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.

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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.

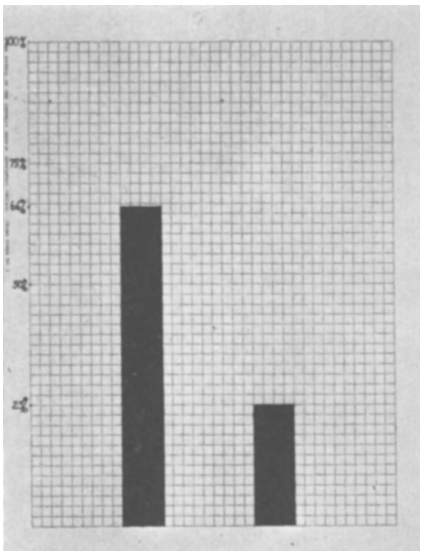

FIG. 1.
Ordinate = Percent of experiments in which *B. prodigiosus* appeared in gall bladder bile.
Tall Column = Eggwhite suspension injected into duodenum.
Short Column = Saline suspension injected into duodenum.

latter opinion state that "technically the experiments have been poorly executed." This technic consisted in tying off the cystic duct of rabbits and injecting typhoid bacilli intravenously, immediately following the operation. Meyer states, "in the ligating of the cystic duct the accompanying cystic artery was in all probability also tied and hemorrhagic infarction occurred from incomplete collateral circulation." Doer[4] also tied off the cystic duct but waited several days before injecting the bacilli intravenously. This result was negative, but we must take into consideration that he used only one rabbit. Johannes[5] states that experimentally it has been established that *Staphylococcus aureus* is eliminated into the gallbladder via the hematogenous route. Koch[6] proves histologically that the bacilli get into the gallbladder through the wall by the blood vessels. Fraenkel[7] says that *B. typhosus* gets into the gallbladder through its vessels and through the liver, but cannot decide which route is the main one.

So we repeated Doer's experiments on 4 dogs with extreme pre-

[4] Doer, R., *Centrollblatt für Bacteriologie*, 1905, **39**, 624.
[5] Johannes, F., *Arch. f. Klin. Chirurg.*, 1927, **144**, 369.
[6] Koch, J., *Ztrsch. f. Hyg.*, 1909, **62**, 1.
[7] Fraenkel, E., *Mitt. aus den Grenzgebieten der Mediz. u. Chir.*, 1909, **20**, 898.

cautions. These dogs were operated upon under ether anesthesia and under sterile conditions. After opening the abdomen the cystic duct was tied off close to the common bile duct, carefully avoiding injury of gallbladder vessels. Two of these dogs were killed on the seventh day, the third dog on the eighteenth day and the fourth dog on the twentieth day. Half an hour before killing these animals 5 cc. of a saline suspension of *B. prodigiosus* (washings of one agar plate in 50 cc. of a saline solution) were injected into the femoral vein of each dog. The bile, *in toto*, was removed under sterile precautions and placed in a flask of broth. The swabs, after swabbing the wall of the gallbladder, were also used to inoculate the broth. All 4 dogs gave positive results, showing the presence of *B. prodigiosus*. We conclude that the hematogenous route also plays a part in the elimination of bacteria into the gallbladder.

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V. Absorption of Bacteria from the Gallbladder.

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In the preceding reports we have observed a cyclic circulation of bacteria in the splanchnic area of the body. The gallbladder was involved in this cycle so we next studied the absorption of bacteria from the gallbladder into the splanchnic circulation.

It has long been known that resorption of neutral fats, lipoids, bile pigment and other substances through the epithelium and lymphatics of the gallbladder mucosa can be demonstrated histologically (Royster[1]). In long continued closure of the cystic duct the cholesterol constituent is reduced from resorption by the bladder wall (Rosenthal and Licht[2]). Blad[3] and Bundschuk[4] described cases of bile peritonitis where, according to their investigations, there was no perforation of the gallbladder. Lange and Roos[5] performed experiments in which, after injection of bacilli into the gallbladder,

[1] Royster, H. A., *Med. J. and Rec.*, 1930, **132**, 232.
[2] Rosenthal and Licht, *Klin. Woch.*, 1928, **7**, 1952.
[3] Blad, A., *Arch. f. Klin. Chir.*, 1917, **109**, 101.
[4] Bundschuk, E., *Arch. f. Klin. Chir.*, 1930, **161**, 549.
[5] Lange and Roos, *Arch. Kais. Gesdhamt*, 1917, **50**, 57.