rats which had been rendered rachitic. Without going into detail at this time, it may be stated that a series of experiments of this nature showed that the 302$\mu\mu$ line possessed marked antirachitic potency, whereas the 313$\mu\mu$ line exerted very slight specific power. This result emphasizes more strongly than ever the remarkable specificity of wave lengths of light in relation to rickets.

It has never been accurately determined whether radiations less than 290$\mu\mu$, the shortest emitted by the sun, have curative power in rickets. About two years ago the shorter ultra-violet waves were segregated from the longer radiations by means of a filter containing chlorine and bromine, which, however, allowed the passage of about 0.1 per cent of radiations between 290$\mu\mu$ and the visible blue.[2] Recently we were able to isolate two bands of radiations given off by the mercury-vapor lamp—those less than 290$\mu\mu$ in length and those between 290$\mu\mu$ and 313$\mu\mu$. Their antirachitic activity was tested directly by irradiating rachitic rats. It was found that radiations shorter than 290$\mu\mu$, in other words shorter than those produced by the sun, exert a more intense antirachitic effect than the most potent region of the solar spectrum. This result is in accordance with clinical experience.

This is a preliminary report.

[1] Hess, A., and Weinstock, M., *J. Am. Med. Assn.*, 1923, lxxx, 1687.

[2] Hess, A. F., and Weinstock, M., *J. Biol. Chem.*, 1925, lxiv, 181.

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The Protoplasmic pH of Living Cells.*

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The intra protoplasmic pH of Amoeba and of cells from different tissues of Necturus and the Frog was obtained by injecting with the micrurgical technique solutions of Clark and Lubs' indicator dyes. This method allows the use of dyes which cannot penetrate living cells from without, a situation which obtains for the majority of indicator dyes. The protoplasm tolerates only a limited amount of the injected fluid. If too much is injected the protoplasm

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undergoes visible disintegration, with the production of an acid which the dye immediately registers. As long as the cell remains alive the final tint in the protoplasm is always the same.

The Necturus and Frog were slightly anesthetized by immersion in etherized water. They were then removed and pieces of the various organs were carefully teased in blood serum. Determinations of pH were made on the cells of ciliated epithelium, gastric and intestinal mucosa, liver, pancreas, striated muscle, and unripe ova. The pH values obtained were the same for every cell: viz., 7.5 ± 0.1 for the nucleus, both normal and injured; 6.9 ± 0.1 for the normal cytoplasm; and 5.3 ± 0.2 for the injured and cytolyzing cytoplasm. These results are in close agreement with those obtained on the starfish egg.[1]

Variations of pH found by previous investigators may be accounted for by the fact that in most of the determinations crushed cellular tissue was used. The low pH values obtained were probably due to the acid produced by injury. On the other hand, the higher pH values can be explained by the presence of variable amounts of alkaline (pH 7.4 to 7.6) interstitial fluids and blood.

The pH of *Amoeba dubia* and *proteus* was also determined to be in the close neighborhood of 6.9 ± 0.1. Amebae, injected with phenol red, were maintained alive and well for over 48 hours without an appreciable change being noted in the color characteristic for the pH originally recorded. The pH value we obtained does not agree with the pH value of 7.6 obtained by the Needhams.[2] The Needhams based their results on the injection of neutral red, brom thymol blue, and phenol red. They do not mention the survival time after the injection of neutral red. They do state, however, that brom thymol blue killed the amebae within 2 to 3 minutes and phenol red, within 5 to 6 minutes.

In conclusion, it may be stated that the living protoplasm of widely differing types of cells, *i. e.*, echinoderm ova,[1] amebae, tissue and germinal cells of Necturus and the Frog, under normal conditions apparently have a remarkably constant pH value, which is slightly on the acid side, while the nuclear pH is distinctly on the alkaline side of neutrality. Injury produces an increased acid reaction in the cytoplasm but does not affect the pH of the nucleus.

This is a preliminary report.

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[1] Chambers, Robert, and Pollack, Herbert, *J. Gen. Physiol.*, 1927, x, 739.

[2] Needham, J., and Needham, D. M., *Proc. Roy. Soc.*, London, Ser. B, 1925, xcviii, 259.