Deacon's Challenge

No 106 - Answer

A serum from a patient with prolactinoma has a prolactin value beyond the analytical range of the assay. The endocrinologists have asked for a numerical value to provide a baseline for monitoring the patient. In an attempt to preserve the matrix upon dilution, 0.1 mL of the sample is mixed with 2.0 mL of a serum from another patient which has a prolactin value of 400 mU/L. If the assay result for the mixture is 1050 mU/L, calculate the prolactin concentration in the serum from the prolactinoma patient.

First calculate the contribution from the base (i.e. normal) sample:

Expected prolactin contribution from base sample =

$$\frac{\text{Serum prolactin (mU/L)} \times \text{Vol base sample (mL)}}{\text{Total volume (mL)}}$$

Substitute: Base sample prolactin = 400 mU/L Base sample volume = 2 mL
Total volume = Vol base sample + Vol prolactinoma sample = 2 + 0.1 = 2.1 mL

Expected contribution from base sample = $\frac{400 \times 2}{2.1}$ = 381 mU/L (to 3 sig figs)

Next calculate the prolactin concentration in the diluted prolactinoma sample:

Prolactin in diluted prolactinoma sample =

Measured total prolactin - Expected prolactin contribution from base sample

= 1050 - 381 = 669 mU/L

Finally correct for the dilution of the prolactinoma sample;

Prolactin in undiluted prolactinoma sample = $\frac{\text{Prolactin in diluted sample} \times \text{Total vol (mL)}}{\text{Vol prolactinoma sample (mL)}}$

= $\frac{669 \times 2.1}{0.1}$

= **14,000 mU/L** (to 3 sig figs)

Question 107

Your paediatricians wish to screen a population for the presence of a rare disease which has a prevalence of 1 in 2000. However, the preferred screening test, for which the sensitivity and specificity are both 99% is prohibitively expensive so you suggest a two step strategy employing a preliminary inexpensive screening test which has a sensitivity of 99% but a specificity of only 96%. The preferred (secondary) test will only be applied to those samples yielding a positive result in the preliminary test. The paediatricians have asked you to calculate:

a) The prevalence of disease in the population giving a positive result to the preliminary screening test.
b) The percentage of patients with disease who will be successfully identified using this strategy.
c) The percentage of patients identified as having the disease by this strategy which are false positives.