Statement of Research Achievements, if any, on which any Award has already been received by the Applicant.

[I] TATA Innovation Fellowship 2018-19 **:** I was honoured to receive TATA Innovation Award by the Department of Biotechnology (DBT) Govt of India for outstanding contribution and commitment to finding innovative solutions in healthcare in the area of translational research. This recognition underscores the significance of my contribution in the area of translational research based on controlled and targeted drug delivery technologies for enhanced therapeutic efficacy and low toxicity of drugs. The main focus is on (a) development of the strategy for cost-saving, patient-friendly, and evidence-based products for industry; and (b) bringing good to patients suffering from osteoporosis and cancer. My focus signifies a major role in establishing specific delivery of drugs through innovative nano-therapeutics thereby bypassing the otherwise established biological barriers.

Key Findings and Contributions: My broad area of interest focuses on developing functionalized delivery systems for cancer and bone-related disorders. Our research also delves into elucidating the mechanistic aspects of cellular translocation to achieve higher therapeutic indices with lower drug toxicity. My group is actively involved in generating new knowledge through the development of novel nano-biomaterials for biomedical applications and has established a niche in translational research. In the realm of knowledge generation and development, we have pioneered novel strategies using nano-therapeutics, elucidating key mechanisms of translocation of nano-particulates that undergo Aggregation Induced Emission, and modulate the tumor microenvironment using endogenous redox-sensitive nano-systems. In translational research, we have successfully developed Layer-by-Layer (LBL) and Self-Microemulsifying Drug Delivery System (SMEDDS) technologies, which have significantly impacted product development in the area of bone-related disorders. Our work has resulted in 25 patented technologies, with four licensed to industries. Two of these technologies have been commercialized: Joint Fresh™ (a standardized nano-formulation for osteoarthritis) marketed by Aeran Labs, and Reunion™ by Pharmanza Herbals Pvt. Ltd.

Challenges and Solutions: During these years we have established a niche area of translational research based on controlled and targeted drug delivery technologies. I have served as Nodal Officer at CDRI of CSIR Network Project entitled “Development of Novel CSIR technologies for Manufacturing Tailored and Patient-Specific Bio-Ceramic Implants and Biomedical Devices at Affordable Cost (BIOCERAM) comprising eight CSIR laboratories. As a Head, Pharmaceutics and Pharmacokinetics division, involved in generating Preclinical (Chemical and pharmaceutical specifications) data for regulatory approval like identity of compound, temperature and humidity stability studies, excipient compatibility studies, photostability studies, Forced degradation studies, Dosage form specifications etc. The following proposals are being envisaged:

- We, as part of the translational research team, are dedicated to collaborating with the pharmaceutical industry, both nationally and internationally, to assess industry interests in niche areas and common interests. We aim to undertake collaborative projects that bridge the gap between chemistry and biology, focusing on developing composite particulate delivery systems for therapeutic, imaging, and consumer applications. One of the significant challenges in translational research is the lack of effectiveness and poor safety profiles that are often not predicted in preclinical and

animal studies. Addressing this requires strengthening in-depth pre-clinical studies to support regulatory approval processes. To achieve this, we plan to enhance functional interactions between academia, the community, and industry, thereby operating more effectively and ensuring a smoother transition from research to practical application.

- Our Fundamental research group are inclined and driven towards academic collaboration with reputed National and International institutes/universities towards development of nano-therapeutics with a strategy of patient-friendly and evidence-based products.
- We also have CRTDH in place our division wherein we will look forward to attract business from larger, domestic and international firms with greater paying capacity to achieve self-sustainability. This proposed R&D hub will aid in designing and development of innovative indigenous products to suit local market needs at affordable prices. Further we are planning to initiate specialized R&D testing facility, R&D infrastructure, BA/& BA study, post translation facility for (drug) candidates.

This TATA Innovation Award has been a pivotal milestone in my career, validating the importance of my research work and motivating me to continue pushing the boundaries of n the area innovative nano-therapeutics leading to translational value.

