on Celecoxib by UV Spectroscopy

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### Abstract

Degradation is a main problem in numerous unstable products. Our study on drug substance involves Acid/base Stress testing. In our recent research we study the effect of different environmental conditions by subjecting the different brands of pharmaceutical formulation i.e. celecoxib (Nuzib, Seleco, Celbexx) under acidic and basic conditions by using spectrophotometer. It is usually preferred over other methods because of less equipment cost and economical maintenance advantage. When celecoxib (Nuzib, Seleco, and Celbexx) subjected to 0.1 N HCl and 0.1 N NaOH, celecoxib showed decreased availability in acidic medium as well as in alkaline medium. The absorbance in basic medium of different brands of celecoxib i.e., Nuzib, Seleco and Celbexx was found to be 0.055, 0.094, 0.071 and their percent availability was found to be 50%, 42.30%, 35.14%. In acidic medium the absorbance of Nuzib, Seleco and Celebex was found to be 0.047, 0.128, 0.074 percent availability was 42.70%, 57.60%, 36.63%. We conclude that the absorbance of all brands of celecoxib decreases in acidic and basic medium which is due to the degradation of celecoxib in both mediums.

**Keywords:** Celecoxib; Acidic medium; Basic medium; U.V spectrophotometer

### Introduction

The first cyclo-oxygenase (COX)-2 selective inhibitor introduced into clinical practice was celecoxib. Coxibs have anti-inflammatory and analgesic activity but without gastrointestinal toxicity like other non selective NSAIDs. To minimize the risk of cardiovascular diseases, we should use the lowest effective dose of celecoxib but for the shortest possible duration and after a careful evaluation of the cardiovascular, renal risks and GI, of the individual patient [1]. Celecoxib and curcumin, which is a natural antioxidant and also an anti-inflammatory agent, have been found to be useful in alleviating the ulcerative colitis [2]. Celecoxib is found to inhibit the proliferation of gastric cancer cell [3]. Celecoxib is a selective cyclooxygenase-2 inhibitor, has found to have antitumor activity [4]. For osteoarthritis, Celecoxib is an effective treatment [5]. Cytochrome P450 (CYP450) enzymes, mainly CYP2C9 and CYP3A4 are the enzymes which metabolizes the celecoxib in body [6] (Figure 1).

### Experimental

#### Material and reagents

Pyrex glass including measuring volumetric flask, cylinder, beakers, pipette, funnel and stirrer were used. All glass wares were first washed with chromic acid then with water and finally rinsed with freshly prepared double distilled water. Reagents were of Analytical grade reagents 0.1 N Sodium hydroxide, 0.1 N Hydrochloric acid and de-ionized water or double distilled water.

#### Instruments

Ultraviolet Lamp Power of 8N, Serial NO: N 045571, LF-204. LS '4W-254 and 365 nm', Spectrophotometer with a quartz cuvette T80 UV-VI spectrometer 'PG Instrument', Weighing Balance Item PA214C: 'Pioneer OHAIUS' and Water Bath 'HH-4' having digital and constant temperature tank.

#### Preparation of 0.1 N Hydrochloric acid and Sodium hydroxide

4 grams of sodium hydroxide is transferred in 100 ml volumetric flask and dissolved in small quantity of water and finally volume was made up to mark of the flask with de-ionized water.

8.3 ml analytical grade hydrochloric acid having 37% purity and 12 N normality was taken in a volumetric flask and the volume was made up to mark flask with DI water.

#### Preparation of celecoxib solution

About 20 tablets of each brand of celecoxib (Nuzib, Seleco, and Celbexx) were weighed and crushed. Average weight was determined 200 ppm of the solution was prepared by weighing the required amount of the powder to obtain 0.020 g active. Celecoxib then dissolved in small quantity of water. The solution was then transferred in to a 100 ml volumetric flask finally volume was made up to mark of the flask with de-ionized water. Absorbance was determined at wavelength max 220 nm. The same procedure was repeated for each brand of celecoxib.

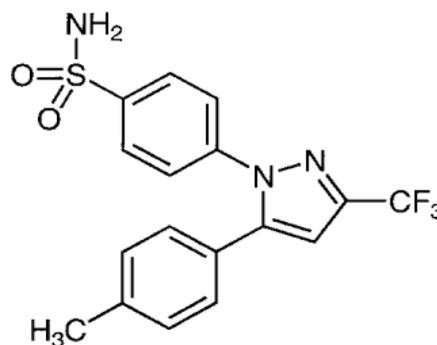


Figure 1: Structure of Celecoxib.

