Nerve conduit joins laser therapy for regeneration

TAICHUNG, Taiwan – Laser therapy, along with a newly developed artificial nerve conduit, could aid regeneration of the peripheral and sciatic nerves.

Researchers from Central Taiwan University of Science and Technology developed the nerve conduit, which contains genipin cross-linked gelatin made using beta-tricalcium phosphate ceramic particles (genipin-gelatin-TCP, or GGT). Gelatin is a biodegradable polymer that offers biocompatibility, plasticity and adhesiveness.

The researchers combined the GGT nerve conduit with low-level laser therapy (LLLT) and found it could accelerate the process of regeneration, as well as the restoration rate of nerves and improvement of muscle recruitment. This type of biodegradable conduit shows potential for reconstructing nerves across long gaps, the researchers said; in the study, the new conduit bridged a transection of the sciatic nerve in rats.

While the effectiveness of the noninvasive LLLT in the regeneration process increased nerve function, the investigators cautioned that additional research is needed for the application of LLLT alongside nerve conduits, as it is a relatively new concept.

Another alternative for nerve repair and regeneration is collagen-based nerve conduits, but – according to the researchers – not only is it more expensive to use than gelatin, but it is also more prone to cracks and tears, especially when a suture needle penetrates the conduits in a medical procedure.

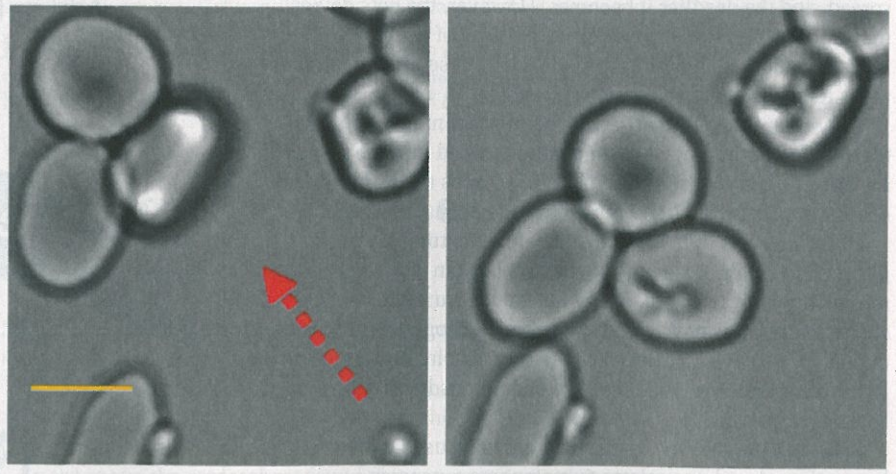
This work could also improve the functional and morphologic recovery of peripheral nerves. Further study of LLLT could pave the way for more effective, noninvasive treatment of various nerve diseases and injuries.

The research was published in *Neural Regeneration Research* (doi: 10.4103/1673-5374.135323).

Laser tweezers used to study malaria

CAMBRIDGE, England – Optical tweezers are helping in the race to find new medicines or vaccines to wipe out malaria.

A team from the Wellcome Trust Sanger Institute and the University of Cambridge is studying how *Plasmodium falciparum* malaria parasites interact with the red blood cells they invade. Optical tweezers have been a powerful tool for studying malaria biology and drug mechanisms at the single-cell level, the researchers said.



Shown is the optical trapping of a freshly released malaria parasite (merozoite), with delivery to and invasion of a targeted erythrocyte. The red arrow shows optical tweezers-directed movement. The merozoite of interest is shown before the application of a trapping force (left) and after the invasion process (right, after 20 s). Scale bar = 5 mm. Adapted from *Biophysical Journal*, Crick et al, Quantitation of malaria parasite-erythrocyte cell-cell interactions using optical tweezers.

The parasites move from one red blood cell to another in less than a minute, although within two to three minutes after leaving a cell, they lose the ability to infect host cells. The researchers used the tweezers to study this transient event, as the tool provides precise control over cells' movements by exerting very small forces with a highly focused laser beam.

"Using laser tweezers to study red blood cell invasion gives us an unprecedented level of control over the whole process and will help us to understand this critical process at a level of detail that has not been possible before," said senior researcher Dr. Julian Rayner of the Wellcome Trust Sanger Institute.

In the study, the tweezers were used specifically to pick up individual parasites as they emerged from the red blood cells. The researchers then delivered each to another red blood cell to study the parasites' invasion process.

They used the optical tweezers, too, to measure how strongly the parasites adhere to red blood cells. They found that attachment could be mediated by multiple weak interactions that potentially could be blocked by a combination of drugs or antibodies.

The new technique may shed light on how different invasion-inhibiting drugs could affect interactions between the parasites and red blood cells, the researchers said. They anticipate that the study's findings will ultimately lead to the development of more effective medicines or a vaccine.

"We now plan to apply this technology to dissect the process of invasion, and understand what genes and proteins function at what step," Rayner said. "This will allow us to design better inhibitors or vaccines that block invasion by targeting multiple steps at the same time."

The research was published in *Biophysical Journal* (doi: 10.1016/j.bpj.2014.07.010).

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