# Deacon's Challenge

## No 126 - Answer

*Calculate the range of the 95% confidence limits for the total cholesterol:HDL-cholesterol ratio calculated from the following data:*

*Total cholesterol = 5.4 mmol/L  Analytical CV = 2.0%*

*HDL-cholesterol = 1.2 mmol/L  Analytical CV = 2.5%*

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The rules for obtaining combined standard deviations when two independent variables ($x$ and $y$ with standard deviations $s_x$ and $s_y$) are multiplied or divided are:

1. $s_{xy} = xy \{\sqrt{(s_x^2/x^2 + s_y^2/y^2)}\}$
2. $s_{x/y} = x/y \{\sqrt{(s_x^2/x^2 + s_y^2/y^2)}\}$

Note that, unlike when variables are added or subtracted, the values for the variables themselves are included in the calculation.

First calculate the standard deviations for each analyte from their *CVs* and concentrations:

$$\text{Standard deviation} = \frac{\text{Concentration x CV (\%)}}{100}$$

$$s_{\text{Total chol}} = \frac{5.4 \times 2.0}{100} = 0.108 \text{ mmol/L}$$

$$s_{\text{HDL-chol}} = \frac{1.2 \times 2.5}{100} = 0.030 \text{ mmol/L}$$

Substitute these, together with values for $x$ and $y$, into equation 2:

$$s_{\text{Total chol/HDL-chol}} = \text{Total chol/HDL-chol} \{\sqrt{(s_{\text{Total chol}}^2/\text{Total chol}^2 + s_{\text{HDL-chol}}^2/\text{HDL-chol}^2)}\}$$

$$= 5.4/1.2 \{\sqrt{(0.108^2/5.4^2 + 0.030^2/1.2^2)}\}$$

$$= 4.5 \{\sqrt{(0.01166/29.16 + 0.0009/1.44)}\}$$

$$= 4.5 \{\sqrt{(0.0003998 + 0.000625)}\}$$

$$= 4.5 \{\sqrt{0.001025}\}$$

$$= 4.5 \times 0.0320$$

$$= 0.144$$

The 95% confidence limits include the mean ± 1.96$s$ so encompasses a range of 2 x 1.96 x $s$

Therefore 95% range = 2 x 1.96 x 0.144 = **0.56** (to 2 sig figs)

No units since the analyte (cholesterol) and units (mmol/L) of each component are the same and cancel.





# Question 127

A patient after returning from holiday presents to his GP with a set of laboratory results obtained during a brief hospital admission in the USA. The GP asks you to convert the following data to "SI units" commonly used in the UK:

| | | |
|---|---|---|
| Plasma glucose | = | 270 mg/dL |
| Plasma creatinine | = | 2.3 mg/dL |
| Plasma BUN | = | 50 mg/dL |

Urine albumin:creatinine ratio = 40 mg/g

(Molecular weights: glucose = 180, creatinine = 113)