**Technology for License Summary**

System and method for high-speed intrathecal delivery of a pharmaceutical bolus that is timed relative to a biological cycle.

**Background**

Intrathecal delivery is conducted with implanted pump devices and a catheter that deliver medications to the cerebrospinal fluid-filled area around the spinal cord to treat chronic and/or cancer-associated pains. Targeted administration of opioids or other analgesics by this method reduces overall dose volume, which can mitigate systemic side-effects and improve timing and efficacy of pain relief. Cerebrospinal fluid (CSF) flow is influenced by several functions, including cardiac and respiratory cycles, where an oscillatory push and pull results in very minimal actual flow rate. This factor can diminish the efficacy of analgesics and can even lead to the formation of granulomas where inflammatory build up occurs near the catheter tip in response to both high concentrations of medication and slow infusion rates. Granuloma formation has been found in 3%–8% of patients with an average diagnosis time of six years post-implantation. Intrathecal delivery could benefit from improvements to analgesic bolus delivery speed and to better regulated timing of bolus release in coordination with cardiac rhythmic cycles.

**Technology**

Dr. Hayek’s technology encompasses a system and method for optimizing the timing of pharmaceutical agent high-speed release into the intrathecal space that is synchronized with cardiac and respiratory cycles. The combination of these cycles and the location of the catheter tip will advise a configurable time point for infusion of the agent into the CSF that increases speed to the target spinal receptors. Biological signals are coordinated between sensors (e.g. blood pressure and/or exhalation), a controller, and the pump device. This technology will allow for more efficacious delivery that enables a clinician to tailor drug delivery to the patient's needs while mitigating the risk for adverse events.