normal mitosis the positive charges disappear quite rapidly during the early prophase.

Irradiation with X-rays not only produces chromosome abnormalities, but reduces the number of cells entering the prophase. The data obtained show a marked reduction in the number of cells in anaphase with time, which reaches a minimum at about 3 hours after irradiation.[1] If the ammonia is considered to act on the nuclei within a few minutes after the seedlings are immersed, the maximum in the percent normal anaphases comes at 3 hours after the action of the ammonia. Ammonia also reduces the number of cells in anaphase from about 1,100 per 30 roots at 0.5 hour after immersion to a minimum of 370 at 3 hours after irradiation (Table IV). This is taken to indicate that ammonia not only suppresses the positive charges on the dividing chromonemata, but also inhibits the onset of the prophase. However, in sharp contradistinction to X-rays ammonia produces the most chromosome abnormalities in the metaphase when the X-ray action is so slight as to be hardly or not at all detectible.

These results, therefore, support the hypothesis that positively charged surfaces are developed in the chromonemata at the onset of the prophase and are gradually neutralized during the prophase. They also suggest that ammonia, like X-rays, inhibits cells from entering the prophase.

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Changes in Protein-Content of Bacterial Suspensions During Lysis and Autolysis.

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The lysis of bacteria by phage has been considered as a simple plasmolysis, quite different from autolysis, and in fact many attempts to detect protein split products in the solution after lysis have failed. Bronfenbrenner and Hetler,[1] however, did find evidence for the appearance of protein split-products in solution after lysis and hence concluded that lysis was due to hydrolysis of the protein of the bacterial cell.

[1] Bronfenbrenner, J., and Hetler, D. M., *J. Exp. Med.*, 1928, **48**, 269.

Meyer, Palmer, Thompson, and Khorazo[2] have reported the appearance of non-protein nitrogen during lysis of Sarcina by lysozyme.

The detection of minute amounts of protein split-products in culture-media is a difficult matter but the loss of protein may be readily and accurately followed provided the culture-medium itself contains little or no protein.

In the present experiments bacteria were grown on the protein-free yeast-extract media previously described.[3] The quantity of cells in suspension was determined by comparing the turbidity of the suspension in water with that of a standard casein-suspension by means of a Klett photoelectric colorimeter. This figure was called "water-insoluble protein" and was found to agree quite closely with the protein-content of growing bacterial suspensions as determined by Kjeldahl determinations of the centrifuged and washed sediment.

A second turbidity-measurement was made on a sample of the suspension diluted in 2% trichloracetic acid. This figure is called "total protein."

The relative changes in those 2 quantities is best shown by plotting the water-insoluble protein of each sample against the total protein for the same sample. The changes in water-insoluble protein and

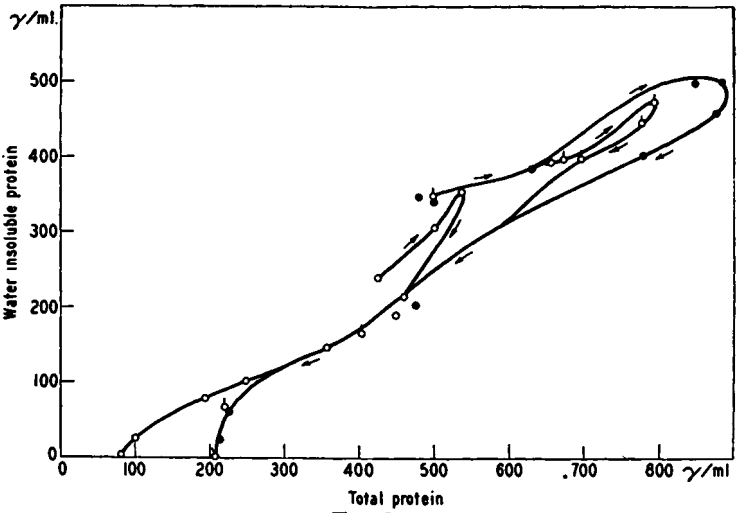

FIG. 1.

