which suggest that the electrosensory system is "oscillating"[3]. Supplementary discharges at fixed latency could be the fish "echoing" to its own discharge[4,5], and in particular the very long trains of pulses at intervals of 11 to 12 msec. The tuberous electroreceptors are present and probably functional at the occurrence of the first discharge[2], but it is possible that the inhibitory path ways normally blocking response to the fish's own emission[6] are not yet established. Recordings made in large tanks showed that multiple discharging was not an artifact due to the very small volume of the recording cell.

Preliminary histological results suggest that, unlike *Eigenmannia*, no recognisable electric organ exists in *Marcusenius* until several weeks after the first discharge. The appearance of the characteristic head-negative adult discharge on about Day 40 probably corresponds to the appearance of the first electroplaques.

Summary. Larvae of both species start discharging at 8 days. *Eigenmannia* immediately produces pulses similar to those of the adult. *Marcusenius* however, possesses a characteristic larval discharge 20 times longer and of opposite polarity to the adult discharge which appears on Day 40.

F. Kirschbaum[7] and G. W. M. Westby

Laboratoire de Physiologie Nerveuse,
Département de Neurophysiologie Sensorille, CNRS,
F–91190 Gif-sur-Yvette (France), 4 July 1975.

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Post-Tetanic Changes of Bilateral Dorsal Root Potentials Evoked by Stimulation of the Cutaneous Afferents

Long-lasting tetanization of the spinal afferents profoundly affects transmission at their synaptic terminals. After conditioning tetanus, the size of the testing monosynaptic reflex evoked by stimulation of the tetanized afferent nerve is increased. This post-tetanic potentiation is most probably caused by prolonged hyperpolarization of the presynaptic fibres[1]. The same explanation was applied to the potentiation of presynaptic inhibition recorded as the dorsal root potential (DRP) in the root by which an afferent volley enters the spinal cord[2,3]. It is known that the DRP is produced not only at the point of entry of an afferent volley but spreads to the opposite side of the cord. Since contralateral depolarization in many respects differs from the ipsilateral potential[4], in the present investigation the post-tetanic changes of bilateral DRPs evoked by stimulation of the cutaneous afferents were studied.

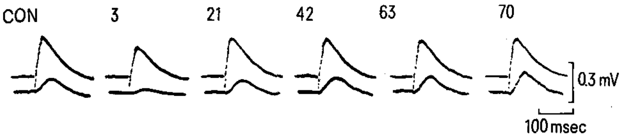

Fig. 1. Changes of bilateral dorsal root potentials produced by stimulation of the superficial peroneal nerve after conditioning tetanus of the same afferents. Upper traces of each record show ipsilateral and lower traces contralateral DRPs. Negativity is signaled by an upward deflection. The strength of afferent stimulation was 1.18 times the threshold strength for the ipsilateral potential. After the first record which shows the control DRPs, a conditioning tetanus of 350 c/sec for 15 sec was given. The next records illustrate changes in the size of the DRPs. The numbers indicate time in sec after termination of the tetanus.

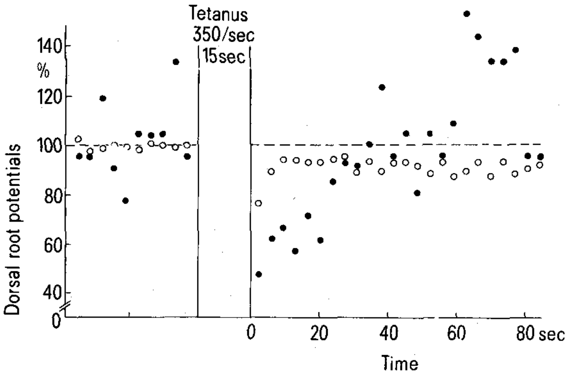

Fig. 2. Post-tetanic changes of ipsilateral and contralateral dorsal root potentials. The DRPs were produced by stimulation of the superficial peroneal nerve at 1.22 threshold strength. At this intensity of stimulation ipsilateral DRP attained about 65% of its maximal size. Abscissa, time in sec. Ordinate, size of the DRPs calculated as percentages of the controls evoked just before tetanus. Open circles represent ipsilateral and close circles contralateral DRPs.

Methods. The experiments were performed on 24 spinal cats lightly anaesthetized with thiamylal sodium (30 mg/kg i.p.). The testing DRPs were evoked by stimulation of the superficial peroneal or posterior tibial nerves every 3–5 sec and led off bilaterally from the most caudal rootlets of the L7 dorsal roots. The conditioning stimulation of the same nerve lasted 15 sec and its frequency ranged from 100 to 450 c/sec.

Results and discussion. Prolonged tetanization of the cutaneous nerve produces differentiated changes in the size of the DRPs on both sides of the spinal cord. They are most easily observed when the strength of an afferent stimulation is adjusted to produce ipsilateral testing DRPs which attain no more than 60–70% of their maximal size. Figure 1 and 2 show the most frequently encountered changes of bilateral DRPs. It may be seen that, just after terminating the tetanus, the ipsilateral DRP is decreased to about 70% of the initial value. Then the depolarization increases, but during several tens of seconds it does not fully recover, attaining 92–95% of the control level. The initial depression of the contralateral DRP is much deeper (up to 45–48% of the control) but its duration is shorter. The size of the potential rapidly increases to regain after about 25 sec its control value and then it augments further, displaying a significant delayed post-tetanic potentiation to about 150% of the initial level. Post-tetanic potentiation of the ipsilateral DRP was observed only in 2 out of 24 preparations. When present, it was small (up to 118% of the control), variable and of short duration.

