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APPLICATION OF UV SPECTROPHOTOMETRIC METHOD FOR DRUG INTERACTION STUDIES OF MEFENAMIC ACID WITH OFLOXACIN

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ABSRACT

A simple, precise and validated UV Spectrophotometric method was developed for Mefenamic acid bulk drug. Beer's lamberts law was followed in the range of 5.0 - 25.0 µg /ml (r^2 =0.999) and LOD, LOQ were found to be 0.2, 0.7 respectively. Then drug interactions were studied for Mefenamic acid and Ofloxacin by UV spectrophotometric method. These studies were performed under different conditions like increasing the concentration of Mefenamic acid, increasing the volume Ofloxacin added and also studied under stomach and intestinal pH conditions and the concentration of Ofloxacin was fixed according to the label claim. The percentage drug interaction was calculated using control absorbance.

KEY WORDS

Mefenamic acid, Ofloxacin and Control absorbance.

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INTRODUCTION[1-3]

Mefenamic acid, an Anthranilic acid derivative, is a member of the Fenamate group of nonsteroidal anti-inflammatory drugs (NSAIDs). It exhibits anti-inflammatory, analgesic, and antipyretic activities. Similar to other NSAIDs, Mefenamic acid inhibits prostaglandin synthetase receptors COX-1 and COX-2, inhibiting the action of prostaglandin synthetase and used for the treatment of rheumatoid arthritis, osteoarthritis, dysmenorrhoea, and mild to moderate pain, inflammation, and fever.

EXPERIMENTAL WORK[4-5]

UV -Visible double beam spectrophotometer - 1800 (Shimadzu) Japan. Analytical balance (Denever), DS-852J, Mumbai.

Chemicals

Mefenamic acid, Ofloxacin, Sodium hydroxide, Distilled water, Hydrochloric acid

Apparatus

Beakers : 100ml
Standard flasks : 100ml and 10ml
Pipettes : 1ml, 5ml

Preparation of Standard Stock Solution

10mg of Mefenamic acid bulk drug was weighed accurately and dissolved in 10ml of 0.1N NaOH in a 100ml volumetric flask. The final volume was made up with 0.1N NaOH to get concentration of 100µg/ml and named as stock -1. And various working concentrations were prepared from stock -1 using the same solvent. The solutions were scanned using UV spectrophotometer in the wavelength range of 200- 400 nm.

Linearity and Calibration

From trial and error method the concentration range from 5-25µg/ml was found to give better linearity. so, aliquots of 0.5-2.5ml of standard stock solution were transferred to a series of 10ml volumetric flask and final volume in each flask were made with 0.1N NaOH to obtain concentration range from 5-25µg/ml. Calibration curve for Mefenamic acid was obtained by measuring absorbance at 285nm Statistical parameters like the slope, intercept, co-efficient of correlation, standard deviation, and Relative standard deviation, were determined.

METHOD VALIDATION

Validation is a method of documented evidence, which provides a high degree of assurance that a specific activity will consistently produce a desired result or product meeting its predetermined specifications and quality characteristics. Method was validated for different parameters like linearity, precision, LOD, LOQ.

DRUG INTERACTION STUDIES

Mefenamic acid is an NSAID drug used for pain and inflammation and Ofloxacin is an antibiotic when both the drugs are administered at the same time drug-drug interaction will occur and seizures will occur.

$$\frac{\text{Control absorbance} - \text{absorbance after interaction}}{\text{Control absorbance}} \times 100$$

Method

1. Different concentrations of Mefenamic acid were prepared in the linearity range from the stock solution.5, 10, 15, 20 and 25 µg/ml concentration solutions were prepared from 100 µg/ml stock solution by taking 0.5 ,1.0 ,1.5 ,2.0, 2.5 ml and made up to 10 ml with 0.1N sodium hydroxide solution. Then absorbance was measured at 285 nm.
2. The standard Ofloxacin concentration was prepared according to the label claim, i.e, 2000 µg/ml was prepared.

