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Development of novel targeted therapeutics for breast cancer

Breast cancer is the most common cancer in women and the second leading cause of cancer-related deaths. Triple-negative breast cancer (TNBC) is a highly aggressive, metastatic, and the deadliest and most incurable type of breast cancer. Significant heterogeneity with 6 genetically-defined subtypes has prevented the development of targeted therapeutics for TNBC. Chemotherapy remains a mainstay treatment, however, only 30% of the patients achieve remission and most patients develop resistance and relapse. To develop highly effective targeted therapeutics and prolong patient survival novel molecular targets needed to be identified. After a decade of research, our studies identified an oncogenic atypical kinase, Elongation Factor-2 kinase (EF2K), as a major oncogenic driver in TNBC and validated it as a novel therapeutic target in triple-negative breast cancer. To specifically target, we developed tumor-targeting RNA-based (siRNA and microRNA) nanotherapeutics. We demonstrated that single lipid or albumin-based nanoparticles can effectively deliver EF2K-specific siRNA and microRNAs into TNBC tumors in mice, inhibit the EF2K gene, and suppresses tumor growth with no toxic or side effects in mice, suggesting that this technology may be used in clinical translation to patients for Phase 1 clinical trials. We also developed small molecule EF2K-inhibitors (patented) with significant efficacy. Overall, the talk will focus on the current state of targeted therapies and the development of successful novel RNA-based nanotherapeutics which is considered a novel era of targeted therapeutics in the treatment of human cancers and diseases.

Recent Publications

1. Bulent Ozpolat, et.al (2022): Translational Modeling Identifies Synergy between Nanoparticle-Delivered miRNA-22 and Standard-of-Care Drugs in Triple-Negative Breast Cancer. Pharmaceutical Research. 39(3). 1-18.
2. Bulent Ozpolat, et.al (2022). Simvastatin-loaded liposome nanoparticles treatment for uterine leiomyoma in a patient-derived xenograft mouse model: a pilot study. Journal of Obstetrics and Gynaecology. 1-5.
3. Bulent Ozpolat, et.al (2022). RNAi-based therapeutics and tumor targeted delivery in cancer. Advanced Drug Delivery Reviews. 182. 114113

Biography

Bulent Ozpolat has expertise in Immunology, Cancer Biology, Genetics, Gene therapy, Experimental Therapeutics, Nanotechnology, nanocarriers, and the development of highly targeted therapeutics for cancer. After getting his M.D. degree from Dokuz Eylul University, he received his Ph.D. degree in Immunology from The University of Texas- MD Anderson Cancer Center Houston, TX, USA, and completed post-doctoral training at MD Anderson Cancer. He has been serving as a faculty for more than 15 years at MD Anderson Cancer Center, which is ranked one top of cancer centers for 15 years in the US. He has 5 patents for the development of targeted therapeutics and published more than 137 publications (H-index 39) (90 research papers, 20 book chapters, and 24 review articles) in peer-reviewed high-impact journals.

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