PHA 5127 (Fall, 2008)
Homework #4 (10 points)

Please show your calculations and make sure your numerical answers have units!

Q1. Predict the half-life of aminoglycoside in a 40 year old, 5'2'' tall, 75 kg female patient with a serum creatinine of 1.2 mg/dL. (3 points)

$$IBW = 45.5 + 2.3 \bullet 2 = 50.1 kg$$
$$TBW = 75.1 kg > 120\% IBW \Rightarrow an\ obese\ patient \therefore use\ ABW$$
$$ABW = 50.1 + 0.4 \bullet (75.1 - 50.1) = 60.1 kg$$
$$CrCL = 0.85 \bullet \frac{(140 - 40) \bullet 60.1}{72 \bullet 1.2} = 59.1 \ \ ml / \min$$
$$ke = 0.00293\ (\text{CrCL}) + 0.014 = 0.187/\text{hr}$$
$$T_{1/2} = \frac{0.693}{0.187} = 3.7\ hr$$

Q2. Drug X is only eliminated by the kidneys and 50% of this drug is binding to plasma proteins. For patient A, his last 24-hour urine collection volume is 2.4 L with the drug concentration in urine of 1 mg/L. His drug concentration in plasma for the last 24 hrs is 2 mg/L. Please estimate his Cl. Does the elimination involve partial re-absorption, complete passive re-absorption, re-absorption through transporters or secretion? Explain! (Assume his GFR is 130 ml/min) (2 pts)

$$CL = CL_{Ren} = \frac{2.4 \bullet 1/2}{24} = 0.05\ L/hr < 130 \bullet 50\% = 65 ml / \min = 3.9 L / hr$$
$\therefore$ involves reabsorption
urine flow rate = 2.4/24=0.1L/hr
$\therefore$ $fu \bullet$ urine flow rate $= 0.5 \bullet 0.1 = 0.05 L/hr = CL_{Ren}$
$\therefore$ complete passive diffusion reabsorption

Q3. Mark each of the following statements True or False. (0.5 point each)

T **F** Increasing urine flow will always increases a drug's renal clearance.

T **F** For gentamycin (polar in its un-ionized form), the extent of re-absorption depends on the degree of its ionization.

T **F** Creatinine clearance can only be used to estimate the renal clearance of drugs that are similar to creatinine, which does not show plasma albumin binding.

T F One compartmental model assumes that drugs take no time to distribute around the body.

T **F** Zero-order elimination has a constant drug elimination rate. If you plot the drug concentration vs. time on an ordinary scale, you should see a straight line. Therefore, zero-order elimination displays linear pharmacokinetics.

T **F** According to the equation CL = ke*Vd, if a patient's Vd doubles, his CL will also double.

A renal clearance of 550 ml /min may suggest the following (assume GFR is 130 ml/min, renal blood flow is 1100ml/min):

T F The drug is eliminated by tubular secretion.

T **F** The drug is extensively reabsorbed in renal tubules.

T F Drug interactions in renal tubules are possible.

T F Drug renal extraction rate E=50%.