THE COMPARATIVE BIOEQUIVALENCE STUDY OF A GENERIC (Dynapharm Ciprofloxacin from Dynapharm (M) Sdn Bhd) AND THE PROPRIETARY (Ciprobay from Bayer) 500 MG CIPROFLOXACIN TABLET IN HEALTHY HUMAN SUBJECTS

Dr. Lee TC, Dr Yim PY, Kenneth Ho
Info Kinetics Sdn Bhd / Clinical Research Centre, Penang

Methodology

This study was carried out in accordance with the principles of ICH and Malaysia Good Clinical Practice (GCP), the EC and Malaysian Note for Guidance on the Investigation of Bioavailability and Bioequivalence.

This is a single-dose, blinded, randomised, two-way crossover study (2 treatments, 2 periods & 2 sequences) with a one-week washout period involving 14 healthy volunteers under fasting conditions. The subjects, research physicians and analysts are blinded – the drug allocation is known by the principal investigator and study co-ordinator. 14 healthy volunteers (7 males, 7 females) age of (mean, range) 23, 20-27 years, weight of (mean, range) 58.8, 41.4 to 79.8 kg and BMI of (mean, range) 21.5, 17.9 to 26.8 kg/m^2 were enrolled into this study.

Ciprofloxacin concentration was measured in blood plasma using Agilent 1100 Series High Performance Liquid Chromatography (HPLC) method developed by Info Kinetics Sdn Bhd. This method was validated to demonstrate adequate sensitivity, specificity, linearity, recovery, accuracy and precision (inter and intra-assay variability).

Statistical Procedures

Standard descriptive statistics were used for the demographic data and derived pharmacokinetics parameters such as Kel and $t_{½}$. Analysis of variance and 90% confidence interval for the mean of "test/reference" ratio of pharmacokinetics parameters such as Cmax and $AUC_{0-\infty}$, were carried out with and without $\log_{10}$ transformation. As Tmax is a discrete variable dependent on the selected blood sampling times, a nonparametric statistical method (Wilcoxon Signed Ranks test) was used. The $t_{½}$ was tested using t-test. All tests were considered significant if $p < 0.05$ at $\alpha = 0.05$ following two-tailed distribution.

Results

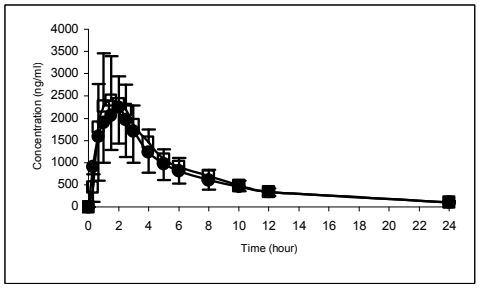

Figure 1

Figure 1 shows the plot of mean plasma ciprofloxacin concentration for both test and reference products. Mean ± SD (• = reference, Ciprobay tablet, □ = test, Dynapharm Ciprofloxacin capsule)

	Test (T)	Reference(R)
Cmax (ng/mL)	2,968.38	2,783.28
Cmax Ratio (T/R)	106.5	
90%CI Log_{10} Cmax	**93.0 – 122.1**	
$AUC_{0-\infty}$ (ng.h/mL)	16,413.83	15,615.17
$AUC_{0-\infty}$ Ratio (T/R)	105.3	
90%CI Log_{10} $AUC_{0-\infty}$	**96.5 – 114.8**	

Table 1. Cmax & AUC Results

Data of one subject (subject no. 014) was omitted as it was an outlier and deemed not suitable for anova analysis. Therefore, data of 13 subjects were analysed and reported.

The mean values for Cmax and $AUC_{0-\infty}$ are presented in Table 1. Their respective test / reference (T/R) ratio and the 90% Confidence Intervals are also presented.

The time to maximum concentration, Tmax and half life ($t_{½}$) of Dynapharm Ciprofloxacin and reference product were not statistically significant.

For Cmax, the US FDA & EC EMEA accepted range is 80-125% for transformed Cmax. Both guidelines require 80-125% for transformed AUC respectively.

The power for this study was about >93% for Cmax and >99% for $AUC_{0-\infty}$ at α of 0.05. The Anderson-Hauck probability outside 0.8-1.25 was $p < 0.007$ and $p < 0.002$ for Cmax and $AUC_{0-\infty}$, respectively.

No serious or unexpected adverse events were reported or observed during the entire study. Both treatments were well tolerated and the overall clinical safety was good. 4 non-serious adverse events (AEs) were reported during the study; all of these were deemed not caused by the study drug.