Statement of Research Achievements

I, Debasish Kumar Dey, feel honored to present my research achievements as a strong contender for the prestigious Presidential Award for the Best Ph.D. in the year of 2021 from Daegu University. My doctoral journey has been marked by dedication, innovation, and impactful contributions in the field of biotechnology.

During my Ph.D. at Daegu University, I embarked on a comprehensive research journey that aimed to address the impact of mycotoxins as an environmental carcinogen. The global concern regarding mycotoxin contamination of food and water is substantial. A specific mycotoxin, Aflatoxin B1 (AFB1), is particularly alarming as it contaminates both food and water sources. AFB1 is associated with severe health problems in humans, such as liver damage, birth defects, and immune system issues. However, its effects on plants and aquatic organisms remain incompletely understood. To address this knowledge gap and grasp the broader impact of AFB1, we investigated it's influence on various model systems representing different environments through rigorous experimentation and a multidisciplinary approach. Next, we developed a rat model to study the influence of AFB1 exposure developing the cancer lesions in colon (marked as polyp developments in colon tissues). One of the highlights of my research is the development of a cutting-edge method for elucidating the impact of AFB1 exposure on colon cells. Recognizing the critical impact of AFB1 on human health and environment, I examined and identified a novel, menially toxic peptide which sustainably inhibited the adverse effect of AFB1. The 9-mer dimeric D-type peptide is named as CopA3 which was solated and modified from a protein called coprisin isolated form *Copris tripartitus.*

Furthermore, my research has investigated several signaling pathway *in-vitro* and validated its anti-tumor activity *in-vivo*. By conducting the protein-peptide interaction analyses and molecular docking efficiently provided insight into the specific binding affinity of CopA3 to the p53-binding pocket of the MDM2 protein, which efficiently blocked the p53 and MDM2 interaction. CopA3 plays a crucial role in the binding with MDM2 and enhanced the nuclear translocation of the p53 protein, which sequentially activated the downstream targets to trigger the autophagic mediated cell death machinery through the JNK/Beclin-1 mediated pathway. Further, we developed a multidrug resistant colon cancer cells and examined the efficacy of CopA3 suppressing the growth of the resistant cells. We successfully identified key molecular markers and its association with drug resistance in colon cancer cells. We demonstrate that the multidrug resistance gene is associated with tumor resistance to chemotherapeutics, which upon CopA3 treatment promotes p53 activation and proteasomal degradation of HIF-1α, effecting the angiogenesis response to hypoxia.

I have actively shared my research findings through high-impact peer-reviewed publications and presentations at international conferences. Collaborations with fellow researchers both within and outside the university have enriched my research perspective and expanded the scope of my contributions.

In conclusion, my doctoral research at Daegu University embodies a commitment to excellence, innovation, and societal relevance. The outcomes of my work hold the potential to drive positive change in the field of oncology. I am deeply honored to be considered for the Presidential Award for the Best Ph.D., and I am confident that my research achievements align with the university's mission of advancing knowledge and fostering global impact.