Researchers at the University of South Florida have developed a novel method for delivering DNA to the brain which may be used as a potential diagnostic and therapeutic agent for the treatment of mild traumatic brain injury (TBI).

TBI causes significant mortality, long term disability and psychological symptoms and is a serious health problem in the United States and around the world. Approximately 1.7 million people sustain a TBI annually. Mild to severe TBI cases can cause intellectual and cognitive deficits, and can affect mood and lead to behavioral changes. Efforts to treat this condition are often hampered by the poor understanding of the mechanism underlying TBI pathogenesis. Drug delivery to the central nervous system (CNS) is another major challenge, with ninety-five percent of drugs failing to enter the CNS mostly due to the blood brain barrier (BBB). Today, gene therapy is viewed as a promising approach for treatment, however, an appropriate method for gene delivery is currently not available.

Our researchers have developed and tested multilayered multifunctional magnetic micelle nanoparticles (4MNPs) to deliver DNA to the brain following mild TBI. Their findings have shown that 4MNPs can effectively carry DNA to the brain after mild TBI and this tool can serve as an excellent therapeutic strategy for the delivery of genes or drugs for treatment of TBI. Use of nanoparticle mediated gene delivery techniques hold great potential in brain therapy as they protect the therapeutic gene, allowing for sustained release and real time monitoring of the delivery.

**ADVANTAGES:**
- A potential diagnostic and therapeutic agent in TBI
- Delivers DNA to the brain following mild TBI

**Theranostic Nanoparticles for Gene and Drug Delivery for TBI**

**Expression of tdTomato Plasmid DNA Delivered via Intranasal Route in the Cortex of Rat Brain 48 Hours After TBI**