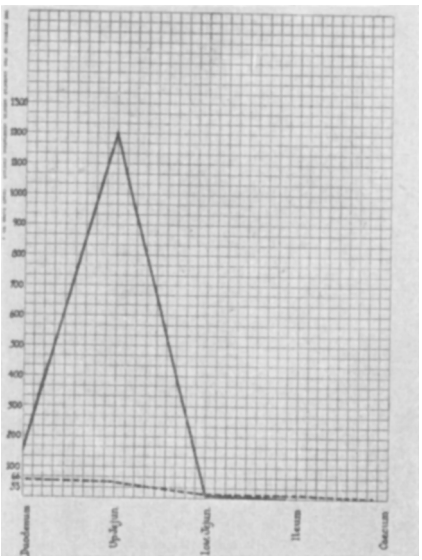

FIG. 1.

Ordinate = Number of viable bacteria. Abscissa = Segments of intestinal tract.
- - - - - - - = Saline suspension injected into duodenum.
——————— = Eggwhite suspension injected into duodenum.

with swabs. The solid line shows the results of the dogs which had been injected intraduodenally with eggwhite, and the dotted line of those injected intraduodenally with the saline.

The study of the action of eggwhite on the permeability of the intestinal wall is being continued.

5314

III. Influence of Eggwhite upon the Cyclic Circulation of Bacteria in the Splanchnic Area.

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Having shown in the 2 preceding articles that eggwhite increases the permeability of the intestinal wall for living bacteria from the intestinal tract into the circulation as well as from the blood stream into the intestinal tract, the question arose whether it is not possible that the bacteria might be absorbed and eliminated at the same time;

that is, can living bacteria be absorbed from one segment and eliminated into another part of the intestine by means of the circulation? Also, what effect would eggwhite have to do with this cyclic circulation of bacteria?

Thirty dogs, fasted for 24 hours, operated upon under ether anesthesia, were used for these experiments. The technic consisted of opening the abdomen, ligating and severing the lower part of the duodenum. Twenty-five cubic centimeters of a suspension of *B. prodigiosus* or *B. murii* were injected into the duodenum in the first series, and 50 cc. into the upper part of the jejunum in the second series. The suspension of bacteria was made up in a normal salt solution in one series and in one fresh raw eggwhite in the other series. The same media without the bacteria were simultaneously injected into the end adjacent to the ligation to produce the same state in the mucous membrane of the segment in which the bacteria were injected. The dogs were killed in 25 minutes, the various segments of the gut were examined for the presence of the test bacteria with sterile swabs which were smeared on agar plates.

Twice as many dogs were used for this experiment as we are reporting. All experiments in which blood was detected in the ligated segments examined were discarded.

The first series in this group of experiments (18 dogs) con-

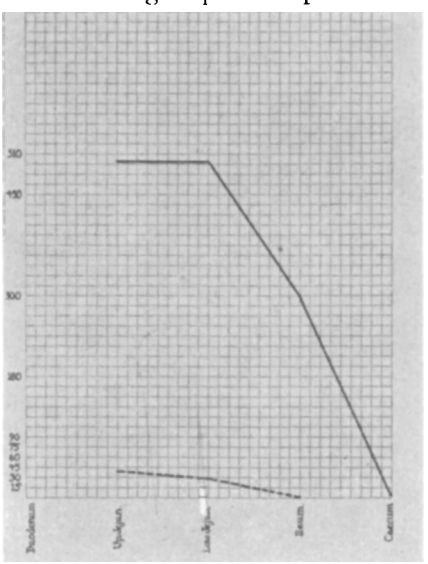

FIG. 1.

