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Targeting anti-pathogen immune responses in the tumor microenvironment: An innovative immunotherapy for cancer

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Statement of the Problem: Cancer and infections are amongst the two most common maladies that we encounter, and the interplay between infections and cancer has been the subject of great interest for more than a century. However, discordant data exist and infections have been implicated in having both positive and negative effects on cancer. We have, therefore, made the study of the interplay between infections and cancer a major focus of our work.

Methodology & Theoretical Orientation: Using conventional mouse syngeneic and genetically driven tumor models and our innovate double-humanized models (created using patient tumor tissue and the same patient's immune cells), we determined the effect of infection (both distant and at the tumor site) on cancer.

Findings: We discovered that influenza infection in the lung leads to increased melanoma growth in a distant site (for example, the flank skin) but decreased melanoma foci in the lung. Further, delivery using heat-inactivated virus to the tumor site produced a similar result and using a nanotechnology-based delivery system improved the anti-tumor outcome. Supporting our laboratory findings, our review of over 200,000 lung cancer patients in the SEER-Medicare Linked Database showed improved cancer-specific and overall survival in lung cancer patients diagnosed with influenza during the course of their cancer.

Conclusion & Significance: This suggests that effective regression of tumors is possible when immune responses targeting foreign antigens are generated in the same tissue as the tumor. Our next step is to combine this targeting of anti-viral immune responses within the tumor with currently approved and novel immunotherapies towards determining whether such combinations improve the effects of targeting anti-viral immune responses and improve the proportion of patients that experience long-term benefit from cancer immunotherapy. Ultimately, our goal is to translate our findings to clinical trials and patient care regimens that improve and save cancer patient lives.

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