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Medical Research in Great Britain.[1]

THE Report of the Medical Research Council for the year 1923–24 to the Committee of the Privy Council for Medical Research consists for the most part of a condensed epitome of the results already achieved during the year by research workers wholly or in part financed by the Council. The large number and great variety of the researches undertaken make it impossible to refer to them individually in this article. Mention will, therefore, be made of a few subjects only which, either from the completeness of the issue arrived at or from the interest of the results obtained at the present stage of the inquiry, force themselves upon the attention.

Results of far-reaching importance are being achieved by the committee appointed under the chairmanship of Prof. J. Barcroft to investigate the properties of hæmoglobin ; and a paper on the correlation between the spectra of various hæmoglobins and their relative affinities for oxygen and carbon monoxide has recently been published from Prof. Barcroft's laboratory in Cambridge. Using the Hartridge reversion spectroscope, it was found that a relationship existed between variations in the gas-binding affinities of different hæmoglobins and in the character of the α-bands. These variations appear to be conferred on the hæmoglobin by differences in the protein part of the molecule.

That light was a potent means of disturbing the equilibrium between hæmoglobin, carbon monoxide, and oxygen was confirmed by the investigators engaged in this research, and its action on other biological processes is being intensively studied by many workers at the present time. It has been found that the bactericidal power of blood is raised by exposing the skin of the subject to ultra-violet radiation, the exposure causing in some obscure manner a greater avidity of the leucocytes for the organisms with which they come in contact. This result may be related to the now well-known beneficial action of sunlight in tuberculous infection in man, an action which is being demonstrated with such success by Rollier at Leysin and by Gauvain in Great Britain.

It is not alone in its power of increasing the resistance of individuals to microbic infection that light is being exploited in research schemes at the present time. Rapid progress is being made in the elucidation of the relation between irradiation and dietetic deficiency. It had previously been shown that exposure of rats fed on a diet deficient in fat-soluble vitamins to ultra-violet radiation was capable of bringing about normal growth. This effect was found to persist if the containers in which the animals lived were irradiated, and the result was interpreted as pointing to some property

[1] Committee of the Privy Council for Medical Research. Report of the Medical Research Council for the year 1923–1924. Pp. 142. (London: H.M. Stationery Office, 1924.) 3s. 6d. net.

conferred by the ultra-violet light on the air in the immediate environment. Independent experimentation, however, failed to confirm this; and quite recently the original observers of the phenomenon have come to the conclusion that the positive results obtained by them were due to the presence of sawdust in the glass containers during the period of irradiation. When a piece of deal board was substituted for the dust an intermediate rate of growth was found. No precautions were taken to prevent the animals consuming some of the sawdust or gnawing away pieces of the irradiated board; but experiments at present in progress suggest that actual ingestion of the irradiated material is not essential for its beneficial action.

This result, if confirmed, is clearly one of fundamental and far-reaching importance. In the experiments referred to, the values for calcification of the bones were found to follow those of growth very closely. Whatever the nature of the emanations from these materials after exposure to ultra-violet light may happen to be, it is clear that a whole new field for research is rapidly opening up. What substances are capable of "phosphorescing" in this manner? Is vitamin A, the origin of which we know to be absolutely dependent on sunlight, a substance in which the power of absorbing ultra-violet light and converting this energy into a form of emanation having a potent effect in controlling the vital processes of growth and calcification, and is it developed to an extreme degree?

The Standards Department of the National Institute for Medical Research has now practically completed the work involved in the preparation of a stable dry standard of insulin. The Toronto unit will be defined in terms of this standard, which should then serve "as a currency for its transmission to all countries."

Much work is in progress on the nature and location of the action of insulin, when injected into animals, in causing the well-recognised fall in the blood sugar concentration. It had previously been shown by two Canadian physiologists that the isolated mammalian heart perfused with Locke's solution caused a fall in the sugar content of the perfusate, and that this fall was accentuated by the addition of insulin. The destiny of this extra quantity of sugar which disappeared remained, however, obscure. The question has recently been reinvestigated at the National Institute for Medical Research. Determination of the quantity of sugar disappearing in a given time, and the amount of carbon dioxide produced by the heart during the same period, have shown that in the absence of insulin there is a yield of carbon dioxide greater than can be accounted for solely by the combustion of the glucose removed. In the presence of insulin, however, the reverse is the case.

It is certain, therefore, that under the latter conditions part of the sugar is not oxidised, and at the present time the form into which the sugar has been changed remains obscure. It has been possible, however, to exclude certain hypotheses, such as that of the transformation of some of the sugar into fat, from a study of the respiratory quotient of the decapitated and eviscerated animal under constant infusion of dextrose. In such a preparation, insulin causes the characteristic fall in blood sugar, even when the muscles are inactivated by curare, without any change in the respiratory quotient which remains throughout at unity. Immediate transformation of the sugar into fat, or into lactic acid, seems therefore to be definitely excluded. Furthermore, investigations at Cambridge have shown that the heat production of isolated frog's muscle is unaffected by the presence in the surrounding fluid of relatively large concentrations of insulin. Recent work, too, on the sugar consumption of the heart-lung preparation has failed to show an increase in the rate of disappearance of this substance from the circulating blood on the addition of insulin. Insulin apparently is essential at some stage on the anabolic ladder of glycogen formation, though it will be clear from the foregoing account that we are still ignorant of the intimate nature of its action.

