Deacon's Challenge

No 144 - Answer

You are provided with brief details of a method to measure peptide-X. If the mean result of assaying a re-dissolved extract of peptide-X gives a result of 8 fmol/tube, calculate the concentration of peptide-X in the original sample, expressing the answer in appropriate units.

Immunoassay method for peptide-X:
Extract 1 mL serum with 5 mL of methanol.
Evaporate methanol to dryness under nitrogen and re-dissolve the residue in 250 µL of assay buffer.
Assay aliquots (100 µL) of this solution in duplicate.
Calibrate the assay against non-extracted standards to give a result in terms of femtomoles (fmol) per assay tube.

Average expected recovery for peptide-X extraction is 80%.

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During the assay the peptide-X in 1 mL serum ends up in 0.25 mL assay buffer. 0.1 mL of this then used in the assay and was found to contain 8 fmol.

Therefore 0.25 mL dissolved residue (equivalent to 1 mL serum) contains

$$\frac{8 \times 0.25}{0.1} \text{ fmol of peptide-X}$$

so 1L of serum contains $\frac{8 \times 0.25 \times 1{,}000}{0.1}$ fmol of peptide-X

Multiply by 100 and divide by 80 to correct for the 80% yield of the extraction step:

$$\text{Concentration} = \frac{8 \times 0.25 \times 1{,}000 \times 100}{0.1 \times 80} = 25{,}000 \text{ fmol/L}$$

Divide by 1,000 to convert to the more convenient units of pmol/L:

$$\text{Concentration of peptide-X} = \frac{25{,}000}{1{,}000} = 25 \text{ pmol/L}$$

Question 145

It is proposed to screen men for prostate cancer using single PSA measurement. Your urology colleagues locally wish to calculate the potential impact of the proposed screening programme on clinic numbers. Assume that all patients with values >4 µg/L will be referred to the clinic. Using the information provided:

(1) How many patients will be referred?
(2) How many of these will have prostate cancer?
(3) What is the diagnostic efficiency of PSA >4 µg/L?
(4) What is the negative predictive value of PSA ≤4 µg/L?

The best local estimates available are an eligible population to be screened of 20,000 men and a prevalence of prostate cancer of 3%. The diagnostic sensitivity for prostate cancer of a PSA >4 µg/L is quoted to be 67% and the specificity 97%.

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