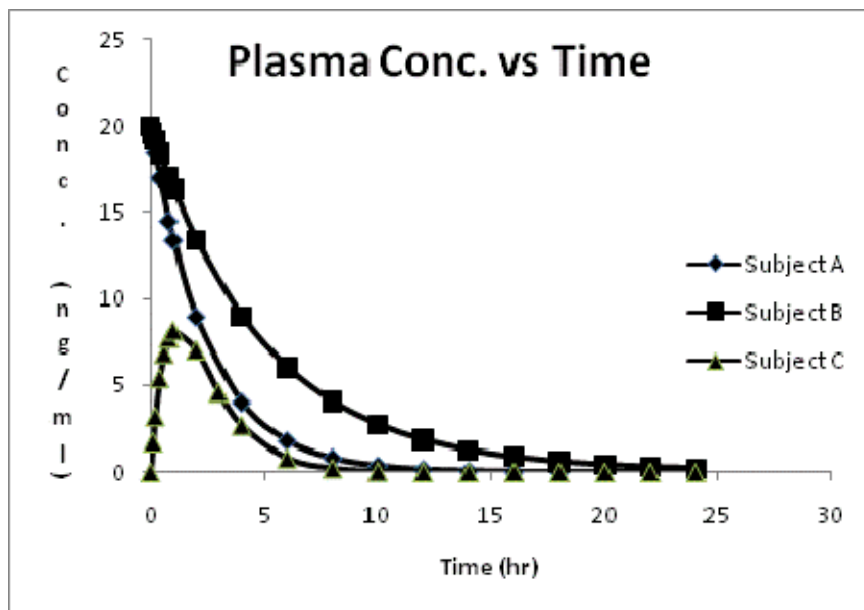


Case Study 1

Fall 2010

- 1) a) Define Pharmacokinetics?
- b) Fig 1 shows the plasma concentration time profiles of three subjects A, B and C after the administration of the same dose of a drug X.
 - i) From the profile explain the differences in the route of administration between the subjects. Write a short answer in terms of LADME.
 - ii) Between subjects A and B identify the subject from which the drug X is eliminated faster?

Fig 1



Ans a) Pharmacokinetics: The time course of the drug and metabolite concentrations in the body.

b) (i) Subject A and B received the drug by an IV bolus (no Liberation and Absorption step). Subject C received a dosage form wherein the drug had to be liberated from the dosage form and been absorbed into the blood. (Liberation and the Absorption step involved).

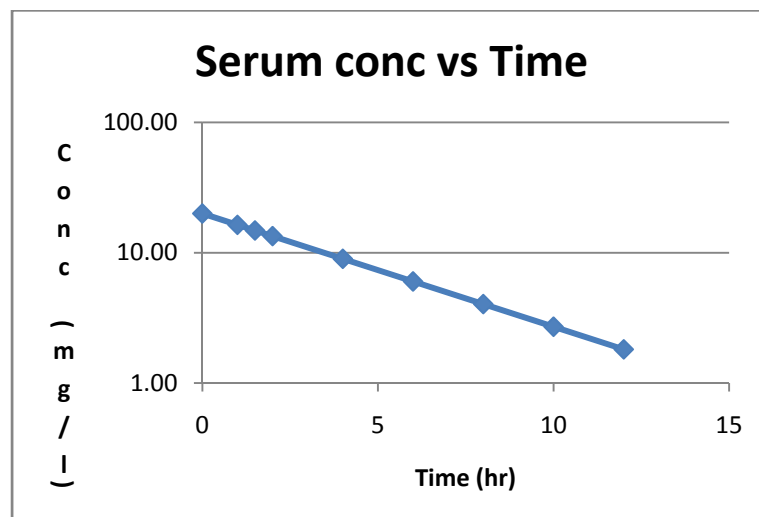
(ii) In subject A the drug is eliminated faster. The plasma concentration fall faster in subject A when compared to subject B.

- 2) The table1 shows the serum concentration profiles of a certain drug in patient X. Please specify the units for the PK parameters to get full credit.
- Determine if the elimination process is a first order or a zero order process. Plot the data on a semilog paper.
 - Calculate K_e , the first order elimination rate constant.
 - Calculate $AUC_{0-t_{last}}$ and AUC_{0-inf} by trapezoidal rule.
 - Calculate the concentration of the drug X in serum at time 5hr.

Table 1

Time (hr)	Conc.(ng/ml)
0	20
1	16.37
1.5	14.82
2	13.41
4	8.99
6	6.02
8	4.04
10	2.71
12	1.81

Ans) a) The elimination is a first order process. (plot of \ln conc vs time is a straight line) hence plot on a semilog paper.



b) The equation is $\ln conc = 2.995 - 0.2 * t$. Therefore the value of $K_e = 0.2 \text{ hr}^{-1}$

c)

Time (hr)	Conc.(ng/ml)	AUC partial
0	20	
1	16.37	18.19
1.5	14.82	7.80
2	13.41	7.06
4	8.99	22.39
6	6.02	15.01
8	4.04	10.06
10	2.71	6.74
12	1.81	4.52

$$AUC_{0-t_{last}} = 91.77 \text{ ng*hr/ml}$$

$$AUC_{t_{last}-inf} = C_{12}/K_e = 1.81/0.2 = 9.05 \text{ ng*hr/ml}$$

$$AUC_{0-inf} = 91.77 + (1.81/0.2) = 100.82 \text{ ng*hr/ml}$$

d) $\ln conc = 2.995 - 0.2 * 5$

$$C_{(5hr)} = 7.352 \text{ ng/ml}$$

True or False:

- 1) Therapeutic Drug Monitoring (TDM) in individual patients is important for drugs with a narrow therapeutic index. True
- 2) When the change in amount of the drug in the body is related to the amount by the following equation $\frac{dX}{dt} = -k * X^0$, where X is the amount of the drug at a given time t, then we say the elimination is a zero order process. True
- 3) The plasma concentration time profile of a certain drug is dependent on the dosage form. True