



Scholars Research Library

Der Pharmacia Lettre, 2012, 4 (2):483-486
(<http://scholarsresearchlibrary.com/archive.html>)



Stability studies for the determination of shelf life of aceclofenac formulation

*Mudasir Mohamad¹ and Roheena Jan²

¹Department of Pharmaceutical Sciences, University of Kashmir, Srinagar

²Department of Education J&K

ABSTRACT

Stability studies for optimized formulations were carried out according to ICH guidelines. The optimized formulations were subjected to accelerated stability studies [1]. Sufficient replicates of formulation were prepared, packed in aluminium foil and stored in petri dishes at temperature of $40 \pm 0.5^\circ\text{C}$, $50 \pm 0.5^\circ\text{C}$ and $60 \pm 0.5^\circ\text{C}$ for 60 days. Samples were withdrawn at intervals of 15, 45 and 60 days and analyzed for drug content by HPLC method. The shelf life of formulations of aceclofenac were determined by accelerated stability studies on the basis of first order degradation kinetics and $t_{0.9}$ (the time required to degrade 10 % of drug at 25°C). The shelf life was found to be 1.469 yrs.

Keywords: Aceclofenac, Formulation, Stability studies, Shelf life.

MATERIALS AND METHODS

The HPLC method was performed according to Ph Eur monograph 1281 [2], with slight modification as per our system availability. The system consisted of Thermofinangn with a UV detector (Model: Surveyor autosampler plus). In this method Acetonitrile: Water (9:1):: Phosphoric acid (70::30) optimized as a mobile phase plus diluent and a 10 cm X 4.6 mm RP C₁₈ Hypersil gold column having a 5 μm packing as a stationary phase. Flow rate of 1.0 ml/min, Detection at 275 nm, Injection volume of 10 μl was used.

Ten different concentrations of aceclofenac ranging from 2– 20 $\mu\text{g/ml}$ were prepared for linearity studies (Table-1). The responses were measured as peak areas and plotted against concentrations to prepare a calibration curve (Fig-1).

Table-1: Concentration and the Area obtained for construction of calibration curve.

Concentration ($\mu\text{g/mL}$)	Area	S.D. (n=3)
2	52000	± 37
4	100000	± 125
6	180000	± 306
8	280000	± 1105
10	380000	± 1285
12	460000	± 1956
14	570000	± 2384
16	699443	± 5695
18	810000	± 6820
20	900000	± 10785

Table -2: Degradation of aceclofenac Formulation at different temperatures

Temperature									
40 ± 0.5°C			50 ± 0.5°C			60 ± 0.5°C			
Drug Content (mg)	% Drug Remaining	Log % Drug Remaining	Drug Content (mg)	% Drug Remaining	Log % Drug Remaining	Drug Content (mg)	% Drug Remaining	Log % Drug Remaining	Log % Drug Remaining
49.7	100	2	49.8	100	2	49.7	100	2	2
49.6	99.79	1.999087	49.5	99.39	1.997343	49.21	99.01	1.995679	1.995679
49.4	99.39	1.997343	49.1	98.59	1.993833	48.83	98.24	1.992288	1.992288
48.9	98.39	1.992951	48.92	98.23	1.992244	48.56	97.70	1.989895	1.989895

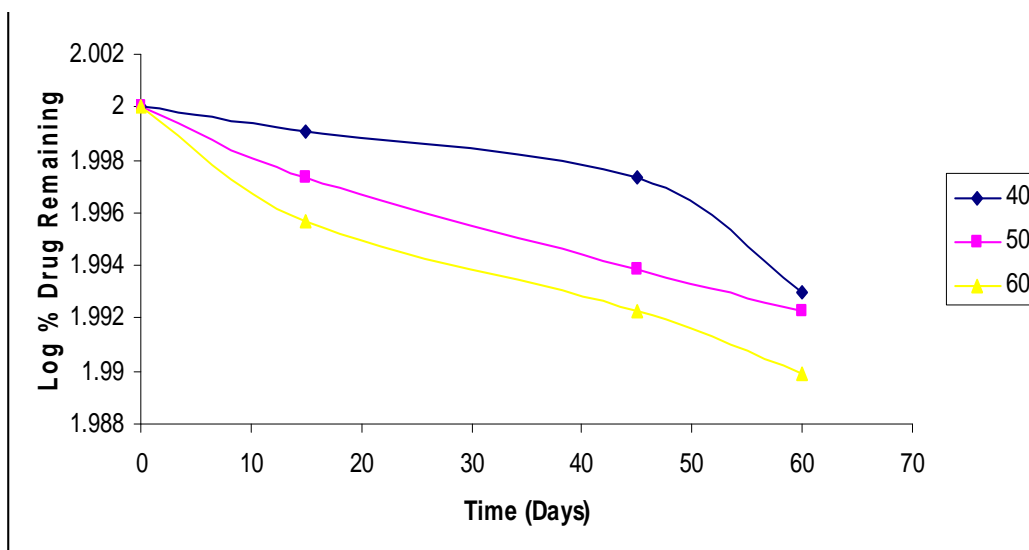


Fig.-2: Degradation Kinetics of aceclofenac Formulation

The logarithm of % drug remaining was plotted against time in days (Fig.-2), which gave almost straight line suggesting that drug degradation followed first order kinetics. The slope of the straight line for each temperature was obtained and the degradation rate constant was calculated using the formula given below:

$$\text{Slope} = -K / 2.303$$

Where, K is degradation rate constant.

