active immunity of a varying degree a number of days following the protecting injections. Because of these factors, the term hyperleukocytic preimmunity is suggested for this process. The question of the specificity of this process will be dealt with in a later article.

Gay and Claypole[2] observed that typhoid immunized animals respond with a peripheral blood hyperleukocytosis upon an intravenous reinjection with living typhoid organisms. They found this hyperleukocytosis to be specific for the microorganism. A typhoid immunized animal did not respond with a hyperleukocytosis to an infection with *Micrococcus aureus*. Gay and Claypole[3] were dealing with a general cellular response in form of an active immunity, since the reinjection was intravenous and was made a sufficient number of days after the first protecting dose to evoke some degree of an active immunity. McWilliams,[4] however, was unable to confirm Gay and Claypole's work neither in regard to the specificity nor to the presence of a hyperleukocytosis. Zinsser and Tsen[5] found a slight leukocytosis in immunized animals but no specificity.

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Absorption of Antigens from Body Surfaces.

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The appearance of agglutinins in the blood 3 weeks after oral vaccination with typhoid antigen was followed in 85 non-febrile dispensary and ablatory patients. Most patients were from orthopedic surgical clinics. One gram of desiccated ox-bile in gelatin capsules was given with a glass of warm water upon rising in the morning. After 30 minutes the typhoid antigen was administered in a glass of warm water. In one series of 24 subjects, 1 cc. of standard typhoid vaccine (Lilly) was administered. In another series 2 cc. of bacteriophage dissolved *B. typhosus* was administered. The meal was withheld from the subjects for 2 hours after the typhoid

[2] Gay, F. P., and Claypole, E. J., *J. Am. Med. Assn.*, 1913, **60**, 1950.

[3] Gay, F. P., and Claypole, E. J., *Arch. Int. Med.*, 1914, **14**, 662.

[4] McWilliams, H. I., *J. Immun.*, 1916, **1**, 159.

[5] Zinsser, Hans, and Tsen, Edgar, *J. Immun.*, 1917, **2**, 247.

antigen was given by mouth. This was repeated each morning for 3 consecutive doses in each series.

Blood was taken from subjects before experiments were started. All showing the presence of agglutinins against typhoid antigen were eliminated. Three weeks after the oral ingestion of the antigen, blood was again drawn and the agglutination tests performed upon the serum. The accompanying table gives the results.

TABLE I.

Typhoid Vaccine		Bacteriophage Dissolved *B. typhosus*	
Number of Cases	Dilution	Number of Cases	Dilution
4	negative	15	1:40
2	1:20	27	1:80
8	1:40	15	1:160
10	1:80	4	1:320

Bile was given before the oral administration. Arnold[1] explained the influence of bile upon permeability of the intestinal tract in the light of his experimental work. The results reported here seem to show that dissolved *B. typhosus* proteins are more efficient than standard typhoid vaccine for oral immunization.

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Susceptibility of Rodents to Gastro-Intestinal Infections.

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Kisskalt[1] found that the susceptibility of mice to enteritides infections was increased after the administration of saponin. He concluded that this was due to the lowering of surface tension and increasing the spaces between the cells lining the mucosa. We have investigated this problem from the viewpoint advocated by Arnold.[2]

Half-grown mice were given 0.1 cc. of a 20% aqueous solution of saponin by stomach tube. The animals were killed at various time intervals and the bacterial flora and hydrogen-ion concentration of the contents of the stomach, duodenum and jejunum were

[1] Arnold, L., *J. Hygiene*, 1929, **29**, 82.

[1] Kisskalt, K., *Arch. F. Hyg.*, 1929, **101**, 205.

[2] Arnold, L., *J. Hyg.*, 1929, **29**, 82.