of this resistance may illuminate critical sites of the cell–carcinogen interaction.

Cells treated *in vitro* with N-methyl-N-nitrosourea, MNU, exhibited malignant transformation and were ten-fold more resistant to MNU toxicity than previously treated normal cells. Transformation and resistance were related and dose dependent. MNU resistant cells were twice as resistant to methyl methanesulphonate toxicity and ten-fold more resistant to the toxic effect of thymidine, compared with normal cells.

Resistance to MNU and thymidine could not be explained by reduced incorporation, as measured by the uptake of the respective radioactively labelled compound. The cross resistance suggested similar sites may be involved in MNU and thymidine toxicity. (Studies performed at the Paterson Laboratories, Christie Hospital, Manchester.)

INHIBITION OF THE EFFECTS OF METHYLCHOLANTHRENE BY VITAMIN A AND VITAMIN A ANALOGUES, Ilse Lasnitzki and De Witt S. Goodman, Strangeways Research Laboratory, Cambridge.

Retinol and retinoic acid have been shown to inhibit carcinogenesis *in vitro* and *in vivo* but their possible clinical use may be limited by their high toxicity. Vitamin A analogues without the biological properties of the natural vitamin may serve as substitutes. The influence of two analogues, α-retinoic acid and anhydroretinoic acid, on the effect of methylcholanthrene was examined in mouse prostates grown *in vitro* and compared with that of retinol and retinoic acid.

The carcinogen alone induced extensive epithelial hyperplasia and dysplasia. All four compounds, applied at various dose levels, were highly active in inhibiting this effect. At the highest concentration they almost totally suppressed the hyperplasia, at the lowest concentration retinoic acid and anhydroretinoic acid were the most effective inhibitors. Mechanisms involved in the antagonism have been investigated.

IMMUNOGENICITY OF EMBRYONIC ANTIGENS ASSOCIATED WITH CHEMICALLY INDUCED RAT TUMOURS, R. W. Baldwin and B. M. Vose, Cancer Research Laboratories, University of Nottingham.

Chemically induced rat hepatomata and sarcomata express neoantigens at the cell surface which are also detectable on mid-gestation rat embryo cells. These antigens are revealed by the cytotoxicity of serum and lymph node cells from multiparous female rats for embryo and tumour cells by serum from these animals. Since the multiparous rat becomes sensitized to these antigens, they are immunogenic when expressed on embryo cells in the pregnant host. Immunization of syngeneic rats with mid-gestation rat embryo cells failed, however, to elicit immunity to challenge with hepatomata or sarcomata. Also, lymphoid cells from multiparous rats were ineffective for adoptively transferring tumour immunity. These studies are discussed in connection with the view that the tumour specific rejection antigens on these tumours differ from the tumour associated embryonic antigens.

" WILD " TYPE ANTIGENS OF SARCOMATA INDUCED BY A NATURAL AMINE SARCOMA VIRUS (MSV-FBJ), David B. Jones and Michael Moore, Charles Salt Research Centre, The Robert Jones and Agnes Hunt Orthopaedic Hospital, Oswestry.

MSV-FBJ is a C-type murine oncornavirus which induces primitive mesenchymal sarcomata of long latency in mice. The agent was originally isolated from a spontaneous murine osteosarcoma and is of demonstrated " wild " type antigencity.

Transplantation rejection techniques have demonstrated a tumour associated antigen common to all cells transformed by MSV-FBJ and also present on cells infected with " wild " type Gross leukaemia virus. The specificity was absent from cells transformed by the " non-wild " type isolate MSV-Harvey (MSV-H).

Serum from mice immunized against MSV-FBJ sarcoma cells reacted in the indirect membrane immunofluorescence test with both MSV-FBJ sarcoma cells and Gross antigen bearing cells, but not with the membrane of MSV-H cells. Further, aged C57B1 serum specifically reactive with cellular rather than virion specificities of Gross virus infected cells reacted with MSV-FBJ sarcoma cells. Identification of antigens on the surface of MSV-FBJ sarcoma cells which were not also present on " wild " type antigen-bearing tumours could not be achieved by absorption techniques.

