filtrate and precipitate were found to be slightly bactericidal, but neither equal to the original power of the alcoholic extract.

It is evident, therefore, that this bactericidal substance in rabbit bile for certain strains of streptococci, is present with or identical with a bile salt, being precipitated by ether, and alcohol soluble. However, since other types of bile do not give these reactions which seem to be peculiar to rabbit bile, one must conclude that rabbit bile either has some substance in its composition that is not found in other types of bile, or that its chemical construction is different, thereby giving it this peculiar property.

23 (1605)

The viability of B. typhosus in alkaline bile in vivo.

By T. D. BECKWITH (by invitation).

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In as much as Nichols suggests the use of alkaline therapy for the purpose of eradicating *B. typhosus* within the gall bladder of human carriers of the disease, the following observations are pertinent.

While carrying out a series of tests with experimental rabbit carriers of typhoid, it was noted in a certain instance that the hydrogen ion concentration of the bile was different from that supposed to characterize the normal animal. This indication was followed with other animals as opportunity presented itself. P_H determinations were made on the bile of uninfected animals as materials appeared. The method followed was that of Clark[1] and Lubs with the comparator block introduced into the system. Readings were made as soon after the death of the animal by exsanguination as possible, generally within three quarters of an hour. In order that contact with the air and consequent loss of dissolved gases might be reduced to a minimum, the bile was kept either within the closed syringe with which it had been aspirated or was placed within a small bore agglutination tube. All animals

[1] Clark, W. M. and Lubs, H. A., *Jour. Bact.*, 1917, ii, 1–34, 109–136, 191–236.

had been fed regularly on a ration of rolled barley and succulent grass.

No animal was classed as a carrier unless it had been inoculated with *B. typhosus* at least two weeks previously since it was felt that time sufficient for physiological adjustment should be given. This period is arbitrary but is conservative since between one and two weeks are required before the weight curve of the animal commences to ascend. Rabbit carriers were prepared according to the method of Gay[1] and Claypole[2] which in this series yielded 100 per cent. efficiency. No bile was classed as having been taken from a positive carrier unless subsequently *B. typhosus* was isolated from it and confirmation made by agglutination.

A series of nine rabbit biles from experimental carriers yielded a mean hydrogen ion determination by the colorometric method of P_H 8.33. A check series of twenty-seven units taken from normal animals gave a mean reading of P_H 7.41. The factor of variability for the first series taken from carrier animals is 6.4 per cent. while the like factor from the larger check series is 2.3 per cent. The two therefore are comparable.

No reason thus far is assigned for this difference in P_H of the two series of fluids. It is felt that a possible explanation based on lysis of cells in the course of the inflammatory process with increase in alkalinity is not sufficient since the lowered hydrogen ion concentration which may be expected to result should be expected to occur earlier were it the cause. The lowered P_H was most evident ten days following preparatory injection of the typhoid organisms.

The results obtained for normal rabbit bile coincide with those of Quagliariello[3] but are somewhat higher in the concentration of the hydrogen ion than those given by Okada[4] who however was working with hepatic rather than with cystic bile.

Relative to these observations it may be stated that *B. typhosus* will live for at least 24 hours in ox bile the reaction of which after autoclaving is altered to P_H 9.2 by the addition of an appropriate

[1] Gay, F. P. and Claypole, E. J., *Archiv. Int. Med.*, 1913, xii, 613.
[2] Nichols, H. J., *Jour. Exp. Med.*, 1916, xxiv, 495–514.
[3] Quagliariello, G., *Atti d. Reale Accad. d. Lincei*, 1911, xx, Ser. 5a, 302–305.
[4] Okada, S., *Jour. Phys.*, 1915, l, 114–118.

amount of sodium hydroxide, the incubation temperature being 37° C.

Results: (1) Bile from carrier rabbits of *B. typhosus* shows a lower hydrogen ion concentration than that from normal animals. In the first the general mean was 8.33 while the latter gave 7.41.

(2) *B. typhosus* is viable in vivo in rabbit bile even when the hydrogen ion concentration is depressed to P_H 9.4.

24 (1606)

The conditions under which the ratio between the urea content of the urine and of the blood remain constant.

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Simultaneous measurements of the hourly rate of urea excretion and of the blood urea concentration have been made under various conditions in man in order to determine whether the ratio between the urine and blood urea ever becomes approximately constant. After the administration of urea and large amounts of water the ratio shows at first a considerable variability, but after the maximum urea concentration in the blood has been attained and the concentration is slowly falling the ratio becomes constant for each individual within fairly narrow limits. Food, excitement, and the various other factors produce marked variations even under these conditions. We have not been able to confirm the conclusion of Austin, Stillman and Van Slyke, that the ratio of urea excretion varies with the square root of the volume of urine when the blood urea concentration is constant.

Under the special conditions outlined above, the rate varies directly with changes in the blood urea concentration from 118 to 20 mgs. per 100 cc.