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### Procedure for the study

**For acid and base:** To determine the effect of acid and base on Celecoxib, 5 ml of 200 ppm solution of each brand of Celecoxib was transferred in to two separate test tubes then 5 ml of 0.1 N hydrochloric acid was added in one test tube and 5 ml of 0.1 N sodium hydroxide was added in another test tube respectively. Then the tubes were left for 30 minutes. The absorbance of the solution was determined using spectrophotometer at wavelength max 299 nm (Tables 1 and 2).

### Result and Discussion

The main objective of this study is to determine the effect of acidic and basic medium on the drug celecoxib. For this reason we prepared a 200 ppm solution of celecoxib. To determine the effect of acid and base on celecoxib the 200 ppm solution of celecoxib was transferred in to two separate test tubes that contain 5 ml of acid HCl and base NaOH separately. Then the tubes were left for 30 minutes. The absorbance of the solution was determined using spectrophotometer at wavelength max 299 nm. The result reveals that the drug is degraded more in acidic medium (0.1 N HCl) as compared to alkaline medium (0.1 N NaOH). In presence of acid the drug is converted to such products that show absorbance at 299 nm. The absorbance in basic medium of different brands of celecoxib i.e., Nuzib, Seleco and Celebexx was found to be 0.055, 0.094, 0.071 and their percent availability was found to be 50%, 42.30%, 35.14%. In acidic medium the absorbance of Nuzi, Seleco and Celebex was found to be 0.047, 0.128, 0.074 percent availability was 42.70%, 57.60%, 36.63%. Our research group performed these types of studies which is useful for determination of drugs in different media [7-11] (Figures 2 and 3).

Absorbance			
Brands	Standard	Acid	Base
Nuzib	0.11	0.047	0.055
Seleco	0.222	0.128	0.094
Celbexx	0.202	0.074	0.071

Table 1: Absorbance of Celecoxib.

Percent Availability			
Brands	Standard	Acid	Base
Nuzib	100%	42.70%	50.00%
Seleco	100%	57.60%	42.30%
Celbexx	100%	36.63%	35.14%

Table 2: Percent availability of Celecoxib.

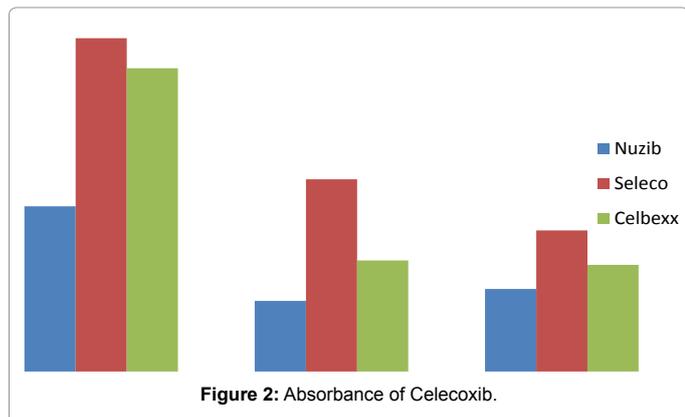


Figure 2: Absorbance of Celecoxib.

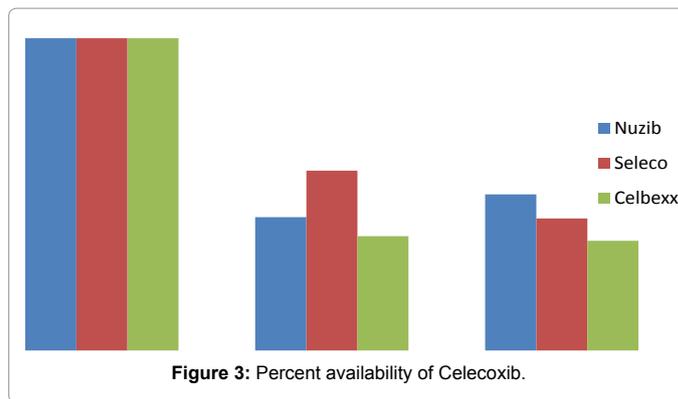


Figure 3: Percent availability of Celecoxib.

### Conclusion

We conclude that the absorbance of all brands of celecoxib decreases in acidic and basic medium which is due to the degradation of celecoxib in both mediums.

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