SMR FOR CANCER MORTALITY IN UMHAUSEN (WESTERN TYROL, AUSTRIA) FOR 1970–91

Carcinoma	Obs	Exp	SMR (95% CI)
Lung			
Male	31	12·1	2·55 (1·7–3·7)*
Female	19	2·1	8·86 (5·3–13·8)*
Both sexes	50	13·0	3·85 (2·9–5·1)*
Other			
Male	29	31·8	0·91 (0·6–1·3)
Female	31	32·3	0·96 (0·6–1·4)
Both sexes	60	63·8	0·94 (0·7–1·2)

*p < 0 05. Obs = observed, exp = expected

medians on the ground floors amounted to 1180 Bq/m³ (maximum 88 000 Bq/m³) in winter and 210 Bq/m³ (maximum 52 000 Bq/m³) in summer, compared with an average of 20 Bq/m³ in the UK.[4] In basements, the respective medians were higher by a factor of 2–3 than on the ground floor. The maximum amount measured was 274 000 Bq/m³.

Mortality data for 1970–91 were used to calculate age and sex standardised mortality rates (SMR) for 51 sites of carcinoma. The total population of Tyrol were controls. A significantly higher risk was recorded for lung cancer (table). The high SMR for lung cancer in female subjects is especially striking. Because case numbers were low for the other cancer sites, these were combined in one group to calculate the SMR. No significant increase in SMR was found for this group. The coincidence of unusually high indoor radon concentrations with high SMR for lung cancer, although highly conspicuous, is not proof of a causal relation. An analysis of confounding factors is in progress. Although scientific proof of an association between unusually high indoor radon concentrations and lung cancer is still outstanding, remedial measures have been initiated.

Institute of Medical Physics, University of Innsbruck, A-6020 Innsbruck, Austria — O. ENNEMOSER, W. AMBACH

Department of Radiation Protection and Nuclear Technology, Innsbruck — P. BRUNNER, P. SCHNEIDER

Cancer Registry of Tyrol, Innsbruck — W. OBERAIGNER

1. Hoppichler F. Indoor radon and lung cancer. *Lancet* 1992; **339:** 1405–06.
2. Forastiere F, Quiercia A, Cavariani F, Miceli M, Perucci CA, Axelson O. Cancer risk and radon exposure. *Lancet* 1992; **339:** 1115.
3. Eatough JP, Henshaw DL. Radon and prostate cancer. *Lancet* 1990; **335:** 1292.
4. Bowie C, Bowie SHU. Radon and health. *Lancet* 1991; **337:** 409–13.

ACE inhibitors for myocardial infarction and unstable angina

SIR,—We appreciate the considerable interest in our report (Nov 14, p 1173). In particular, we would clarify the issues raised by Dr Hall and colleagues (Dec 19/26, p 1547). They note an apparent discrepancy between the numbers of patients classified as having a fatal myocardial infarction (MI) in our two reports on mortality from the treatment trial[1] and prevention trial[2] compared with the detailed report on ischaemic events. In these reports, a fatal MI was identified when the principal investigator at each clinic or a death certificate identified the cause of death as having been due to MI. In analysing the data for the latter report we noted that in a few instances, a patient may have had an MI and died within a few days but the cause of death was identified as being due to pump failure or arrhythmias. To have a consistent separation between fatal and non-fatal MI, we arbitrarily separated all deaths within 7 days for an MI as fatal and the remainder as non-fatal events. Irrespective of these distinctions between fatal and non-fatal MI, the total number of MI in each of the two randomised groups is unchanged. Moreover, the difference between enalapril and placebo groups in the number of fatal MI by either definition is almost identical (difference in combined trials based on the *New England Journal of Medicine* articles is 19, and on the *Lancet* article, difference is 18), indicating the robustness of our results.

The numbers of deaths during the placebo run-in phase, which averaged 15 days, was 34 in 7092 patients (0·22% per week), compared with 4 deaths during the active run-in phase, which averaged 6 days in 7402 patients (0·06% per week). These data provide no evidence of early harm by the use of enalapril.

