Noninvasive Gut-to-Brain Oral Delivery Systems

Department of Chemical Engineering/Institute of Biomedical Engineering,
National Tsing Hua University, Hsinchu, Taiwan (ROC)
E-mail: hwsung@mx.nthu.edu.tw

Biography

Hsing-Wen Sung holds the prestigious positions of National Chair Professor and Tsing Hua Distinguished Chair Professor in the Department of Chemical Engineering/Institute of Biomedical Engineering at National Tsing Hua University. He earned his Ph.D. from the Department of Chemical Engineering/Biomedical Engineering Program at the Georgia Institute of Technology in May 1988. Professor Sung's research focuses on biomaterials, tissue engineering, and drug/gene delivery. His outstanding contributions have garnered him several accolades, including being recognized as a Fellow of the National Academy of Inventors (NAI), Fellow of the American Institute for Medical and Biological Engineering (AIMBE), and Fellow of the International Union of Societies for Biomaterials Science and Engineering (IUSBSE). He is also an Academician of the Asia Pacific Academy of Materials (APAM). In addition to these distinctions, Professor Sung has received esteemed awards such as Elsevier 2015 Biomaterials Best Paper Award and the 2016 TERMIS-AP Outstanding Scientist Award. Professor Sung's significant contributions extend to his editorial roles, serving on the Editorial/Advisory Boards of prestigious journals like the Journal of Controlled Release, Advanced Healthcare Materials, and Advanced Materials. Furthermore, he has been a Handling Editor for Biomaterials. With a remarkable publication record, Professor Sung has authored 310 scientific papers and holds an impressive 136 international patents. His research has left a substantial impact, evident in over 33325 citations and an h-index of approximately 99, as reported by Google Scholar.

Abstract

During my childhood, my parents often mentioned the belief that consuming pig brains could enhance brainpower. However, as I delved into the field of drug delivery systems, I came to realize that this notion is largely a myth. In truth, the majority of orally administered therapeutic agents struggle to reach the brain's affected areas due to two significant biological barriers: the intestinal epithelial barrier (IEB) and the blood-brain barrier (BBB), both situated between the gut and the brain. The intricate communication pathways between the gut and the brain, facilitated by the immune system, nervous system, and hormones, play a pivotal role in regulating various bodily functions. Consequently, the gut emerges as a promising target for novel therapies through oral treatments for a multitude of diseases. In light of this, we propose two innovative noninvasive strategies for gut-to-brain oral drug delivery: one targeting the mucosal immune system and the other leveraging the nervous system. These approaches offer new avenues for addressing gliomas, obesity, and obesity-induced metabolic disorders, respectively. Furthermore, these proposed gut-to-brain oral drug delivery systems hold potential for revolutionizing the treatment landscape for other diseases, such as meningitis, various cancers, sepsis, and Parkinson’s disease—ailments for which effective cures are yet to be fully realized.