

Introduction to a Nanofiber Hydrogel Composite

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Currently 250,000 to 390,000 Americans are estimated to live with a spinal cord injury. United Spinal Association (2025) states that the number grows by 18,000 approximately every year. That's 18,000 thousand people each year who suffer from a spinal cord ranging from the cervical to the sacrum, an injury that can cause full paralysis with loss of bowel and bladder control, an injury where the person may be able to feel below the official level of injury or not at all (complete or incomplete injury). Although the intensity of the injury and side effects lies on the level of the spinal cord that was injured, no matter what level was injured it's unlikely that someone would make a full recovery. This is where a nanofiber-hydrogel composite could come into play. "A nanofiber hydrogel composite is a material that integrates the properties of fibrous scaffolds with those of hydrogels. This composite scaffold mimics the structure of extracellular matrix (ECM) and modulates the immune response in vivo, making it particularly useful for applications such as bone defect repair and soft tissue reconstruction." is the official definition provided by the national library of medicine (2023). Research on the progression of nanofiber-hydrogels in uses of tissue engineering scaffolds is still lacking, which is partially why it's important to focus on this field. The point of this experiment is to make a nanofiber-hydrogel composite that would act as a passageway to strengthen cells and allow for transmission of brain signals to the rest of the body. The experiment was started off with the two compounds: dimethylformamide - which is an aqueous solution, and poly vinyl chloride - which a solid crystal-like substance. The substances alginate and hyaluronic acid were also used.

Awards Won:

Shanghai Science Association for Young Talents: Award