

Comparative immunohistochemical study of the effects of pilocarpine on the mossy cells, mossy fibres and inhibitory neurones in murine dentate gyrus

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Treatment with pilocarpine (PILO) induces variable degrees of loss of mossy cells (MCs) and mossy fibre (MF) sprouting in rodents, the relationships of which have not been examined in individual animals. Our aim was to test whether the loss of MCs and MF sprouting are coupled processes in PILO-treated rodents. Animals which exhibited intense PILO-induced convulsions for at least 30 min were used in this study. After a 2-month survival period, the incidence of epileptic seizures was checked individually by neuropeptide-Y (NPY) immunohistochemistry, and the numbers of MCs were counted by means of immunohistochemistry, for calretinin (CR) in mice and calcitonin gene-related peptide (CGRP) in rats. MF sprouting was checked by using Timm's silver-sulphide method for zinc. In our comparative studies, NPY immunohistochemistry resulted in more positive animals than on zinc staining. The CR immunoreactivity remained unchanged even in those mice that displayed MF sprouting and greatly increased NPY immunoreactivity. CR immunoreactivity was also verified after transection of the fornix to exclude the extrahippocampal source of this peptide. However, the CGRP immunoreactivity was severely reduced in those rats that exhibited simultaneous increases in zinc content and NPY immunoreactivity in the supragranular layer and stratum lucidum. Our findings suggest that the MCs survive PILO treatment in mice, but not in rats. There is direct evidence of a close relationship between the loss of MCs and MF sprouting in rats, but not in mice. Thus, similar PILO seizures may result from different changes in the neuronal circuits of rodents.

Key words: dentate gyrus, pilocarpine, mossy fibres, seizures, neuropeptide-Y, immunohistochemistry

ABBREVIATIONS

CGRP – calcitonin gene-related peptide

CR – calretinin

DAB – 3,3'-diaminobenzidine

DG – dentate gyrus

GC – granule cell

IML – internal molecular layer

IR – immunoreactive

MC – mossy cell

MF – mossy fibre

NPY – neuropeptide-Y

PB – phosphate buffer

PILO – pilocarpine

SE – status epilepticus

SGL – supragranular layer

SL – stratum lucidum

SLM – stratum lacunosum-moleculare

SRS – spontaneous recurrent seizures

Syn-I – synapsin-I

TLE – temporal lobe epilepsy

INTRODUCTION

The pilocarpine (PILO) model of epilepsy in rodents reproduces some of the features of human temporal lobe epilepsy (TLE) (Nadler et al. 1980, Turski et al. 1984, Ben-Ari 1985). A single dose of PILO acutely initiates progressive behavioural changes indicative of status epilepticus (SE), and the animals may subsequently exhibit spontaneous recurrent seizures (SRS). The acute period of SE or SRS has been reported to

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