Deacon's Challenge No. 83 Answer

It has been suggested that a proposed analytical goal for an analyte is that the between batch analytical coefficient of variation should not exceed one half of the "true biological" inter-individual coefficient of variation. Calculate the percentage "expansion" of the measured reference range over the true biological reference range when this analytical goal is exactly met.

The relationship between the total, analytical and biological variation is:

$$CV_{Total}^2 = CV_{Analytical}^2 + CV_{Biological}^2$$

$$CV_{Total} = \sqrt{[CV_{Analytical}^2 + CV_{Biological}^2]}$$

When $CV_{Analytical} = 0.5\ CV_{Biological}$

the total *CV* expressed in terms of the biological *CV* becomes:

$$CV_{Total} = \sqrt{[(0.5\ CV_{Biological})^2 + CV_{Biological}^2]}$$

$$= \sqrt{[(0.25 \times CV_{Biological}^2) + CV_{Biological}^2]}$$

$$= \sqrt{(1.25 \times CV_{Biological}^2)}$$

$$= 1.12\ CV_{Biological} \text{ (3 sig figs)}$$

The span of the reference range is a multiple of the total *CV* (for 95% confidence limits it spans approximately 4 *CV*s). Therefore the reference range expands by a factor of 1.12 (=112%) over and above the biological reference range i.e. has increased by approximately **12%.**

Question 84

You receive a cerebrospinal fluid (CSF) sample that is blood stained, with a CSF red cell count of 12,100 cells per cubic millimetre. Following immediate centrifugation a clear colourless supernatant is obtained, on which the CSF protein concentration is 1.67 g/L. On a blood sample taken on the same day, the serum total protein concentration was 71 g/L and the blood red cell count (RBC) was 4.2 x 10^{12} cells/L. How much of the CSF measured protein was due to contamination from blood during the lumbar puncture?

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