[II] INSA-DFG fellowship award under Bilateral Exchange Programme by Indian National Science Academy, New Delhi and Deutsche Forschungsgemeinschaft, Germany) 2008**.** INSA-DFG fellowship was awarded based on scientific merit for enhancing scientific collaboration with academies/organizations abroad by exchanging research experience and scientific information. To this effect, I was nominated to carry out research in Germany on a long-term fellowship at the Institute of Pharmaceutical Technology at Freie University and established a long-lasting scientific relationship.

[III] STEM award (Technology Transfer Impact Award) 2022 by Society for Technology Management, India for stewarding IP commercialization of Standardized Nano-formulation from *Spinacea Oleracea* for Osteoarthritis. The STEM Impact Award is a first-of-its-kind initiative in India that celebrates the impact of technology transfer activities in Indian academic & research institutions. Our continued work on thrust area on disease of national importance has broadened our scope of reach and impact in bringing the benefits to the public at large by developing a product for **osteoarthritis.**

[IV] Listed in the top 2% scientists of the world in the area of Pharmacology and Pharmacy, a list released by Stanford University. Featured in the World's Top 2% Scientists in 2022 in their fields according to the latest Stanford ranking. The list is the compilation of a database of more than 100,000 top scientists that provides standardized information on citations, h-index, co-authorship-adjusted hm-index, citations to articles in different authorship positions and a composite indicator.

[V]Technology award (2021) for the technology transfer for CDRI 219-C002 (Cassia occidentalis) for bone regeneration and mitigation of corticosteroid-induced osteoporosis Industry to M/s Pharmanza Herbal Pvt. Ltd, Gujarat Date of Technology Transfer: 10-14 Feb 2020.

[VI] Visiting Scientist at **Free University** of Berlin, Germany 2008 and at **Bradford University**, UK 2009

[VII] Received **Fast Track Young Scientist Award** by Department of Science and Technology, India 2006.

DBT BRITE AWARDS

Dr. Prabhat Ranjan Mishra

CSIR-Central Drug Research Institute (CDRI)
Lucknow

Dr. Prabhat Ranjan Mishra is presently working as a Principal Scientist and Associate Professor, in Phar-maceutics and Pharmacokinetics Division at CSIR-Central Drug Research Institute (CDRI), Lucknow. Dr. Prabhat completed his Master's in Pharmaceutical Sciences and PhD from Dr. H.S. Gour University, Sagar (M.P). He worked for 2 years with Nicholas (P) India limited andas a visiting scientist at Institute of Pharmacy,FreieUniversität Berlin, Germany &University of Bradford, UK, under Royal society-CSIR joint research project prior to joining CSIR organization.

Dr. Mishra's work includes, development of target oriented drug delivery systems with a special emphasis on ligand/receptor interaction, intracellular trafficking, and enhancing bioavailability of poorly absorbed drugs. Hiswork focuseson exploring applicability of layer-by-layer technology, nanocrystal technology and lipid/polymeric nanoparticles. He has contributed towards engineering biomaterials based on controlled and targeted drug delivery technologies for enhanced therapeutic efficacy. Besides his research interest are (a) development of strategy for cost-saving, patient-friendly and evidence-based products for industry; and (b) bringing good to patients suffering from cancer, osteoporosis and parasitic diseases. Dr. Mishra has published more than 125 research papers in the journals of repute and patented 19 technologies. Out of technologies patented, three has been licensed & two commercialized. The technology related to anti-osteoarthritic product based on nanoemulsion pre-concentrate comprising of standardized extract of Spinaceaoleracea, has been launched and available in the market as Joint Fresh™. He has been actively involved in CDRI Drug Discovery and Development programme.

Department has bestowed Tata Innovation Fellowship on Dr. Prabhat R. Mishra in recognition of his significant contribution in area of Human Health.

47

Dr Prabhat Ranjan Mishra