suggests that the herpes infection during her illness was not primary but a reactivation of a latent virus.

The precise association of this herpes simplex infection to her cardiomyopathy is uncertain. As herpes simplex is an "opportunistic" virus it may well have been a secondary manifestation. Moreover, herpes simplex infection has not been found in association with myocardial involvement, either in our own laboratory experience or to my knowledge by other workers. However, it seems possible that primary infection or reactivation of a latent herpes simplex infection during pregnancy may cause cardiomyopathy. This possibility seems worth investigating by serological tests in other cases of cardiomyopathy of pregnancy.—

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Infusion of Liver Tumours

SIR,—We read with interest the leading article on infusion of liver tumours (10 August, p. 329), as well as the article by Mr. J. L. Provan and others (10 August, p. 346). We agree that "some of these questions may be answered more readily in countries where malignant hepatoma is commoner. . . ." We have now treated 20 patients in this way.

Controlled therapeutic trials on the treatment of primary hepatoma in the Bantu have been in progress at the City Deep Mine Hospital in Johannesburg for several years.[1–3] One hundred and ninety patients with hepatoma have been studied. Systemic cancer chemotherapy using many well-tried preparations, radiotherapy, and radiotherapy plus chemotherapy have been disappointing. There has, however, been extended survival time in all treatment groups as compared with vitamin C-treated randomized controls. One of us (G. F.) treated an additional 103 patients with primary liver cancer with various cytotoxic drugs with equally poor results. Our technique of liver infusion has been based on that of Sullivan and Watkins.[4,5] We use the Watkins Chronofusor by choice as the most accurate infusor apparatus available. Heath Robinson methods such as suspending a Vacolitre by a hook from the ceiling, besides being dangerous (air embolism), are a trial to patients, doctors, and nursing staff. Even the Bowman pump is not without danger, and the patient must be confined to bed. The Fenwall apparatus is better, since all air can be expelled from the plastic bag when filling it with infusate, and it is light and portable although rather bulky. But the patient certainly cannot go to work wearing apparatus such as this.

Since surgery has its limitations, hepatic artery infusion is the logical route to try next. An angiogram is a prerequisite. Even with the aid of an angiogram and even when the hepatic artery is catheterized selectively, there is a lack of specific regional infusion in the liver. In Bantu patients with malignant hepatoma the liver is hard and friable, and its size obstructs surgical approach to the artery through the lesser omentum. Catheterizing the right gastro-epiploic artery is, however, a simple matter. The right gastric artery is ligated to prevent infusate reaching the stomach. Disulphine blue dye injected through the catheter shows where the infusate will go. Brachial artery and femoral artery catheterization do not provide the essential information. A Teflon catheter can be left in for many months. Many repeat courses of treatment can be given, alternating with sterile water, or the end of the catheter may be occluded and reopened at will, simply by forcible injection of saline in a syringe.

Regarding the question of choice of drug, the answer will be forthcoming from careful documentation of all data. At the present time methotrexate given intra-arterially gives the best response in our series. Dosage schedules and duration of treatment must be compared and correlated against results in terms of useful life. From such data the best schedule for adequate trial of therapy for malignant hepatoma can be worked out. The time has passed when a single case report or reports on groups of two or three patients are adequate.—We are, etc.,

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Streptomycin and C.S.F. Sugar

SIR,—In the bacterial meningitides the cerebrospinal fluid cell count and sugar concentration are the most useful indices of the effectiveness of therapy. However, Brain[1] observed that measurements of C.S.F. sugar were unreliable in tuberculous meningitis treated with intrathecal streptomycin. This observation was made before the glucose oxidase method for measuring glucose became available. We have investigated therefore the effect of streptomycin on the level of C.S.F. sugar estimated by glucose oxidase and ferricyanide methods. Preliminary experiments showed that in 18 specimens of C.S.F. the addition of streptomycin to a concentration of 100 mg./100 ml. caused an apparent rise of 22% of C.S.F. sugar measured by an AutoAnalyzer modification of the Hoffman[2] ferricyanide method, while in 10 specimens assayed by a glucose oxidase method[3] the addition of streptomycin did not alter the C.S.F. sugar concentration.

Samples of C.S.F. from 15 patients were collected into fluoride-oxalate tubes in the course of routine investigations for a variety of neurological diseases. No patient had a meningitic illness. Two aliquots of 2 ml. were taken from each specimen, and to one was added 2 mg. of streptomycin sulphate in 0.2 ml. of solution. The sugar concentration in each aliquot was analysed by a glucose oxidase method,[4] by the AutoAnalyzer modification of Hoffman's method,[2] and by a manual ferricyanide method.[5] The mean sugar concentration (± standard deviation) measured by each technique is shown in the Table.

After allowing for dilution, the mean C.S.F. sugar concentration by the AutoAnalyzer method was 26% higher in the streptomycin-containing aliquots than in the controls, and this difference was statistically highly significant. Though streptomycin produced a small rise of 4.9% in the mean sugar concentration measured by a manual ferricyanide method, neither with this nor with a glucose oxidase method was the change statistically significant.

Streptomycin is a compound of streptidine and a disaccharide, streptobiosamine.[6] However, the chemistry of oxidation of streptomycin by ferricyanide is more complex than the simple oxidation of this disaccharide, for the exact experimental conditions alter the result. With the AutoAnalyzer method one mole of glucose is approximately equivalent to three moles of streptomycin. The quantity of streptomycin added to the aliquots was chosen to produce a concentration in the C.S.F. of about twice the maximum expected after an intrathecal injection of 50 mg. of streptomycin. It is concluded that the C.S.F. sugar concentration can be used as an index of the activity of the disease during the intrathecal treatment of tuberculous meningitis with streptomycin provided that a glucose oxidase assay method is used.—We are, etc.,

	AutoAnalyzer Ferricyanide Method	Manual Ferricyanide Method	Glucose Oxidase Method
C.S.F. Mean sugar concentration, mg./100 ml.	71·5 ± 8·1*	83·8 ± 10·2†	68·7 ± 10·6†
C.S.F. and Strept. Mean sugar concentration, mg./100 ml.	82·3 ± 12·2	79·9 ± 13·0	62·6 ± 10·8
C.S.F. and Strept. Corrected for dilution. Mean sugar concentration, mg./100 ml.	90·7 ± 13·3*	87·9 ± 13·8†	68·9 ± 11·8†
Change due to streptomycin	+26·6%	+4·9%	+0·3%

* $P < 0.0005$. † Not significant.

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