−80 mV. Similar waves of depolarization could be detected in primary afferents. Direct comparison of potentials recorded from each element revealed a striking mirror-like congruity between the onset and the time course of spontaneous depolarizations in motoneurone and primary afferent fibre (figure). This congruity was especially evident in dorsal root fibres establishing direct monosynaptic contacts with motoneurones. Records of the figure, A, demonstrate such an example and indicate that the temporal profiles of depolarizing potentials in both elements are identical. Moreover, the observed waves had the same order of magnitude.

The correlation between spontaneous depolarizing potentials in motoneurones and in primary afferents, which do not synapse directly on motoneurones but can influence them polysynaptically, was less perfect. The amplitude of depolarizing potentials in such fibres usually did not exceed 10% of the depolarization recorded simultaneously from a motoneurone (figure, B). This general tendency was apparent in all 65 motoneurone-dorsal root fibre pairs investigated.

The spontaneous waves were completely and reversibly abolished by elevation of external Mg^{2+} to the final concentration of 1–2 mM or by removal of external Ca^{2+} and addition of Mn^{2+} (2 mM). In contrast, picrotoxin (0.1–0.5 mM) increased the size and frequency of depolarizing potentials. The latter remained after the isolation of the segment where the recorded elements were located suggesting that correlated fluctuations appear to result from ongoing activity within one segment.

The duration, waveform and frequency of spontaneous waves was quite distinct from those of miniature synaptic potentials detected in amphibian motoneurones[4] and in primary afferent fibres[5]. However, the waves of depolarization were occasionally associated with a burst of miniature synaptic potentials, either in motoneurones or in afferent fibres.

Although the mechanism of the observed interaction remains to be discovered, it might be of considerable physiological significance, since it may reflect the synaptic transmittability within the spinal cord, and might operate as a possible communication channel between specific neuronal ensembles. In other experiments we observed that intracellular stimulation of the individual dorsal root fibres produced quite distinct synaptic responses in target motoneurones, depending upon the phase of slow depolarizing fluctuations occurring in the latter.

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Spontaneous miniature potentials in primary afferent fibres

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Summary. Intracellular recording from primary afferent fibres of the isolated frog spinal cord revealed the existence of spontaneous synaptic activity, related probably to the firing of presynaptic inhibitory fibres.

Since the discovery of spontaneous miniature potentials at vertebrate neuromuscular junction[2], they have been recorded from the postsynaptic cells at many other peripheral and central synapses with chemical mode of transmission[3], including amphibian spinal neurones[4]. However, no spontaneous activity resembling miniature synaptic potentials could be detected at axo-axonic synapses existing between primary afferent collaterals and presynaptic inhibitory fibres, which are the axonal branches of special interneurones in the spinal cord, although these synapses exhibit the standard features such as synaptic vesicles and the active zones of contact[5]. We report here the first evidence that primary afferent fibres exhibit a spontaneous synaptic activity related probably to the functioning of presynaptic inhibitory fibres. We also report on changes in the spontaneous activity produced by picrotoxin, tetrodotoxin and manganese.

Experiments were performed on the isolated perfused spinal cord[6] of *Rana ridibunda,* using an oxygenated bathing solution of composition (mM): NaCl 98.0; KCl 2.0; $CaCl_2$ 1.8; $MgCl_2$ 0.01–0.05; NaH_2PO_4 1.2; $NaHPO_4$ 2.0; $NaHCO_3$ 6.0; glucose 5.5; pH 7.4–7.6. In order to have a higher input resistance of the fibres recorded from and a smaller distance between the site of impalement (dorsal root entry zone) and the terminal branches of primary afferents, and thus to facilitate the detection of synaptic activity, we used small specimens weighing 40–50 g. Although many fibres were slightly damaged by the microelectrode and their resting membrane potential varied between −50 and −60 mV, some had the resting membrane potential over −80 mV, and we could keep the best fibres up to 5–7 h.

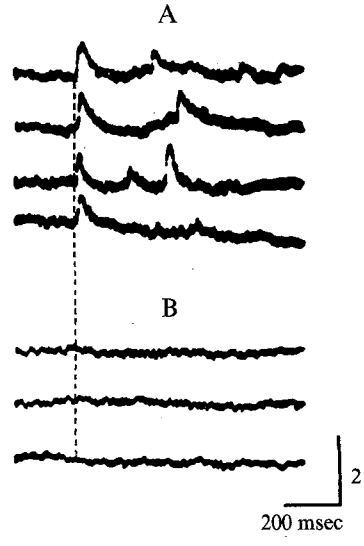

Fig. 1. Effect of picrotoxin on spontaneous miniature potentials and minimal responses on ventral root stimulation recorded from the same dorsal root fibre. A: potentials recorded in normal solution. B: 8 min following bath application of 0.3 mM picrotoxin. The dashed line indicates the beginning of minimal responses.

