

## Motoneurone field potential responses to iontophoretically applied 5-hydroxytryptamine

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Barasi & Roberts (1972, 1973) have reported that stimulation of the nucleus raphe medianus increases the amplitude of the monosynaptic reflex and the amplitude of the dorsal or ventral root evoked field potential recorded in the ventral horn of the lumbar spinal cord. It is possible that this stimulation releases 5-hydroxytryptamine (5-HT) directly onto motoneurons from terminals which have been shown by Fuxe (1964) to contain 5-HT. We have therefore examined the effects of 5-HT applied by iontophoresis whilst recording the motoneurone field potentials.

Thirty-six rats were anaesthetized with 0.7% fluothane in O<sub>2</sub>. Following laminectomy, dorsal and ventral roots were cut and laid upon silver wire stimulating electrodes. Six barrelled glass micropipettes were filled with the following drug solutions: 5-HT bimalate (0.2 M, pH 3.0, 5.0 or 7.0), cinanserin hydrochloride (0.2 M, pH 3.0), methysergide bimalate (0.01 M, pH 3.5), imipramine hydrochloride (0.2 M, pH 5.5), sodium L-glutamate (0.2 M, pH 7.0).

Motoneurons were identified by their antidromic spike discharge to stimulation of the ventral roots. They showed no spontaneous activity and drug induced changes in excitability were examined by recording changes in the field potential evoked by stimulation of dorsal or ventral roots. The field potential increased in amplitude with increased intensity of root stimulation. Iontophoretically applied 5-HT increased the amplitude of the field potential in a dose (current) dependent fashion. If an application of a high current of 5-HT was continued for a long period the response to 5-HT declined. Thus, although plateau responses were clearly established before this occurred it is possible that desensitization of the receptors of 5-HT changed the dose-response curves. Currents from 5-HT solutions at pH 3.0, 5.0 and 7.0 had qualitatively similar effects, but

the response latency increased and the amplitude of the drug effect decreased with higher pH. This is to be expected as it has been demonstrated for another monoamine, noradrenaline, that the transport number of the drug ion decreases with increased pH (Bevan, Bradshaw, Roberts & Szabadi, 1973).

The 5-HT antagonists cinanserin and methysergide reversibly reduced the effects of 5-HT. Selectivity of action was suggested by the lack of a direct effect of the antagonists upon the root evoked field potentials. Preliminary observations indicate that glutamate has only weak effects on these field potentials and is not therefore a suitable control agonist. Dose (current)/plateau response curves to 5-HT are moved to the right by the antagonist cinanserin and changes in the slope of the curve suggest the effect is not due to competition, but care must be exercised with this interpretation due to the possible occurrence of tachyphylaxis.

The iontophoretic application of imipramine with currents of 50 nA for 2-8 min potentiates the effects of iontophoretically applied 5-HT by increasing the rate of onset, amplitude and duration of the response to 5-HT.

We conclude that the effects of 5-HT upon the root-evoked field potential closely resemble the effects which have been previously reported, of stimulation of nucleus raphe medianus (Barasi & Roberts, 1973).

## References

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