If the authors of the chapters that have just been mentioned never stray far from experimental data, this must be attributed to their own individual temperaments rather than to editorial censorship, for right next to the carefully pruned "Influence of Hormones on Enzymatic Reactions" is the luxuriant growth of "Biological Energy Transformations and the Cancer Problem." The author of the latter, V. R. Potter, is not intimidated in the least by the intricacies of biological energy transformations, and he shows that he knows his way about in this field, but in order to reach the cancer problem from this well-trodden field he has to pass through a maze consisting of nucleoproteins, the Rous tumor virus and other assorted odds and ends. In this maze he is not so sure-footed. It is supposed that the clue to the cancer problem lies in an understanding of the interrelationships between the tumor virus, the synthesis of nucleoproteins and the energy transformations of the cell. "The Chemical Formulation of Gene Structure and Gene Action" also has a decided speculative orientation. There is here much to arouse the interest of biochemists, who are only beginning to be aware of one of the greatest of biological problems. Much of Gulick's discussion of the chemical nature of the gene is unfortunately marred by an acceptance of certain theories of the constitution of proteins that already have been discredited.

When discussing problems of cancer and the gene it is at present exceedingly difficult to bring observation and theory into satisfactory relation to each other. In the two chapters yet to be considered the problems discussed are more amenable to satisfactory treatment. In "Gramicidin, Tyrocidine and Tyrothricin" Hotchkiss shows that, although these substances are, because of their toxicity, of quite limited value as therapeutic agents, an understanding of their chemical constitution and mode of action on living cells is of general interest. The observations concerning the effect of gramicidin on the phosphate-uptake of cells, for example, provides a novel insight into the problems of cellular metabolism. "Tyrosinase," by Nelson and Dawson, has been saved for the last simply because reading it gave the reviewer so much pleasure. Here is an intricate subject treated clearly and convincingly. There has been no lack of controversy in this field, and yet the authors succeed in giving fair treatment to the views of others, although they do not hesitate to consider the problem as a whole from their own point of view. A paper like this one on tyrosinase could be written only by authors who have worked in this field for many years and have discussed the subject with their students from every point of view. The reader of this account of their work is struck both by the fine achievement and by the promise of more to come. Two items that especially impressed the reviewer are: the evidence that one enzyme can be involved in two entirely different reactions; and the evidence that tyrosinase becomes inactivated by the process of enzymatic activity itself, rather than by any known products of the reaction it promotes.

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SPECIAL ARTICLES

NORMAL HUMAN STROMATA AS ANTIGENS FOR COMPLEMENT FIXATION IN THE SERA OF PATIENTS WITH RELAPSING VIVAX MALARIA[1, 2]

SEVERAL publications have dealt with the use, in tests for complement fixation in the sera of human patients with malaria, of antigens prepared from the blood of monkeys heavily infected with *Pl. knowlesi*[3] or from that of chickens heavily parasitized with *Pl. gallinaceum*.[4] Positive reactions were usually encountered only after several paroxysms in the first attack, persisted for some weeks or months, and occurred especially frequently after relapses. Kligler and Yoeli[4] noted, also, that sera of occasional malaria patients fixed complement with antigens prepared from normal chicken erythrocytes. It has now been found that such malarial sera as react with antigen from normal chicken stromata also fix complement more strongly with normal human stromata, and that many malarial sera which fail to react either with *gallinaceum* antigen or normal chicken stromata fix complement strongly with the normal human antigen. Although immunologically non-specific, this reaction appears reasonably disease-specific for malaria, with easily excluded exceptions such as noted below, for in tests on 32 normal and 81 pathological sera only 4 probable false positives were found among the latter.

[1] The work described in this paper was carried out under a contract recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and Columbia University. Filed with the Committee on June 1, 1944.

[2] From the Department of Medicine and Division of War Research, Columbia University, College of Physicians and Surgeons, and the Presbyterian Hospital, in the City of New York.

