It will be seen from the table that the variations in the different counts are not greater than would normally be expected. Counts made at the same time either with different methods or as duplicates with the same method agree within the usual limits. Counts made from hour to hour show variations which are in accord with those which Sabin, Cunningham, Doan and Kindwall[5] have shown to be normal. The greatly divergent variations reported from the use of the indirect methods are, however, not present, and it is permissible to conclude that this method offers increased accuracy over those previously employed in making total white counts of avian blood in which the nuclei of red blood cells are invariably present.

3969

Mechanism of Allergy in Tuberculosis.

ARNOLD R. RICH AND MARGARET R. LEWIS. (Introduced by L. E. Holt, Jr.)

From the Department of Pathology, The Johns Hopkins University, and the Department of Embryology, The Carnegie Institute of Washington.

These experiments are part of an investigation into the mechanism of allergy in tuberculosis and its relation to immunity. This report is concerned with the problem of individual cell sensitiveness in the allergic animal.

The tuberculin reaction and the allergic lesions occurring in the body during the progress of infection are generally regarded as being, most probably, the result of an antigen-antibody reaction, in which bacillary products react with an antibody formed during the course of the infection. Rich and McCordock have been unsuccessful in attempts to demonstrate satisfactorily, *in vivo,* the presence of such an antibody in the plasma of allergic animals, and this has been the experience of others who have recently made similar attempts. The surmise has therefore arisen that if an antibody-antigen reaction is indeed responsible for the allergic inflammation and necrosis, this reaction probably takes place in or on the cells themselves, to which the antibody may be bound.

It has never been proven, however, that the isolated cells of the allergic body are really changed in a manner which renders them more sensitive than normal cells to the effects of the products of the tubercle bacillus. Studies *in vivo* are complicated by the presence

[5] Sabin, F. R., Cunningham, R. S., Doan, C. A., Kindwall, J. A., *Johns Hopkins Hosp. Bull.,* 1925, xxxvii, 14.

of the body fluids, by circulatory changes, by uncontrollable variations in antigen concentration which result from the local fixation of the antigen in allergic animals, and by other factors. The purpose of the present experiments was, therefore, to test the sensitiveness of isolated cells to tuberculin *in vitro,* in a manner which might give us information as to whether or not the individual cells of the allergic body become altered in such a way that, regardless of the medium by which they are surrounded, they will be damaged by a given amount of tuberculin more readily than normal cells. To this end we have used the method of tissue culture. We have exposed the washed cells of normal and of allergic guinea pigs to measured amounts of tuberculin, and we have, in each experiment, combined the cells and plasmas in the various ways which might throw light upon the question as to whether a humoral factor is involved in the allergic reaction.

Our experiments, which include hundreds of cultures of spleen and of white blood cells, show in the clearest manner that the cells of an allergic animal are much more sensitive to the effects of tuberculin than are those of a normal animal. They are killed by amounts of tuberculin in which normal cells grow freely. The sensitiveness of the washed cells of each allergic animal was exhibited in the same degree, regardless of whether they were exposed to tuberculin in the plasma of normal or of allergic animals. Tuberculin in allergic plasma had no more effect upon normal cells than had tuberculin in normal plasma. The table summarizes part of a typical experiment:

TABLE I.

Washed cells from	Grown in plasma from	Added to plasma at start	Migration and growth	Condition of cells
Normal animal	Normal animal	1:60 tuberculin	Very good	Very good during 4 days
Normal animal	Allergic animal	1:60 tuberculin	Very good	Very good during 4 days
Normal animal	Normal animal	1:60 concentrated glycerine broth control	Very good	Very good during 4 days
Normal animal	Allergic animal	1:60 concentrated glycerine broth control	Very good	Very good during 4 days
Allergic animal	Normal animal	1:60 concentrated glycerine broth control	Very good	Very good during 4 days
Allergic animal	Allergic animal	1:60 concentrated glycerine broth control	Very good	Very good during 4 days
Allergic animal	Normal animal	1:60 tuberculin	Very slight	Most cells dead within 48 hrs.
Allergic animal	Allergic animal	1:60 tuberculin	Very slight	Most cells dead within 48 hrs.

We are at present examining the Arthus phenomenon in a similar manner, and also the reaction of normal and allergic cells to the intact tubercle bacillus.

Conclusion. Cellular injury and necrosis associated with allergy in tuberculosis result from a change in the individual fixed tissue and blood cells, which renders them more sensitive to the products of the tubercle bacillus. There are no humoral factors necessary for the production of the injurious local effects of allergy in tuberculosis.

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Rate of Reflex Conduction in a Cataleptic Patient.

LEE EDWARD TRAVIS. (Introduced by W. W. Tuttle.)

From the Psychopathic Hospital, State University of Iowa.

A previous study of normal subjects has well established the fact that in the case of the knee-jerk the average length of time elapsing between the instant of stimulation of the patellar tendon and the appearance of action currents in the executant muscle is .0197 seconds.[1] This average is based upon records obtained from 87 individuals who presented reflex times ranging from .0114 to .0268 seconds. Reflex conduction rate is relatively constant for the same individual under normal conditions. However it was thought that certain mental and physical abnormalities might affect it and with this thought in mind a study was made of a case diagnosed as toxic-infective-exhaustive psychosis. When the first records were obtained the patient displayed catalepsy, *cerea flexibilitas,* muteness, stupor, and absolute disorientation. The findings revealed her reflex time to be .0059 seconds. Four days after these records were obtained she showed marked improvement—the catalepsy and *cerea flexibilitas* had practically disappeared, and she was talking and enjoying herself with other patients. Records now revealed the fact that her reflex time was .0180 seconds. Twenty-five days later when she was discharged as "physically improved and mentally recovered" her reflex time was .0185 seconds. Thus it appears that the catatonia here was accompanied by a markedly reduced patellar tendon reflex time, and that as the catatonic condition cleared up the reflex time approached the average for normal indi-

[1] Travis, Lee Edward, *Science,* Jan. 13, 1928.