Condition -1

Interaction when 0.01 drop of 2000 µg/ml Ofloxacin was added

5-25 µg/ml concentrations of Mefenamic acid was prepared along with 0.01ml of Ofloxacin and the absorbance was measured at 285 nm.

Condition -2

Interaction when 0.01 drop of 2000 µg/ml Ofloxacin was added

5-25 µg/ml concentrations of Mefenamic acid was prepared along with 0.05ml of Ofloxacin and the absorbance was measured at 285 nm.

Interaction studies at different pH conditions

Drug interaction studies were performed at stomach pH -3 and intestine pH - 9. This was performed by selecting median concentration of Mefenamic acid 15 µg/ml.

RESULTS AND DISSCUSSION

The percentage drug interaction was calculated by using control absorbance (absorbance of highest concentration). The increase in the percentage drug interaction was found to be more when 0.05ml of Ofloxacin was added, compared to that when 0.01 drop was added. Hence the percentage drug interaction was said to be increasing with the increasing concentration of Mefenamic acid and also with the increase in volume of Ofloxacin

Table No.1: Linearity and Calibration

S.No	Concentration in µg/ml	Absorbance at 285 nm
1	5	0.245
2	10	0.398
3	15	0.569
4	20	0.749
5	25	0.924

Table No.2: Optimized Validation Parameters for Mefenamic Acid

S.No	Validation parameters	Results
1	Linearity	5-25 µg
2	correlation coefficient	0.999
3	Precision Intraday precision 5mcg/ml (n=6)	<2% 1.423(5µg/ml)
	15mcg/ml (n=6)	0.4478(15µg/ml)
	25mcg/ml (n=6)	0.313(25µg/ml)
	Interday precision (n=6)	0.592(1st day)
		0.461(2nd day)
		0.640(3rd day)
4	LOD	0.2
5	LOQ	0.7

Table No.3: Condition -1, Interaction when 0.01 drop of 2000 µg/ml Ofloxacin was added

S.No	Concentration of Mefenamic acid in µg/ml	Initial absorbance	Absorbance after interaction	Percentage drug interaction
1	5	0.245	0.782	15%
2	10	0.398	0.786	18%
3	15	0.569	1.182	27%
4	20	0.749	1.301	40%
5	25	0.924	1.368	48%

Table No.4: Condition -2, Interaction when 0.01 drop of 2000 µg/ml Ofloxacin was added

S.No	Concentration of Mefenamic acid in µg/ml	Initial absorbance	Absorbance after interaction	Percentage drug interaction
1	5	0.245	1.10	19%
2	10	0.398	1.11	20%
3	15	0.569	1.636	77%
4	20	0.749	1.724	86%
5	25	0.924	1.836	98%

Table No.5: Interaction studies at different pH conditions

S.No	Concentration of Mefenamic acid	Amount of Ofloxacin	pH	Initial absorbance
1	15 µg/ml	_	9	0.683
2	15 µg/ml	_	3	0.326

Table No.6: Interaction studies at different pH conditions

S.No	Concentration of Mefenamic acid	Amount of Ofloxacin added	pH	Absorbance after interaction	Percentage drug interaction
1	15 µg/ml	0.01 ml	9	1.023	3.6%
2	15 µg/ml	0.01 ml	3	0.785	64.9%
3	15 µg/ml	0.05ml	9	1.162	9.4%
4	15 µg/ml	0.05ml	3	0.895	88.0%

