CHE-PETE SEMINAR SERIES

Integrating CRISPR and Stem Cell Models for Engineering Human Pigmentation

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Melanin is a heterogenous biopolymer found across life forms. Human skin color is determined by the quantity, type and distribution of melanin, which is a biopolymer synthesized within the skin melanocytes. Variability in melanin synthesis in humans is linked to differential disease susceptibility such as skin cancers (e.g. melanoma) and abnormal wound healing. Additionally, melanin biochemical synthesis pathways go awry in several hypo- and hyper pigmentation diseases. The global economic cost of human pigmentation disorders estimated to be ~ USD 8.6 billion for the year 2026. The lack of understanding of genes and pathways that regulate melanin production has hindered the development of effective therapies against human pigmentation diseases including melanoma. Our work is aimed at bridging this knowledge gap by integrating genome editing, with in-vitro stem cells derived models of human melanogenesis and melanoma. Here, I will discuss how combining melanin's light scattering properties with genome engineering and omics approaches can be leveraged to advance our understanding of the genetic circuitry driving human melanogenesis and melanoma initiation.

Vivek Bajpai is an assistant professor in the School of Sustainable Chemical, Biological and Materials Engineering (SCBME) at the University of Oklahoma. He is also a member of Material Science and Engineering Program, School of Biomedical Engineering, Department of Dermatology and Stephenson Cancer Center at the University of Oklahoma, USA. Before joining the University of Oklahoma, Dr. Bajpai completed his postdoctoral training in Chemical and Systems Biology at Stanford University. He holds a medical degree from MLB Medical College in India, a MS in Bioengineering from the Indian Institute of Technology Kanpur and a doctorate in chemical engineering from the University at Buffalo, State University of New York. Dr. Bajpai's research work has been published in the top tier journals in the field such as Science, Nature Biomedical Engineering, Nature Genetics, Stem Cells, Cardiovascular Research etc. and his contributions have been recognized by several awards such as Horizon Award from the U.S. Department of Defense, Outstanding Investigator Award from National Institute of Health and Research and Creative Activity Award from the University of Oklahoma . His research is supported by grants from National Institute of General Medical Sciences, United States Army, United State Economic Development Agency and Oklahoma Center for Adult Stem Cell Research.