with massive skin infiltrations. This patient had failed to react to Fowler's solution. W.B.C. 96,000 per cu. mm. Five inoculations of 3, 5, 5, 5 and 6 cc. respectively were given over a period of 12 days. The leukocyte count after therapy was 192,000 per cu. mm. The patient died a few days after the last inoculation.

Case IX. Mr. C., aet 46. Chronic myeloid leukemia. W.B.C. 162,000 per cu. mm. Eleven inoculations of 5 cc. each were given over a period of 20 days. The leukocyte count following treatment was 47,000 per cu. mm. During the treatment the spleen decreased in size. The patient was then given Fowler's solution and the leukocyte count gradually increased. After it had reached 346,000 per cu. mm., 5 inoculations of tartar emetic were given and the count dropped to 210,000. This patient died 3 months later.

Conclusion. Following intravenous inoculation of one per cent solution of potassium antimonyl tartrate, the leukocyte count was reduced in 6 of 9 patients who exhibited leukocytoses of abnormal cells.

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Nature of Formalin Inactivation of Bacteriophage.

E. W. SCHULTZ AND L. P. GEBHARDT.

From the Department of Bacteriology and Experimental Pathology, Stanford University, California.

Immunologists and students of the filtrable viruses are familiar with the fact that formalin possesses the unique property of converting toxins to toxoids and viruses to what may be called "virusoids" and of doing this without greatly impairing the antigenicity of these agents. While various physical and chemical agents readily inactivate toxins and viruses, such inactivation is generally associated with complete loss of antibody stimulating powers. The unique property which formalin possesses has interested us for some time. Schultz, Quigley and Bullock,[1] in discussing the antigenicity of formalin inactivated bacteriophage suspensions stated that "it is by no means clear that formalin actually kills or effaces the identity of the virus." We have felt for some time that the preservation of the antigenicity of formalin inactivated toxins, bacteriophage and of

[1] Schultz, E. W., Quigley, J. S., and Bullock, L. T., *J. Immunol.*, 1929, **17**, 245.

animal viruses might possibly rest on some common mode of action—one in which the toxin or virus is not permanently altered, but is held in an inactive state only so long as the formalin is combined with the antigen, and that the antigenicity of formalin inactivated toxins or viruses might be explained on the basis of a "dissociation" which is later effected within the body. It seems possible that the inactivation itself may be of the nature of an ordinary "formol reaction" in which formaldehyde combines with the amino group to form a methylene derivative and that after injection into the body the formalin radical in the new complex may be removed by some chemical process, probably oxidative in character, which restores the toxin or virus to its native state. The difficulty in testing such an hypothesis consists, of course, in finding a method which will release or destroy the linked formaldehyde without at the same time destroying the toxin or virus.

We have recently been successful in reactivating formalin inactivated staphylococcus bacteriophage suspensions by a very simple procedure. A certain staphylococcus bacteriophage suspension (Ph. 127—A.D. 100), which is normally active in a dilution of 10^{-9}, is completely inactivated by 0.018% formaldehyde (HCHO) in 24 hours at 37°C. If one adds from 1 to 5 cc. of such an inactivated suspension to 100 cc. or more of distilled water (pH 6 to 6.6) and stores this at 37°C., active phage is released. The reactivation proceeds slowly and does not approach completion until after a period of 10 to 15 days.

Studies are now in progress to determine whether reactivation of other viruses and of toxins can be accomplished by appropriate methods, including the use of mild oxidizing agents. We have, however, proceeded far enough in these studies to say that the formalin inactivated poliomyelitis virus cannot be reactivated by the simple procedure which suffices to reactivate bacteriophage.