

Though the series surveyed is still small, it is apparent that most if not all cases of carcinoma *in situ* are detected, but that certain glandular cancers and an occasional invasive squamous cancer might be missed.

The present instrument provides a 30-parameter measurement output per field in just under one second but its logic circuitry is not entirely appropriate to malignant cell scanning. A new instrument, more purpose built, is being constructed so that rapid scanning of linear cell tracks on film strip is possible. It is estimated that a three minute scan of around 50,000 cells should be possible if the problem of cell presentation and suitable contrast training is achieved.

It is suggested that a test profile may be necessary to detect the endometrial and other invasive cancers by adding the 6-phosphogluconate-dehydrogenase enzyme test to the cell samples of all women over the 45-age group.

LABORATORY TESTS IN VIRAL HEPATITIS

PATRICIA E. TAYLOR, A. J. ZUCKERMAN, AND W. D. BRIGHTON (*London School of Hygiene and Tropical Medicine, and the National Institute for Medical Research, Hampstead Laboratories*) Increasing evidence suggests that the Australia antigen is closely related to, if not identical, with the agent responsible for viral hepatitis (Levene and Blumberg, 1969; London, Sutnick, and Blumberg, 1969). This antigen was first described in 1964 by Blumberg who found that sera from two multiply transfused haemophiliacs contains an antibody which reacted with the serum of an Australian aborigine in immunodiffusion tests to form a single precipitin line. The aboriginal antigen was first considered to be another example of a serum protein pleomorphism, but this view was later modified with the discovery of its association with leukaemia, Down's syndrome, and hepatitis (Blumberg, Gerstley, Hungerford, London, and Sutnick, 1967). Soon after Blumberg's report, Prince (1968) described a similar closely related if not identical antigen, the SH antigen, in the blood of transfused patients during the incubation period and early acute phase of post-transfusion hepatitis.

A modified two-dimensional immunodiffusion technique, complement fixation, and immune electron microscopy are being used at the London School of Hygiene and Tropical Medicine to study the epidemiological distribution and morphological characteristics of the antigen. For all three tests, indicator sera containing antibody to the Australia-SH antigen have generally been obtained from patients who have been presumably hyper-immunized by receiving multiple transfusions of blood or plasma, some of it containing the Australia-SH antigen. On occasion, antibody to the antigen has also been found in persons who have not been transfused but who have had subclinical contact with cases of viral hepatitis.

The technique used for immunodiffusion and the source of reference reagents have already been described (Zuckerman and Taylor, 1969). With this technique, antigen has been found in approximately 40% of adult patients with acute viral hepatitis. Detectable antibody has not been found in sera collected from these patients during convalescence. The presence of the antigen is

usually transient during the acute phase of the disease. However, fresh samples of serum collected in 1968 and 1969 from a blood donor who was identified in 1951 as a 'silent' carrier of the virus of serum hepatitis have been found to contain the antigen (Zuckerman and Taylor, 1969). This indicates that, on occasion, a long-term carrier state may develop. Furthermore, in two instances, both antigen and antibody have been present at the same time in the same specimen of serum.

A standard microtitre complement fixation system (Sever, 1962) is also being used for the detection of Australia-SH antigen. Preliminary results indicate that this technique is somewhat more sensitive than immunodiffusion. Very high antigen titres, up to 1:2,048 or more, are found. With some specimens, a prozone effect is noticeable.

Immune electron microscopic studies, carried out in collaboration with Mrs J. D. Almeida and Professor A. P. Waterson of the Royal Postgraduate Medical School, have revealed characteristic particles which correspond to the Australia-SH antigen (Almeida, Zuckerman, Taylor, and Waterson, 1969). The main antigenic constituent is a roughly spherical particle approximately 200 Å in diameter. A considerable degree of pleomorphism exists and many tubular and aberrant forms are seen. The tubular forms may extend up to several thousand Ångstroms in length, along which can be seen a periodicity of approximately 30 Å. The diameter of these tubular forms is approximately 200 Å.

In addition to the above studies, intensive efforts are being made to cultivate the responsible agent of viral hepatitis in tissue cultures of human embryonic liver, as primary cultures of differentiated parenchymal cells and as a continuous cell line made up principally of spindle-shaped cells. Cultures of tissue obtained from adult liver by percutaneous needle biopsy are also being used. In addition, immunofluorescent methods similar to those described by Millman, Zavatore, Gerstley, and Blumberg (1969) are being applied for the detection of antigen in hepatic cells obtained by needle biopsy of the liver from patients with the antigen in the serum. Future studies include the development of other serological methods, including passive haemagglutination and immunoelectrophoresis, for the study of the antigen.

REFERENCES

- Almeida, J. D., Zuckerman, A. J., Taylor, P. E., and Waterson, A. P. (1969). *Microbios*, 2, 117.
 Blumberg, B. S. (1964). *Bull. N.Y. Acad. Med.*, 40, 377.
 —, Gerstley, B. J. S., Hungerford, D. A., London, W. T., and Sutnick, A. I. (1967). *Ann. intern. Med.*, 66, 924.
 Levene, C., and Blumberg, B. S. (1969). *Nature (Lond.)*, 221, 195.
 London, W. T., Sutnick, A. I., and Blumberg, B. S. (1969). *Ann. intern. Med.*, 70, 55.
 Millman, I., Zavatore, V., Gerstley, B. J. S., and Blumberg, B. S. (1969). *Nature (Lond.)*, 222, 181.
 Prince, A. M. (1968). *Proc. nat. Acad. Sci.*, 60, 814.
 Sever, J. L. (1962). *J. Immunol.*, 88, 32.
 Zuckerman, A. J., and Taylor, P. E. (1969). *Nature (Lond.)*, 223, 81.

THE BACTERIOLOGY OF TRAVELLER'S DIARRHOEA

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