

The fourth scientific report, apart from an introduction, is restricted to three papers which bear directly upon the nature of cancer, and indirectly upon the genesis of some forms of the disease. The necessity for narrowing the field of inquiry was alluded to in the first annual report. This object has been advanced materially by the demonstration that the relation of each malignant new growth to the affected animal is an individual one, parallel to that obtaining between the organs of the body and the organism as a whole. More precise conceptions have been obtained of the influence of heredity in place of the indefinite and contradictory views previously current. Cellular alterations bridging over the differences between normal and cancerous cells have been demonstrated to take place in growths under continuous observation and under natural conditions. Taken together, these three advances indicate the direction in which further investigation can be profitably undertaken. In addition, these demonstrations are supported by most important new statistical information which has been made accessible in the last report of the Registrar-General.

#### *Statistics.*

It will be remembered that the policy pursued in regard to the statistical investigation of cancer has been to supplement the national statistics, and, if possible, to add to their utility by special inquiries, but not to endeavour to overlap or in any way to replace them. This policy has been dictated by the belief that the adequate investigation of most of the statistical features of cancer is best carried out by the Registrar-General's staff, since the data available for such a purpose do not exist outside of the national statistical office. It has been encouraged by the willingness with which the medical superintendents of statistics have collaborated with the Imperial Cancer Research Fund in supplementing and amplifying information calculated to assist purely pathological and experimental investigations. This collaboration and co-ordination, which does not exist in the case of organizations for the investigation of cancer in other countries, where independent statistical inquiries have been undertaken with the voluntary assistance of the medical profession, has been of the greatest importance in England and Wales by preventing profitless overlapping, and in effecting real advances in the accurate statistical knowledge of the incidence of cancer.

For several reasons it had long been desired that the reports of the Registrar-General should contain detailed information on the incidence of cancer in different parts of the body, and Dr. Tatham was able to make arrangements for obtaining this information at the outset of these investigations. The application of the law of age-incidence for cancer to short-lived as well as to long-lived animals reinforced the other reasons for obtaining it, and suggested that knowledge would be advanced by more detailed information about the age-incidence of cancer in the several organs of man as distinct from its dependence on the age-distribution of persons. It was anticipated that the data would be of both biological and statistical value, and the facts published by Dr. Stevenson in the last report of the Registrar-General illustrate that this hope has been fulfilled in several directions. The tabulation of the new data for the years 1901-9 has permitted an analysis of the figures recording the increase of deaths attributed to cancer, and bringing out the fact that the increase during this period is referable to certain anatomical regions and not to others. Thus, for males, the main increase falls on the alimentary tract, especially the stomach. The liver and gall-bladder and the skin show no, or only a slight, increase. For females, the increase, although it falls mainly on the alimentary tract (stomach and intestines), affects also the mamma, while the uterus, ovary, liver and gall-bladder, rectum and skin show little or no increase. It is also of importance that the recorded mortality from cancer of the generative organs has not increased at the same rate as that for other organs, and that most of the increases affect the higher age-periods predominantly.

For the first time it is fully demonstrated that it is wrong to make statements of a disquieting nature about the increase of cancer in general. In conjunction with other investigations means are afforded of determining, for parts of the body where the disease appears to be increasing, whether the increase is real or only apparent, and of ascertaining the casual factors peculiar to such parts. While it is evident that several of the differences brought out by the figures can be explained by more accurate diagnosis and by transference of the seat of the disease from the secondary to the primary situations, as illustrated—*e.g.*, by the relation revealed between cancer of the liver and gall-bladder and the alimentary tract—this may not account fully for other features. In particular, the increase recorded for the mamma in women, and the tongue in men, requires further study and elucidation.

Secondly, the analysis shows that the incidence is very unequally distributed among the several situations, and, indeed, that the whole curve of incidence may be different for different organs. A progressive increase up to the highest age-periods is characteristic of the face, lip, mouth, bladder, urethra, and breast only. The other organs show a distinct diminution in the highest age-periods; but it is not yet possible to determine whether this curve indicates a liability rising to a maximum followed by a diminution, or is merely the result of deaths being still ascribed to other causes in the case of cancer of internal organs in aged people. The proportion of total deaths ascribed to the ill-defined cause of old age is 65·6 per thousand, as compared with 65·7 for cancer, and it must be borne in mind that the increases recorded for cancer affect principally the higher age-periods, and that the average age of the population is increasing. Sufficient has been said to indicate how important are the problems which are solved or revealed by the improvement in the details given in the national statistics.

The study of the occurrence of cancer in mankind, and in domesticated animals in widely separated parts of the globe, has shown that the practice of peculiar customs (involving the subjection of particular parts of the body to chronic irritation) provokes the disease in situations and organs from which it is absent when these customs do not obtain. It is reasonable to suppose that the frequency of cancer would be diminished if such practices as the use of the kangri in Kashmir, the chewing of betel-nut, the eating of very hot rice in China were discontinued. It is also reasonable to assume that the introduction into England of these exotic customs would greatly increase the frequency of cancer in this country.

So definite is the evidence of the mediate causation of certain forms of cancer by chronic irritants that the possibility of variations in the cancer death-rate must be admitted as regards particular