IEEE Journal of Translational Engineering in Health and Medicine

Received 6 May 2024; revised 17 August 2024 and 15 September 2024; accepted 16 November 2024.
Date of publication 20 November 2024; date of current version 5 December 2024.

Digital Object Identifier 10.1109/JTEHM.2024.3503498

Laminar Fluid Ejection for Olfactory Drug Delivery: A Proof of Concept Study

THOMAS M. MORIN[1,2], NICK ALLAN[3], JOSHUA COUTTS[3], JACOB M. HOOKER[1,4], MORGAN LANGILLE[5,6], ARRON METCALFE[5], ANDREW THAMBOO[7], JAMES JACKSON[8], MANU SHARMA[8], TIM REES[8], KENZA ENRIGHT[8], AND KEN IRVING[8]

[1]Massachusetts General Hospital, Charlestown, MA 02129, USA
[2]Department of Psychology, Brandeis University, Waltham, MA 02453, USA
[3]StarFish Medical, Victoria, BC V8Z 1E7, Canada
[4]Harvard Medical School, Boston, MA 02115, USA
[5]Canadian Imaging Research Centre, Saint John, NB N6A 5B7, Canada
[6]Department of Pharmacology, Department of Microbiology and Immunology, Dalhousie University, Halifax, NS B3H 4R2, Canada
[7]St. Paul's Sinus Centre, St. Paul's Hospital, Vancouver, BC V6Z 1Y6, Canada
[8]Rocket Science Health, Victoria, BC V8V 2Y1, Canada

CORRESPONDING AUTHOR: K. ENRIGHT (kenza@rocketscience.health)

This work involved human subjects or animals in its research. Approval of all ethical and experimental procedures and protocols was granted by the Horizon Health Network's Human Research Protection Program under Application No. CIRC-P18-1214 and No. #262367, and the Providence Health Care Research Ethics Board under Application No. #314993.

This article has supplementary downloadable material available at https://doi.org/10.1109/JTEHM.2024.3503498, provided by the authors.

ABSTRACT Focal intranasal drug delivery to the olfactory cleft is a promising avenue for pharmaceuticals targeting the brain. However, traditional nasal sprays often fail to deliver enough medication to this specific area. We present a laminar fluid ejection (LFE) method for precise delivery of medications to the olfactory cleft. Using a 3D-printed model of the nasal passages, we determined the precise velocity and angle of insertion needed to deposit fluid at the olfactory cleft. Then, we conducted three proof-of-concept in-vivo imaging studies to confirm olfactory delivery in humans. First, we used Technetium-99 (a radiolabeled