our statesmanship, our economic system which are at fault when the abundance which is produced cannot be brought to the many who are in need of it. Social and political sciences and even economic science are no doubt applying themselves to this problem, and let us hope they will be able to remove it from an atmosphere of social prejudice and party bias to the calm, truth-seeking atmosphere of pure scientific investigation. Agricultural science can go forward fearlessly to increase knowledge in the good hope and belief that increased knowledge will be in itself a blessing.

Cancer Research in Great Britain

THE thirteenth annual report of the British Empire Cancer Campaign was presented at a meeting held at the House of Lords on November 23. The report gives an effective summary compiled by institutions and individuals of the greater part of British research on malignant disease. The field of cancer research may be divided into three parts : the origin of the disease ; the nature of malignant growths ; and the effect of treatment in alleviating or curing the disease. Investigations in man, in animals and in cells growing outside the body in tissue culture have been made in all three directions during the last year.

Attempts to understand the nature of the processes which cause cancer in man have been made by studying cancer mortality according to the organ in which it occurs in different districts and different occupations. Observations of this kind have in the past indicated that coal tar and certain lubricating oils might be carcinogenic and so lead eventually to the isolation of the pure carcinogenic compound, benzpyrene. Previous investigation into the mortality from cancer in different countries has shown surprising differences, such as the high incidence of liver cancer in the East and its comparative rarity in Europe. In Switzerland, cancer of the œsophagus is more frequent than in the rest of Europe. Dr. Stocks, of the General Register Office, has examined the geographical distribution of 522,251 deaths occurring between 1921 and 1930 from cancer in the counties of England and Wales. He has calculated the "actual mortality per cent of that expected from the distribution of population by age and class of district". The results are depicted in a series of maps. Some of the more outstanding differences are shown in the accompanying table.

Death from cancer of all sites is more common than would be expected in North Wales and unexpectedly rare in Radnor and East Suffolk. In Wales, gastric cancer is frequent, and Carnarvonshire accounts for more than twice the expected number of deaths, but lung cancer is rather infrequent. The results show resemblances between the distribution of œsophageal cancer and rectal cancer, while the distribution of gastric cancer is quite different. The distribution of the ratios for breast cancer is much more uniform than for any other type of cancer shown. It is as yet impossible to determine whether these differences are due to genetical factors, to geological or meteorological conditions, to the different diets and habits of people, or to the difference in accuracy of diagnosis.

Prof. E. L. and Mrs. Kennaway have computed the incidence of death from cancer of the lung and larynx in a large number of occupations, for the years 1921–32. During the period 1919–34 there was an eight-fold increase in the mortality from lung cancer. The cause of this increase has not been identified, but it does not appear to be due to urbanization as the relative increase among agricultural workers is only slightly less than among the total population. Workers exposed to coal gas and tar and those engaged in tobacco and metal grinding trades show high susceptibility, while coal miners, cotton spinners and agricultural workers have a low susceptibility to lung cancer. This latter finding is reflected in one of Dr. Stocks's maps. Mortality from cancer of the lung is less

DEVIATION OF ACTUAL MORTALITY FROM THAT EXPECTED FROM THE DISTRIBUTION OF POPULATION BY AGE AND CLASS OF DISTRICT.

	High Incidence	Low Incidence
All sites (males)	Flint, London, Huntingdon.	East Suffolk, Radnor.
All sites (females)	Anglesey, Merioneth.	Radnor.
Stomach (males)	Ely, Anglesey, Carnarvon, Denbigh, Merioneth, Montgomery, Pembroke.	East Suffolk.
Stomach (females)	Anglesey, Carnarvon, Denbigh, Merioneth, Pembroke.	West Sussex.
Œsophagus (males)	Berkshire.	Durham, Lincoln (Holland and Lindsey), Northumberland, Nottingham, Merioneth, Monmouth.
Skin (males)	Lincoln (Holland), Anglesey, Cardigan.	Gloucester, Carnarvon, Radnor.
Lung (males)	Hertford, London, Middlesex, Essex, Nottingham.	Berkshire, Cumberland, Devon, Dorset, Durham, Gloucester, Lincoln (Holland), Northampton, Suffolk, all Wales except Flint.

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than would be expected in agricultural areas and in the mining areas of South Wales, Cumberland and Durham.

