albumin concentration but also by the hydrogen ion concentration. Ionisation of calcium is greater in acidotic than alkalotic conditions. A clinical manifestation of this is the rarity of tetany in chronic renal failure even in the presence of very low serum calcium concentrations because of the prevailing metabolic acidosis.

None of the formulae used by Dr Conceicao's group for the derived values of ionised calcium concentration makes any allowance for variations in the hydrogen ion concentration. In practice, in the narrow physiological range of hydrogen ion concentration this can probably be discounted. Thus in both the group of normal subjects and in those on maintenance haemodialysis no significant difference was found between the directly measured and the derived values of serum ionised calcium concentration. In a group of patients with chronic renal failure treated conservatively many will presumably have metabolic acidosis; one would therefore predict the derived values of serum ionised calcium to be an underestimate, as was indeed found.

Direct measurement of the serum ionised calcium concentration is not widely available. Formulae for computing the value from the total serum calcium and the serum albumin are useful provided that one remembers that the result will be accurate only in the physiological range of hydrogen ion concentration. It would, of course, be of great benefit if a nomogram could be produced which corrected not only for the serum albumin but also for the hydrogen ion concentration. This would certainly be a more economic solution than the provision of directly measured serum ionised calcium estimations as a routine hospital laboratory service.

BARRY MONK

Royal Victoria Hospital,
Bournemouth, Dorset

SIR,—We agree with Dr S C Conceicao and his colleagues (29 April, p 1103) that ideally ionised calcium should be measured directly rather than calculated from other measurements. However, direct measurement requires the rapid analysis of an anaerobic blood sample and the rate of analysis with the instruments available at present is slow. Most hospital laboratories would find it impracticable to make a direct measurement for each of the many patients in whom there is a clinical suspicion of a calcium disturbance, and some form of screening test to select patients for further investigation is required.

The authors found that indirect methods first described in 1935¹ and 1954² for calculating ionised calcium from total calcium and total protein were unreliable. This is, perhaps, not unexpected since Dent and Watson³ pointed out that such calculations are inaccurate when the distribution of serum proteins is abnormal, and this is often the case in renal disease.

We believe it unwise to extend the criticism of these total protein methods to include more recent methods for predicting ionised calcium (or adjusting total calcium) based on albumin⁴⁻⁵ without evidence. It may also be unwise to extend conclusions based on data from patients with renal disease to include patients with other conditions, in whom there is good evidence that it is better to use serum albumin than total protein to predict ionised calcium (or to adjust total calcium).⁴⁻⁶

Dr Conceicao and his colleagues dismiss methods based on albumin on the grounds that Pain *et al*⁷ have shown significant differences between normals in the regression of calcium on albumin in tourniquet experiments, although they do not mention the subsequent statistical criticism of this paper.⁸⁻¹⁰ The same group¹¹ have since published a letter reporting that they have tested further tourniquet data by analysis of variance and found a significant component due to differences between individual regression coefficients, and we have confirmed this. Thus a single equation cannot be used to allow for the increase in calcium following the application of a tourniquet. However, we have additional data in preparation for publication which show that a single equation can be applied to patients with changes in plasma albumin concentration due to disease.

In some patients with renal disease and proteinuria the total serum calcium concentration is higher than in patients with the same degree of hypoalbuminaemia from other causes.¹²⁻¹³ It is therefore impossible to predict whether a calculation based on albumin will work in patients with renal disease, and experimental data are needed.

In any event, the findings of Dr Conceicao and his colleagues do not invalidate our previous conclusion that an adjustment of serum total calcium based on albumin is of great value in the many non-renal disease states in which a screening test for disorders of calcium homeostasis is required.⁵

B E WALKER
R B PAYNE

St James's University Hospital,
Leeds

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Diffusing capacity in patients with chronic airflow obstruction

SIR,—After reading Dr Anne E Tattersfield's article on the treatment of chronic bronchitis and emphysema (29 April, p 1123) I should like to comment on the value of pulmonary function tests in identifying patients with bronchial asthma from those with chronic bronchitis. This is important because asthmatics benefit more from treatment than bronchitics.

In a study of 72 asthmatic and 45 bronchitic patients who had airflow obstruction of comparable severity, the diagnosis being made on clinical criteria, the bronchitics had a low % predicted forced vital capacity (FVC) (<70), a relatively normal % predicted total lung capacity (TLC), a low % predicted single-breath carbon monoxide diffusing capacity (DLCO) (<50), and a raised arterial carbon dioxide tension (Paco₂) (mean $\pm$ SD 6.7 $\pm$ 1.7

kPa (50.1 $\pm$ 13.1 mm Hg)). The asthmatics on the other hand had a relatively normal % predicted FVC and a high % predicted TLC (115) with a near-normal % predicted DLCO (78.2) and a normal or low Paco₂ (5.2 $\pm$ 0.65 kPa (39.5 $\pm$ 4.9 mm Hg)).

The value of the DLCO in the differential diagnosis of patients with chronic airflow obstruction was also shown in a further study in which the % predicted DLCO was 52.9 (SE $\pm$ 3.65) in 89 bronchitics compared with 91.4 (SE $\pm$ 3.7) in 63 intrinsic asthmatics (non-reactive skin tests). This latter group, because the symptoms are frequently of late onset, are most likely to be confused with bronchitics.²

K N V PALMER

University Department of Medicine,
Foresterhill,
Aberdeen

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Prolactin-secreting tumours

SIR,—We were interested in the recent article by Dr T Bergh and his colleagues (8 April, p 875) related to pregnancy in the presence of prolactin-secreting pituitary adenomas. We would like to stress that reliance on conventional visual field testing which the article implies in order to exclude chiasmal compression may be misleading, as the following history illustrates.

A 34-year-old woman presented with a 13-year history of galactorrhoea and asymmetrical enlargement of the pituitary fossa. Visual acuity was normal and visual fields to confrontation, perimetry, and tangent screen were all intact with the exception of a possible small (2°) central scotoma on the tangent screen. Visual evoked responses to pattern¹ were markedly abnormal in the left eye (latency 131 ms; upper limit of normal 110 ms) and the EMI scan and pneumogram showed unequivocal suprasellar extension of a pituitary tumour. At operation this was found to be extending 2.5 cm above the sella, causing compression of the chiasm and left optic nerve.

Clearly this patient would have run considerable risk of further pituitary enlargement and serious visual complications in pregnancy. We would like to stress that in patients with prolactin-secreting or indeed any variety of pituitary tumour merely testing the visual fields does not reliably exclude chiasmal compression. Visual evoked responses and EMI scanning should be performed in every case.

C H HAWKES

Department of Neurology,
Ipswich Hospital,
Ipswich, Suffolk

LINDSAY SYMON

Department of Neurosurgical Studies,
Institute of Neurology,
London WC1

¹ Halliday, A M, McDonald, W I, and Mushin, J, *Lancet*, 1972, **1**, 982.

A British "Doctors' Ten"

SIR,—There is an increased general awareness of the value of moderate exercise in the promotion of health and the Personal View by Dr Tapani Kosonen (21 January, p 169) on the Helsinki "Doctors' Ten" provided a stimulus for action.

The "Doctors' Ten" is a run of 10 km