The issues raised by Dr Chaudhary and colleagues and by Dr Cruickshank (Dec 19/26, p 1547) warrant further studies of the effect of angiotensin-converting enzyme inhibitors in other high risk populations without low ejection fraction and heart failure. These studies should be ideally complemented by detailed mechanistic studies (eg, angiographic or ultrasound assessments of atherosclerosis) so that the generalisability of intriguing findings of reductions in MI and unstable angina can be assessed.

Department of Cardiology, McMaster University, Hamilton, Ontario, Canada; Robertwood Johnson Medical School, New Brunswick, New Jersey, USA; and Division of Cardiology, University of Michigan Medical Centre, Ann Arbor, Michigan

SALIM YUSUF
JOHN B. KOSTIS
BERTRAM PITT,
on behalf of the SOLVD Investigators

1. The SOLVD Investigators. Effect of enalapril on survival in patients with reduced left ventricular ejection fractions and congestive heart failure. *N Engl J Med* 1991; **325:** 293–301.
2. The SOLVD Investigators. Effect of enalapril on mortality and the development of heart failure in asymptomatic patients with reduced left ventricular ejection fractions. *N Engl J Med* 1992; **327:** 685–91.

Phosphocreatine turnover and pH balance in forearm muscle of patients with syndrome X

SIR,—Syndrome X might encompass several pathophysiological entities.[1] However, data on obvious restriction of flow is lacking and because perfusion disorders of skeletal muscle are unlikely, we speculate that an inherent metabolic defect could explain the low energy charge. Our first results derived from muscle biopsy specimens.[2] To get in-vivo data, we investigated skeletal muscle oxidative performance by ^{31}P nuclear magnetic resonance (NMR) spectroscopy of the forearm at rest and during exercise and recovery from exercise. In-vivo ^{31}P-NMR spectroscopy allows following the changes in phosphorus metabolite levels and intracellular pH in human skeletal muscle non-invaseively.[3]

We investigated 2 patients with syndrome X in a series of 7 in which myocardial and skeletal muscle biopsy samples showed low energy charge.[2] The patients were chosen according to clinical presentation, 1 having heavy symptoms with angina and the other being clinically less severe. 8 informed, healthy/untrained, male volunteers aged 24–51 years acted as controls. NMR spectroscopy was done on a Bruker Biospec 24/30 with a 2·35 T magnet, giving an operating frequency of 40·55 MHz for ^{31}P nuclei. The ^{31}P-NMR spectra from the forearm muscles were acquired by accumulating 128 FIDs with a repetition rate of 1 s and a radio frequency pulse length of 125 μs (70° flip angle). During exercise and recovery, spectra were collected continuously after the completion of 4 scans. The phosphocreatine (PCr), inorganic phosphate (Pi), phosphomonoesters (PME), and the α, β, γ-ATP resonances were identified from their chemical shifts and calculated.[4] Spectra from the patients were obtained at rest, during 12 min of exercise, and during 12 min of recovery. Exercise involved handgrip training equipment equilibrated to 100 N and each subject worked at 20% of his own maximum capacity. Myocardial biopsy specimens from the 2 patients displayed low energy charge values (0·56 and 0·59, respectively). Also, energy charge of skeletal muscle biopsy samples were abnormal (0·56 and 0·69, respectively).

Changes in PCr were followed continuously, spectroscopically, and expressed as PCr/(PCr + Pi). The initial resting values of the 2 patients and the controls for PCr and intracellular pH were similar. During exercise the rate of decrease of PCr and of pH was greater in patients than in controls (figure). PCr fell to 42% and 48% in the less severe patient, and to 58% (mean) of initial resting values in controls after 12 min of exercise. PCr resynthesis during post-exercise recovery was faster in controls. After exercise, pH was significantly lower in the patients (5·96 and 6·68, respectively) than