following injection. Sixteen of the 18 animals developed typical findings of the disease.

No detailed observations on the pathology of these animals have been made but studies are going on in this connection at present.

Arrangements are being made for the study of other virus diseases in the cat in order to determine whether the agent responsible for this blood picture is a hitherto unknown one or is one that has been known to produce disease in the cat but the effect of which on the blood was unknown.

In conclusion, evidence has been presented which seems to justify the statement that there is a transmissible disease in the cat characterized by neutropenia and leucopenia. The causative agent would seem to be a filterable agent or a virus.

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Relation of Chemically Induced Activity in Nerve to Changes in Demarcation Potential.*

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Repetitive activity often develops in mammalian nerves as a result of a localized injury (Adrian).[1] The phenomenon has been explained by assuming that circulating currents set up between the depolarized region of injury and the normal nerve result in periodic stimulation, at a frequency which depends on the rate of recovery of the normal nerve surface and the strength of the circulating currents. Recently, Fessard[2] has shown that repetitive activity can result when crystals of certain salts are applied to a nerve trunk, and that the region thus treated may be either positive or negative to the untreated parts. In recent work we have made an extended investigation of chemical activation of nerve, using isotonic solutions containing various effective salts applied to single active fibers dissected from the sciatic nerve of the frog. In these experiments

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1 Adrian, E. D., *Proc. Roy. Soc. B*, 1930, **106**, 596.

2 Fessard, A., *L'Activité Rythmique des Nerfs Isolés*, Hermann and Co., Paris, 1936.

the impulses were recorded at the treated region. This is an ideal preparation for studying the relation between chemically induced activity and changes in demarcation potential.

The present experiments were undertaken (1) to observe the impulse discharge and the change in demarcation potential by simultaneous measurement of the two through the same pair of matched electrodes, (2) to measure the effect of anions on the demarcation potential of a single fiber, since this has never been observed in studies on the sheathed frog nerve (Wilbrandt,[3] for discussion), and (3) to test our hypothesis that chemically induced activity results only during the period of active exchange of ions in a nerve, and that the degree of activity depends upon the rate of this exchange.

We have observed that activity can occur with a positive change in demarcation potential, as in isotonic NaSCN; or with a negative change in demarcation potential, as when NaCl + KCl (4 times normal) is applied to a fiber previously soaked in NaCl. From this it would seem that a sufficient change in electrical potential, of either sign can disturb the molecular organization sufficiently to cause impulses to develop. However, we have also found activity with no change in demarcation potential (within ±0.1 millivolt), in Na_3Ci. Although these latter changes in demarcation potential were somewhat variable, Fig. 1 shows a clear-cut case of activity occurring when no change in demarcation potential resulted. This

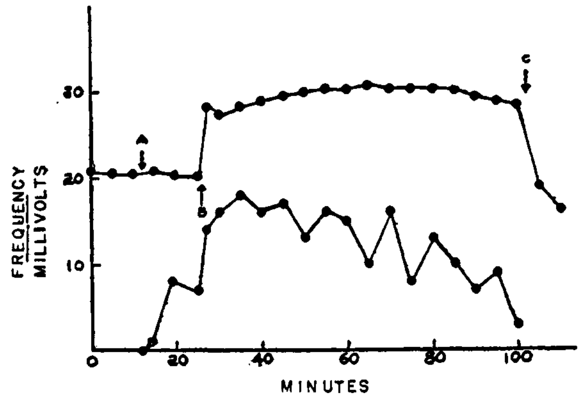

FIG. 1.

Relation between demarcation potential and frequency of response (impulses per second). At A, isotonic Na_3Ci was applied; at B, isotonic NaSCN; and at C, isotonic Na_3Ci. The upper curve is the demarcation potential relative to a region of the fiber depolarized by KCl. The lower curve is the impulse frequency.

3 Wilbrandt, W., *J. Gen. Physiol.*, 1937, **20**, 519.

may mean Na_3Ci, by removing Ca^{++}, unstabilizes the molecular organization whose cycle of alteration constitutes the spike potential, while NaSCN or KCl produce their effect by the potential changes set up across this surface layer of molecules. This possibility is being further investigated.

Isotonic NaSCN always stimulated (after preliminary treatment with Na_3Ci or NaCl to remove some of the Ca^{++}), at a time when the demarcation potential went positive compared to that in NaCl. This effect is shown in Fig. 1 and can be consistently obtained provided the nerve be treated previously with a calcium-removing agent. A nerve treated with NaSCN without previous soaking in NaCl or Na_3Ci shows a positive shift of potential of lesser degree, which may be due to the lowering of the K^+ concentration relative to that in Ringer's fluid.

In our previous work we have found a similarity of the cycle of activity in NaSCN to that in KCl when these are applied after lowering the Ca^{++} content of the nerve. The activity goes more or less abruptly to its maximum frequency and then falls off to zero over a period of 5-10 minutes. This transient burst of activity is accompanied by a sudden but persistent change in demarcation potential, in a positive sense for NaSCN, and, as was to be expected, in a negative sense for KCl.

The period of most rapid change in demarcation potential following the application of NaSCN (Fig. 1) is probably associated with the most rapid exchange of anions. Since at this time the activity also shows an abrupt increase in frequency with a slower increase afterward there appears to be a correlation between change in activity and change in interface potential. However, the irregular decline of frequency occurs during the steady persistence of the increased demarcation potential, and the maximum of frequency does not coincide with the maximum rate of change of demarcation potential.

Our hypothesis that chemical stimulation occurs only during the actual exchange of ions is thus supported by these observations. However, the additional hypothesis that the highest frequency of impulses occurs during the most rapid exchange of ions is not confirmed because the maximum frequency does not coincide with the maximum rate of change of demarcation potential. The implications of this latter relationship must, however, be investigated more extensively.