

pared with that of the pepsin in a similar bottle kept in the thermostat at a temperature of 39° C.

The reported results were demonstrated by the reactions for pepsin of Jacoby and Solms, of Fuld, and of Gross.

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A demonstration of the effects of CO₂ upon the frog's pupil.

By **JOHN AUER.**

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Frogs placed in an atmosphere of CO₂ gas show within thirty seconds, before any symptoms of excitement, a good constriction of the pupil. This constriction becomes almost maximal within five minutes; there is no dilatation.

The same effect is exerted by CO₂ gas upon excised frog's bulbi.

When the frog's iris, in the excised bulbus or in the living animal, is under the influence of CO₂ gas, the powerful mydriatic effect of adrenalin is strongly reduced.

Since CO₂ produces this myotic action upon excised bulbi, its effect must be exerted, largely at least, upon the sphincter pupillæ, that is, its action is peripheral. These experiments, however, do not exclude a possible central action.

This myotic effect of asphyxia in frogs is interesting, as asphyxia in mammals produces chiefly dilatation.

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On the specific acquired resistance of red blood cells.

By **RICHARD WEIL.**

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It is a well known fact that the serum plays a preponderating rôle in the immune reactions of animals. On the other hand, it has been amply shown that the immune characters of the serum

may be in no proportion to the immunity of the organism as a whole. There must therefore be an additional factor, hypothetically designated by Behring as cytogenetic immunity. Of this type of immunity there is the following experimental evidence. In 1898, Kossel stated that if an animal were injected with eel serum, its washed red cells manifested resistance to the hemolytic action of the latter *in vitro*; a fact confirmed by Camus and Gley, and by Tshistovitch. In 1908, it was shown by Morawitz and Pratt that in animals injected with phenylhydrazin, the red cells became resistant to all hemolytic agents. This they showed to be not an immune reaction, but the direct result of the chemical action of the drug on the red cells.

It was the object of the present series of experiments to determine whether it was possible to induce a *specific* resistance of the red cells to poisons injected into the animal. Dogs and rabbits were used. Among the hemolysins injected were: eel serum, and dog serum; saponin, and digitalin; staphylolysin, tetanolyisin, and prodigious toxin; and phenylhydrazin. Eel serum, saponin, and phenylhydrazin were selected for routine experimentation. All of these were found to induce a severe grade of anemia. The animals were bled at intervals, and the resistance of the corpuscles, after repeated washings in salt solution, tested against a variety of destructive agents. Eel serum was found to induce occasionally a marked change in the red cells; saponin did so almost invariably, in case the animal survived the treatment; phenylhydrazin did so without exception. In the early stage of treatment, the resistance of the red cells to all hemolytic agents, including the injected hemolysin, was diminished. In the later stages, it was increased in a characteristic manner. The red cells of animals injected with phenylhydrazin showed a marked increase of resistance to all types of hemolysins. Animals injected with eel serum and with saponin came to possess a type of erythrocytes which were very resistant to the specific injected hemolysin, but were almost invariably more easily destroyed than normal control cells by all other hemolytic agencies, including anisotonic salt solutions (demonstration). In those animals injected with eel serum, which failed to develop a specific resistance of the red cells, the serum showed marked anti-hemolytic powers. It is evident, therefore, that the erythrocytes have developed a specific immunity.

The cause of this resistance has been made the subject of further study. After testing the saponin and eel serum on a variety of red cells, the supernatant fluid was pipetted off, and tested on normal red cells. It was found that the fluid which had been in contact with resistant cells was least hemolytic, and vice versa. It is conceivable that the resistant erythrocytes may either absorb a disproportionate quantity of the hemolysin, or may contain a neutralizing substance.

It has been customary in human pathology to judge of the resistance of red cells according to their vulnerability in anisotonic solutions of salt. The above described experiments indicate that specific resistance to a circulating toxin may be associated with marked loss of resistance to anisotonic solutions of salts. The red cells in advanced cases of cancer have been shown (Lang and others) to possess a greatly increased degree of resistance to anisotonic solutions. The demonstration of a hemolysin in the circulating blood of cancerous cases, and of an increased resistance thereto on the part of the red cells, has made it possible to prove that the resistance is specific to this hemolysin, and only accidental and occasional for the anisotonic solutions.

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The butyric reaction for syphilis in man and in the monkey.

By **HIDEYO NOGUCHI.**

[From the Rockefeller Institute for Medical Research.]

In a preliminary communication¹ I stated elsewhere that an increase in certain protein constituents of the blood serum and of the cerebro-spinal fluid of patients suffering from active or latent syphilis or parasyphilitic affections is a constant occurrence. I wish to describe here briefly the technique of employing butyric acid for the detection of this increase of protein.

Cerebro-spinal fluid.—One or two parts² of spinal fluid³ are mixed with five parts⁴ of 10 per cent. butyric acid solution⁵ and are

¹ Noguchi: *Jour. of Exp. Med.*, 1909, xi, p. 84.

² 0.1 or 0.2 c.c. are sufficient and convenient.

³ Must not contain blood.

⁴ 0.5 c.c. for the quantities above specified.

⁵ Best in 0.9 per cent. salt solution.