

## CANCER—A BIOLOGICAL APPROACH\*

**T**HE understanding and control of cancer is the most urgent problem of medicine today. A marked increase in the absolute mortality from cancer has been demonstrated in various regions of the world. The incidence of the cancer of the lung has shown a ten-fold rise during the past few decades, while Leukæmia is another malignant condition whose phenomenal increase during the last ten years is causing grave concern.

The intense research on cancer, so far, has been heavily biased in two practical directions, viz., the early diagnosis of cancer and therapy by non-surgical means. Though these approaches are desirable from strictly utilitarian aspects, a clear picture of the process in terms of general biological concepts is an essential prerequisite for a rational study of carcinogenesis.

Cancer is growth of cells free from the normal control exercised by the organism as a whole. In the broad sense of the term, the change is a genetic one. Whether it represents a true somatic mutation, transfer of plasma genes, incorporation of a virus into a provirous state or some new concept yet to be formulated is a matter for investigation.

Though certain trends are discernible, the processes of normal control of cellular growth are still speculative. Effective controls vary greatly from one cell type to another. The pituitary control of the thyroid function provides one of the most clearly manifested feedback mechanisms in biological hormonal control. The first requirement for malignant growth is the loss of control mediated by physiological contact with adjacent cells. A significant proportion of the control of cellular reactions is intrinsic to the cells themselves. Cells of many types are constantly liberating 'self-markers' which are strongly suspected to be the specific agents of growth control and an interesting immunological theory of cancer has been built around this self-marker hypothesis. The loss of these markers is considered to be the primary determinant of malignancy.

The outstanding feature of recent work on transplantation has been the recognition that all populations of cancer cells are heterogeneous and are subject to the processes of mutation and selective survival. Mutation is as frequent in somatic cells as in germ cells. Development of malignancy is the result of successive muta-

tions occurring in cells capable of continued proliferation. There is a strong tendency for virologists to consider the theory of cancer as a parasitic disease due to infection of cells by extrinsic viruses, as representing simply one rather potent means by which what is functionally equivalent to a somatic mutation can be produced.

Mutation, whether occurring spontaneously, or under the influence of mutagenic agents is regarded as a random occurrence. There is now, however, a fairly long list of chemicals which can be called mutagenics. Certain polycyclic aromatic hydrocarbons, azo dyes, epoxides, some ethyleneimenes and nitrogen mustards have all been shown to be carcinogenic in nature. An impressive amount of statistical evidence has shown cigarette smoking and atmospheric pollution associated with urbanisation and industrialisation as factors for the increase in lung cancer and the polycyclic hydrocarbon 3:4 benzpyrene content of these has been incriminated as the carcinogenic chemical.

But the greatest danger to mankind, today, is the global dissemination of radioactive material. Ionizing radiations, whether from X-rays, atomic explosions or entry of radioactive material into the body, play a very significant role as mutagenic agents. One important aspect of somatic mutation theory of cancer is the way in which it brings into the same focus the two important harmful effects of ionizing radiation, carcinogenesis and genetic damage. Just as genetic damage may only become manifest in distant generations, so somatic damage may have no immediate effect but may lead to an accumulation of stock of mutant cells, all, one or more steps nearer the malignant change. There is no doubt that every type of ionizing radiation has a measurable mutagenic power and the effect is cumulative. It is impossible to say that any dose of radiation is harmless. Fully established chronic effect of the atom bomb explosion over Japan has been the development of leukaemia in survivors years later.

Grave are the implications of the inevitable increase in the use of nuclear power, by the wide distribution of radioactive isotopes, by the global concentration of fission products from test explosions of nuclear and thermonuclear weapons and in the release of radioactive waste products disposal.

If somatic mutation is the key to the understanding of cancer, since there is no conceivable

\* Based on the articles by Sir Macfarlane Burnet in the *British Medical Journal* 1957, April 6th and 13th.



way to induce a specific back-mutation, therapy along somatic-genetic lines is unthinkable. The chemotherapeutic approach based on physiological differences between the normal and the cancer cells suffers from the overwhelming intrinsic disadvantage that all anti-cancer drugs are also carcinogens.

There is little ground for optimism about

cancer. Somatic cells, being what they are, the impact of the environment must inexorably lead to the accumulation of mutant cells and the development of cancer. Unless all sources of mutagenic stimuli are controlled, no hope of decreasing the incidence of cancer can be visualised in the near future.

M. SIRSI.

## OBITUARY

### PROF. BASANT KUMAR DAS

**T**HE news of the death of Prof. B. K. Das on 6th April 1957, was received with deep regret by all who knew him. In the death of Prof. Das, India has lost a distinguished Zoologist of international repute. It is well known that Prof. Das was largely responsible for organising the Zoology Departments of the Calcutta and Hyderabad Universities.

Prof. Das was born on November 21, 1895, at Gangoor in Burdwan District. He was educated at the Government High School at Allahabad, and then at the Muir Central College, Allahabad, where he passed his M.Sc. in Zoology in 1918 standing first in the examination. In recognition of his merit and distinction in research he was awarded scholarships of the U.P. Government. In 1920 he was appointed Lecturer in Zoology at the Allahabad University, and, in 1923, he was awarded the U.P. State Scholarship for study abroad, and joined the Imperial College of Science and Technology, London, under the late Prof. E. W. MacBride, F.R.S. While at London University, he carried out researches on air-breathing fishes of India and obtained the D.Sc. Degree of the London University. On his return to India he was appointed Professor of Zoology of the

Calcutta University. After working there for five years he joined the Osmania University in 1932, where he continued as Professor of Zoology till he retired from service. After retirement he was closely associated with the organisation of the Fisheries Department in Hyderabad. Professor Das's researches on air-breathing fishes has received worldwide recognition. It was for this work that he was awarded the Huxley Memorial Prize in 1931. In 1935, he represented India at the International Zoological Congress held in Lisbon and was elected as one of their Vice-Presidents. In 1940, he was President of the Zoological Section of the Indian Science Congress held at Madras.

Prof. Das took immense interest in his students, both in regard to their scientific training as well as their personal welfare and was a source of great inspiration to them. His death is a great personal loss to all his students. Even after retirement from the University service, Prof. Das rendered immense help to research workers by giving guidance and technical help. He leaves behind his wife, two daughters, two brothers and a number of friends to bemoan his loss.

B. S. BHIMACHAR.

### INTERNATIONAL CONFERENCE ON RADIO-ISOTOPES IN SCIENTIFIC RESEARCH

**F**URTHER to our previous announcement (Curr. Sci., 1957, p. 131), we now officially learn that the above Conference, organised by UNESCO, will be held in the premises of the New Faculty of Medicine, 45, Rue des Saints-Peres, Paris, from 9th to 20th September 1957.

English and French will be the working languages of the Conference and the UNESCO Secretariat will provide simultaneous interpretations in both the languages. Speeches made by Russian and Spanish participants of the Conference will also be interpreted in English and French. Papers presented and summaries

of speeches made in languages other than English or French will be recorded in these two working languages only.

During this part of the year, when the weather will be usually fine in Paris, it would be difficult to find hostel accommodation unless reservations are made. Therefore, the participants are requested to correspond with UNESCO Radio-Isotopes Conference, 19 Avenue Kleber, Paris (16<sup>e</sup>), France, giving full particulars in block letters of their names, addresses, etc., so as to reach them on or before the 10th August 1957.