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Restoration of Dorsal Root Potential by Strychnine after Abolition by Partial Sectioning of Spinal Cord.

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According to the interpretation of Barron and Matthews[1] the primary site of origin of the spinal cord potential as led electrotonically from the dorsal root is in the dorsal root terminations. Bonnet and Bremer[2] and Eccles,[3] however, think that the dorsal root potential more probably originates in the internuncial neurones. That internuncial neurones can be the origin of the dorsal root potential can be simply demonstrated with the aid of strychnine in the following type of experiment (Fig. 1).

Toads were used. The spinal cord with its roots was exposed and the brain severed from the cord just below the medulla under ether anesthesia, care being taken to preserve the blood supply of the

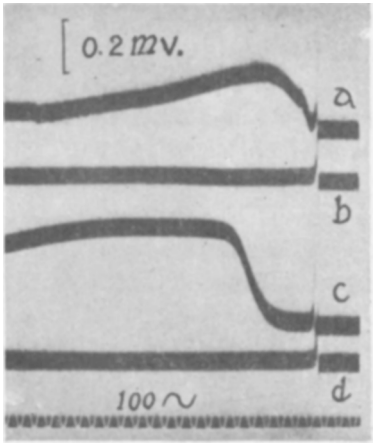

FIG. 1.
To show the restoration of the dorsal root potential by strychnine after abolition by partial sectioning of the spinal cord. Leading electrodes on the right 3rd dorsal root, 0.7 and 3 mm from cord. Stimulating electrodes on the ipsilateral 9th dorsal root, 13 and 16 mm from cord. a, control. b, 5 min. later, after a transverse dorsal cut midway between the two roots, note abolition of the potential. c, Another 33 min. later, after strychnine, note the return of the potential and that it has an abnormally long latency. d, Another 4 min. later, after transection of the whole spinal cord between the roots, note the disappearance of the restored potential. Curves to be read from right to left.

1 Barron, D. H., and Matthews, B. H. C., *J. Physiol.*, 1938, **92**, 276.

2 Bonnet, V., and Bremer, F., *C. R. Soc. Biol., Paris*, 1938, **127**, 806, 812.

3 Eccles, J. C., *Ann. Rev. Physiol.*, 1939, **1**, 363.

cord. Between the discontinuance of the ether and the beginning of the observations there was an interval of at least 40 min. Curare was given to eliminate movements of the animal. The stimulus was applied on the 9th dorsal root while the leading electrodes were on the ipsilateral 3rd root. With the toads used the points of entrance of these two roots into the cord were usually 7-8 mm apart. After ascertaining the presence of the potential and its size, a partial cut of the spinal cord was made midway between the two roots. The cut was sometimes a transverse dorsal one, of a depth corresponding roughly to about ¼ of the thickness of the spinal cord, calculated to sever the fiber tracts in both dorsal columns; sometimes it was limited to the ipsilateral dorsal half of the cord, severing the dorsal column on one side only. Either procedure invariably abolished the potential. A 1/20,000-1/10,000 solution of strychnine nitrate was then irrigated repeatedly on the spinal cord. Within about 10 min. the stimulation of the 9th root was found again to produce large potential in the 3rd root. In about 30 min. the restored potential generally became larger than, and could be 3-4 times as large as the original potential before the cut. As a control against the possibility of the restored potential being due to physical spreading of potential changes from below the cut, the latter was then extended to transect the whole spinal cord; this invariably abolished the potential again. It may also be noted that with a strychninized spinal cord to begin with, such partial cuts as normally abolished the potential, had very little effect.

The dorsal root potential obtained after strychninization presents several interesting and puzzling characteristics. A striking point is that while greatly increased in size it has a much longer latency. The peculiarities of the strychnine potential are now under detailed study. But it seems to be immediately obvious that the restored potential due to strychnine described above must be essentially of internuncial neurone origin.