FORMULATION AND EVALUATION OF CURCUMIN NANOPARTICLES TO REPOLARIZE TUMOR ASSOCIATED MACROPHAGES TO ANTI-TUMOR MACROPHAGES FOR CANCER IMMUNOTHERAPY

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Tumor-associated macrophages (TAMs) constitute the most abundant cell population in the tumor microenvironment, playing a crucial role in fostering an immunosuppressive milieu. TAMs can undergo polarization into two distinct forms, namely M1 and M2-like TAMs, influenced by a complex interplay of cytokines, chemokines, and various tumor-secreted factors. M1 macrophages exhibit anti-cancer properties, while M2 macrophages promote tumor growth and metastasis. Targeting M2-TAMs with the goal of repolarizing them into an M1-like phenotype holds promise as a strategy in cancer immunotherapy. Curcumin, with a rich history as an adjuvant in numerous immunotherapeutic approaches due to its potent immune-activation capabilities, faces challenges related to its low bioavailability and rapid clearance from the body, limiting its effectiveness in inducing a positive immune response. However, Curcumin encapsulated in biodegradable poly lactic -co glycolic acid (PLGA) polymeric nanoparticles (NPs) are used to release curcumin in slow and controlled manner and also give stability to the drug. The study encompassed the preparation, encapsulation, and cytotoxicity assay of curcumin NPs. In addition, a cell co-culture system and an M2 macrophage model were employed to assess the immunomodulatory effects of Curcumin NPs on M2-TAMs. Our findings explore the impact of curcumin nanoparticles (NPs) on the repolarization processes of M2-TAMs, with a focus on the modulation of key M1 markers like TNF-α and iNOS, as well as M2 markers such as TGF-β and Arg-1. Together, these results enable a comparison of the immunomodulatory impacts of curcumin nanoparticles versus unbound curcumin in the reprogramming of M1 or M2-TAMs.