Biopharmaceutics and pharmacokinetics II

One compartment open model

Extravascular administration problems

1. A single oral dose (100 mg) of an antibiotic was given to an adult male patient (43 years, 72 kg). From the literature, the pharmacokinetics of this drug fit a one compartment open model. The equation that best fits the pharmacokinetics of the
drug is

$$Cp = 45\ (e^{-0.17*t} - e^{-1.5*t})$$

From the equation above, calculate (Assume C p is in g/mL and the first-order rate constants are in hours^{-1})

(a)t max,

(b)C max

(c)t 1/2 for the drug in this patient.

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2. Two drugs, A and B, have the following pharmacokinetic parameters after a single oral dose of 500

Drug	K_a (hr^{-1})	K (hr^{-1})	V_d (ml)
A	1.0	0.2	10,000
B	0.2	1.0	20,000

Both drugs follow a one-compartment pharmacokinetic model and are 100% bioavailable.

a. Calculate the t max for each drug.

b. Calculate the C max for each drug

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3. from a comparative pharmacokinetic study of two cephalosporinic antibiotics, the following data are obtained

Pharmacokinetic parameters	Antibiotic (A)	Antibiotic (B)
Distribution	One compartment	One compartment
Administration	Oral	Oral
Vd (liter)	14	12
K_a (hr^{-1})	0.6	1.2
K (hr^{-1})	0.4	0.3
Lag time	0	0
t_{max}	2.02	1.54
X_0 mg	500	500

Supposing that the antimicrobial activity for both is the same. Which one is more suitable taking in consideration the following:

a. The higher concentration level in the blood
b. The one that has longer time in the body

Give analysis of your answer??

4. After 6 hours of the oral administration of a drug, the blood plasma concentration was 14μ/ml. taken in consideration that the drug distributes according to one-compartmental open model after extravascular administration of the drug and presents complete absorption, its constant rate of absorption K_a is 0.72 hr^{-1}, the constant rate of elimination is 0.15 hr^{-1} and the apparent volume of distribution V_d is 13L.

Calculate the administered dose??

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5. A drug is administered by intramuscular rout of administration and follow one compartmental open model; the pharmacokinetics parameters of this drug were:

$K_a = 0.23\ h^{-1}$, $K_e = 0.07\ h^{-1}$ and the $V_d = 9L$.

After 4 hours the plasma concentration was 25 µ/ml, determine the administered dose??