



1 Article

2 **Cerebellar blood flow and gene expression in crossed**
3 **cerebellar diaschisis after transient middle cerebral**
4 **artery occlusion in rats**

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17 Received: date; Accepted: date; Published: date

18 **Abstract:** Crossed cerebellar diaschisis (CCD) is a state of hypoperfusion and hypometabolism in
19 the contralesional cerebellar hemisphere caused by a supratentorial lesion, but its pathophysiology
20 is not fully understood. We evaluated chronological changes in cerebellar blood flow (CbBF) and
21 gene expressions in the cerebellum using a rat model of transient middle cerebral artery occlusion
22 (MCAO). CbBF was analyzed at two and seven days after MCAO using SPECT. DNA microarray
23 analysis and western blotting of the cerebellar cortex were performed and apoptotic cells in the
24 cerebellar cortex were stained. CbBF in the contralesional hemisphere was significantly decreased
25 and this lateral imbalance recovered over one week. Gene set enrichment analysis revealed that a
26 gene set for “oxidative phosphorylation” was significantly upregulated while fourteen other gene
27 sets including “apoptosis”, “hypoxia” and “reactive oxygen species” showed a tendency toward
28 upregulation in the contralesional cerebellum. MCAO upregulated the expressions of nuclear factor
29 erythroid 2-related factor 2 (Nrf2) and heme oxygenase-1 (HO-1) in the contralesional cerebellar
30 cortex. The number of apoptotic cells increased in the molecular layer of the contralesional
31 cerebellum. Focal cerebral ischemia in our rat MCAO model caused CCD along with enhanced
32 expression of genes related to oxidative stress and apoptosis.

33 **Keywords:** apoptosis; cerebral blood flow; crossed cerebellar diaschisis; ischemic stroke; oxidative
34 stress
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