राष्ट्रीय औषधीय शिक्षा एवं अनुसंधान संस्थान (नाईपर), रायबरेली
(औषध विभाग, रसायन एवं उर्वरक मंत्रालय, भारत सरकार का एक स्वायत्तशासी संस्थान)
National Institute of Pharmaceutical Education and Research (NIPER), Raebareli
(An Autonomous Institute under the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Govt. of India)

August 28th 2023

Subject: Citation (summary) of outstanding research work of **Dr Prabhat Ranjan Mishra** for SUN Pharma Research Award-2023 nomination in Pharmaceutical Sciences

Dr Mishra has made an outstanding contribution to developing bio-functionalized nano-biomaterials for therapeutics & diagnostic applications and elucidating the mechanistic aspect of its cellular translocation to achieve a higher therapeutic index with the low toxicity of drugs. His contributions signify a major role in establishing specific delivery of drugs through innovative nano-therapeutics thereby bypassing the otherwise established biological barriers.

Knowledge generation and development: In brief, he elucidated Aggregation Induced Emission (AIE) mechanism demonstrating image-guided chemotherapy through anisamide anchored nano-liquid crystals with enhanced antitumor efficacy (***ACS Appl. Mater. Interfaces*** **2018; I.F. 10.38**) while modulation of tumor microenvironment using endogenous stimuli-responsive lyotropic nano-liquid crystals to achieve advanced comprehensive cancer nano-theranostics (***Acta Biomaterialia*** **2020 I.F. 10.63).** He also demonstrated that lipid bilayer–camouflaged mesoporous silica nanoparticles ensue synchronized translocation of topotecan and metformin to promote apoptosis via mitochondrial membrane depolarization and cell cycle arrest to achieve 100-fold higher drug concentration in tumor (***Adv. Healthcare Mater*** **2018 I.F. 11.12)** while establishing proton sponge effect escaping lysosomal degradation by pyridoxine tethered nanoparticles facilitating intracellular localization resulting in fifteen-fold reduction in therapeutic dose of doxorubicin with enhanced antitumor efficacy (***ACS Appl. Mater. Interfaces*** **2016; I.F. 10.38)**. He discovered that hyaluronic acid anchored nanocrystals expedites CD44 receptor-mediated endocytosis to exhibit reduced lung metastasis and toxicity of paclitaxel while enhancing oral bioavailability through reversible P-gp modulation with a significant reduction in tumor growth ensuing patient-friendly "chemotherapy at home" (***Acta Biomater. 2015*****; I.F. 10.63).** He established the potential role of putrescine in targeting glypican-1 receptor spatially and also elucidated that redox-sensitive micellar system bearing epalrestat and doxorubicin gets disrupted in tumor redox environment through VTC receptor-mediated uptake to promote synergistic tumor suppression ensuing receptor-mediated endocytosis (***Biomat. Sci*** **2019, 2020, I.F. 7.59)**.

Translational contribution and commercialization: He successfully developed layer-by-layer (LBL) and SMEDDS technology that impacted product development in the area of bone-related disorders. He has been instrumental in patenting 25 technologies, out of which **FIVE have been licensed** to Industries while **TWO are commercialized as Joint Fresh™ and Reunion™ [**(*Granted* ***US patent*** *8,496,964;* ***AU Patent****; 2010217238A;* ***EP patent*** *2400957 B1*) Other products for the treatment of osteoarthritis and bone loss are also developed (Granted ***US Patent*** *10,596,115;* ***AU Patent*** *2014291615;* ***US patent*** *10265297*)]. In addition, he has been actively involved in developing Umifenovir and its formulation under repurposing for COVID patients whose **Phase III clinical trial** has been completed.

SUN Pharma Science Foundation
15-Barakhamba Road, Connaught Place,
New Delhi – 110001

Shubhini A. Saraf
Director

ट्रांजिट कैंपस : बिजनौर-सिसेंडी रोड,
सरोजनी नगर, लखनऊ-226 002 (उ.प्र.), भारत
दूरभाष / फैक्स : 0522-2497903
Web / वेब : www.niperraebareli.edu.in

Transit Campus : Bijnor Sisendi Road,
Sarojini Nagar, Lucknow-226 002 (U.P.), India
Phone/Fax : 0522-2497903