management of patients with terminal renal failure now that methods for supporting life are available is greatly facilitated by the support of the clinical biochemistry department.

Whether it is decided to treat an individual patient with long-term intermittent dialysis or renal transplantation, it is generally important to be able to define fairly accurately the aetiology of the renal disease for it may well have an important bearing on the long-term prognosis. A comprehensive assessment of the patient therefore invariably includes biochemical tests of renal function, so that response to treatment can subsequently be monitored.

Renal transplantation is not performed nowadays until the patient has been adequately prepared by dialysis, sources of infection eradicated, and hypertension controlled.

After cadaveric renal transplantation most of our patients enter a dangerous phase of oliguric renal failure—this is usually due to ischaemic tubular necrosis (ATN). During this period the patient continues on dialysis but we have no certain way of differentiating between ATN, infarction, ureteric obstruction or rejection, short of taking a biopsy.

After two to three weeks the patient enters a diuretic phase, and care needs to be taken to avoid excessive fluid and electrolyte losses. It is here that biochemical help becomes important. Once renal function stabilizes, long-term follow up is necessary in order to identify deterioration in function from whatever cause. Late rejection is notoriousy unresponsive to conventional treatment regimes but if patients are to survive to receive further grafts, long-term surveillance is obligatory.

Microbiological Aspects of Transplantation: Viruses

J. NAGINGTON (*Public Health Laboratory, Cambridge*) The virus infections associated with transplantation are important for the patient and have provided information, through immunosuppression, on some aspects of the host-parasite relationship.

Virological surveillance at the Cambridge Renal Unit was begun with the first transplant in 1966 and the number of patients transplanted by the end of 1972 was 181. The observations made are in agreement with those made elsewhere and have provided illustrations of some of the problems.

Over 90% of the viruses isolated have been of the *Herpesvirus* group, ie, herpes simplex, varicella-zoster, and cytomegalovirus. The type of infection has varied from cold sores to fatal haemorrhagic chickenpox.

No increased infection rate of common respiratory virus infections was seen and antibody production against these and rubella was normal, which supports the contention that present immunosuppressive therapy does not reduce this immune response. Because immunosuppression is directed against the cell-mediated or delayed hypersensitivity response it is likely that the infections seen were related to this.

The *Herpesvirus* group is associated with persistent latent infection which makes reactivation an important possibility and this is supported by the occurrence of 60% of all herpes simplex infections within two months of transplantation. At least 64% of patients were considered to have been infected with cytomegalovirus at some time before admission and 86% showed active infection afterwards. However, the part played by increased susceptibility and cross-infection cannot so far be determined.

The severity of serum hepatitis infections has also been related to the cell-mediated immune response in the hypothesis of Dudley, Fox, and Sherlock (1972) and although our experience has fortunately been limited, the observations made are consistent with this hypothesis.

Reference

Dudley, F. J., Fox, R. A., and Sherlock, S. (1972). *Lancet*, **1**, 723.

Experience of Processing Results for Quality Control Off Line

P. C. TAYLOR AND A. B. CARTER (*Middlesex Hospital, London*) The concept of quality control using analysis of results from patients' blood counts is dependent upon day-to-day consistency in the type of patients whose blood samples are counted. Only when this is true can calibration changes be accurately shown by parallel changes in the analysed test results.

We have found detectable variations from day to day in average, median, or modal values of the leucocyte count, haemoglobin, red cell count, and the calculated haematocrit obtained from the patients' blood samples, and at our hospital have been unable to find any method for analysing patients' data usefully to detect small changes in the haemoglobin. However, small changes in the calibration of MCV, MCH, and MCHC are detectable and can be measured by examining patients' data. Each day approximately half of the 200 or so samples we receive have normal haemoglobin—13-16 g% and leucocyte counts less than 10 000/cmm; the mean values of the MCV, MCH, and MCHC of these 'normal' samples have remained constant over many years. Two per cent changes in calibration of Coulter S in respect of the red cell indices when they occur can be confidently detected and measured by examining patients' data.

Since 1969 we have used data processing of patients' results from the Coulter S for quality control

of red cell indices. When the haemoglobin is correctly calibrated using a reference whole blood sample, data processing will measure any change in the MCV, MCH, and MCHC and indirectly the red cell count and haematocrit. The means of parameters after calibrating the Coulter S using known standards have been calculated many times over the past three and a half years and the figures we obtain are as follows: MCV 90·0 fl, MCH 30·0 pg, MCHC 33·3 g/dl. The means, calculated daily, are compared with these figures and the Coulter S is recalibrated if the differences are greater than 2%. Recalibration is achieved by altering the incorrect parameter/s by the percentage difference between the two figures.

The data for analysis are punched onto paper tape together with patient identification using a teletype linked directly to the Coulter S by an Infotronics 85S interface. The paper tape is processed using the University of London IBM 360/65 computer which is programmed to exclude any control samples and calculate means and standard deviations on each parameter. The program is then re-cycled to exclude the entire data from any patient with one parameter greater than 2·5 standard deviations from the mean. The means of the MCV, MCH, and MCHC are taken as our calibration data, as these figures are derived from the Coulter printout, the mathematics of the Coulter are also checked by the program.

Using the identification data the computer is also programmed to print a list of results sorted alphabetically by the patient's name to facilitate answering telephone enquiries, and lists and analyses any control samples run throughout the day. Court, a plug-in addition to the Coulter S, manufactured by T & T Technology, also uses the means as a form of quality control, a built-in program performs means on all parameters within limits set by the user, excluding control samples and blank counts. We have used this system for a trial period of six months and found the system simpler to set up, in that no additional computer or program facilities are required, and provides data for quality control, but it is obviously less flexible and subject to conjecture as to which limits are set.