Changes in water-insoluble and total protein during lysis of *Staphylococcus musca* by bacteriophage. The different symbols in graphs denote different experiments.

[2] Meyer, K., Palmer, J. W., Thompson, R., and Khorazo, D., *J. Biol. Chem.*, 1936, **113**, 479.

[3] Northrop, J. H., *J. Gen. Physiol.*, 1938, **21**, 335.

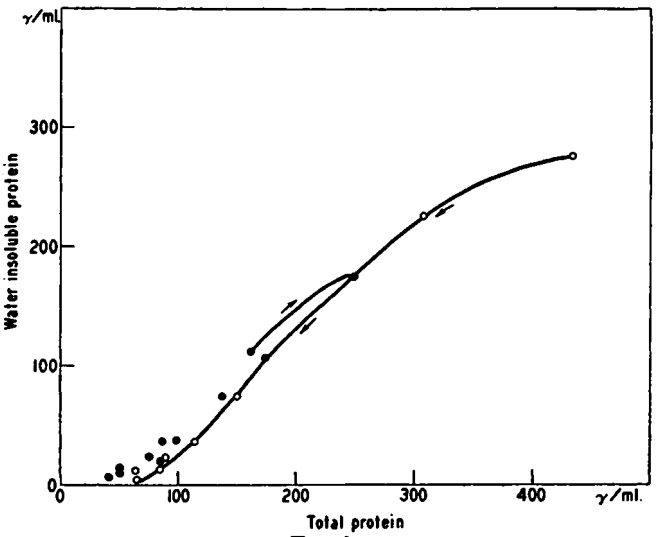

FIG. 2.

Changes in water-insoluble and total protein during lysis of *Staphylococcus aureus* by bacteriophage.

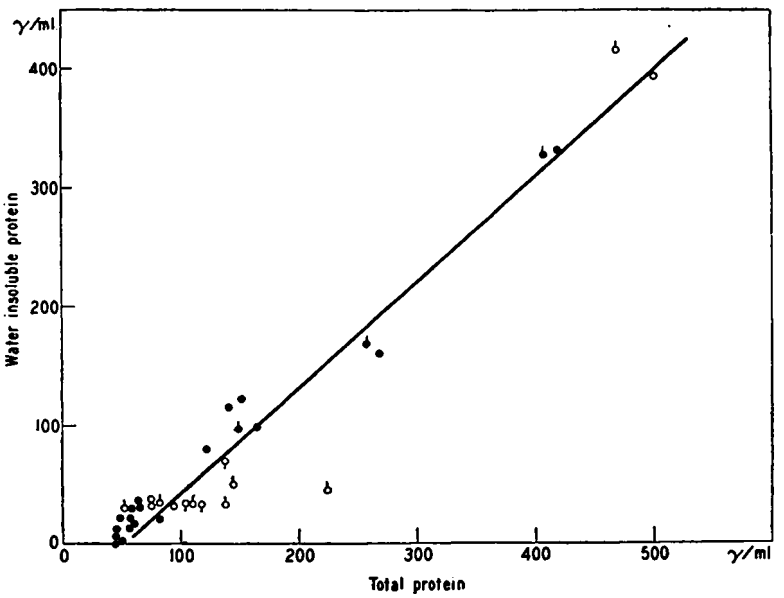

FIG. 3.

Changes in water-insoluble and total protein during autolysis of *Staphylococcus aureus* under anaërobic conditions.

total protein during growth and lysis have been determined for *Staphylococcus aureus, Staphylococcus musca, B. coli,* and *B. megatherium.* The changes in the staphylococcal cultures during autolysis