The membrane potential of some fibres (which always received powerful phasic depolarizing input from ventral roots) showed transient spontaneous depolarizations of characteristic time course (figure 1). A total of 32 fibres were investigated. The amplitude of spontaneous potentials varied from fibre to fibre over a range 0.5–2.0 mV. These spontaneous potentials appear in each fibre at random intervals, but occasionally there were transient bursts of high-frequency activity. The time course and the frequency of intrafibre spontaneous potentials are quite distinct from those of miniature synaptic potentials recorded from amphibian motoneurones[4]. The rising phase of individual potentials in the present experiments was 8.0–20.0 msec and their exponentially decaying falling phase lasted 70–150 msec. Thus their size and time course agrees closely with the time course and amplitude of the minimal depolarizing responses elicited in the same fibres by threshold stimuli applied to the ventral roots, as shown in figure 1, A.

Picrotoxin (0.1–0.5 mM), which is known as a specific antagonist of presynaptic inhibition[7,8], invariably and completely antagonized both the ventral root responses and spontaneous synaptic potentials (figure 1, B) suggesting that both are associated with activity of GABA-ergic inhibitory endings. This blocking effect was produced in a graded manner.

Tetrodotoxin (Sankyo, 1.5×10^{-7} to 2.10^{-7} g/ml) caused a marked reduction in the frequency of spontaneous synaptic activity in primary afferents, and eventually abolished all discriminable spontaneous potentials. The effect of tetrodotoxin was partly reversible (figure 2). Spontaneous synaptic potentials were also reversibly eliminated by removal of external Ca^{2+} and addition of Mn^{2+} (2 mM). As neither Mn^{2+} ions nor tetrodotoxin affect nonimpulse-related miniature synaptic potentials[9,10], it leads to the conclusion that the spontaneous potentials recorded from dorsal root fibres are produced by ongoing spontaneous impulses in interneurones and that individual quanta of transmitter at axo-axonic synapses, if present, produce such small potential changes as to be unrecordable under the present conditions. The latter fact may be due to the unfavourable recording conditions due to long distance between the site of impalement and the synaptic contact.

The marked sensitivity of spontaneous potentials to picrotoxin and the depolarizing nature of these potentials must be related to presynaptic inhibitory mechanism which is probably GABA mediated.

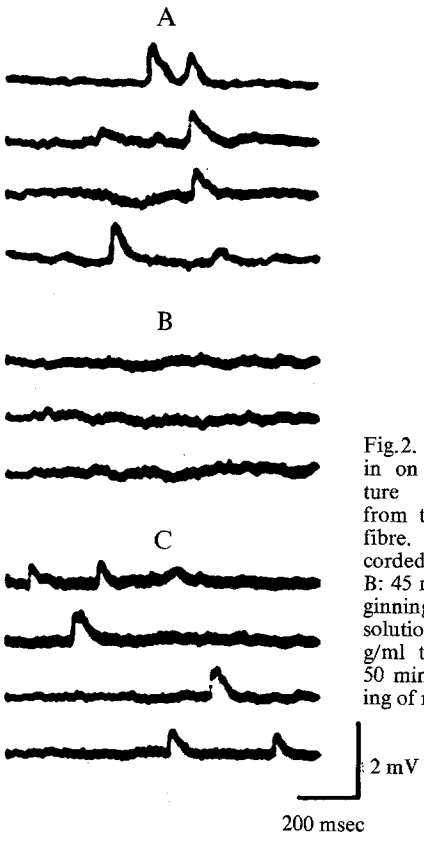

Fig. 2. Effect of tetrodotoxin on spontaneous miniature potentials recorded from the same dorsal root fibre. A: potentials recorded in normal solution. B: 45 min following the beginning of perfusion with solution containing 2.10^{-7} g/ml tetrodotoxin. C: 2 h 50 min following readmitting of normal solution.

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Effects of ovariectomy on the oxidative metabolism of the central nervous system and adrenal glands in female hamster *(Mesocricetus auratus)*

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Summary. We have studied the influence of ovariectomy on the oxidative activity of hypophysis, hypothalamus, posterior cortex, septal area, amygdala and adrenal glands, in female hamsters, because their neuroendocrine behavior seems to differ from that of rats. Our results show a decreasing the O_2 uptake in the hypothalamus and adrenal glands and an increase in the rest of the structures.

The oxidative metabolism of the hypothalamus in rats has been shown to be related to the increase of gonadotropin secretion from the anterior hypophysis[1–3]. Changes in levels of gonadotropins and sexual hormones, have caused modifications in O_2 uptake, not only of the hypothalamic[4,5] but also of the limbic system[6]. Ovariectomy causes alterations in the oxidative metabolism, in the rat, of both structures[4–7].

The probable role played by the posterior cortex (laterooccipital) in sexual cycle control, has been studied in recent years[8–10]. Likewise, also in rats, participation of the adrenal glands in the processes of ovulation and follicular development has been reported very recently[11].

Since there exist a number of works [12–15] showing that neuroendocrine processes in hamsters are different from