Studies of the excess metabolism of muscular exercise in man over and above the resting level have shown that this, provided the exercise is short-lived, has a respiratory quotient of unity. Experimental evidence all tends towards the conclusion that muscle is capable of metabolising directly carbohydrate alone.

It will be apparent from the few foregoing examples of work which is being pursued in the physiological and biochemical laboratories of Great Britain, that these two sciences are extremely virile and rich in productive effort. Turning to experimental medicine and clinical research, we find that here again much progress is recorded and "the Council are of opinion that during the past five years these University clinics have wholly justified their foundation by their success." Where the material for research is human, it is unavoidable that advance should be slower than in the sciences contributing to medicine. Furthermore, we must remember that the staffs of the medical and surgical units of the London hospitals are not in a position officially to exercise their option as to the type of case admitted to their wards any more than their colleagues on the remaining hospital "firms."

For teaching purposes this is no doubt an advantage, but it must inevitably break any attempt at co-ordinated research into the mechanism of the disturbances which culminate in disease. The first effective trial unit made by the Medical Research Committee, namely, the

Cardiac Department of University College Hospital Medical School, has more than justified its existence. This unit is unique in that it is engaged in an intensive study of the physiology, pathology, and nosology of one system only; a fact which is probably not unrelated to the richness of its scientific produce. The conception of "capillary pulsation" as a sign primarily of high pulse pressure, and in consequence a common accompaniment of aortic insufficiency, has been shown to be erroneous, the main causative factor of the phenomenon being a "widening of the arterioles of the skin or mucous membrane in which it occurs." The capillaries of the human skin have been shown to be capable of exerting relatively high pressures (from 50 to 100 mm. of mercury) when they are stimulated to contract by light stroking of the skin. Injury to the skin, on the other hand, leads to a train of vascular changes—dilatation and increased permeability of the minute vessels—which is conditioned by the liberation from the injured cells of a substance akin to histamine. To quote from an original paper,

"from the simple reactions of a healthy skin to the relatively mild stimuli such as are experienced daily by almost all; through the more serious, though trivial, local injuries, the bruise, the blister and the small scald, which find their simple household remedies; to the most grave mechanical injuries and extensive burns which in their late manifestations endanger life, we pass by transition. It begins to be apparent why this transition is throughout a transition of quantity and not of quality; for underlying the whole series of reactions there is seemingly one chief determining cause, the unvarying reply of the affected cell to injury; this response of the cell, protective as it is to the cell itself, when united with that of neighbours, produces a massive action, threatening or terminating the life of the organism as a whole; an example which is not the sole example of conflict between the cell and the community of which it is a member."

In the introductory review by the Council of its second quinquennium, attention is directed to the unsatisfactory position and progress of pathology and bacteriology. It is pointed out that in Great Britain this is in part due to the "accidents of historical circumstances," but that "in all countries bacteriology is halting for more intimate knowledge of the infective organisms and of their biochemistry, while pathology only shows promise of advance in so far as it proceeds as a study of the reactions of the body to disturbance, as a part indeed of physiology, and in so far as it can express its phenomena in terms of biochemistry."

The munificent benefactions which these two sciences have recently received at the Universities of Oxford and Cambridge through the generosity of the Dunn Trustees, the Rockefeller Foundation, and Mr. Ernest Gates, coupled with their full recognition by the universities as being sciences laudable of pursuit, will, however, doubtless raise their position rapidly and effectively to the level and productive capability of those sciences which are less directly concerned with the alleviation of human suffering.

It is impossible to read this Report of the Council without being impressed with the wide range of its activities and the wisdom it displays in allocating the funds entrusted to it by Parliament for the furtherance of medical research. E. B. V.

Geography and World Development.

Geography and World Power. By James Fairgrieve. Fifth impression. Pp. viii+373. (London: University of London Press, Ltd., 1924.) 5*s.* net.

North America: an Historical, Economic, and Regional Geography. By Ll. Rodwell Jones and Dr. P. W. Bryan. Pp. xiii+537. (London: Methuen and Co., Ltd., 1924.) 21*s.* net.

Europe. Vol. 1: *The Peninsula.* Edited by B. C. Wallis. (Stanford's Compendium of Geography and Travel, New Issue.) Pp. xxiii+763+40 maps. (London: Edward Stanford, Ltd., 1924.) 15*s.* net.

The New World: Problems in Political Geography. By Dr. Isaiah Bowman. Revised and enlarged edition. Pp. vi+630+112. (London, Calcutta and Sydney: G. G. Harrap and Co., Ltd., 1924.) 21*s.* net.

Elementary Commercial Geography. By Dr. Hugh Robert Mill and Fawcett Allen. Pp. ix+194. (Cambridge: At the University Press, 1924.) 4*s.*

MODERN science has changed the size and shape of the earth. Time is the measure of its distances and routes the framework of its shape. London is nearer to New York than to Kashgar, and the Pacific Ocean, once the limits of the Orient and Occident, is now becoming the strategic and economic centre of a new world based upon the universal ocean. The latest development is a bi-weekly service of motor cars across the French Sahara. The adjustment of human activities to physiographic conditions has been in progress from before the dawn of history, and human institutions have shown that they are no more permanent than the "everlasting" hills.

The author of "Geography and World Power" defines history in its widest sense on its material side as the story of man's increasing ability to control energy. In a most suggestive book he gives a series of excellent studies, showing how empires and states have developed conformable to certain major phenomena of a physical order, and how a change in geographic values has effected changes in the relative importance of nations. Some, no doubt, will quarrel with the word "control," and especially so when it is urged that