# Short-term exposure to enriched environment in adult rats restores MK-801-induced cognitive deficits and gabaergic interneuron immunoreactivity loss

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Perinatal injections of N-methyl-D-aspartate (NMDA) receptor antagonist in rodents emulate some cognitive impairments and neurochemical alterations, such as decreased GABAergic (gamma aminobutyric acid) interneuron immunoreactivity, also found in schizophrenia. These features are pervasive, and developing neuroprotective or neurorestorative strategies is of special interest. In this work, we aimed to investigate if a short exposure to enriched environment (EE) in early adulthood (P55-P73) was an effective strategy to improve cognitive dysfunction and to restore interneuron expression in medial prefrontal cortex (mPFC) and hippocampus (HPC). For that purpose,we administered MK-801 intraperitoneally to Long Evans rats from postnatal days 10 to 20. Twenty-four hours after the last injection, MK-801 produced a transient decrease in spontaneous motor activity and exploration, but those abnormalities were absent at P24 and P55. The open field test on P73 manifested that EE reduced anxiety-like behavior. In addition, MK-801-treated rats showed cognitive impairment in novel object recognition test that was reversed by EE. We quantified different interneuron populations based on their calcium-binding protein expression (parvalbumin, calretinin, and calbindin), glutamic acid decarboxylase 67, and neuronal nuclei-positive cells by means of unbiased stereology and found that EE enhanced interneuron immunoreactivity up to normal values in MK- 801-treated rats. Our results demonstrate that a timely intervention with EE is a powerful tool to reverse long-lasting changes in cognition and neurochemical markers of interneurons in an animal model of schizophrenia. 

Calcium-binding proteins

Cognitive dysfunction

Enriched environment

Interneurons

MK-801

4 aminobutyric acid

calbindin

calretinin

dizocilpine

glutamate decarboxylase 67

parvalbumin

4 aminobutyric acid receptor

amino acid receptor blocking agent

dizocilpine maleate

adult

animal cell

animal experiment

animal model

animal tissue

anxiety

Article

cognition

cognitive defect

controlled study

environmental enrichment

environmental exposure

exploratory behavior

female

GABAergic system

hippocampus

immunoreactivity

male

medial prefrontal cortex

motor activity

nonhuman

novel object recognition test

open field test

perinatal period

protein expression

rat

schizophrenia

stereology

age

animal

chemically induced

cognitive defect

drug effect

environment

interneuron

Long Evans rat

metabolism

newborn

pathology

time factor

Age Factors

Animals

Animals, Newborn

Cognitive Dysfunction

Dizocilpine Maleate

Environment

Excitatory Amino Acid Antagonists

Female

GABAergic Neurons

Interneurons

Male

Rats

Rats, Long-Evans

Time Factors