昭和医科大学学士会後援セミナー

mRNA-based cancer therapeutics

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mRNA technology has transformed the way we approach the development of vaccines and therapeutics, enabling rapid, cost-effective, and highly adaptable strategies compared to traditional methods. Its versatility allows for the precise design of molecules that can address a wide range of diseases, sparking tremendous interest across the biomedical and pharmaceutical fields. Unlike conventional drug development approaches that often require complex protein production or viral vectors, mRNA therapeutics rely on synthetic nucleic acids that can be rapidly designed, manufactured, and optimized, significantly accelerating the translation of new therapeutic concepts into clinical applications.

In oncology, mRNA-based therapeutics have shown remarkable promise in preclinical studies, successfully inducing potent anti-tumor immune responses while maintaining favorable safety profiles. By encoding tumor antigens, cytokines, immune modulators, or therapeutic proteins, mRNA can be engineered to stimulate both innate and adaptive immune responses, thereby enhancing the body's ability to recognize and eliminate malignant cells. Several mRNA-based cancer vaccines and immunotherapies have now progressed into early-phase clinical trials, highlighting the growing translational potential of this technology.

Building on the demonstrated safety and effectiveness of clinically approved mRNA vaccines, mRNA therapeutics are poised to become a powerful platform for next-generation cancer treatments. In this talk, Prof. Liu will present his recent work on mRNA-based cancer therapeutics, with a particular focus on the rational design and delivery of mRNA nanomedicines. He will discuss how advances in lipid nanoparticles and

biomaterial engineering can improve the stability, targeting capability, and intracellular delivery efficiency of therapeutic mRNA.

In addition, Prof. Liu will highlight the underlying immunological mechanisms that drive therapeutic responses and present our preclinical studies demonstrating the efficacy of these approaches in aggressive cancer models, including glioblastoma. He will also discuss key challenges in the field, such as improving delivery efficiency, overcoming immunosuppressive tumor microenvironments, and bridging the gap between preclinical research and clinical translation. Finally, he will outline emerging opportunities for combining mRNA therapeutics with other treatment modalities, including immune checkpoint blockade and nanomedicine-based strategies, to achieve synergistic anti-tumor effects and improve patient outcomes.

（雑誌掲載時、スペースがある場合は写真も掲載）