J Mol Neurosci (2008) 34:109–119
DOI 10.1007/s12031-007-9019-5

Expression of CAPON after Spinal Cord Injury in Rats

Chun Cheng · Xin Li · Shangfeng Gao · Shuqiong Niu · Mengling Chen · Jing Qin · Zhiqin Guo · Jian Zhao · Aiguo Shen

Received: 17 June 2007 / Accepted: 16 July 2007 / Published online: 12 December 2007

Abstract The adaptor protein, carboxy-terminal PDZ ligand of nNOS (CAPON), regulates the distribution of neuronal nitric oxide synthase (nNOS) that increased after spinal cord injury (SCI) and produces the key signaling molecule nitric oxide (NO). But little is known about the role of CAPON in the pathological process of SCI. The main objective of the present study was to investigate expression of CAPON and nNOS in a spinal cord contusion model in adult rats. Real time-polymerase chain reaction (PCR) and Western blot analysis revealed that mRNA and protein for CAPON increased at 2 h after SCI and reached the peak at 8 h, gradually recovered to the baseline level at 14 days. The expression of nNOS mRNA and protein was similar to that of CAPON. During the peak expression, CAPON mRNA was found in the ventral horn, mediate zone, dorsal horn, and white matter by in situ hybridization. Immunofluorescence showed that CAPON was colocalized with nNOS in neurons, oligodendrocytes, and some astrocytes of spinal cord tissues within 5 mm from the epicenter. Interaction between CAPON and nNOS was also detected by co-immunoprecipitation. Thus, the transient expression of high levels of CAPON may provide new insight into the secondary response after SCI.

Keywords Spinal cord injury · CAPON · nNOS · Neuron · Oligodendrocyte · Astrocyte · Rat

Introduction

Spinal cord injury (SCI) is a devastating event experienced by humans, especially young adults (Bracken et al. 1981). Traumatic injury of the spinal cord initiates a series of cellular and molecular events that include both primary and secondary injury cascades (Dusart and Schwab 1993; Dumont et al. 2001; Liu et al. 2005; Genovese et al. 2006; Xiong et al. 2007). Secondary response may contribute significantly to the neuropathology associated with the initial injury (Dusart and Schwab 1993; Xiong et al. 2007). Some molecules may be involved in the process of secondary injury such as nitric oxide (NO), which is an important neurotransmitter in the central nervous system (CNS) (Matsuyama et al. 1998; Genovese et al. 2006). It is well known that NO is produced by three types of nitric oxide synthase (NOS) enzymes: the constitutive calcium (Ca^{2+})/calmodulin-dependent neuronal NOS (nNOS) and endothelial NOS (eNOS) isoforms, and the inducible Ca^{2+}-independent isoform (iNOS) (Griffith and Stuehr 1995). nNOS is larger than eNOS and iNOS because of an N-terminal extension that contains a PSD95/DLG/ZO-1 (PDZ) domain (Cho et al. 1992; Ponting and Phillips 1995) that interacts with a variety of other proteins including postsynaptic density 95/93 (PSD95/93) (Brenman

Chun Cheng and Xin Li contributed equally to this work.

C. Cheng · X. Li · S. Niu · Z. Guo · A. Shen (✉)
The Jiangsu Province Key Laboratory of Neuroregeneration,
Nantong University,
19 Qi-xiu Road,
Nantong, Jiangsu 226001, China
e-mail: Shen_aiguo@yahoo.com

C. Cheng · X. Li · S. Gao · M. Chen · J. Qin
Department of Microbiology and Immunology,
Nantong University (Former Nantong Medical College),
Nantong 226001, China

J. Zhao
Department of Orthopaedics,
Affiliated Hospital of Nantong University,
Nantong 226001, China