ride has been replaced by bromide, pituitary extract causes no change in the concentrations of chloride and of bromide or in the distributions of chloride or of bromide between erythrocytes and serum of intact (14 experiments on 6 dogs) or of nephrectomized dogs (5 dogs). The *relative* concentrations of bromides and chlorides are about the same in serum and urine (14 experiments on 6 dogs). 3. Pituitary extract causes no change in the water-content of erythrocytes or of serum (34 experiments).

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Causation of B. Welchii Infection in Dogs with Sterile Liver Extract and Bile Salts.

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In a recent paper Rewbridge[1] reported that the intraperitoneal injection of sterile bile or pure bile salts brought about prompt invasion of the peritoneum by *B. welchii.* Andrews[2] also showed that autolysis of sterile liver in the peritoneum also provoked a severe *B. welchii* infection. In view of the above and of the work of Dragstedt[3] on the rich flora of the normal liver as well as that of Arnold[4] on the absorption of bacteria into the lymph stream under physiological conditions, our studies were continued and may be summed up as follows. Thirty-nine dogs were used in the series of experiments, 3 dogs in each of the groups.

Experiments were done in which the bile of dogs was led in tubes into the depths of the pelvis and also into the chest cavity. The results were similar. Severe *B. welchii* infections took place within 24 hours in most cases. These experiments showed that the proximity of the intestinal tract or the liver (known foci with rich flora) was not necessary to provoke these infections.

Next, concentrated solutions of liver extract prepared as mentioned in a previous paper[2] and 10% solutions of bile salts were injected into normal dogs into the pelvic peritoneum and also into

[1] Rewbridge, Allan G., and Hrdina, L. S., PROC. SOC. EXP. BIOL. AND MED., 1930, **27**, 528.

[2] Andrews, E., and Hrdina, L. S., PROC. SOC. EXP. BIOL. AND MED., 1930, **27**, 987.

[3] Ellis, J. C., and Dragstedt, L. R., *Arch. Surg.*, 1930, **20**, 8.

[4] Arnold, Lloyd, *J. Hyg.*, 1929, **29**, 82.

the chest. In each case these sterile injections *caused violent* anaerobic infections and death in the course of 12 to 20 hours, indicating as in the above experiments that the infection probably took place locally and not by invasion of bacteria from distant sources.

In view of the findings of Reith[5] of anaerobes in normal muscle the following experiments were done. Intramuscular injections of both sterile 10% bile salts and of liver extracts were made under the scapulae in dogs. In most cases within 18 hours there was present an obvious gas gangrene of the adjacent muscular tissue. Emphysema could be felt before the skin was opened. Autopsy showed numerous small gas bubbles, the characteristic odor and greyish gangrenous muscle and culture showed many *B. welchii.* Next specimens of muscles excised under sterile precautions were ground and implanted into dogs' abdomens. Marked septic peritonitis ensued with death in less than 24 hours. Autoclaved ground muscle in like amounts produced no symptoms whatsoever, showing that in this case the infection was probably present in the normal muscle. To settle this point experiments were done in which dogs received barbital in sufficient doses to keep them asleep for 24 hours. One leg was ligated with hay wire so tightly that the arterial circulation was entirely cut off. In the control group simple gangrene of the leg took place, without gas formation, odor or positive culture in most cases. In another group sterile liver extract was injected into the tied off leg, and in each of these cases there was typical gas gangrene, emphysema, typical odor and positive cultures of *B. welchii.*

In view of the fact that in the above experiments the legs are known to contain *B. welchii* and do not develop gas gangrene unless the provocative injection is made, one is led to assume that the mechanism is to be explained on the basis that bile, bile salts, liver extract and perhaps many other substances cause a lowering of the bactericidal power of tissues to such an extent that the bacteria which are always present, either dying or encapsulated in cells, are allowed to grow and to cause actual clinical infection.

[5] Reith, A. F., *J. Bact.*, 1926, **12**, 367.