

“Mucus Penetrating Nanoparticles”

Justin Hanes, Ph.D.

Johns Hopkins University School of Medicine

Abstract

The controlled delivery of bioactive molecules to target tissues can significantly improve drug effectiveness while reducing side effects by concentrating medicine at selected sites in the body. Mucus layers coat and protect nearly all entry points into the body that are not coated by skin. Until recently, human mucus was thought to be nearly impenetrable to drug delivery particles even as small as 59 nm in diameter. Particles that become trapped in mucus are typically rapidly cleared from the organ of interest, usually within minutes to a few hours. Thus, while the barrier properties of mucus provide outstanding protection against infection and other potentially toxic substances, they have also thwarted efforts to achieve uniform and sustained drug and gene delivery to mucosal surfaces. This talk will focus on our work to understand the length-scale dependent and adhesion-mediated barrier properties of mucosal fluids, and how this knowledge has guided the development of polymeric nanoparticulate carriers capable of improved drug and gene delivery to the respiratory tract, female reproductive tract, gastrointestinal tract, surface of the eye, and other mucosal tissues.

Bio

Justin Hanes is the Lewis J. Ort Family Professor and Director of the Center for Nanomedicine at the Johns Hopkins University School of Medicine. He holds faculty appointments in Biomedical Engineering, Chemical & Biomolecular Engineering, Environmental Health Sciences, Neurosurgery, Oncology, and a primary appointment in Ophthalmology. He directs a research program at the interface of biomaterials, biophysics, drug delivery and translational medicine at Johns Hopkins. He is a founder and member of the board of directors of Kala Pharmaceuticals, a company commercializing his laboratory's "mucus penetrating particle" nanotechnology, and he is founder, CEO and Chair of the Board of Directors of GrayBug, a private company developing advanced drug delivery systems with a special focus on the treatment of diseases that affect vision. He also serves on the scientific advisory board for Genentech in the Drug Delivery Division. Justin received a B.S. in Chemical Engineering from UCLA in 1991 and Ph.D. in Chemical Engineering from MIT in 1996. He did postdoctoral training in Oncology and Neurosurgery at the Johns Hopkins University School of Medicine in 1996-1998.