Letters to the Editors

(69) 57 and 74); it is also stated that when these reagents must be used the Chester Beattie Code of Practice should be rigidly followed.

I suggest that papers reporting studies in which these reagents are used should state that these are carcinogenic hydrocarbons. The chemical firms supplying these materials should indicate in their catalogues that these are carcinogenic hydrocarbons and that the Chester Beattie Code of Practice should be followed in their use.

SYLVIA W DAVIES
Department of Pathology,
St Catherine's Hospital,
Church Road,
Birkenhead,
Merseyside L42 0LQ

Reference

- ¹ *Safety in Pathology Laboratories*, Department of Health and Social Security 1972 Dd 908849 K200 5/72 (8967) HMSO, 1972;44.

Historic laboratory apparatus

The photograph shows a paraffin lamp; the coil-like objects on top are hollow, cone-shaped receptacles of copper which fit closely into one another. This paraffin lamp was found in an old laboratory in Valetta, Malta, where, at the beginning of this century, much of the research work that led to the discovery of the *Micrococcus melitensis* (now called *Brucella melitensis*)

in the blood of the goat took place under the aegis of the Commission for the Investigation of Mediterranean Fever.

Happily, this old laboratory has now been restored (25 June 1980) by the expert and devoted work of the eminent Maltese medical historian, Dr Paul Cassar, who would appreciate very much the views and suggestions of your readers as to what could possibly be the nature and uses of this ancient? DIY item of laboratory equipment.

ETHELWALD E VELLA
Colonel,
Royal Army Medical College,
Millbank,
London SW1P 4RJ

Stability of heparin in intravenous fluids

Administration of heparin by continuous intravenous infusions has been shown to be as effective as intermittent intravenous injection in the treatment of thromboembolism, but major bleeding is a more frequent complication with intermittent injection of heparin than with continuous infusion.^{1,2} Nevertheless, reports that heparin may be unstable in intravenous fluids continue to cast doubt on continuous infusion being the optimal method of administration. Jacobs *et al.*³ and Okuno and Nelson,⁴ using different assays of heparin, reported a loss of its potency in commonly used intravenous fluids, even within a few hours, and measurements with anti-Xa assay apparently showed

erratic behaviour. These observations require confirmation since they carry significant implications regarding heparin administration in the management of venous thromboembolism.

The stability of heparin in intravenous fluids has been re-examined using four assays which measure most known aspects of heparin activity. The activated partial thromboplastin time method, the protamine sulphate titration technique, the metachromatic assay, and an anti-Xa assay were used, and details of these methods have been reported previously.⁵ Heparin (mucous) from Allen and Hanburys (Glaxo Australia) batch No. 251324 (5000 units/ml) was used in these studies; 5 ml of heparin was added to 1 litre glass bottles of saline, 5% dextrose (Abbott Laboratories), and Hartmann's solution (Travenol Laboratories). It was found that the initial volume of fluid in these bottles ranged from 1001 to 1069 ml (± 1 ml). Thus the final concentration of heparin was 24 ± 1 units/ml. The bottles were stored at room temperature ($22 \pm 2^\circ\text{C}$), and samples were removed with a syringe as required.

As can be seen from the Table, no loss was detected in the potency of heparin in intravenous fluids for up to 24 hours by either the chemical or biological assays. Contrary to the suggestion of Okuno and Nelson,⁴ sensitivity of the method of assay was found to have no relation to the stability of heparin. In a separate series of experiments, the pH was monitored continuously with a strip-chart recorder connected to a Radiometer PHM61 pH meter

Potency of heparin in intravenous fluids with time as a percentage of the initial potency

Intravenous fluid	pH after heparin addition	Time after heparin addition (hours)	Anti-Xa assay	Protamine sulphate titration	Metachromatic assay	APTT
Hartmann's solution	5.92	0	100	100	100	100
		3	103	100	104	102
		6	104	100	97	98
		24	104	100	100	98
Saline	5.40	0	100	100	100	100
		3	98	100	96	101
		6	104	100	100	103
		24	101	100	102	102
5% Dextrose	5.95	0	100	100	100	100
		3	94	100	102	101
		6	97	100	99	97
		24	100	100	100	95

Results are the mean of six measurements. The pH of the final mixture did not show a change with time.