[3] M. D. Eaton and L. T. Coggeshall, 1939, through L. T. Coggeshall, A.A.A.S. Symposium on Human Malaria, Washington, 1941. A. D. Dulaney, W. K. Stratman-Thomas and O. S. Warr, *Jour. Infect. Dis.*, 70: 221, 1942.

[4] I. J. Kligler and M. Yoeli, *Am. Jour. Trop. Med.*, 21: 531, 1941.

These were shown by sera from a case of severe gastro-intestinal bleeding with many transfusions, and from three cases of secondary syphilis, two immediately after the 3-day arsphenamine drip treatment, the other immediately after 4 days' treatment with penicillin, 600,000 units in all. Malaria appeared rigorously excluded in two of the presumably false-positive cases and unlikely in the others. In three of these instances complement was also fixed strongly with *gallinaceum* antigen.

In the sera of patients with malaria, the reaction with normal stromata appeared less frequently in paretics with induced malaria than in chronically relapsing *vivax* cases. In the serological check-up of the latter group, then, the readily available normal human stromata appear to be about as sensitive an indicator as the more difficultly accessible and expensive *gallinaceum* antigens thus far available. The experimental basis for this conclusion is summarized below for 167 sera of 23 chronically relapsing *vivax* patients studied at weekly intervals for one to three months:

Antigen:	*Pl. gallinaceum*	Normal human stromata
No. of patients positive (++ fixation or more) at least once	16	14
Per cent. positive patients	70	61
No. of positive reactions in 167 tests	37	47
Per cent. positive reactions	22	28

Kligler and Yoeli[4] have noted that *knowlesi* and *gallinaceum* antigens are of roughly equivalent value in the complement fixation tests.

The immunologically non-specific malaria reaction with normal human stromata is not of the Forssman type, since all sera showing agglutination of sheep cells were absorbed with these before carrying out the complement-fixation tests. The reaction is apparently due to an auto-antibody, but occurs with the stromata of other species as well. A detailed discussion will be given in a later, more complete publication.

The normal human stromata antigen is prepared as follows: Washed human red cells, preferably from freshly drawn blood, are poured into several volumes of chilled water saturated with CO_2. The precipitated material is centrifuged in the cold, washed several times with cold 0.2 per cent. NaCl solution, taken up in a 2:1 mixture of cold 0.9 per cent. NaCl and 1.26 per cent. $NaHCO_3$ solutions, and frozen until the next day, when it is thawed and centrifuged. The insoluble material, which carries the major portion of the active antigen, is suspended smoothly in 0.9 per cent. NaCl solution and lyophilized in small quantities in ampoules which are then vacuum-sealed and stored in the cold. For use, each sample is rehydrated and diluted to about four blood volumes, or more if necessary in order not to exceed one quarter of the minimum anticomplementary dose. Different preparations varied in reactivity, but not in relation to the blood groups involved, some of the most active lots deriving from O cells.

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INDUCTION OF LEUKEMIA IN MICE[1]

MOUSE leukemia appears spontaneously in a high percentage of mice of particular inbred strains.[2,3,4,5] The disease can be induced in others by the administration of carcinogens,[5,6,7,8] exposure to x-rays,[9,10] or injection of estrogenic hormones.[11,12] Onset of the disease has been accelerated by the action of carcinogens in three of the four high leukemia strains tested;[5,6,7,13] similar studies have not been reported on x-rays and estrogens. A low leukemia strain susceptible to the induction of leukemia with estrogens proved to be resistant to induction of the disease with one of the carcinogenic hydrocarbons, methylcholanthrene.[14] X-rays and methylcholanthrene were independently and synergistically leukemogenic for F_1 hybrids of Furth's Rf and Ak stocks;[15] synergism was not demonstrable for strain dba mice which proved susceptible to induction of leukemia by methylcholanthrene but not with x-rays.[16]

The present investigation was undertaken to determine to what extent susceptibility of a strain of mice to one leukemogenic influence implies susceptibility of the same strain to other leukemia-inciting physical or chemical agents. Mice of four stocks (strains F, A,

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