Biomimetic Conductive Hydrogels

Tech ID: 30560 / UC Case 2019-314-0

SUMMARY

UCLA researchers in the Department of Bioengineering have developed a novel electrically conductive scaffold system with a hyaluronic acid (HA)-based hydrogel for biomimetic research to treat spinal cord and other central nervous system (CNS) injuries.

BACKGROUND

Spinal cord injuries affect approximately 300,000 people in the United States and lead to decreased quality of life and costly medical care. Current restorative treatments such as central nervous system (CNS) implants have a risk of being rejected by the body, and scar tissue at the site of injury presents a blockade for potential invasive treatments. Hyaluronic acid (HA), a naturally occurring substance in living organisms, reduces scar tissue. HA can also be made into HA-based hydrogels with a polyethylene glycol (PEG) polymer, but current hydrogels have poor conductivity when used as a coating for implantable CNS devices.

INNOVATION

UCLA researchers in the Department of Bioengineering have developed a novel electrically conductive scaffold system with a HA-based hydrogel for biomimetic research to treat spinal cord and other central nervous system (CNS) injuries. Unlike traditional HA-based hydrogels with a polyethylene glycol (PEG) polymer, the present hydrogel exhibits high conductivity. The hydrogel may be applied as a thin coating to implantable CNS bioelectronic devices to allow for transmission from source to target while mitigating signal loss to surrounding tissue. The hydrogel is also biocompatible and mitigates the risk of rejection by the body of implantable devices, such as spinal microelectrode arrays. Additionally, the scaffold system may be used for the culture of neural progenitor cells, and the hydrogel is a biocompatible medium for the safe injection of functional neural networks at spinal cord injury sites.

APPLICATIONS

- Electrically conductive cell scaffold system for the culture of neural progenitor cells
- Treatment of spinal cord and other CNS injuries

ADVANTAGES

- Hydrogel is biocompatible and conductive
- Hydrogel may be applied as a thin coating to implantable CNS devices to mitigate signal loss to surrounding tissue and to mitigate the risk of rejection by the body of implantable devices (i.e., spinal microelectrode arrays)
- Hydrogel allows for the safe injection of neural progenitor cells or functional neural networks at spinal cord injury sites

STATE OF DEVELOPMENT

This invention has been developed and tested for chemical and mechanical properties, conductivity, and biocompatibility with Neu7 astrocytes.

The invention is currently being tested with additional materials to improve conductivity.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,896,738	02/13/2024	2019-314

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OTHER INFORMATION

KEYWORDS

hydrogel, central nervous system, spinal cord, spinal cord injury, HA, hyaluronic acid, NPC, neural progenitor cells, graphene scaffold, peg-maleimide, nanoribbons, microelectrode array, conductive hydrogel, biomaterial, central nervous system, oligodendr

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Materials & Chemicals**
  - Biological
- **Medical**
  - Delivery Systems
  - Disease: Central Nervous System
  - Stem Cell
  - Therapeutics
- **Nanotechnology**
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