Effect of tempol in vivo on flow-induced dilation in vitro in middle cerebral arteries of healthy Sprague-Dawley rats

Anita Cosic¹, Sanela Unfirer¹, Ivana Jukic¹, Ana Stupin¹, Ines Drenjancevic¹
¹Faculty of Medicine Osijek, University Josip Juraj Strossmayer Osijek

OBJECTIVE: This study aimed to determine if in vivo scavenging of superoxide by TEMPOL influences the mechanisms of flow-induced dilation (FID) of middle cerebral arteries (MCA) in vitro.

DESIGN AND METHODS: 11-weeks old healthy male Spraque-Dawley (SD) rats (N=10-16) were given drinking water (control group) or 1 nM/L of TEMPOL in drinking water (TEMPOL group) for 7 days. FID (response to stepwise increase in pressure gradient (Δ10-Δ100 mmHg)) was determined in isolated, pressurized MCA in the absence/presence of the NOS inhibitor L-NAME, COX-1,2 inhibitor indomethacin (INDO), CYP450 epoxidase inhibitor MS-PPOH. Cu/Zn SOD, MnSOD, EC-SOD, COX 1,2, GPx4 and catalase mRNA levels were determined by real-time qPCR from brain blood vessels (N=5-8). All experimental procedures were approved by the local Ethical Committee and conformed to the EU Directive 86/609.

RESULTS: FID (no inhibitors) was similar between groups (p>0.05). FID was similarly affected by inhibitors in both groups. TEMPOL significantly upregulated Cu/Zn- and MnSODs and COX1, while downregulated COX2 genes compared to control.

In control group MnSOD positively correlated to COX1 (r=0.802, p=0.05) and GPx1 (r=0.904, p=0.01). In TEMPOL group, Cu/ZnSOD positively correlated to GPx1 (r=0.979, p=0.004), while MnSOD positively correlated to COX2 (r=0.859, p=0.029).

CONCLUSIONS: TEMPOL affected the expression of COX and SOD isoforms, which may be accountable for preserved FID.