Docket #: S21-124

New Tools and Molecular Target for Gene Therapy of Chronic Pain

Researchers at Stanford have developed non-opiate methods for treating chronic pain and for retrograde transduction of neurons. This work is based on the discovery of a pathway that drives persistent pain, and the identification of the CaMKv gene as a key molecular determinant of mechanical hypersensitivity. The researchers are now advancing a therapy that reduces CaMKv activity in opioid receptor mu 1 (OPRM1) expressing neurons of a patient's rostral ventromedial medulla (RVM). The agent (e.g., an RNAi agent) reduces expression or activity of CaMKv in the RVM. The agent includes a newly developed retrograde-enhanced recombinant AAV particle that can be used to deliver the RNAi agent such as an shRNA that targets CaMKv. The researchers packaged shRNAi in their new AAV vector to knockdown the molecular target and achieve complete chronic pain elimination with little effect on normal touch sensation in mouse models of inflammatory and neuropathic pain.

Stage of Development
The novel gene therapy platform, including the new retrograde AAV vector and new molecular target, have shown robust efficiency in eliminating chronic pain in mouse models of inflammatory and neuropathic pain.

Applications

- Treatment for chronic pain

Advantages

- Novel molecular target
- Complete chronic pain elimination in mouse models

- Persistent mechanical pain caused by inflammation or nerve injury is a debilitating clinical problem
- Non-opiate treatment of chronic pain is an urgent social need
- A better understanding of descending pain modulation pathways could help identify novel targets for non-opiate treatment of chronic pain

Publications

- Chrobak, Ula. Study finds chronic and acute pain use different brain circuits. *Stanford Report* (2026).
- Wang, Q., Lee, J.H., Nachtrab, G. et al. *Nature (2026).* https://doi.org/10.1038/s41586-026-10296-y

Patents

- Published Application: WO2023288184
- Published Application: 20250281639

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