Nanoformulation of the CCL21 Chemokine as for Cancer Treatment

Joyce Solheim, PhD
Professor, Eppley Institute
University of Nebraska Medical Center

Immunotherapy strategies that can evoke concentrated, durable responses against a wide range of cancers are greatly needed. C-C motif chemokine ligand 21 (CCL21) functions as a chemoattractant, regulating the localization of immune cells. Previous studies by the Solheim lab and others at UNMC showed that CCL21 intratumoral treatment was capable of recruiting dendritic cells (DCs), T cells, natural killer (NK) cells, and NKT cells into mouse pancreatic tumors and mammary tumors. These studies also demonstrated that CCL21 was able to induce a systemic anti-tumor immune response that could slow the growth not only of the directly treated tumors but also the growth of tumors on the opposite flanks of the mice. Together, the Solheim and Bronich laboratories have recently developed and tested a novel alginate-based nanoformulation of CCL21. The choice of alginate as the major component of the nanoparticles was based on its biocompatibility and safety record. Nanoformulated CCL21 significantly prolonged the survival of neuroblastoma tumor-bearing mice and reduced neuroblastoma tumor growth, compared to control treatments (including CCL21 alone). In many mice that received the CCL21 nanoformulation, the tumors completely regressed, and when these mice were rechallenged they failed to produce new tumors, thereby indicating that a protective immune response had been induced. Thus, this CCL21 nanoformulation has potential as a novel treatment for children and adolescents diagnosed with neuroblastoma, as well as for other types of cancer that afflict pediatric or adult patients.

Biography

Dr. Joyce Solheim’s research is focused on immunology and cell biology as related to cancer, with particular emphasis on the development of novel, effective immunotherapies for cancer. She joined the Eppley Institute in the University of Nebraska Medical Center (UNMC) in 1999, and now as Professor she serves as a member of the Fred & Pamela Buffett Cancer Center Senior Leadership Council and as the Director of the Cancer Research Doctoral Program. At UNMC, she also serves as the Assistant Director of the National Cancer Institute-sponsored Cancer Biology T32 Training Program and as the Co-Director of the Career Development Program for junior faculty and the Developmental Research Program in the Specialized Program of Research Excellence in Pancreatic Cancer. She has been an Associate Editor and a Section Editor for the Journal of Immunology, and was appointed as a Member of the Faculty of 1000 Biology in the Immunology Section.