

Deacon's Challenge

No 109 - Answer

Fractionated urinary metanephrines are a useful test for diagnosis of pheochromocytoma. Your assay has a diagnostic sensitivity of 100% and a specificity of 95%. It is known that the prevalence of pheochromocytoma in patients under investigation for hypertension is 0.8%.

You investigate 1250 patients in a year. Calculate the number of false positive test results you would generate and the probability that a patient with a positive test result really has a pheochromocytoma.

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To answer this question it is necessary to calculate:

- the number of true positives (TP) i.e. the number of patients **with** pheochromocytoma yielding a positive metanephrine result
- the number of false positives (FP) i.e. the number of patients **without** pheochromocytoma also yielding a positive epinephrine result

If the prevalence of pheochromocytoma in the population tested is 0.8%, then if 1250 patients are tested within a year then the number of patients with pheochromocytoma is

$$1250 \times \frac{0.8}{100} = 10$$

and the remainder tested ($1250 - 10 = 1240$) do not have pheochromocytoma.

Since the diagnostic sensitivity is 100% this means that all patients with pheochromocytoma will give a positive result so that the value for TP is also 10

Specificity is the percentage of negative results obtained in patients who do not have pheochromocytoma:

$$\text{Specificity (\%)} = \frac{\text{TN} \times 100}{(\text{TN} + \text{FP})}$$

Substitute: specificity = 95% and $(\text{TN} + \text{FP}) = 1240$ (the number of patients who do not have pheochromocytoma) and solve for TN:

$$95 = \frac{\text{TN} \times 100}{1240}$$

$$\text{TN} = \frac{95 \times 1240}{100} = 1178$$

The remainder of the patients without pheochromocytoma must yield positive results (FP), therefore

$$\text{False positives (FP)} = 1240 - 1178 = 62$$

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The probability that a patient yielding a positive result actually has pheochromocytoma is the positive predictive value of the test – PV(+):

$$\text{PV(+)} = \frac{\text{True positives}}{\text{All positives}} = \frac{\text{TP}}{\text{TP} + \text{FP}} = \frac{10}{10 + 62} = 0.14 \text{ (14\%)} \text{ to 2 sig figs}$$

Question 110

Your bench method for making up a 0.2 mol/L solution of anion X⁻ requires you to dissolve 53.65 g of salt A.X heptahydrate in and make the volume up to 1 L with water. You mistakenly use the anhydrous salt instead. What volumes of water and your solution must be mixed together to correct for this error and produce a final solution of volume 1 L.

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Clozapine and Norclozapine

Clozapine is used to treat schizophrenic illness and other neuropsychiatric diseases. Measurement of clozapine and its metabolite norclozapine is useful in:

- Confirming non-compliance and monitoring unresponsive patients
- Minimising toxicity
- Patients with altered pharmacokinetics such as hepatic disease and smokers

Sandwell and West Birmingham Hospitals NHS Trust

For further information contact:
info@cityassays.org.uk or visit
www.cityassays.org.uk and
download an information leaflet

Turn round target: 3 working days

Sample: Trough specimen (pre-dose or 6 hours post-dose; minimum 2ml EDTA whole blood or plasma)

Price: £18

Address for samples:
Clinical Biochemistry, City Hospital,
Dudley Road, Birmingham B18 7QH

