Effects of exertion on hormone secretion

SIR,—We have already reported changes in plasma cortisol, testosterone, growth hormone, renin activity, and serum osmolality in a group of Finnish sportsmen who ran a non-competitive marathon over the classical course in Athens in October 1973.¹⁻³ As these data suggested a correlation between physical fitness and changes in hormone profiles we investigated a similar group of nine amateur Finnish runners aged 29-54 (mean 43) years running the same course in October 1976. The group included a woman and a father and son. All participants were in good physical condition and had been running regularly as part of a programme to increase physical fitness and promote *mens sana in corpore sano*.

The experimental conditions were the same as in 1973. Water was allowed ad libitum. The sky was cloudy, however, and the temperature only 18°C, in contrast to the fierce sunshine and 30°C in 1973. The mean running time was the same as before—that is, 242 min. Control blood samples were obtained on arrival in Greece two days before the run and also one week previously in Finland to show whether travel stress affected hormone levels. The results of hormone determinations are shown in the accompanying table.

Plasma hormone levels before and after exertion

Plasma hormone measured	Hormone concentration (mean $\pm$ SD)		
	Control samples		After marathon (at about 1700)
	In Finland (at 1700)	In Greece (at 0900)	
Cortisol (μ mol/l)	0.22 $\pm$ 0.06	0.39 $\pm$ 0.010	0.82 $\pm$ 0.27
ACTH (ng/l)	not determined	57.0 $\pm$ 13	108 $\pm$ 32
TSH (μ g/l)	4.8 $\pm$ 1.7	3.9 $\pm$ 1.8	5.3 $\pm$ 2.2
Vasopressin (ng/l)	9.9 $\pm$ 5.8	10.5 $\pm$ 4.4 (n = 7)	27.0 $\pm$ 14

Conversion: SI to traditional units—Cortisol: 1 μ mol/l $\approx$ 36 μ g/100 ml.

For cortisol, determined by competitive protein-binding, the mean control values were the same as in 1973. After the run the level, as expected, had risen significantly ($P < 0.0005$), but the rise was less pronounced than in 1973 (0.82 ± 0.27 v 1.15 ± 0.36 μ mol/l (30 ± 9.8 v 41.7 ± 13.1 μ g/100 ml)). Corticotrophin (ACTH), determined by radioimmunoassay (RIA) and not previously studied in connection with the marathon, increased like cortisol. The less pronounced pituitary-adrenal response of the present group of runners may have been due to the less stressful environmental conditions, better training and adjustment of the runners, or both. In fact, their physical and psychological status at the end of the run was much better than in 1973 and they showed no signs of exhaustion.

For thyroid-stimulating hormone (TSH), determined by RIA,⁴ the mean value remained practically unchanged, indicating that pituitary hormones are selectively stimulated during the marathon. A steady level of TSH has likewise been found in six healthy adult males during short exhaustive and long mild exercise.⁵ During exercise there is an increased demand for thyroxine accompanied by an increase in free thyroxine concentration in the blood but without any concomitant change in the level of TSH. These apparent contradictions are so far unexplained.⁶ Determination of thyroid hormones, including the reverse triiodothyronine, may provide some information on this point.

For vasopressin, determined by RIA,⁷ the mean value rose 2.5-fold ($P < 0.005$). We suggest that vasopressin release was triggered by increased serum osmolality.² The rise clearly

reflects a physiological response serving to maintain water balance, the levels reached being above those causing antidiuresis in man. During such prolonged exertion insufficient release would become a threat to fluid balance. In all our subjects release was adequate.

Thus the hormone profile during a marathon is affected by several factors which remain to be investigated further.

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A G DESSYPRIS
F FYHRQUIST
B-A LAMBERG

University Endocrine Laboratory,
Minerva Institute,
Helsinki, Finland

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An epidural service

SIR,—The article by Mr A B W Taylor and others (6 August, p 370) was very interesting reading and the team is to be congratulated on their enterprise in providing epidural cover in this way.

We have at this hospital provided a similar epidural service for the past three years, although only two people, both having had the full course of training at Birmingham, have been involved in the administration of the epidural blocks, one a consultant and one a clinical assistant. I was somewhat loth to entrust the administration of epidurals to junior staff, as I did not wish the procedure in any way to risk coming into disrepute and if one wants a job done well generally one does it oneself.

However, I may be wrong in this and Mr Taylor may well be leading the way in teaching his juniors to supply the anaesthesia. I do, however, find the figure of a 98% success rate somewhat difficult to assimilate. If the criterion of a successful block was the presence of perineal anaesthesia at suturing I feel this may be misleading. The only real criterion that matters is relief of pain in labour. Sadly, in our own series total relief of pain is present in only about 70% of cases and partial relief of pain in about another 20% (290 cases).

There remains still a suspicion in the minds of many women and also a few doctors, many of them presenile, regarding this method of anaesthesia and I for one am considering giving up the struggle. Let us hope Mr Taylor and his team are made of sterner stuff.

A F PENTECOST

West Kent General Hospital,
Maidstone

Damaged laryngeal nerves in thyroid surgery

SIR,—I am pleased to see the problem of damage to the laryngeal nerves in thyroid surgery reviewed in your leading article

(13 August, p 416). The apparent recovery of the voice over the period of three months to a year or so after unilateral division of recurrent laryngeal nerve is at a price. The patient is left unable to shout, as may be required in some emergency situations or when talking to the partially deaf. The background noise of a busy street or television viewing when sound levels tend to be high defeats these patients. At the end of a prolonged period of talking the voice may fatigue to the point that kind inquiries as to health are made during social contact. Questioning patients reveals the experience of people leaning forward to catch the voice. Reaction to genuine disability is usually considerate.

The loss of timbre to the voice is eventually forgotten by the patient, but the unilateral narrowing of the rima glottidis will create an increased back-pressure varying with the force and rate of respiration. The consequence over the years should be that these patients will show an increased incidence of panacinar emphysema when compared with other patients of the same age.

Many patients face several surgical procedures and many require endotracheal anaesthesia. The fibrosed cord consequent upon recurrent laryngeal nerve division will suffer distortion from which it cannot be expected to recover and the voice will become even less effective.

Finally, the normal upward current of mucus now meets a cord permanently displaced towards the midline of the glottis. I think that this represents an impediment to the normal scavenging of the bronchial tree.

E R BLAY

Coventry

Medical manpower

SIR,—The "model for medical manpower studies" described by Professor J Parkhouse (20 August, p 530) brings a breath of fresh air to a topic bedevilled by prejudice, medico-political expediency, and a kind of intellectual tunnel vision among self-appointed prophets of medical doom. It should be possible to enjoy many hours of simple fun with the model by feeding in various assumptions and finding where they lead, and no doubt the aforesaid prophets will soon be busily putting the process into reverse so as to find which unproved assumptions will best lead to their foregone conclusions. These assumptions will then become revealed truth and those daring to question them will be reviled as heretics.

One important factor, however, to which the model does not seem readily adaptable, concerns the effects of the sharply increased percentage of women entrants to the profession since the consequences of various social and professional trends on their effective contribution to medical work cannot readily be predicted. There remains a great unknown—how many years of service, at what levels, and in what specialties will the woman doctor of the future provide? Professional service-years, not numbers of names on the *Register*, and balance between specialties rather than total numbers of consultants, juniors, or general practitioners will determine whether or not the medical services will be adequately staffed a decade or more from now. Not being either a mathematician or a clairvoyant, I am inclined to adopt what I admit is an over-simplification: