

paper shows by comparison with the counts made by the indirect method.

Our thanks are expressed to Dr. A. Bliss Dayton of the Department of Internal Medicine for his assistance and criticism.

61 (2584)

Observations on the theory of tetany.

By IRVINE H. PAGE.

[*From the Research Division of Eli Lilly and Company, Marine Biological Laboratory, Woods Hole, Massachusetts.*]

It has been found that in the sea urchin egg within certain time limits isotonic solutions of sodium phosphate at various $[H^+]$, inhibit cell division only by the limiting effect of the hydrogen ion concentration of the external solution. By direct analysis of the eggs it has been shown that within limits the $PO_4 =$ anion does not penetrate.

Eggs treated with isotonic phosphate over a wide hydrogen ion range, subsequently placed in isotonic electrolytes, and finally placed in sea water to determine their viability, show that (1) KCl has practically no injurious effect, (2) NaCl is most toxic with the peak of minimum toxicity at 7.4-7.8, (3) $CaCl_2$ is toxic with the minimum peak at 7.8, (4) $MgCl_2$ has relatively little toxicity but markedly shifts the peak towards the alkaline side.

$CaCl_2$ and $MgCl_2$ are remarkable in that eggs removed from the ovaries and placed directly into isotonic solutions of these salts even on the most vigorous washing and centrifuging do not cytolysed while the same eggs if allowed to stand in sea water for $\frac{1}{2}$ hour or over, agglutinate and cytolysed immediately. Dr. Heilbrunn¹ has independently confirmed this point. This very extraordinary change is of interest from the point of view of the theory of agglutination and ageing.

Our experiments are directed towards the investigation of the mechanism of tetany. With such simple protoplasmic systems as the sea urchin egg many more environmental factors are under our control than in cells in organoid form. Inasmuch as phos-

¹ Heilbrunn, L. V., Personal Communication.

phates seem intimately concerned in the syndrome of tetany it becomes of interest to find out whether they may cause a pathological unbalancing of the cell—probably of the calcium equilibrium—in such a way that the cell is open to injury by non-specific tetanogenic ions or molecules. The above experiments seem to show that the egg is rendered very susceptible to poisoning, especially by NaCl, when the egg was previously treated with phosphate. This observation suggests Greenwald's¹ theory of tetany—a poisoning by the sodium ion.

California Branch.

University of California, October 18, 1924.

62 (2585)

Some biochemical notes on *Ariolimax californicus*, Cooper.

By D. B. DILL and R. E. SWAIN.

[*From the Department of Chemistry, Stanford University, Calif.*]

Ariolimax californicus is a species of land mollusk common in the vicinity of Stanford University. It is striking because of its yellow color and large size.

The blood of this mollusk is blue when oxidized and the blood ash contains little or no iron but much copper. It is, therefore, concluded that the oxygen carrying protein is hemocyanin. Urea, uric acid, ammonia and creatine + creatinine were found in the blood by qualitative tests. It contained 2.2 percent solids, 0.35 percent ash, and 0.22 percent total nitrogen.

Extracts of the salivary glands, stomach, intestine and liver were examined for the presence of enzymes. The salivary glands yielded a diastatic enzyme which was most active on the acid side of neutrality. Diastase, lactase, maltase and emulsin were found throughout the alimentary tract. Proteolytic enzymes could not be detected by experiments *in vitro*.

¹ Greenwald, I., *J. Biol. Chem.*, 1923, liv, 285.