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Medicine

CANCER

Studies of basic mechanisms concerned in immune responses and of the role of viruses in the causation of cancer continue to provide the most solid basis for advance in both the treatment and prevention of the disease.

Some of the most interesting new developments in this area have stemmed from the use of cell-fusion techniques by Henry Harris and his colleagues at Oxford. They reported the suppression of the malignant behaviour of a line of mouse cancer cells by fusing them (with the aid of the Sendai virus) to non-

malignant hamster-derived cells of the A9 line. Also reported was the suppression of histocompatibility antigens.

Empirical treatment of cancer with growth-inhibitory drugs has to some extent given way to attempts to treat cancer by boosting the body's supposed or actual immunological reaction to cancers arising within it. The relatively long survival period of a few recipients of transplanted organs, despite the prediction on theoretical grounds of early rejection of the transplant tissues, and the grave nature of cancer as a disease process, justified attempts by clinicians to treat cancer by methods not fully tested previously in laboratory animals. Georges Mathé and co-workers have claimed encouraging results in the treatment of leukemia by nonspecific stimulation of immunity by repeated BCG vaccination and other means. Others have met with less success in similar attempts. At present the large-scale treatment of cancer by transplantation surgery or nonspecific immunotherapy still seems unfeasible. The most specific form of immunotherapy entails the injection into the patient of lymphocytes from another animal that has been exposed to tumour tissue from the patient. Such lymphocytes may be specifically reactive against the cancer cells in question, and destroy them. At least four lymphocytes are needed to destroy one cancer cell, however, so that for immunotherapy of this kind to be effective most of the cancerous tissue in a patient must first be removed by surgery or destroyed by drugs or radiotherapy, leaving relatively few cells to be destroyed by the injected lymphocytes.

A sinister complication of the prolonged drug-induced or antilymphocyte serum-induced immunosuppression necessary if organs or tissues are to survive usefully after homograft transplantation is that otherwise suppressed virus-induced cancers may be permitted to grow. This is the most likely explanation for the raised incidence of reticulum-cell sarcoma among recipients of kidney transplants, as it is of the increased risk of development of polyoma virus-induced cancers in mice following treatment with antilymphocyte serum.

A report by D. L. Morton, R. A. Malmgren, and their colleagues suggested that osteogenic and some soft-tissue sarcomas share common antigens, and may be caused by viruses. Whether or not this is true, it is becoming increasingly clear both that viruses and chemical agents capable of inducing cancer are widespread in nature, and that a wide variety of agents, including drugs, other chemicals, and viruses, may impair immune responsiveness. These facts make it difficult to distinguish between carcinogens and cocarcinogens (*i.e.*, agents that enhance the effect of carcinogens), and they make more likely the possibility that cancer development is as dependent on exposure to cocarcinogenic factors (including immune suppressants) and on the capacity of the body to rid itself of abnormal cells or repair them as it is on exposure to true carcinogens.

Despite these changes in concept of cancer causation, the identification of dimethylnitrosamine (DMN), a potent carcinogen, in an alcoholic beverage consumed in a locality in Africa where cancer of the esophagus is prevalent may have opened a new chapter in our understanding of important causes of cancer in man. Nitrosamines, such as DMN, may be formed by the interaction of secondary amines and nitrites. Secondary amines are present in many foodstuffs so that the advisability of using nitrites for preserving

food has now come into question, as has their use as fertilizers and the safety of consuming foods naturally high in nitrate or nitrite content. Under present conditions, the abandonment of the use of nitrites to preserve meat products would greatly increase the risk of growth of *Clostridium botulinum* and consequently of rapidly fatal botulism. Nevertheless, if the presence of nitrosamines in nitrite-preserved foodstuffs is unequivocally demonstrated, there may have to be a complete revolution in food-preservative (especially meat- and cheese-preservative) methodology.

(F. J. C. R.)