

gation such a study was made of normal defibrinated pig's blood under ordinary conditions, on the one hand, and after radiation with rays of various wave length on the other hand.

The tests were performed by measuring the growth of living seedlings of the plant *Lupinus albus* immersed in definite nutrient solution with and without admixture of one per cent of blood. Specimens of pig's blood were exposed to the action of ultraviolet rays for periods varying from 10 to 30 minutes, the radiations being performed by means of the Hanovia "Alpine Sun" mercury vapor quartz lamp. Other specimens of blood were x-rayed by one of the authors with broken doses from Coolidge and nitrogen gas tubes for periods varying from 1 to 3 minutes. Finally a few experiments were made with blood treated for one hour with radium emanation of small dosage.

The results obtained were interesting. The toxicity of blood for *Lupinus* seedlings after ultraviolet radiation was unaffected and in some cases was lightly diminished. In case of Roentgen rays the toxicity of blood after radiation was distinctly increased, and a difference was noted between specimens radiated with the two kinds of tubes. Radiation with the Coolidge tube rendered the blood much more toxic for the plants than radiation with the gas tube. The few experiments performed with blood exposed to radium emanation gave results practically the same as those obtained with Roentgen rays; that is, the blood was rendered more toxic for the phytopharmacological preparations. Furthermore, after treatment with radium the blood exhibited a distinct hemolysis.

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Culture filtrates of hemolytic streptococci from scarlet fever: Intracutaneous reactions in test animals.

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A number of substances poisonous for animal cells have been described as appearing in filtrates of young cultures of hemo-

lytic streptococci. The presence of hemolysin (Besredka, 1901) and leucocidin (Ruediger, 1905) with the production of an antiserum for the latter and not for the former has been many times corroborated. The presence of a specific exotoxin (Clark and Felton, 1918, Havens and Taylor, 1921) has been denied by Zinsser, Parker and Kuttner (1921), who state that they find in these young culture filtrates only non-specific low grade poisons (called "X substances" by them) that do not stimulate the production of antisera. For all this work, the animal tests of the poisonous products were made only by way of the veins, the subcutis or the peritoneal cavity. Zinsser reports only intravenous inoculations. The latest and most suggestive announcement has just been made by the Dicks.¹ They have a toxic filtrate obtained from cultures of hemolytic streptococci from scarlet fever, that gives an *intracutaneous* reaction in people presumably susceptible to scarlet fever, that is neutralized by serum from scarlet fever convalescents, and that gives no intracutaneous reaction in scarlet fever convalescents.

The Dicks kindly sent us some of their toxic filtrate, and Dr. Zingher in our laboratory has fully corroborated the Dicks' use of their test in humans. We have obtained similar toxic filtrates from the hemolytic streptococci we have isolated from scarlet fever cases. According to Dr. Zingher's tests, these act in humans as does the filtrate obtained from the Dicks. Our methods of growth will be given later. As the Dicks have not yet published their culture methods in detail, we cannot say how ours agree. We have found that the intracutaneous injection of these filtrates into young depilated rabbits gives a very clear cut reaction and that the filtrates are neutralized by serum from convalescent scarlet fever patients. The reaction in guinea pigs is not as clear cut as in the rabbits.

The Dicks' toxic substance is in a four-day culture filtrate. These investigators have not yet published attempts to work out the curve of production. We have found that so far our own filtrates give the strongest and most lasting reaction in rabbits at about the end of the second day of growth, after which there is a moderate drop to the end of the fourth day which is the latest we have tested them. This curve corresponds to that reported by Clark and Felton for the appearance of their toxic filtrate and,

¹ Dick, G. F. and G. H., *J. Am. Med. Assoc.*, 1924, lxxxii, 265.

according to the published reports, leaves behind by many hours the curves of the production of hemolysin, of leucocysin and of the X substances of Zinsser, et al.

In the tests in rabbits we have been able to show so far that while convalescent scarlet fever serum seems to neutralize the filtrates of the growth of the hemolytic streptococci from scarlet fever, as shown by the intracutaneous reaction, it has not yet neutralized toxic filtrates obtained in the same way from *Staphylococcus pyogenes* or from *Escherichia coli*. Neither has it neutralized a toxic filtrate obtained from a hemolytic streptococcus from endocarditis while it has neutralized one (strain F) isolated from a wound infection, which we included by absorption of agglutinins in our agglutinative group of hemolytic streptococci obtained from scarlet fever. Young rabbits (about 1500 gm.) of the type giving a good skin reaction with vaccine virus and depilated as we depilate for that test seem to be especially suitable for this test and in the many questions of interest that are coming up in connection with this work they promise to be a great help.

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Results obtained with the Dick test in normal individuals and in acute and convalescent cases of scarlet fever.

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Studies have been made with the Dick test among normal individuals along lines similar to those carried out with the Schick test. The susceptibility by age groups from birth to adult life has been investigated and found to correspond closely to the percentage susceptibility to diphtheria, as shown by the Schick test. Comparative studies have been made with the reaction on mothers and their offspring. The results indicate that the reactions are similar in the mother and offspring during the first six months of life. The antibodies are transmitted through the placenta