PHA 5127 – Fall 2003
Homework # 3 - Answers

1. B.G., a 62-year-old, 50 kg female, was admitted to the hospital for possible digoxin toxicity. Her serum creatinine was 3.0 mg/dL and her dosing regimen at home had been 0.25 mg of digoxin daily for many months. The digoxin plasma concentration on admission was reported to be 4.0 µg/L. How long will it take for the digoxin concentration to fall from 4.0 to 2.0 µg/mL?
(for patients with CHF: $CL = (0.33mL/kg/\min)\cdot(weight/kg) + 0.9\cdot CrCL$
$Vd = (3.8L/kg)\cdot(weight/kg) + 3.1\cdot CrCL$)

$$CrCL = \frac{(140-age)\cdot weight}{85\cdot SeCr} = \frac{(140-62)\cdot 50}{85\cdot 3.0} = 15.3mL/\min$$

$$CL = (0.33mL/kg/\min)\cdot(weight/kg) + 0.9\cdot CrCL = 0.33\cdot 50 + 0.9\cdot 15.3 = 30.3mL/\min$$

$$Vd = (3.8L/kg)\cdot(weight/kg) + 3.1\cdot CrCL = 3.8\cdot 50 + 3.1\cdot 15.3 = 237.4L$$

$$k_e = \frac{CL}{Vd} = \frac{1.82}{237.4} = 0.0077h^{-1}$$

$$t_{1/2} = \frac{0.693\cdot Vd}{CL} = \frac{0.693\cdot 237.4}{1.82} = 90.4h \approx 3.8days$$

2. Consider the following drugs A, B and C.

   All three drugs are eliminated by renal elimination only. Determine if the drugs are filtrated, reabsorbed or secreted (show calculations and explain).

Drug	**CLren (L/h)**	**fb**	**GFR*fu**
A	3.3	0.75	32.5mL/min=1.95L/h secretion
B	7.8	0.03	126.1mL/min=7.6L/h filtration
C	1.6	0.45	71.5mL/min=4.3L/h partial reabsorption

3. M.W. is a 30-year-old, 70 kg female with a serum creatinine of 0.9 mg/dL. An initial gentamicin dose of 100mg was infused intravenously over 30 minutes (use i.v. bolus equation). Calculate the plasma concentration of gentamicin one hour after the infusion was started (i.e., one half-hour after infusion was completed). (Vd = 0.25 L/kg, CL=CrCL)

$$Vd = 0.25 \cdot 70 = 17.5L$$

$$CrCL = 0.85 \cdot \frac{(140 - age) \cdot IBW}{72 \cdot SeCr} = 0.85 \cdot \frac{(140 - 30) \cdot 70}{72 \cdot 0.9} = 101mL/\min \approx 6.06L/h$$

$$k_e = \frac{CL}{Vd} = \frac{6.06}{17.5} = 0.346h^{-1}$$

$$C = \frac{Dose}{Vd} \cdot e^{-k_e \cdot t} = \frac{100}{17.5} \cdot e^{-0.346 \cdot 1} = 5.71 \cdot 0.71 = 4.1mg/L$$