ONCOLOGY

Faculty Profiles | Johns Hopkins University

JOHNS HOPKINS UNIVERSITY

JOHNS HOPKINS TECHNOLOGY VENTURES

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TECHNOLOGY VENTURES

CANCER MULTI-OMICS

KELLIE SMITH, PH.D.

Associate Professor of Oncology

AREAS OF SPECIALIZATION

Immunotherapy; biomarkers; transcriptomics

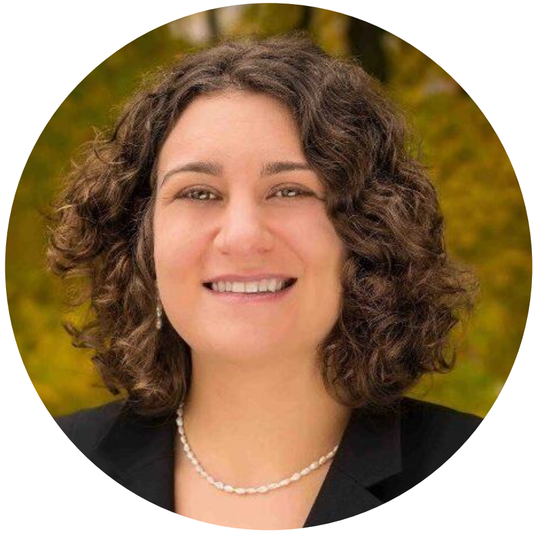
SUMMARY OF WORK

Dr. Smith's lab focuses on defining the functional programming of tumor-specific CD4+ and CD8+ T cells as it relates to response to immunotherapy. Collaboration on immunotherapy clinical trials aimed at improving treatment options, preventing disease recurrence, and understanding the predictors of response to treatment in both early and advanced-stage disease.

PUBLICATIONS

- The Mutation-Associated Neoantigen Functional Expansion of Specific T Cells (MANAFEST) Assay: A Sensitive Platform for Monitoring Antitumor Immunity
- Compartmental analysis of T cell clonal dynamics as a function of pathologic response to neoadjuvant PD-1 blockade in resectable non-small cell lung cancer
- Transcriptional programs of neoantigen-specific TIL in anti-PD-1-treated lung cancers

ELANA FERTIG, PH.D.



Professor of Oncology. Division Director of Oncology Quantitative Sciences. Co-Director Convergence Institute

AREAS OF SPECIALIZATION

Bioinformatics, Single-cell multi-omics, Therapeutic resistance in cancer, Transcriptional regulation in cancer

SUMMARY OF WORK

Dr. Fertig's Lab develops systems biology methodologies to elucidate the tumor and immune cell interactions. Her wet lab develops time course models of therapeutic resistance and performs single cell technology development. Her computational methods blend mathematical modeling and artificial intelligence to determine the biomarkers and molecular mechanisms of therapeutic resistance from multi-platform genomics data.

PUBLICATIONS

- Leveraging multi-omics data to empower quantitative systems pharmacology in immuno-oncology
- Machine learning integrating spatial omics uncovers humoral immunity patterns in intratumoral tertiary lymphoid structures in pancreatic cancer pathologic responders
- A differential ligand-receptor network inference method to identify alterations in communication between myeloid cells and CD8 T cells in response to PancVAX neo-epitope ...
- Systems immunology spanning tumors, lymph nodes, and periphery

DENIS WIRTZ, PH.D.

Vice Provost for Research, Theophilus Halley Smoot Professor of Engineering Science
Chemical & Biomolecular Engineering, Pathology, Oncology

AREAS OF SPECIALIZATION

Digital pathology, Cancer Biology, High-throughput technologies

SUMMARY OF WORK

Dr. Wirt'z lab studies the biophysical properties of healthy and diseased cells. His lab develops methods for particle tracking, 3D tissue mapping, high-throughput single cell technologies, and concomitant machine learning algorithms. These technologies are applied to investigate how cell-motility, tissue structure, and tissue composition affect disease states including tumor proliferation and metastasis.

PUBLICATIONS

- Generative interpolation and restoration of images using deep learning for improved 3D tissue mapping
- High-Resolution 3D Printing of Pancreatic Ductal Microanatomy Enabled by Serial Histology
- Spatial transcriptomics analysis of PanIN reveals loss of pro-inflammatory signaling and the presence of cancer-associated fibroblasts
- A 3D in vitro assay to study combined immune cell infiltration and cytotoxicity
- Engineering self-propelled tumor-infiltrating CAR T cells using synthetic velocity receptors

RACHEL KARCHIN, PH.D.

Professor, Biomedical Engineering, Oncology, Computer Science

AREAS OF SPECIALIZATION

Genetic variation, somatic mutations, tumor evolution, computational immuno-oncology

SUMMARY OF WORK

As a core member of the Johns Hopkins University Institute for Computational Medicine, Karchin has created leading-edge tools to interpret genomic variants, identify cancer drivers, and model multivariate biomarkers of cancer prognosis and of tumor evolution. These including integrating information from molecular modeling and sequence analysis with clinical patient data and in vitro functional studies

PUBLICATIONS

- Evaluation of simulation methods for tumor subclonal reconstruction
- CAGI, the Critical Assessment of Genome Interpretation, establishes progress and prospects for computational genetic variant interpretation methods
- Clustering by antigen-presenting genes reveals immune landscapes and predicts response to checkpoint immunotherapy
- SpliceMutr enables pan-cancer analysis of splicing-derived neoantigen burden in tumors
- Deep neural networks predict class I major histocompatibility complex epitope presentation and transfer learn neoepitope immunogenicity

ALEKSANDER POPEL, PH.D.

