

- 5 Seelig MS, Goldberg P, Kozinn PJ, Berger AR. Fungal endocarditis: patients at risk and their treatment. *Postgrad Med J* 1979; **55**:632-41.
- 6 Seelig MS, Speth P, Kozinn PJ, Taschgian CL, Toni EF, Goldberg P. Patterns of *Candida* endocarditis following cardiac surgery: importance of early diagnosis and therapy. *Progr Cardiovasc Dis* 1974; **17**:125-60.
- 7 Winner HI. A study of *Candida albicans* agglutins in human sera. *J Hyg Camb* 1955; **53**:509.
- 8 Murray IG, Buckley HR, Turner CG. Serological evidence of *Candida* infection after open-heart surgery. *J Med Microbiol* 1969; **2**:463.
- 9 Evans EGV, Forester RA. Antibodies to *Candida* after operation on the heart. *J Med Microbiol* 1976; **9**:303-8.
- 10 Kay JH, Bernstein S, Tsuji HK, Redington JV, Milgram M, Brem T. Surgical treatment of *Candida* endocarditis. *JAMA* 1962; **203**:621.
- 11 Medoff G, Kobayashi GS. Strategies in the treatment of systemic fungal infections. *N Engl J Med* 1980; **302**:145-55.

Correspondence

Plasma catecholamines in exercise-induced asthma

Sir,—The results of Zielinski *et al* (*Thorax* 1980; **35**: 823) on plasma catecholamines in exercise-induced asthma must be interpreted with extreme caution. Plasma catecholamines were determined by a fluorimetric assay which lacks both specificity and sensitivity and is inadequate for the measurement of plasma catecholamines. The basal values reported for adrenaline are five to ten times higher, and for noradrenaline three to five times higher than those measured by radioenzymatic assay (Barnes *et al*, *Clin Sci* 1981; **60**:18P), or by high pressure liquid chromatography with electrochemical detection or by gas chromatography-mass spectrometry. The pre-exercise values reported by Zielinski *et al* correspond to those attained during infusions of 0.075 µg/kg/min noradrenaline and 0.05 µg/kg/min adrenaline (FitzGerald *et al*, *Eur J Clin Invest* 1980; **10**:401) which cause marked cardiovascular and metabolic effects and produce significant bronchodilatation in asthmatic subjects (Barnes *et al*, *N Engl J Med* 1980; **303**:263).

Using a fluorimetric assay any changes in catecholamines during exercise are very difficult to evaluate. Their demonstration that adrenaline does not rise and that noradrenaline only rises by 50% during submaximal exercise in normal subjects is in conflict with previous studies; where a three to fivefold rise in adrenaline and five to tenfold in noradrenaline have been reported (Galbo *et al*, *J Appl Physiol* 1975; **38**:70), and are almost certainly the result of the insensitivity of the fluorimetric assay used. Comparisons between normal and asthmatic subjects are therefore invalid. We have recently measured the catecholamine response to exercise in asthmatic and non-atopic normal subjects using a sensitive radioenzymatic assay. The normal subjects showed a threefold rise in adrenaline and a fivefold rise in noradrenaline whereas the asthmatic subjects showed no rise in adrenaline and only a twofold rise in noradrenaline, suggesting an impaired sympatho-adrenal response to exercise in asthmatic subjects

(Barnes *et al*, *Clin Sci* 1980; **58**:4P). The results are discussed in more detail elsewhere in this issue of *Thorax*.

PETER BARNES
PHILIP IND
MORRIS BROWN

Department of Respiratory Medicine
Hammersmith Hospital,
and Department of Clinical Pharmacology
Postgraduate Medical School
London

Sir,—I fully agree that radioenzymatic assay is more sensitive and specific in measuring plasma catecholamines than the fluorimetric method. Moreover, much less blood is needed. We would have used it if it had been available. Nevertheless I would not agree that the method in question is inadequate for such measurements. Sensitivity of the fluorimetric method is sufficient for plasma measurements if a large sample of plasma is used and measurement procedures are meticulously performed (Jiang *et al*, *Mayo Clin Proc* 1976; **51**:112). Some authors have reported comparable values of plasma catecholamines using both fluorimetric and radioenzymatic methods (Miura *et al*, *J Lab Clin Med* 1977; **89**:421, Campese *et al*, *J Lab Clin Med* 1980; **95**:927). In the papers to which we referred to in our paper, plasma catecholamines were determined using the fluorimetric method. We were not especially interested in basal values which vary depending on the time of the day and can increase in anticipation of muscular exercise (Mason *et al*, *Psych Med* 1973; **35**:406). We were interested in changes of adrenaline and noradrenaline levels in plasma brought about by physical exercise in three different groups of subjects. For that specific purpose I would find our methods satisfactory.

JAN ZIELIŃSKI
Department of Medicine
Institute of Tuberculosis
Warszawa