

## **Flexible needle for targeted delivery of chronic pain treatment**

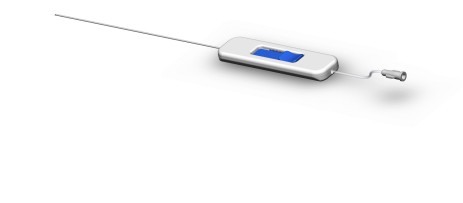
---

### **Unmet Need**

For patients suffering from chronic pain associated with degenerative changes, inflammation, neuropathy or cancer, the ability to carry out daily life and work activities is a challenge. Current treatment methods are limited and associated with high-risk surgical procedures. Pharmaceuticals and opioids can lead to central nervous system side-effects, limited efficacy, and addiction, whereas spinal cord stimulation (SCS) and dorsal root ganglia (DRG) stimulation are costly open surgical procedures associated with high mortality and morbidity rates. A promising minimally invasive and effective alternative is the delivery of stem cells, steroids, nerve blocks, anti-inflammatory agents, growth factors, or gene-therapy agents directly to nerve roots exiting the spinal column near the pain source. However, these nerve-roots are hard to effectively reach with straight needles even with image-guided placement, impeding the effective delivery of treatments. There is a need for more flexible needles to deliver treatments to difficult-to-reach nerve-roots via minimally invasive techniques.

### **Technology**

Duke inventors have designed a flexible needle device to deliver chronic pain therapies to difficult-to-reach targets within the spine. Specifically, the device consists of a 21-gauge introducer needle that houses a 25-gauge, pre-curved nitinol cannula that is deployed via a sliding mechanism on a handheld hub. Taking advantage of the shape memory characteristics of nitinol, the distal end of the cannula can be heat-set to a specific curvature. Therapeutics can be then introduced through a Luer connection at the proximal end of the device. This device is in the high-fidelity



#### Duke File (IDF) Number

IDF #:T-006481

#### Patent Information

Patent #: 11,717,618  
Patent Title: MEDICINAL FLUID DELIVERY DEVICES  
AND ASSOCIATES METHODS FOR ADVANCING AND  
RETRACTING NEEDLES  
Country United States of America

#### Meet the Inventors

[Carroll, Kathleen "Katie"](#)  
[Amrhein, Timothy](#)  
[Gray-Leithe, Linda](#)  
[Ji, Ru-Rong](#)  
[Lad, Shivanand \(Nandan\)](#)

#### Contact For More Info

Krishnan, Shweta  
919-681-7541  
[shweta.krishnan@duke.edu](mailto:shweta.krishnan@duke.edu)

#### Department

Neurosurgery (Dept. & CRU)

#### Publication(s)

#### External Link(s)

- [From inventors with Duke's FastTrack Program](#)
- [From the lab of Dr. Timothy Amrhein, MD](#)

prototyping stage.

## Other Applications

This technology could also be used for many different procedures requiring injection into a difficult-to-access geometry, such as for delivering an epidural blood patch to a dural tear.

## Advantages

- Smaller size than most flexible needles on the market
- Enables curved tip 'advancement' rather than just tip 'articulation'
- Shape memory of nitinol cannula allows for highly specific needle pre-curvature
- Nitinol cannula comes pre-threaded through introducer needle
- Provides user precise control over directional trajectory and advancement of nitinol cannula
- Minimally invasive, intuitive and easy-to-use coaxial design

