

CANCER RESEARCH

THE annual report for 1943 of the director of the Imperial Cancer Research Fund* makes encouraging reading, not because any startling or dramatic results emerge, but because the problem continues to be assailed on sound scientific lines by a number of different methods which are fully co-ordinated. Dr. W. E. Gye reports that during the past year work has centred almost entirely on experiments relating to mammary cancer in mice, the induction of cancer with pure chemicals, the action of hormones on the pituitary body and on the prostate gland, and to chemotherapy.

As regards carcinogenesis, H. G. Crabtree's earlier work has shown that a series of halogen compounds, graded with respect to their power of checking cell-glycolysis, could retard the development of skin tumours induced by pure chemical substances. The halogen compounds used could also affect other chemical cell-mechanisms, in particular those involving the sulphhydryl group; for example, glutathione, enzymes containing sulphhydryl groups as active centres, or the normal synthesis of proteins with sulphur-containing amino-acids in their essential composition. Recent observations suggest that sulphur metabolism is a factor in the artificial induction of cancer; it may also assist in determining the occurrence of spontaneous mammary tumours in inbred strains of mice.

The general growth-inhibiting properties of many carcinogenic and non-carcinogenic hydrocarbons seem to be related to the depletion of sulphur-containing amino-acids which co-operate in their elimination. Experiments have been made on the effect of tumour induction when sulphur metabolism is disturbed. One method consisted in the application of bromobenzene to the skin. This substance in the organism is detoxicated by combining with cysteine and is then eliminated as a mercapturate. Crabtree has demonstrated the inhibiting effect of bromobenzene on the formation of skin tumours in mice by 3:4-benzopyrene. The earlier types used in these inhibiting experiments, by virtue of their mobile halogen atoms, can react with the sulphhydryl type with elimination of halogen acid, while the present type reacts by a coupled oxidation in which the relatively unreactive halogen remains as a constituent of the resulting mercapturate. This inhibition of tumour induction probably occurs with both types of compounds under conditions of localized sulphur deficiency, which suggests that sulphur metabolism is intimately concerned in the processes of chemical carcinogenesis.

Dr. B. D. Pullinger has continued her study of the Deelman phenomena, that is, the localization of tumours in scars and healing wounds. Her experiments indicate that trauma, as represented by excised wounds, has a slight stimulating action in increasing tumour incidence. Her work also suggests that the intervention of some specific carcinogenic chemical is necessary to stimulate or originate tumour growth, as well as the added non-specific action of trauma.

Cramer and Horning's work has shown that there is a reciprocal action between the sex organs and the pituitary body. Pursuing this work, Dr. Vaquez-Lopez has studied the effect of oestrinization in a number of species of animals. In the hamster, for

* Fortieth Annual Report, 1942-1943, of the Imperial Cancer Research Fund. Pp. 32. (London: Imperial Cancer Research Fund, 1943.)

example, when oestrogenic substances (oestradiol benzoate and diethylstilboestrol) were subcutaneously implanted, the epithelial cells of the pars intermedia of the pituitary body multiply and invade the posterior lobe, which consequently enlarges. The invasion often replaces the whole of the pars nervosa and may extend along the neurohypophysis to the brain. In mice a similar enlargement takes place in the anterior lobe of the pituitary body. This hormonal stimulus causes an extension of a normal process; it is an invasive phenomenon, not a new growth, for there is no defensive reaction of nerve tissue to the emigration of intermedia cells, such as occurs in the event of an invasion by alien cells. Long-continued treatment with oestrogens gives rise to profound changes not only in the organs of internal secretion, such as pituitary gland, the suprarenal glands and the islets of Langerhans in the pancreas, but also in the testis, the mammary gland and the prostate. This work, then, bears upon the enlargement of the prostate in old age and, possibly, its tendency to malignant disease. Horning is now investigating the effects of oestrinization on the prostatic glands of pure-line mice of high and low incidence of mammary cancer.

Interesting work has been done by Dr. R. J. Ludlow and Miss H. Barlow on tissue cultures. The cell characteristics of primary tumours, both spontaneous ones and those induced by oestrin and chemicals, have been studied, as well as the action of malignant and non-malignant cells on fibroblasts *in vitro*. The latter research leads to the conclusion that some product of the metabolism of growing epithelial cells stimulates the growth of fibroblasts.

Mammary cancer in inbred strains of mice, on which Bittner, Andervont, Little and W. S. Murray in America have recently done much work*, has been further studied by Dr. Ludford and Dr. L. Dmochowski, and Dr. Ludford and Miss Barlow have continued their work on chemotherapy.

Knowledge of cancer increases year by year, and this report is no mean contribution to a problem which is gradually emerging from obscurity.

* Bittner, *Trans. Stud. Coll. Phys.*, Philadelphia, 9, 129 (1941).

PROTECTIVE SYSTEMS FOR RURAL ELECTRICAL DISTRIBUTION

A SYMPOSIUM of four papers on this subject was presented before the Institution of Electrical Engineers in London on May 12. In the first paper, by D. C. Field on systems up to 33 kV., the general principles of protection are discussed, emphasis being laid on the importance of considering the prevention of faults as well as their isolation. From an analysis of the causes of interruptions, which shows that a large number are only transient, and from the special conditions pertaining to a rural system, it is concluded that it is preferable to restrict the number of points at which automatic protection is provided, in order to facilitate the rapid resumption of supply. The methods of protection adopted in one large rural area are briefly described, together with a summary of the experience gained in operating several classes of equipment, including arc-suppression coils, auto-reclose switches and fuse-gear.

The second paper, by O. Howarth, is confined to 11 kV. networks and consists of a description of the