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The Anamnestic Reaction: Response of Previously Immunized Animals to Heterologous Antigens.

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Cole[1] observed, in 1904, that after an animal has been immunized subsequent injection of the same antigen causes antibodies to appear earlier than after the first injection. Previously immunized animals also show circulating antibodies after the injection of amounts of homologous antigen which, in animals injected for the first time, are insufficient to cause the appearance of demonstrable antibodies. A clinical counterpart of these experiments has been observed in what is called accelerated serum disease: symptoms and circulating precipitin appear earlier when a patient is treated a second time with serum. It has been observed,[2] too, that individuals previously vaccinated against typhoid may show a reappearance of typhoid agglutinins during the course of typhus. Bieling[3] studied this anamnestic phenomenon in rabbits, using as antigens the Shiga and His-Russel types of *B. dysenteriae* and *B. typhosus*. He found that the heterologous antigen would call back, so to speak, the agglutinins for the antigen previously administered.

In subjecting the anamnestic reaction to a systematic study we have used 4 antigens sufficiently remote from each other in biological origin to exclude group reactions. A series of 18 rabbits has been studied over a period of 3½ years. The antigens used were horse serum, chicken serum, crystalline egg albumin and *B. typhosus*. Immunization with horse serum and chicken serum was accomplished by giving 3 intravenous injections (0.5 cc., 1.0 cc., 1.5 cc.) at intervals of 5 days. For the egg albumin immunization, 3 intravenous injections (1.0 cc., 2.0 cc., 3.0 cc.) of a 3 per cent solution at 5 day intervals were given. Suspensions of *B. typhosus* at first heat killed, and later, living organisms were injected intravenously 7 times in the course of 16 days, the number of organisms amounting to approximately 5½ billion. Titrations of precipitin or agglutinin were made 5 days after the last antigen injection, and then at intervals of 7 days. Reinjection with a second antigen was not made until the antibodies produced during the previous immunization had disappeared entirely from the circulation. It was found that rabbits previously injected with horse serum would fre-

quently show a reappearance of horse serum precipitin when subsequently given injections of chicken serum. Immunization later with egg albumin sometimes caused not only the appearance of precipitin for egg albumin but also in some cases the reappearance of both horse and chicken precipitin. A later immunization with *B. typhosus* caused the appearance in the circulation of *B. typhosus* precipitin, and precipitin for one or more of the antigens which had previously been injected. If, after immunization with the fourth antigen, only one heterologous precipitin reappeared, it was always the one for the last antigen used; if two heterologous antibodies appeared, they corresponded always to the last two antigens used. In a few instances heterologous antibodies for all three of the antigens previously used reappeared in the circulation when the fourth antigen was injected. Efforts to cause this anamnestic appearance of antibodies by the injection of such non-antigenic substances as 10 per cent NaCl solution, peptone, and turpentine (subcutaneously) yielded only negative results.

The anamnestic reaction is not satisfactorily explained on the basis of heterogenetic antigens; nor does it harmonize with the Ehrlich theory. This is a preliminary report.

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[1] Cole, R., *Z. Hyg.*, 1904, xlvi, 371.

[2] Weil, E., and Felix, A., *Wien. Kl. Woch.*, 1916, xxix, 974.

[3] Bieling, R., *Z. Immunol.*, 1919, xxviii, 246.

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Effect of Ligation of the Pancreatico-Duodenal Artery on the Blood Sugar and Urine.

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In previous papers[1, 2] the author and co-workers presented experimental evidence which seemed to indicate that changes in the permeability of the capillary vessels of the pancreas, produced by perfusions of its arterial supply, resulted in a mobilization of trypsin into the blood stream, via the portal circulation, with the production of a hyperglycemia and glycosuria. It was also suggested that the presence of trypsin in the blood stream may be part of the mechan-