By complement fixation, murine oncornavirus group specific antigen was identified in crude extracts of MSV-FBJ sarcomata together with soluble antigens of type specificity.

The significance of these antigens in relation to those previously defined for "wild" type murine leukaemias will be discussed.

HOST IMMUNE RESPONSES IN B.C.G. THERAPY OF A RAT OSTEOSARCOMA, N. Lawrence and M. Moore, Charles Salt Research Centre, The Robert Jones and Agnes Hunt Orthopaedic Hospital, Oswestry.

The growth of syngeneic grafts of tumour cells is suppressed when cells are mixed with B.C.G. before inoculation, or if clinically established nodules are infiltrated with microorganisms. Theoretically, three types of processes operating individually or in combination might account for this phenomenon: (i) non-immune effects; (ii) B.C.G. immunity and (iii) tumour immunity.

In experiments performed with an immunogenic, chemically induced osteosarcoma, growth inhibition by B.C.G. was less effective in rats immunosuppressed by thymectomy and irradiation than in their immunocompetent counterparts. In the study of the respective roles of immunity to tumour and B.C.G., the differential radiosensitivity of primary and secondary immunity permitted the evaluation of the effect of immunity to one antigen on a second antigen, to which primary immunity had been prevented by interim irradiation.

Evidence will be presented to show that the host response to B.C.G. is essentially local and immunological. Tumour outgrowth from B.C.G. tumour cell inocula occurred with greater frequency in rats prevented from responding to tumour antigen than in normal recipients, suggesting that while local immune reactivity to B.C.G. is a necessary component of successful tumour growth inhibition, it is not invariably sufficient.

TUMOUR THERAPY IN DOGS USING B.C.G., L. N. Owen and D. E. Bostock, Department of Animal Pathology, School of Veterinary Medicine, University of Cambridge.

Experimental dogs have been injected intradermally, intravenously, intrathoracically and intraperitoneally with percutaneous B.C.G. vaccine (Glaxo).

Following i.v. injection a patchy interstitial pneumonia has been found with small granulomata in lungs and liver. There is lymph node hyperplasia. A small and transient rise in temperature occurs.

Dogs with osteosarcoma treated surgically or by x-irradiation have been injected i.v. with B.C.G. alone or B.C.G. and autologous tumour cells. Results are encouraging. Dogs with lymphosarcoma treated by chemotherapy and followed by intravenous B.C.G. alone have not responded well.

Two dogs, one lymphosarcoma and one osteosarcoma, had anaphylactic shock after the second B.C.G. injection and an antihistamine drug is now routinely given before the B.C.G.

IMMUNOLOGICAL MECHANISMS IN CONTROL OF MALIGNANT DISEASE, C. Bone and R. S. Camplejohn, Departments of Surgery and Pathology, University of Newcastle upon Tyne.

Cellular immune mechanisms have often been implicated as important factors in the restriction and control of neoplastic proliferation. A study was planned to investigate the relationship between cellular immunity, the rate of malignant cell proliferation and prognosis in 40 patients with carcinoma of the rectum.

Cellular immunity was measured by assessing the patients' delayed hypersensitivity responses to 2–4 dinitrochlorobenzene (DNCB). The proliferation rates of the rectal carcinomata and the mucosa from which they arose were measured using an *in vivo* stathmokinetic technique (Refsum and Berdal, *Tidskr. norske Laegeforen.*, 1968, **126.** 1224).

Each tumour was staged according to its size and evidence of lymphatic involvement or metastases. The patients' clinical progress was followed.

It was found that there was highly significant ($P > 0{\cdot}001$) relationship between competent cellular immunity and favourable prognosis. It was also found that the proliferation rate of the rectal carcinomata was only half that of the mucosa from which they arose and growth was due to a diminished cell loss.