

Tail Region of the Primary Somatosensory Cortex and Its Relation to Pain Function

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Summary

In the present study, electrophysiological mapping methods were used to estimate the size of the tail representation area of the primary somatosensory cortex (SI) of the rat. Using a half-maximal evoked potential method and multiunit recording method, we estimated that the SI tail area was 0.51 and 0.78 mm², respectively. A dissector method was used to estimate the neuronal densities. There was, on average, 84 829 neurons/mm³ and 117 750 neurons under 1 mm² of cortical area in the tail area of the SI. Therefore, there are about 94 000 neurons in the estimated 0.8 mm² of the SI that are involved in processing sensory signals from the tail. Anteroposteriorly oriented, evenly spaced 16-channel microwires were chronically implanted in the frontoparietooccipital cortex that was centered on the SI. Thereafter, evoked field potentials were used to estimate the change in the size of the tail area with two modalities—pain and touch—under two states: anesthetized and conscious. No significant difference was found between the size of the tail area when tactile and noxious stimulations were used. However, the number of tail responsive channels showed a significant increase when the rat was awake and behaving.

Key words Dissector method, Neuronal density, Pain, Primary somatosensory cortex, Tail

Introduction

The sensorimotor system of the rat tail has been a useful model system in pain research, such as with the tail flick test [1]. This system has many advantages to recommend as a model somatosensory system. The tail of the rat is long and

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