PHA 5127
Key to Case study III
(Fall 2003)

Case #1:

A 36 year old female patient was admitted into hospital because of gram-positive bacteria infection. She is 66 inches tall with weight of 70 Kg. The physician decided to give her gentamicin via i.v. bolus injection. Before staring the antibiotics, the physician ordered a lab test for creatinine. The serum creatinine level of this patient was reported to be 1.6 mg/dL. (Ke for aminoglycoside, Ke = 0.00293 (CrCL) +0.014), Unit for Ke is (hr. $^{-1}$), Unit for CrCL is ml/min)

1.) Please calculate what is the creatinine clearance for this patient.
2.) Please state the reason why you need to use IBW for calculate the creatinine clearance?
3.) Two hours after given a iv. Bolus injection, the blood sample was taken from the patient, and drug concentration was measured as: 4.2 mg/L. How long will it take for plasma level drops down to 1 mg/L?

Answer:

1.) **Firstly**, calculate the IBW, please note this is a case for ***female*** patient,

IBW (female) = 45.5 kg + 2.3 * (66-60) = 59.3 (Kg)

Then, by using the IBW, we can calculate the creatinine clearance for this patient.

$$CrCL_{female} = 0.85 \cdot \frac{(140-36)\cdot 59.3}{72 \cdot 1.6} = 45.5(ml/\min)$$

Or using the equation from equation sheet,

$$CrCL_{female} = \frac{(140-36)\cdot 59.3}{85 \cdot 1.6} = 45.5(ml/\min)$$

2.) Since creatinine is produced by the muscle in the body. And it is not deposit in fat.

3.) **Firstly**, we need to find out what the Ke value of gentamicin is for this patient.

Ke = 0.00293*45.5 + 0.014 = 0.14 (hr. $^{-1}$)

Recall, for a single dose iv. Bolus,

$$C_t = C_0 * e^{-Ke*t} = 4.2 * e^{-0.14*t} = 1$$

T = 10.25 (hr.)

Therefore, it would take additional 10.25 hours before the drug reached 1 mg/L, i e, it would take about 12.25 hours before the drug concentration dropped to 1 mg/L after the iv. Bolus.

Case #2:

Drug X is a week base with pKa=8.8. Its unionized form is non-polar. It has a volume of distribution of 28 L with a half life 1hour. The fraction unbound (fu) of the drug is 0.1. And we know that the renal clearance accounts for 16% of the total body clearance. Please find out,

1.) what is the renal clearance.
2.) Is active secretion involved in the renal clearance? Why?
3.) If you drop the urine pH from 7.4 to 4.0, what will happen about renal clearance, based on what you learned in class? Why?

1.) $Ke = 0.693 / 1 = 0.693\ (hr^{-1})$
CL total = Ke*Vd = 0.693*28 = 19.4 (L / hr.)
CL renal = CL total * 16% = 19.4 * 0.16 = 3.1 (L /hr.)

2.) Active secretion is involved in, because:

CL renal = 3.1 (L / hr.) = 51.67 (ml / min) > fu*GFR = 0.1 * 130 = 13 (ml/min)

3.) The renal clearance will increase since in the acidic enviroment, drug X will have more ionized form and will not be reabsorbed. (only the non-polar unionized form can be reaborbed).