Deacon's Challenge No.3 Answer

The imprecision of a certain assay for troponin I yields a coefficient of variation of 13% between 0.3 and 0.5 µg/L, around the decision point for myocardial infarction of 0.4 µg/L. A result of 0.46 µg/L is obtained on a sample. Assuming that is the true level of troponin I, give an estimate of the probability that analysis of that same sample would give a result below the decision point.

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First calculate the standard deviation (SD):

$$CV(\%) = \frac{SD \times 100}{Mean}$$

where CV = coefficient of variation = 13%
mean = true value for the sample = 0.46 µg/L

$$13 = \frac{SD \times 100}{0.46}$$

$$SD = \frac{13 \times 0.46}{100} = 0.06 \text{ µg/L}$$

Therefore the analyses of the sample are distributed with a mean of 0.46 µg/L and SD of 0.06 µg/L. We want find out what proportion of results will be below the decision point of 0.4 µg/L. To do this we need to 'normalize' the data so that the mean is zero and the SD =1. i.e. calculate the standard deviate - 'z':

$$z = \frac{\text{decision point} - \text{mean}}{SD} = \frac{0.4 - 0.46}{0.06} = \frac{-0.06}{0.06} = -1$$

Therefore the decision point is -1SD from the mean. ±1SD encompasses two thirds of values (this information can be gained from tables of z). Therefore one third of results will be outside the mean ±1SD range (one sixth greater than mean +SD and one sixth less than mean - SD).

Therefore the probability of obtaining a result below the decision point is 1/6 i.e. 0.17 ■

Deacon's Challenge Question No. 4

A solution containing a substance of molecular weight 400 at a concentration of 3 g/L transmitted 75% of incident light of a particular wavelength in a 1cm cuvette. Calculate the % of incident light of the same wavelength that would be transmitted by a solution of the same substance at a concentration of 4 g/L and calculate the molar absorption coefficient for that substance at this wavelength.

(MRCPath)