Post-tetanic depression of bilateral DRPs depended on their initial amplitude. On the ipsilateral side of the cord, the most conspicuous decrease of the DRPs occurred when they were produced by a just above threshold stimulation. With the increase of the DRPs, their post-tetanic depression was gradually reduced. When the DRPs were produced at 4 times the threshold strength, their changes following tetanization were negligible and consisted in reduction of the depolarization only to 95–99% of the control. It follows from these experiments that the size of the post-tetanic depression of the ipsilateral DRP is inversely proportional to their initial amplitude. On the contralateral side of the cord, the relationship between the size of the DRPs and their depression occurring just after terminating the tetanus proved to be quite opposite. The greater the amplitude of contralateral DRPs, the greater their post-tetanic depression. On the other hand, the delayed post-tetanic potentiation of the contralateral DRPs was inversely proportional to their preceding depression.

Our experiments reveal that in contrast to the DRPs evoked by stimulation of the whole dorsal roots or of the muscle afferents which exhibit appreciable post-tetanic potentiation[2,3,5], the depolarization of the dorsal roots produced by stimulation of the cutaneous nerves undergoes mainly post-tetanic depression. The other trait of the post-tetanic changes of the DRPs observed in our experiments seems to be connected with differences in depolarizations resulting from testing volleys on both sides of the cord. The contralateral DRPs are much smaller than the ipsilateral ones[4], and it was found that they appear at slightly higher intensities of afferent stimulation. Hence, at very low intensities of stimulation, contralateral depolarizations are almost invisible and post-tetanic depression of presynaptic inhibition may be considered to occur exclusively on the ipsilateral side of the cord. On the contrary, when the strength of the testing stimulation is high enough to excite all alpha cutaneous afferents, following tetanization only contralateral DRPs are affected.

The described pattern of post-tetanic depression shows that only in a narrow range of the stimulation intensities producing the testing DRPs (such as chosen to produce changes illustrated in Figures 1 and 2) it is possible to evoke bilateral reduction of presynaptic inhibition. Even in these instances the depression of the contralateral DRP is rapidly followed by its potentiation. Both at low and at high intensities of the testing stimulation, the alterations of the DRPs concern only one side of the cord. These findings suggest the existence of a subtle mechanism counteracting the simultaneous decrease of presynaptic inhibition on both sides of the lumbar spinal cord.

Summary. In spinal cats following tetanic stimulation of the cutaneous nerve bilateral dorsal root potentials in the lumbar spinal cord are depressed. Because of differences between ipsi- and contralateral potentials, this depression can usually be evoked only on one side of the cord.

W. Hołobut and A. Niechaj

Department of Human Physiology, Medical School,
Dymitrowa 11, P-20080 Lublin (Poland), 16 July 1975.

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Development of Longitudinal Retraction of Carotid Arteries in Neonatal Dogs

The large arteries of the body are under longitudinal traction. This extends the vessels and has several physiological effects: a) traction interacts with blood pressure to help maintain arteries at constant length[1], b) traction and longitudinal extension alter arterial pulse wave velocity, and thus, indirectly influence arterial pressure[2], c) traction causes retraction of severed arteries, promoting hemostasis[3].

Longitudinal traction has been measured directly[1], but more frequently it has been assessed by measuring vessel retraction upon excision. For example, when severed, the carotid artery in adult dogs retracts about 38%[1,4,5]. The magnitude of this value varies in different vessels and in different species, but retraction occurs in virtually all arteries studied[1,4–8]. What is the genesis of longitudinal traction and how does it develop? The present experiments were undertaken to consider this question by evaluating the retraction of carotid arteries in neonatal dogs.

Method. Two groups of puppies were used. Pregnant mongrel dogs were purchased from Sleepy Hollow Farms to obtain puppies up to 4 weeks of age. The pregnant animals delivered their puppies in the laboratory, and the puppies were nursed by the mother until the time of experiment. Animals 4 weeks of age and older were purchased directly from Sleepy Hollow Farms. Animals were housed in groups according to age, and were fed Purina High Protein Lab Chow and water ad lib until they were studied. Each animal was anesthetized, placed on its back with the head and neck in a natural position, and the animal was used for various experiments concerned with the physiology of the newborn. At the completion of these experiments the animal was sacrificed by i.v. injection of a supersaturated solution of KCl to arrest the heart. A longitudinal incision then was made in the neck lateral to the midline. The incision was carried down to expose the carotid trunk, the sheath was opened and the vagus nerve and internal jugular vein were excised to expose about 3 cm length of isolated common carotid artery. A measured length of vessel was marked by placing 2 small notches in the wall precisely 20 mm apart. The artery then was transected distal to this measured segment and the vessel was permitted to retract; after waiting about 1 min the distance between the 2 notches was measured to the nearest 0.25 mm. Vessel retraction was computed as the difference between the extended and retracted lengths, divided by the extended length. Multiplying this value by 100 gave vessel retraction as a percent of its original in situ length.

Results. A total of 105 common carotid arteries were studied in puppies between 0 and 16 weeks of age. The Figure presents carotid artery retraction values and animal body weight values, both plotted as a function of

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