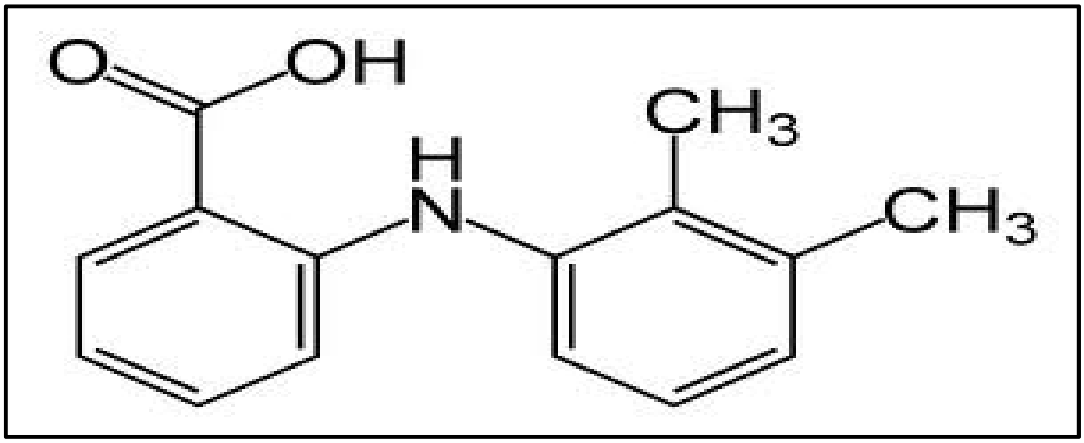

Figure No.1: Molecular structure of Mefenamic acid

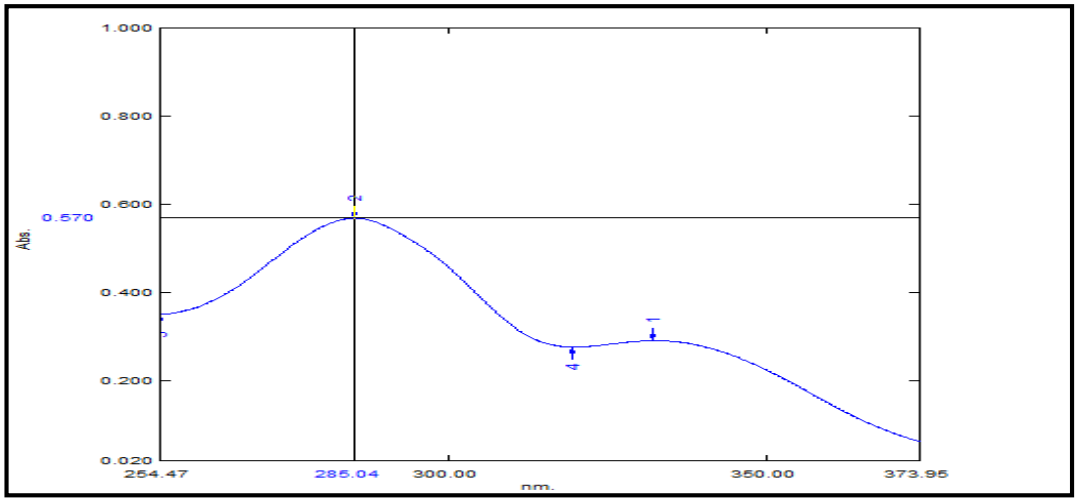

Figure No.2: UV spectrum of Mefenamic acid

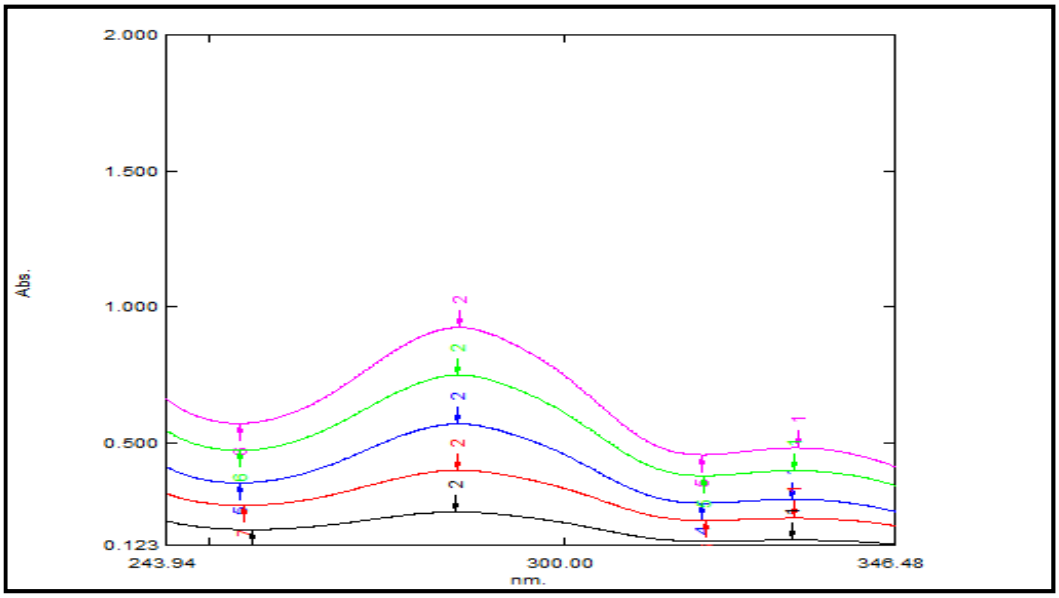

Figure No.3: Overlay spectrum of Mefenamic acid

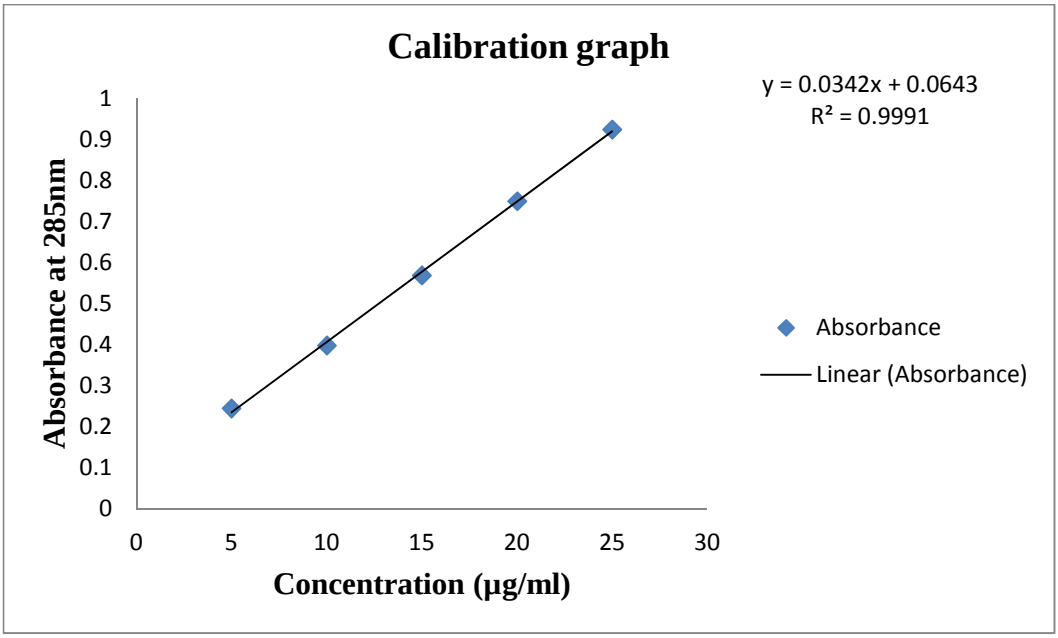

Figure No.4: Linearity curve of Mefenamic acid

CONCLUSION

The above results conclude that at both the pH conditions the percentage drug interaction was found to be increasing with increase in the amount of Ofloxacin added. But the percentage drug interaction was found to be more in stomach pH when compared to that of intestinal pH.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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