Therapeutic Effect of Gold Nanoparticles in a Murine Model of Focal Ischemic Stroke

Stephen F Rodrigues, Kaléo Elache, Koiti Araki, Sandra H Farsky
Faculty of Pharmaceutical Sciences / University of São Paulo
kaleo_elache@hotmail.com

Objectives
Once is widely known that inflammation plays an important role in the pathology of ischemic stroke and gold nanoparticles (AuNPs) own anti-inflammatory and antioxidant properties (Leonavičienė et al., 2012), the aim of this study was to investigate the effect of AuNPs of different sizes when injected before or after a focal ischemia and reperfusion (I/R)-induced injury in brain of mice.

Methods/Procedures
Ischemia was induced in male C57bl/6 mice by the focal intraluminal middle cerebral artery occlusion (MCAO) model. Monofilament was removed twenty minutes after occlusion and reperfusion was allowed for 24 hours and experiments were carried out by that time. Infarct volume and cerebral edema were measured in brain segments after tissue labeling with TTC (2,3,5-triphenyltetrazolium chloride). “Image J” program was used to quantify both infarct volume and cerebral edema. Total leukocyte count was done using hemocytometer and differential leukocyte count, by blood smear.

Results
AuNPs with different sizes and administered 30 minutes before or 5 hours later reduced edema resulting from cerebral ischemic injury followed by reperfusion. No interference in volume of infarct tissue was noticed though (AuNPs caused only slight reduction of the infarct volume). AuNPs in all conditions did not alter either the total or differential number of circulatory leukocytes.

Figure 1: Effect of treatment with AuNPs of 15 nm-, 20 nm- or 30 nm-size or control solution (saline), given 30 minutes before (A) or 5 hours later (B), on the infarct volume (in %) in brain of mice with I/R-induced injury.

Figure 2: Effect of treatment with AuNPs of 15 nm-, 20 nm- or 30 nm-size or control solution (saline), given 30 minutes before (A) or 5 hours later (B), on the edema volume (in %) in brain of mice with I/R-induced injury. * P< 0.05 vs saline; # P< 0.05 vs SHAM (ANOVA followed by Tukey).

Figure 3: Effect of treatment with AuNPs of 15 nm-, 20 nm- or 30 nm-size or control solution (saline), given 30 minutes before (A, B) or 5 hours later (C, D), on total or differential circulating leukocyte count in mice with I/R-induced injury.

Conclusion
Once we have demonstrated that AuNPs reduce cerebral edema after I/R injury, their use for treatment of ischemic stroke can be viilumbrated.

References