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Article

Laser exposure of gold nanorods can increase neuronal cell outgrowth

Chiara Paviolo, John W. Haycock, Jiawey Yong, Aimin Yu, Paul R. Stoddart, Sally L. McArthur 

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Abstract

The usage of gold nanoparticles (Au NPs) in biological applications has risen significantly over the last 10 years. With the wide variety of chemical and biological functionalization available and their distinctive optical properties, Au NPs are currently used in a range of biological applications including sensing, labeling, drug delivery, and imaging applications. Among the available particles, gold nanorods (Au NRs) are particularly useful because their optical absorption can be tuned across the visible to near infrared region. Here, we present a novel application of Au NRs associated with low power laser exposure of NG108-15 neuronal cells. When cells were irradiated with a 780 nm laser, the average number of neurons with neurites increased. A similar stimulatory effect was observed for cells that were cultured with poly-(4-styrenesulfonic acid)-coated and silica-coated Au NRs. Furthermore, when the NG108-15 cells were cultured with both bare and coated Au NRs and then irradiated with 1.2–7.5 W/cm² at 780 nm, they showed a neurite length increase of up to 25 µm versus control. To the best of our knowledge, this effect has never been reported before. While the pathways of the stimulation is not yet clear, the data presented here demonstrates that it is linked to the absorption of light by the Au NRs. These initial results open up new opportunities for peripheral nerve regeneration treatments and for novel approaches to addressing central nervous system axons following spinal cord injury. *Biotechnol. Bioeng.* 2013; 110: 2277–2291. © 2013

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