Deacon's Challenge

No 120 - Answer

Use the following data (obtained on paired specimens) to calculate the percentage of filtered urea reabsorbed by the renal tubules:

Plasma urea	=	*7.5 mmol/L*
Urine urea	=	*360 mmol/L*
Plasma creatinine	=	*150 µmol/L*
Urine creatinine	=	*12 mmol/L*

Let: U_{Ur} = urine urea concentration = 360 mmol/L

P_{Cr} = plasma creatinine concentration = 150 µmol/L

U_{Cr} = urine creatinine concentration = 12 mmol/L = 12,000 µmol/L

P_{Ur} = plasma urea concentration = 7.5 mmol/L

The fraction of filtered urea which is excreted i.e. FE_{Ur} is:

$$FE_{Ur} = \frac{\text{Rate of urinary urea excretion}}{\text{Rate of urea filtration}}$$

Since: rate of urinary urea excretion = $U_{Ur} \times V$

where V = urine flow rate (L/min)

and: rate of urea filtration = $GFR \times P_{Ur}$

then: $$FE_{Ur} = \frac{U_{Ur} \times V}{GFR \times P_{Ur}}$$

GFR is unknown so use creatinine clearance as the nearest estimate available:

$$GFR = \frac{U_{Cr} \times V}{P_{Cr}}$$

Substitute for *GFR* into the expression for FEUr:

$$FE_{Ur} = \frac{U_{Ur} \times V \times P_{Cr}}{U_{Cr} \times V \times P_{Ur}}$$

Since the V terms cancel this becomes:

$$FE_{Ur} = \frac{U_{Ur} \times P_{Cr}}{U_{Rr} \times P_{Ur}}$$

Substitute these values to calculate FE_{Ur} remembering to multiply the urine creatinine by 1000 to convert it to µmol/L (the same units as used for plasma creatinine):

$$FE_{Ur} = \frac{360 \times 150}{12000 \times 7.5} = 0.6$$

If 0.6 of filtered urea is excreted then 1 - 0.6 = 0.4 of filtered urea is reabsorbed.

Therefore percentage of filtered urea reabsorbed by tubules = 0.4 x 100 = **40%** ■

Question 121

A patient in your local lipid clinic had a serum total cholesterol concentration of 7.2 mmol/L. He was treated with a statin; and 3 months later his serum cholesterol concentration is 6.0 mmol/L. Given that the controls for your cholesterol assay run standard deviations of 0.041, 0.062 and 0.094 mmol/L at 2.7, 4.3 and 6.7 mmol/L respectively, and that the intra-individual biological variation of serum cholesterol concentration is quoted as 5.4%, determine whether this represents a significant change in his serum cholesterol.

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