

Direct Injection of Hydrogels Embedding Gold Nanoparticles for Local Therapy after Spinal Cord Injury

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Background

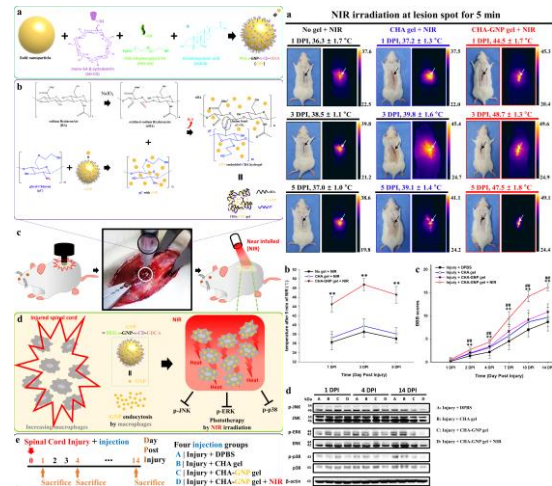
There are few studies describing treatments of inflammation following SCI using a direct injection of drugs into a lesion.

Methods

In this study, we created a hydrogel composed of glycol chitosan (gC) and oxidized hyaluronate (oHA). Gold nanoparticles (GNPs) were conjugated with ursodeoxycholic acid (UDCA). The GNP-UDCA complex was embedded into gC-oHA (CHA) hydrogels to form a CHA-GNP-UDCA gel. This CHA-GNP-UDCA gel was injected once into an epicenter of an injured region in SCI rats. Near-infrared (NIR) irradiation was then applied to the lesion as a means of local therapy. To optimize the viscosity for injection into a lesion, several volume ratios of gC and oHA were investigated using scanning electron microscopy (SEM) and a rotating rheometer.

Results

The optimally synthesized CHA-GNP-UDCA gel under NIR irradiation suppressed the production of inflammatory cytokines in vitro. In addition, the optimized CHA-GNP-UDCA gel under NIR irradiation inhibited the cystic cavity of the lesion



and significantly improved the hindlimb function. The production of inflammatory cytokines following SCI was significantly inhibited in the CHA-GNP-UDCA gel + NIR group.

Conclusions

CHA-GNP-UDCA gels with NIR irradiation can therefore have therapeutic effects for those with spinal cord injuries.