

PHA 5127 Dose Optimization I
Fall 2011
Homework IV
10 points

If you have any questions regarding this homework assignment, do not hesitate to contact Benjamin Weber (benjaminweber@ufl.edu). Please provide all answers with their **appropriate**. 0.25 points will be deducted for each missing or inappropriate unit. Please provide all answers on separate sheets (does not apply to TRUE/FALSE questions). **Remember to show how you found your answer.** Answers lacking adequate justification may not receive full credit.

Problem 1 (3.5 points)

A female patient (5'10" tall, 60kg, 40 years old) shows a serum creatinine level of 1.2 mg/dL.

- a) Use the Cockcroft-Gault-Equation to calculate her creatinine clearance.
- b) Drug A (highly lipophilic) shows a plasma protein binding and tissue protein binding of 40% and 50%, respectively. Drug A is eliminated by hepatic (30%) and renal processes (70%). Calculate the total systemic clearance of drug A (in L/h) when administered to the patient. Assume that the drug is neither actively secreted nor reabsorbed.
- c) Give the equation that can be used to calculate the plasma-concentration time profile for any given time t when 100mg of drug A are administered to the patient via IV bolus injection. Assume that the drug is immediately distributed throughout the body and that all elimination processes are first-order processes. (Linear pharmacokinetics)

Problem 2 (1 point)

What is the maximum renal clearance a drug can show? Explain briefly.

Problem 3 (1 point)

A patient receives a drug (lipophilic) as an IV bolus injection. Assume a one-compartment body model, linear pharmacokinetic and first-order elimination processes. The following characteristics about the drug are known.

$$CL = CL_{ren} = 50 \frac{L}{h}$$

$$Vd = 250L$$

$$f_u = 0.8$$

Which two of the following statements must necessarily be correct?

- The drug shows pronounced hepatic metabolism
- The tissue protein binding is larger than the plasma protein binding
- The drug is eliminated by active tubular secretion
- The drug is not passively reabsorbed from the tubulus
- The drug shows similar plasma binding characteristics as creatinine

Problem 4 (1.5 points)

The following equation describes the plasma concentration at any given time t for a one-compartment body model after IV bolus injection. Which (three) assumptions about the drug are necessary for this equation to be adequate?

$$C(t) = C_0 e^{-k_e t}$$

Problem 5 (3 points)

TRUE (T) or FALSE (F)

A drug that is neither a base nor an acid will most likely not show a renal clearance larger than 130 mL/min.

T F

A drug which is actively secreted cannot be passively reabsorbed.

T F

The pH of the urine does never affect the magnitude of renal reabsorption.

T F

A drug that is actively secreted must show a renal clearance larger than 130 mL/min.

T F

A drug that is fully reabsorbed is likely to show a tissue protein binding larger than 20%.

T F

The term “linear pharmacokinetics” does not imply that a plot of plasma concentration vs. time gives a straight line.

T F