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Research Article

DEGRADATION STUDY OF FIVE DIFFERENT BRANDS OF CIPROFLOXACIN USING UV VISIBLE SPECTROPHOTOMETER AND THEIR COMPARATIVE STUDY

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ABSTRACT
Degradation studies help to anticipate the future stability issue the drug product may undergo, and provide useful information for both formulation and stability. We explored the degree of degradation in five different brands of Ciprofloxacin tablet, with the purpose to determine the most stable brand out of the five. 500 ppm and 250 ppm samples of each brand were prepared to observe the effect of time, acid (0.1N HCl) and base (0.1N NaOH). Their absorbance was recorded using a Shimadzu UV-Visible spectrophotometer at 271.4 nm. The results suggest that out of the five brands, cyrocin possessed the highest stability and degraded the least.
Keywords: Acid, base, degradation studies, ciproxin

INTRODUCTION

Ciprofloxacin (Cyclopropyl-6-fluoro-1,4-dihydro-4-oxo-7-piperazin-1-ylquino-line-3-corboxylic acid), the molecular formula $C_{17}H_{18}FN_3O_3$ basically a synthetic antibacterial drug belonging to the class quinolones, fluoroquinolones[1]. Its structure is shown in Figure 1. Ciprofloxacin is bactericidal and acts by inhibiting DNA gyrase and topoisomerase IV, which are responsible for the reproduction of bacterial DNA. Ciprofloxacin is a broader spectrum drug and it is more potent *in vitro* than the non-fluorinated quinolone nalidixic acid. Ciprofloxacin is effective against a range of bacteria but particularly the Gram-negative organisms. It has less activity against Gram-positive bacteria. Ciprofloxacin mainly use in infections of the urinary tract, gastrointestinal and respiratory tracts, gonorrhea and especially in septicemia. It is useful for oral therapy of chronic Gram-negative infections such as osteomyelitis and for acute exacerbations of *Pseudomonas* infection in cystic fibrosis[2]. Ciprofloxacin Hydrochloride is a pale yellow, crystalline slightly hygroscopic powder. It is soluble in water and very slightly soluble in dehydrated alcohol and particularly insoluble in acetone, in dichloromethane and in ethyl acetate, slightly soluble in methyl alcohol[3].

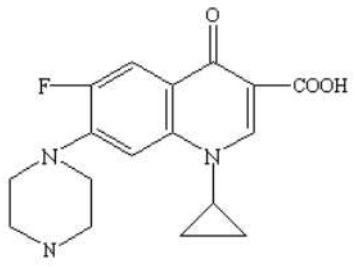

Figure 1: Ciprofloxacin

MATERIALS AND METHODS

Instrumentation

UV-Visible spectrophotometer was employed for absorption measurements (Shimadzu Model 1700), along with a pair of 5 cm quartz cuvettes.

Chemicals and reagents

Single strips (250 mg) of tablet Cipvax (Genome), tablet Cyrocin (High noon), tablet Ciplet (Indus), tablet Cinolox (Axis) and tablet Ciproday 9Davis) pharma were purchased from the local pharmacy. Chemicals used, including 0.1N HCl and 0.1N NaOH, were provided by Jinnah University for Women, Department of Pharmacy.

Sample Preparation (500 ppm)

Five tablets belonging to five different brands of Ciprofloxacin HCl were triturated separately in a mortar and pestle. Powder, equivalent to 25 mg of Ciprofloxacin HCl, once accurately weighed, was transferred to five separate 50 ml volumetric flasks. Due to the inaccessibility of distilled water, tap water was used to dissolve the powdered materials and to make the final volume up to 50 ml. Solutions obtained of the desired concentration (500 ppm) were transferred individually to cuvette to measure the absorbance at 271.4 nm using a spectrophotometer.

Degradation studies of Ciprofloxacin

Effect of Time

To study the effect of time, 500 ppm samples of each brand of Ciprofloxacin were taken in a cuvette separately and the initial absorbance of each sample was taken with the help of spectrophotometer. The samples were then left for a period of 48 hours. Upon completion of the time period, the final absorbance of the five samples was recorded again. Results are shown in Table 1.

