Answer Homework 3
Spring 2010

1. The figure below shows the estimated renal function maturation versus age. In your own words, define A50 and discuss the important factors to consider if you were to recommend a drug eliminated exclusively by the kidney.

A50 is the age at which the kidneys are half mature
The kidneys mature 90% by 3 years old. Since most drugs’ dosing regimens were define in population > 3 years old, a correction factors may be needed for dosing neonate population if a drug is exclusively excreted really.

2. For a drug that mainly binds alpha 1-acid glycoprotein, using the equation below to proof how clearance changes in young and elder population for both high and low extraction drugs. Discuss which type of drug (high or low extraction) is affected by the age the most.

\[
CL = \frac{Q \cdot f_u \cdot CL_{int}}{Q + f_u \cdot CL_{int}}
\]

HE: unbound > Q in denominator, CL=Q. Since Q lower in older population, CL of old < young
LE: Q>unbound in the denominator, CL=fu*Clint. Since fu and Clint decrease in older population, CL of old < young.
LE likely more affected by age.
3. Calculate the steady state accumulation ratio of vancomycin using peak concentrations after 1g q12hr IV for a 50 year old female weighting 60 kg with serum creatinine concentration of 2.3 mL/min. Discuss the likelihood of toxicity based on the calculated accumulation ratio.

\[
C_{\text{max}, 1}\text{st dose} = \frac{\text{Dose}}{V_d} = \frac{1000 \text{ mg}}{36.7 \text{ L}} = 27.2 \text{ mg/L}
\]

\[
C_{\text{max, ss}} = \frac{D}{V_d(1-e^{-kt\text{ou}})} = 65.0 \text{ mg/L}
\]

Accumulation ratio = \(\frac{65.0}{27.2} = 2.4\)

4. Discuss the best approach to treat drug X and drug y and discuss how they relate to bactericidal versus bacteriostatic killing of antibiotics. What may not be the ideal combination therapy of antibiotics?

**Drug X:**

Conc depdendent

**Drug Y:**

Time dependent

The two concepts are not related. Do not mix bacteriostatic with bactericidal. Bactericidal killing depends on bacteria’s growth rate, which can be reduced by bacteriostatic drug.