Results obtained in studying the effect of X-rays and radium on malignant growths are reported from many centres in Great Britain, Australia and Canada. In treatment there has been a tendency to utilize deep X-ray therapy for lesions in which radium has previously been usually employed. An interesting development of X-ray technique is the use of the low-voltage (60,000 volt) tube advocated by Prof. H. Chaoul of Berlin. With this instrument the actual source of the X-rays can be placed within a few millimetres of the tissues. It is as yet too early to compare this with the older methods, but it should be advantageous in certain cases. The comparison of results obtained by different methods of therapy will be simplified by the adoption of a standard method of recording cancer cases in different hospitals. The value of such standard records is enhanced now that it is realized that accurate dosage is important for successful treatment. It is essential to protect the operators from stray radiation, and workers in some centres carry small charged condensers; the amount of discharge occurring in the condenser gives a measure of the radiation and acts as a warning or tell-tale to the therapist.

X-rays and radium are both able to produce tumours and also to destroy them. Dr. A. Haddow has found that several chemical agents which produce cancer when applied to animals also inhibit the growth of tumours. The inhibition appears to some extent specific for carcinogenic agents, although feebly-carcinogenic and non-carcinogenic compounds are sometimes inhibitory. Many non-carcinogenic compounds have no growth-inhibiting effect. Not only tumour growth but also body growth is decreased by treatment with carcinogenic hydrocarbons, and it is suggested that the carcinogenic action is the result of a restraining action rather than stimulating action on cell growth. The movement of the fluorescent carcinogenic hydrocarbons in the body has been observed in a darkened room under ultra-violet illumination by Dr. P. R. Peacock. He finds that colloidal particles of hydrocarbons are rapidly removed from the blood stream by the liver and then excreted into the intestine, dissolved in bile. It is possible that the compounds are reabsorbed from the intestine into the blood stream.

The first known pure carcinogenic compound was 1 : 2 : 5 : 6-dibenzanthracene, and it is interesting to see how its molecular structure can be modified without destroying the biological activity, as shown by further work at the Royal Cancer Hospital. 1 : 2 : 5 : 6-dibenzfluorene, in which the 6-membered central ring is replaced by a 5-membered ring, is carcinogenic. 1 : 2 : 5 : 6-dibenzacridine and 3 : 4 : 5 : 6-dibenzacridine, in which one of the central carbon atoms of the original compound is replaced by nitrogen, are carcinogenic. While 1 : 2 : 5 : 6-dibenzanthracene is much more active than the 1 : 2 : 7 : 8- (or 3 : 4 : 5 : 6-) compound, 3 : 4 : 5 : 6-dibenzacridine is much more active than 1 : 2 : 5 : 6-dibenzacridine. If two carbon atoms are replaced by nitrogen as in 1 : 2 : 5 : 6-dibenzphenazine the activity disappears. Other new carcinogenic compounds are 1 : 2 : 5 : 6-dibenzcarbazole and 3 : 4 : 5 : 6-dibenzcarbazole, which may be considered as dibenzfluorene compounds with one nitrogen in place of one central carbon atom. These compounds resemble the acridine derivatives in that greater activity is associated with the 3 : 4 : 5 : 6-configuration. Painting of mice with 3 : 4 : 5 : 6-dibenzcarbazole produces epitheliomata on the skin and proliferation of the bile ducts, and nodules resembling hepatoma in the liver.

Some derivatives of 1 : 2 : 5 : 6-dibenzanthracene have considerable œstrogenic activity. Profs. Cook and Dodds and Dr. Lawson have shown that 9 : 10-dihydroxy-9 : 10-di-*n*-propyl-9 : 10-dihydro-1 : 2 : 5 : 6-dibenzanthracene can fully reproduce almost all the biological effects that are known to be produced by the natural hormone œstrone. New compounds have now been tested which have œstrogenic activity but do not contain the phenanthrene nucleus. The most active of these new substances appears to be 1 : 2-dihydroxy-1 : 2-di-α-naphthylacenaphthene and the simplest compound known to have œstrogenic activity is 4 : 4′-dihydroxy diphenyl.

Further work on the relation of ovarian hormones to cancer is reported. Mr. Burrows obtained mammary tumours in castrated male mice which were painted with a benzene solution of œstrone. Dr. Bonser has compared the reaction of male mice of two pure strains to painting with œstrone. In one agouti strain, in which spontaneous mammary cancer never occurs, there was widespread generalized growth with production of acini but no production of mammary cancer. In an albino strain, the females of which often develop mammary cancer, the males treated with œstrone showed a more localized acinar development, and this was associated with the development of mammary carcinoma. The results show how reaction to œstrone is dependent on the ancestry of the animals used, and also how the two factors, heredity and environment, are concerned in the origin of malignant disease. There is little doubt that when we can fully account for the distribution of human cancer in terms of these factors, we shall be near to the solution of the problem of the prevention of the disease.

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