Table 1: Effect of time

Brand	Initial	Final	% Assay
Cyrocin	2.756	2.703	97.9 %
Cipvax	2.874	2.685	93.4 %
Ciplet	2.831	2.125	75.0 %
Cinolox	2.868	2.725	95.0 %
Ciproday	2.885	2.716	94.1 %

Effect of Acid

To study the effect of acid, 5 ml of 250 ppm samples of each brand of Ciprofloxacin were taken in five separate volumetric flasks containing 5 ml of water. The samples were then transferred to a cuvette separately, and the initial absorbance of each sample, prior to treatment with acid, was measured with a spectrophotometer. 5 ml from each sample (250 ppm) of Ciprofloxacin was withdrawn, and transferred to five separate volumetric flasks, to which 5 ml of 0.1N HCl was added. The samples were then left for a period of 30 minutes. Upon completion of the time period, the final absorbance of the samples was recorded again, and the results compared. Results are shown in Table 2.

Table 2: Effect of acid

Brand	Initial	Final	% Assay
Cyrocin	2.941	3.299	112.1 %
Cipvax	2.944	3.328	113.0 %
Ciplet	2.939	3.337	113.5 %
Cinolox	2.895	3.304	114.1 %
Ciproday	2.904	3.363	115.8 %

Effect of Base

To study the effect of base, 5 ml of 250 ppm sample of each brand of Ciprofloxacin were taken in five separate volumetric flasks containing 5 ml of water. The samples were then transferred in to a cuvette and the initial absorbance of each sample, prior to treatment with base was noted. 5 ml from each sample (250 ppm) of Ciprofloxacin was withdrawn and transferred to five volumetric flasks, to which 5 ml of 0.1N NaOH was added. The samples were then left for a period of 30 minutes. Upon completion of the time period, the final absorbance of the samples was recorded again, and the results compared. Results are shown in Table 3.

Table 3: Effect of base

Brand	Initial	Final	% Assay
Cyrocin	2.941	3.014	102.4 %
Cipvax	2.944	3.053	103.7 %
Ciplet	2.939	3.039	103.4 %
Cinolox	2.895	3.017	104.2 %
Ciproday	2.904	3.061	105.4 %

RESULTS AND DISCUSSION

This research was performed with the purpose to compare the degree of degradation in five different brands of Ciprofloxacin, namely Cyrocin, Cipvax, Ciplet, Cinolox and Ciproday, when exposed to effect of time, acid and base. According to the results of effect of time, as accumulated in Table 1, Cyrocin (97.9 %) experienced the least amount of degradation followed by Cinolox (95.0 %), Ciproday (94.1 %), Cipvax (93.4 %) and Ciplet (75.0 %). In case of the results of effect of acid that are shown in Table 2, Cyrocin (112.1 %) exhibited the least amount of degradation followed by Cipvax (113 %), Ciplet (113.5 %), Cinolox (114.1 %) and Ciproday (115.8 %). As for the results of effect of base displayed in Table 3, Cyrocin (102.4 %), showed the least amount of degradation followed by Ciplet (103.4 %), Cipvax (103.7 %), Cinolox (104.2 %) and Ciproday (105.4 %).

CONCLUSION

Our research group has concluded that out of five brands of Ciprofloxacin used in the experiment, cyrocin is the most stable as it showed consistent results in the presence of acid, base and as well as in case of effect of time. Cipvax and ciplet performed satisfactorily, while cinolox and ciproday left much to be desired, for they degraded the most. In addition, it is also concluded that the drugs degraded most in 0.1N HCl and moderate in effect of time while degradation accrued least in 0.1N NaOH. It is, however, to be noted that the tests were performed in as much of a controlled environment as possible. Yet the accuracy of the results is debatable, if we take into account the handling, personnel and environmental errors that more than likely happened during the various stages of research work.

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