Deacon's Challenge

No 100 - Answer

A patient is infused with a drug at the rate of 100 g/min until a steady state plasma concentration of 100 g/dL is achieved. Calculate the clearance of the drug in mL/min. Comment on your answer.

The clearance of a drug is the *volume of plasma* from which the drug is completely removed per unit time and can be calculated from its rate of removal and the plasma concentration once a *steady state* has been achieved:

$$\text{Clearance} = \frac{\text{Rate of removal from body}}{\text{Plasma concentration}}$$

In a steady state the plasma concentration is constant because:

$$\text{Rate of administration} = \text{Rate of removal}$$

Therefore rate of administration can be substituted for rate of removal:

$$\text{Clearance} = \frac{\text{Rate of administration}}{\text{Plasma concentration}}$$

Divide the plasma concentration by 100 to convert from g/dL to g/mL (since 1 dL = 100 mL).

$$\text{Plasma concentration} = \frac{100}{100} = 1 \text{ g/mL}$$

$$\text{Therefore clearance} = \frac{100 \text{ (µg/min)}}{1 \text{ (µg/mL)}} = \textbf{100 mL/min}$$

The significance of the clearance depends on the route(s) by which the drug is removed from the circulation, which could be:

Metabolism
Biliary excretion
Renal excretion

Only if biliary excretion and metabolism are insignificant will the value reflect renal clearance and only if the drug is not reabsorbed nor secreted by the renal tubules will the renal clearance be a measure of GFR.

N.B This is question 100 so I used 100 for each piece of data to give a final answer of 100!

Question 101

The 95% confidence limits for a creatinine quality control sample are 94-106 µmol/L. What is the minimum number of results required to detect, with a power of 80%, a change *(P<5%)* in bias equivalent to one standard deviation?