with *Park No. 8* antisera. *Park No. 8 phage b* antiserum reacts only with the specific antigen; however, the *phage b* antigen has a wide reactivity with both *Park No. 8* and heterologous antisera.

The *No. 19* immune serum has a wider range of reactions than *Park No. 8* antiserum. It has strong reactions with 2 of its variants, *19 'antiserum'* and *19 'broth 45°C'*, but does not react with the remaining 2. It also reacts to a slighter extent with the heterologous *Park No. 8* and *Park No. 8 phage a* antigens. It is interesting to note that its reaction with *19 'broth 45°C'*, was stronger than with the homologous *No. 19* antigen although the table does not indicate this reaction. The *No. 19* antigen reacted less intensely in the reciprocal relationships. *19 'LiCl'* and *19 'phenol'* bear no antigenic relationship to the *No. 19* strain. On the other hand their antisera react with *Park No. 8* antigen.

A multiplicity of antigenic factors may account for the diversity in antigenic variation amongst the variants. Dissociation seems to alter the antigenic structure of a single strain in a number of possible different ways. Variants from the same parent strain, though similar in morphological and cultural characteristics and derived in a similar manner, may differ in antigenic nature. The antigenic character of a variant may be so altered that it will react with heterologous strains or variants which will not react with the parent strain.

The literature affords conflicting reports regarding the antigenic relationship of the Hofmann bacillus to the diphtheria bacillus. Our results afford no indication of a relationship.

7313 P

Action of Veratrine on Medullated Nerve.

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Fromherz[1] has recently investigated the effect of veratrine and other drugs upon the electrical response of medullated nerve, using a moving coil galvanometer as a measuring instrument. He detects little difference in response between normal and veratrinized nerve, if the nerve is suspended in oxygen throughout. If, how-

[1] Fromherz, H., *J. Physiol.*, 1933, **79**, 67.

ever, veratrinized nerve be asphyxiated and allowed to recover in oxygen, he finds that the after-potential after a single shock or short tetanus may last as long as 10 minutes. We have reinvestigated the action of veratrine on the sciatic nerve of *R. pipiens* with the cathode ray oscillograph, and find that if the concentration is suitably adjusted to the temperature, typical veratrine after-potentials as measured out to one-half second can be obtained whether the nerve is in air or in oxygen. The results of Graham and Gasser[2] are therefore not due to partially asphyxial conditions, as suggested by Fromherz[1] and Hill.[5]

In order to study the after-potential throughout its course we have modified the usual oscillographic technique by employing a voltage amplifier of the direct-coupled type, especially designed to avoid amplifier drift (the theory of this amplifier has been published by Schmitt[3] and the details of the circuit as modified for electrophysiological use will be published elsewhere). By this method the resting potential is followed continuously so that due allowance for drift in resting potential can be made in estimating the duration of the after-potential. After a shock the potential changes can be followed for the first 3-4 seconds by photographing a slow sweep of the oscillograph beam; thereafter the potential may be measured every few seconds for as long as desired by reading the balancing potentiometer, using the oscillograph at high amplification as a null instrument. Preliminary experiments have revealed after-potentials lasting as long as 6 minutes after a single stimulation of veratrinized nerve in oxygen after previous asphyxiation. Without asphyxiation the potential seldom lasts longer than 10-30 seconds.

The action of veratrine on the gaseous metabolism of frog sciatic nerves at rest and in activity has also been studied. It has been found that the acceleration of the oxygen consumption reported by Schmitt and Gasser[4] usually reaches its maximal value within 10-30 minutes after exposure to veratrine, as determined by tipping the veratrine from a side arm in the Warburg respirometer onto the nerves lying in the main portion of the vessel. If after this veratrinization the nerves be asphyxiated and the oxygen consumption again followed after recovery, the new rate of respiration does not exceed that before asphyxiation. Hence it appears that veratrine permeates the nerve fairly rapidly under aerobic conditions and produces clear cut increases in oxygen consumption. It is difficult

[2] Graham, H. T., and Gasser, H. S., *J. Pharm. Exp. Ther.*, 1931, **43**, 163.

[3] Schmitt, O. H. A., *Rev. Sci. Instr.*, 1933, **4**, 661.

[4] Schmitt, F. O., and Gasser, H. S., *Am. J. Physiol.*, 1933, **104**, 320.

to interpret these experiments on the basis of the hypothesis of Fromherz[1] and of Hill[5] that veratrine is unable to penetrate the myelin sheath until after the sheath has been rendered permeable by a temporary lack of oxygen.

According to Hill the heat production following stimulation of veratrinized nerve in oxygen is not materially greater than normal unless the nerve has been previously asphyxiated. In this condition the heat production following a single shock may be a thousand times normal. Stimulation at a rate of 30 shocks per minute gave a heat production more than 30 times normal in one experiment. Under the conditions of our experiments this would correspond to an excess oxygen consumption of at least 15%. Schmitt and Gasser[4] have already observed definite increases in oxygen consumption of veratrinized nerves when stimulated at a rate of 2 per second. Preliminary experiments with an improved respirometer have demonstrated increases of 1-3% above the resting level with rates of stimulation of 16-30 shocks per minute, whether or not the nerve has been subjected to previous asphyxiation. The possibility therefore exists that a portion of the large heat production reported by Hill may have no counterpart in processes involving oxygen consumption.

7314 P

Normal and Experimentally Modified Mitotic Activity of Adrenal Gland in Guinea Pig.*†

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The mitotic activity of the thyroid gland in the guinea pig can be used as a quantitative measure of the stimulating effect exerted by various agencies on this organ.[1] In the following investigations we extended this method to the adrenal gland of the guinea pig and we determined the number of mitoses in this gland in the normal animal

[5] Hill, A. V., *Proc. Roy. Soc.*, 1933, **113**, 386.

* These investigations were carried out with the aid of a grant for research in science made to Washington University by the Rockefeller Foundation.

† I wish to express my appreciation to Miss Helen Aff for her assistance in this experiment.

[1] Gray, S. H., and Loeb, Leo, *Am. J. Path.*, 1928, **3**, 257.