Ordinate = Number of bacteria on agar plates.
Abscissa = Segments of the intestinal tract.
- - - - - - - = Saline suspension injected into duodenum.
——————— = Eggwhite suspension injected into duodenum.

sisted in injecting bacteria into the duodenum. The duodenum, upper jejunum, lower jejunum, ileum and caecum were examined for the presence of the test bacteria. Fig. 1 gives the results of the experiments. In the duodenum there was always a full growth of bacteria, so it was not recorded on the figure. The abscissa represents the segments of the intestinal tract and the ordinate the number of colonies on agar plates. The solid line shows the results in the dogs where the eggwhite was injected; and the dotted line where the saline suspension was used.

The second series (12 dogs) consisted in injecting the test bacteria into the upper jejunum, and examining the duodenum for the presence of these bacteria. In this case the common bile duct was also ligated and severed to exclude the possibility of bacteria descending from the liver. The accompanying Fig. 2 shows the re-

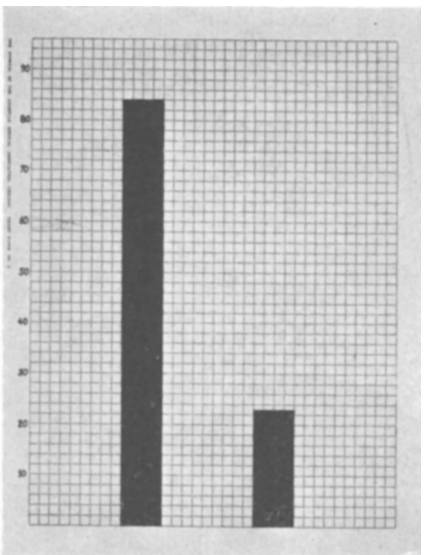

FIG. 2.
Ordinate = Average number of bacteria appearing in the duodenum.
Tall Column = Eggwhite suspension injected into jejunum.
Short Column = Saline suspension injected into jejunum.

sults of the experiments. The higher column shows the relative amount of bacteria (see ordinate) in the duodenum of the dogs where the eggwhite was used, and the shorter one, the saline suspension. The plates from the upper jejunum showed, of course, a full growth and were not recorded.

These experiments tend to show that in the dog bacteria can be absorbed from the duodenum and excreted into the jejunum. Bac-

teria can also be absorbed from the jejunum and excreted into the duodenum. Raw eggwhite increases the number of bacteria excreted in each series of experiments.

The study of the effect of eggwhite on the permeability of the intestinal wall is being continued.

5315

IV. Influence of Eggwhite in the Duodenum upon the Elimination of Bacteria into the Gallbladder.

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Further study of the action of a fresh raw eggwhite upon the cyclic circulation of bacteria in the splanchnic area, led us to examine the gallbladder for bacteria after intraduodenal injection. The following experiments were carried out:

The abdomens of 27 dogs, fasted for 24 hours, were opened under ether anesthesia and the cystic duct ligated and severed. Twenty-five cubic centimeters of a suspension of *B. prodigiosus* in saline solution (washings of 24 hours' growth on agar plate in 50 cc. of saline solution) was injected directly into the duodenum in 15 dogs. In the other 12 dogs the *B. prodigiosus* was injected with a fresh raw eggwhite, one for each dog. In 30 minutes the dogs were killed and the bile from the gallbladder was poured directly into a large flask of broth. The results were recorded 24 hours after incubating the cultures at 37°C. The results are shown in an accompanying chart where the ordinate shows percent of positive results (appearance of *B. prodigiosus* in gallbladder), the higher column representing the experiments where the eggwhite was used and the lower, the saline solution.

The technic used in these experiments may be criticized, since the hemato-hepatogenous route of the infection of the gallbladder is generally accepted (Meyer[1]). But one cannot also overlook the statements of some investigators, who also accept the probabilities of infection of the gallbladder through the lymph and blood vessels (Gay,[2] Chirolanza[3]). The opponents though (Meyer[1]) of the

[1] Meyer, K. F., Neilson, N., and Fensier, *J. Infect. Dis.*, 1921, **28**, 456.

[2] Gay, F., Typhoid Fever, 1918.

[3] Chirolanza, R., *Z. f. Hyg.*, 1909, **62**, 11.