Deacon's Challenge

No 115 - Answer

Calculate the measured plasma sodium concentration if blood with a true plasma sodium concentration of 140 mmol/L is mistakenly drawn into an 'anticoagulation' Vacutainer tube.

These tubes originally contain 0.5 mL trisodium citrate solution (citrate concentration 0.105 mol/L) and the final volume of anticoagulated blood is 4.5 mL. You may assume that the sodium measurement is analytically correct.

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Since each citrate ion is associated with 3 sodium ions

Na conc^{n} in anticoagulant = 3 x 0.105 = 0.315 mol/L = 315 mmol/L

Volume of blood = Final volume - Anticoagulant volume

= 4.5 - 0.5 = 4.0 mL

The sodium in the anticoagulant will be distributed throughout the **plasma** compartment of the blood only. The haematocrit is not given but it would be reasonable to assume a value of 0.5:

Plasma volume = Blood vol (mL) x haematocrit = 4.0 x 0.5 = 2.0 mL.

Total "solution" vol = Plasma vol + Anticoagulant vol

= 2.0 + 0.5 = 2.5 mL

$$\text{Na from plasma} = \frac{\text{Plasma Na(mmol/L) x Plasma vol (mL)}}{\text{Total vol (mL)}} = \frac{140 \times 2.0}{2.5} = 112 \text{ mmol/L}$$

$$\text{Na from anticoagulant} = \frac{\text{Anticoagulant Na (mmol/L) x Anticoagulant vol (mL)}}{\text{Total vol (mL)}}$$

$$= \frac{315 \times 0.5}{2.5} = 63 \text{ mmol/L}$$

Total Na = Na from plasma (mmol/L) + Na from anticoagulant (mmol/L)

= 112 + 63 = **175 mmol/L**

Question 116

A metabolic disease is known to result in decreased plasma activity of enzyme X. X was measured in 100 normal subjects and 100 individuals with the disease in question:

	95% confidence limits
Normal subjects	830 - 1222 U/L
Disease group	108 - 892 U/L

Calculate the diagnostic sensitivity and specificity of this test at a decision limit (diagnostic cut-point) of 830 U/L.

Values of the normal deviate (*z*-score) and *P* are:

P(%)	10	5	2	1	0.2	0.1
z	1.65	1.96	2.33	2.58	3.09	3.29

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