Deacon's Challenge No. 27 Answer

A new method for HCG in urine is being evaluated. The concentration in a sample from a pregnant woman is measured at 8240 IU/L. A 50 µL aliquot of an international standard containing 50,000 IU/L is added to 450 µL of the same urine sample and the sample mixed. On measuring the mixed sample, the new concentration is found to be 12100 IU/L. What is the recovery of HCG by this method?

MRCPath, Spring 2002

$$\text{Recovery (\%)} = \frac{\text{Amount recovered}}{\text{Amount added}} \times 100$$

A recovery experiment is usually carried out by adding a known amount (the "spike") of standard to a patient's sample ("base sample") to create a "spiked sample". The spiked and base sample are then assayed and the recovery calculated:

$$\text{Recovery (\%)} = \frac{(\text{Spiked result} - \text{Base result}) \times 100}{\text{Spike added}}$$

Concentration can be substituted for "amount" .

The increase in HCG concentration which should result from addition of 50 µL of HCG solution, containing 50,000 IU/L of HCG, to 450 µL of patients sample (i.e. the "spike") is:

$$\text{HCG spike} = \frac{\text{Volume of stock (µL)} \times \text{Concentration of HCG stock (IU/L)}}{\text{Final volume of spiked sample (µL)}}$$

$$= \frac{50 \times 50{,}000}{(50 + 450)}$$

$$= 5000 \text{ IU/L}$$

"Spiking" of the base sample has also diluted its HCG content so the base value which is to be subtracted from the "spiked value" must be adjusted to take this into account:

$$\text{Base concentration} = \frac{\text{Measured concentration (IU/L)} \times \text{volume of base sample mixed with "spike" (µL)}}{\text{Total volume (µL)}}$$

$$= \frac{8240 \times 450}{(450 + 50)}$$

$$= 7416 \text{ iu/L}$$

$$\text{Therefore, recovery} = \frac{(12100 - 7416) \times 100}{5000}$$

$$= \frac{4684 \times 100}{5000} = 93.7\ \%$$

Question No. 28

A proposed diagnostic serological test for coeliac disease was evaluated in 200 consecutive patients referred to a paediatric gastroenterology service in whom the condition was suspected clinically. The test result was compared with the diagnosis as established by biopsy, withdrawal of gluten and response to re-challenge. On this basis, 76 children had the condition of whom only 64 gave a positive test result: 10 positive test results occurred in children who were shown not to have coeliac disease.

Calculate the sensitivity and specificity of the test and the predictive value of a positive result.

MRCPath, May 1998