Neural tracers activate fast retrograde axonal transport of gold nanoparticles in neurons

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Drug delivery to the central nervous system is notoriously difficult by conventional methods due to the presence of the blood brain and the blood-spinal cord barrier. Neuroanatomical tract tracers have long been used to trace neuronal connectivity pathways in the anterograde (central to periphery) and retrograde (periphery to central) directions. This study builds upon a previous study by Mao et al[1], which demonstrated retrograde delivery of gold nanoparticle-wheat germ agglutinin-peroxidase conjugates (AuNP-WGA-HRP) to the respiratory control center after injection into the diaphragm in a spinal hemi-section injury model, bypassing the blood-spinal cord and blood-brain barrier. Using microfluidic chips and live neurons, we have studied the cellular uptake mechanisms and axonal transport properties of these gold nanoparticle-WGA conjugates in detail, and have shown that their uptake and transport behaviour is dominated by the presence WGA. This provides important information on the kinetics and the molecular mechanisms of transport at work, providing a pathway to the development of a novel, specific therapeutic delivery system to sites of injury in the central nervous system.

References:

[1] *Scientific reports* **2016**, 6, 25794