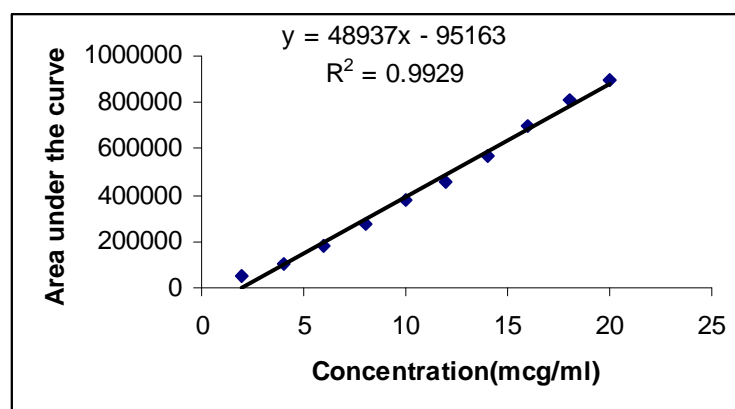


Fig.1: Calibration curve of aceclofenac by HPLC method

Table-3: Degradation Rate Constants Determined at Various Temperatures and Shelf-Life of aceclofenac

Temperature (°C)	Slope X 10 ⁻⁴	K (Day ⁻¹) X 10 ⁻⁴	Log K + 5	Absolute Temperature T (K)	1/T x 10 ⁻³ (K ⁻¹)	Shelf-life at 25°C (Year)
40	-1.1	2.533	1.403	338	2.95	1.469
50	-1.3	2.993	1.476	348	2.87	
60	-1.6	3.684	1.566	358	2.79	
Value at 25°C		1.9921	1.087	323	3.095	

An Arrhenius plot was drawn by plotting logarithm of K values against reciprocals of absolute temperature (Fig.-3). The value of K at 25°C (K₂₅) was extrapolated from the Arrhenius plot and shelf-life of the formulation was calculated by substituting the values of K₂₅ in the following equation:

$$t_{0.9} = 0.1054/K_{25}$$

Where, $t_{0.9}$ is the time required for 10% degradation of the drug and is referred to as the “Shelf-life” of the product. The degradation rate constant at various temperatures and the shelf life of the formulation is reported in Tables-2.

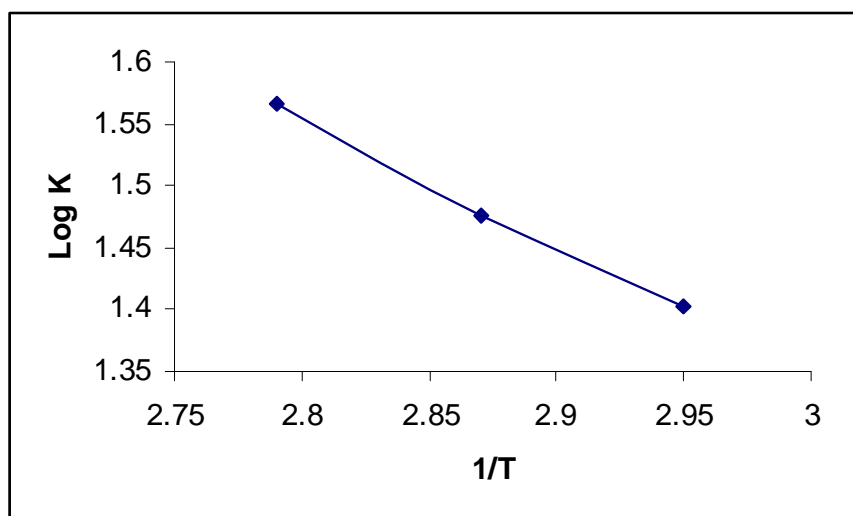


Fig.-3: Arrhenius plot for optimized aceclofenac

CONCLUSION

In this study, the shelf life of transdermal formulations of Aceclofenac was found to be 1.469 yrs.

REFERENCES

- [1] J. T. Carstensen; Drug stability: principle and practices, Marcel Dekker Inc., **1990**, 43, 125-142.
- [2] Ph Eur monographs 1281 4th Ed. **2002**, 572-573.
- [3] P. Arora, B. Mukherjee, *J. Pharm. Sci.*, **2002**, 9, 2076-2089.
- [4] M. Bakshi and S. Singh, *J. Pharmaceut. Biomed. Analys*, **2002**, 28, 1011-1040.
- [5] A. Barua, D. Kostic, J. Olson, *J. Liq. Chromatogr.*, **1995**, 18, 1459-1471.
- [6] FDA, guideline for submitting documentation for stability of human drugs and biologics. Food and drug administration, Rockville, **1987**.
- [7] ICH, stability testing of new drug substances & products, International Conference on Harmonization, IFPMA, Geneva, **1993**.
- [8] ICH, test on validation of analytical procedure, International Conference on Harmonization, IFPMA, Geneva, **1994**.
- [9] ICH, impurities in new drug substances, International Conference on Harmonization, IFPMA, Geneva, **1995**.
- [10] ICH, quality of biotechnological products: stability testing of biotechnological/ biological products, International Conference of Harmonization, IFPMA, Geneva, **1995**.
- [11] ICH, impurities in new drug products, International Conference on Harmonization, IFPMA, Geneva, **1996**.
- [12] ICH, stability testing photostability testing of new drug substances of products, International Conference on Harmonization, IFPMA, Geneva, **1996**.
- [13] ICH, validation of analytical procedure, International Conference on Harmonization, IFPMA, Geneva, **1996**.
- [14] ICH, specification test procedure and acceptance criteria for new drug substances and new drug products chemical substances, International Conference on Harmonization, IFPMA, Geneva, **1999**.
- [15] ICH, good manufacturing practice for active pharmaceutical ingredients. International Conference on Harmonization, IFPMA, Geneva, **2000**.
- [16] ICH, stability testing of new drug substances and products, International Conference on Harmonization, IFPMA, Geneva, **2000**.