Deacon's Challenge No. 7 Answer

In health, most of sodium filtered by the glomeruli is reabsorbed at various sites along the nephron. Estimate the effect on urinary sodium excretion in a person with otherwise normal renal function of a 1% decrease in the overall reabsorption of sodium, indicating any assumptions that you make.

(MRCPath Nov 1999)

The first step is to calculate the filtered load of sodium presented to the tubules:

Filtered load = rate of filtration x plasma concentration

It is conventional to express sodium excretion on a 24h basis. We are not given any numerical data so it is necessary to assume reasonable values for the rate of filtration (i.e. GFR) and plasma sodium concentration. The units used must be comparable.

Assume GFR = 100mL/min = $\frac{100 \times 60 \times 24}{1000}$ = 144 L/24h

Assume plasma sodium = 140 mmol/L

Filtered sodium = 144 x 140 = 20160 mmol/24h

Failure to reabsorb 1% of this will result in an extra 1% being excreted in the urine.

Extra Na excreted = Filtered sodium x 1% = $\frac{20160 \times 1}{100}$ = 202 mmol/24h (to 3 sig figs)

Therefore a 1% decrease in sodium reabsorption will result in an increase in sodium excretion of approximately 200 mmol/24h.

Exam tip: This question is typical of many in that you are not asked to perform a precise calculation but to produce an estimate based on reasonable assumptions. It is your experience and understanding that is being tested. Before the exam make sure that you not only know the common reference ranges but have some idea of values for such parameters as ECF vol, the value of 't' which corresponds to 95% confidence limits etc. ■

Question No. 8

While trying to follow the National Service Framework guidelines for coronary heart disease a doctor prescribed a statin to lower the cholesterol of a patient with coronary heart disease. The patient's original cholesterol level was 5.8 mmol/L and at the next visit the doctor was delighted to find that it was just below the target level of 5.0 mmol/L at 4.9 mmol/L and discharged the patient. The patient, a statistician, was less sure the treatment had been responsible. Given that the physiological coefficient of variation for cholesterol is 6% and the analytical coefficient of variation is 3%, calculate the least significant change (at $p<0.05$) in cholesterol as a percentage at his original level, and determine whether the second measurement was significantly different from the first.

(MRCPath November 2000)