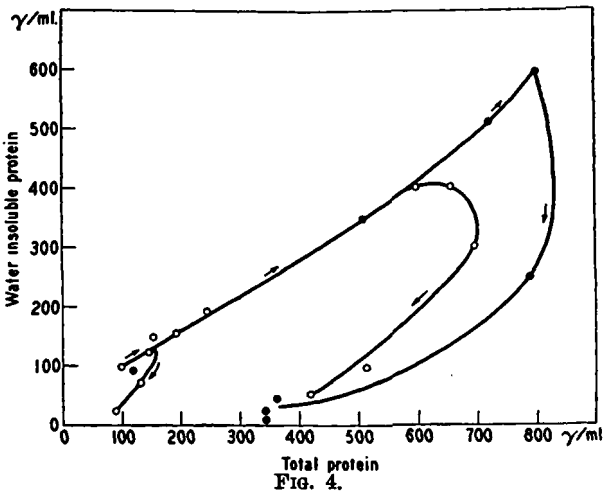

FIG. 4.

Changes in water-insoluble and total protein during lysis of *B. coli* by bacteriophage.

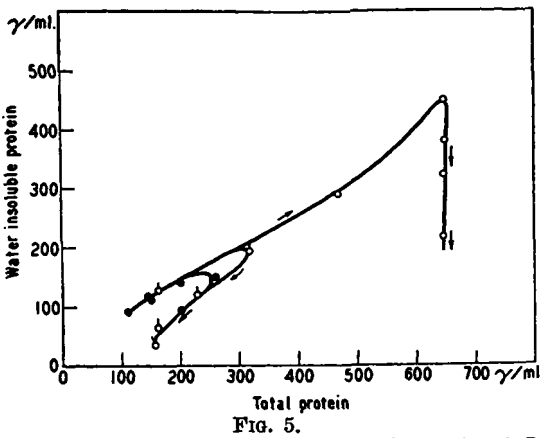

FIG. 5.

Changes in water-insoluble and total protein during lysis of *B. megatherium* by bacteriophage.

under anaërobic conditions[4] have also been determined. The results are shown in Figs. 1-5. The direction of the change in concentration is indicated by the arrows.

The results show that in the case of the staphylococcal suspensions the figures for total protein and water-insoluble protein are nearly equal during either growth, lysis, or autolysis (Figs. 1, 2, 3). No protein is liberated, therefore, when the cells break down. A very small amount of protein remains in solution after the aqueous solution is clear but there is no significant difference between the

[4] Jaumain, D., *Compt. rend. Soc. Biol.*, 1922, **87**, 790.

curves for autolysis and for lysis. The protein must, therefore, be hydrolyzed immediately upon disintegration of the cell.

In the case of *B. coli* (Fig. 4) or *B. megatherium* (Fig. 5), however, some protein does appear in solution as the cells disintegrate, since the decrease in water-insoluble protein during lysis is faster than the decrease in total protein. The total protein also decreases before lysis is complete and at the end of the process the solution is practically protein-free.

The coli and megatherium could not be made to autolyze.

According to these results there is no general relationship between lysis and protein-hydroysis with different basterial suspensions. No protein appears in solution during lysis or autolysis of staphylococcus while some does appear during lysis of *B. coli* or *B. megatherium.*

The writer is indebted to Dr. A. P. Krueger for the *Staphylococcus aureus* cultures and phage and to Professor André Gratia for the *B. coli* and *B. megatherium* cultures and their accompanying phages.

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Immediate Effects of Coronary Sinus Ligation on Dynamics of Coronary Circulation.

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It has been suggested by Gross,[1] Robertson,[2] and Ungerleider[3] that ligation of the coronary sinus or coronary veins might materially aid hearts whose normal blood supply had been partially removed. Fortunately, such a concept can be tested physiologically and hence an experimental study was made of the possible practical value of such a procedure.

In order to obtain a better understanding of what happens dynamically in the coronary vascular bed following ligation of the coronary venous system, the following have been studied in 28 acute experiments on dogs and largely by optical methods: (1) the coronary

[1] Gross, L., Blum, L., and Silverman, *J. Exp. Med.*, 1937, **65**, 91.

[2] Robertson, H. F., *Am. Heart J.*, 1935, **10**, 533.

[3] Ungerleider, H., Kerkhof, A., and Fahr, G., PROC. SOC. EXP. BIOL. AND MED., 1938, **37**, 703.