Vice Provost for Research. Theophilus Halley Smoot Professor of Engineering Science. Chemical & Biomolecular Engineering, Pathology, Oncology

AREAS OF SPECIALIZATION

Systems biology, computational medicine, biology angiogenesis , cancer immuno-oncology, peripheral arterial disease

SUMMARY OF WORK

His research focuses on systems biology and medicine and systems pharmacology using both computational and experimental approaches. These include immuno-oncology computational models, combining spatial transcriptomics and immune phenotyping to model and predict therapeutic responses. Fundamental research in cell biology, including cancer metastasis and angiogenesis.

PUBLICATIONS

- Leveraging multi-omics data to empower quantitative systems pharmacology in immuno-oncology
- Chemokine-derived oncolytic peptide induces immunogenic cancer cell death and significantly suppresses tumor growth
- Generating immunogenomic data-guided virtual patients using a QSP model to predict response of advanced NSCLC to PD-L1 inhibition
- Integrating single cell sequencing with a spatial quantitative systems pharmacology model spQSP for personalized prediction of triple-negative breast cancer immunotherapy response

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TECHNOLOGY VENTURES

IMMUNOTHERAPY

JAMIE SPANGLER, PH.D.

The William R. Brody Faculty Scholar; Assistant Professor, Biomedical Engineering, Chemical & Biomolecular Engineering, Oncology

AREAS OF SPECIALIZATION

Structural and molecular immunology, protein engineering, therapeutic antibody discovery and design, targeted drug development

SUMMARY OF WORK

Dr. Spangler's research aims to expand the repertoire of protein therapeutics by redesigning naturally occurring proteins and engineering new molecules to overcome the deficiencies of existing drugs. Integrating cutting-edge tools from structural biophysics, biomolecular engineering, and translational immunology, her research focuses on developing innovative platforms for the discovery and design of proteins that recruit novel mechanisms for disease therapy.

PUBLICATIONS

- Multiparatopic antibodies induce targeted downregulation of programmed death-ligand 1
- Redirecting the specificity of tripartite motif containing-21 scaffolds using a novel discovery and design approach
- An engineered immunocytokine with collagen affinity improves the tumor bioavailability, tolerability, and therapeutic efficacy of IL-2
- Discovery of Antibodies Targeting Multipass Transmembrane Proteins Using a Suspension Cell-Based Evolutionary Platform

JONATHAN SCHNECK, M.D., PH.D.

Professor of Pathology, Oncology, Medicine

AREA OF SPECIALIZATION

Molecular immunology, immunoengineering, therapeutic cellular discovery and design

SUMMARY OF WORK

Dr. Schneck's research focuses on biomaterial platforms to genetically and environmentally control T cell organization. He has pioneered the development of soluble HLA molecules and artificial antigen-presenting cells to study manipulation of in-vivo T cell responses. These tools are combined with multiscale and multidimensional, analysis of the T cell responses to investigate biology of T cells responses and develop novel therapeutics.

PUBLICATIONS

- Particle elasticity influences polymeric artificial antigen presenting cell effectiveness *in vivo* via CD8+ T cell activation, macrophage uptake, and the protein corona
- In Vivo Stimulation of Therapeutic Antigen-Specific T Cells in an Artificial Lymph Node Matrix
- In Vivo Expansion of Endogenous Antigen-Specific CD8+ T cells using Artificial T-Cell Stimulating Microparticles
- Rapid expansion of highly functional antigen-specific T cells from patients with melanoma by nanoscale artificial antigen-presenting cells
- Nanoparticle-based modulation of $CD4^+$ T cell effector and helper functions enhances adoptive immunotherapy

LEI ZHENG, M.D., PH.D.

Associate Professor of Oncology, Surgery

AREAS OF SPECIALIZATION

Immunotherapy; pancreatic cancer

SUMMARY OF WORK

Dr. Zheng's lab focuses on pancreatic cancer immunotherapy research including neoadjuvant therapies and preclinical models of pancreatic cancer. This has led to their development of a colorectal cancer GVAX vaccine. Additionally, research in understanding the mechanistic roles of the tumor microenvironment in cancer development and metastasis and identifying new targets for pancreatic cancer therapies

PUBLICATIONS

- A platform trial of neoadjuvant and adjuvant antitumor vaccination alone or in combination with PD-1 antagonist and CD137 agonist antibodies in patients with resectable pancreatic adenocarcinoma
- Multi-omic analyses of changes in the tumor microenvironment of pancreatic adenocarcinoma following neoadjuvant treatment with anti-PD-1 therapy
- A feasibility study of combined epigenetic and vaccine therapy in advanced colorectal cancer with pharmacodynamic endpoint
- A phase II study of allogeneic GM-CSF–transfected pancreatic tumor vaccine (GVAX) with Ipilimumab as maintenance treatment for metastatic pancreatic cancer

SUMAN PAUL, MBBS, PH.D.

Assistant Professor of Oncology

AREAS OF SPECIALIZATION

Oncology, cell therapies, antibody therapies

SUMMARY OF WORK

Dr. Paul's research focuses on developing new biologic therapies for the treatment of T-cell lymphomas and T-cell leukemias. They combine research in immunooncology to identify novel cancer antigens and develop targetted biologics such as engineered antibodies and cell therapies.

PUBLICATIONS

- TRBC1-targeting antibody–drug conjugates for the treatment of T cell cancers
- Hydrophobic interactions dominate the recognition of a KRAS G12V neoantigen
- Structural engineering of chimeric antigen receptors targeting HLA-restricted neoantigens
- Targeting loss of heterozygosity for cancer-specific immunotherapy
- Targeting a neoantigen derived from a common TP53 mutation
- Targeting MHC-linked wild type p53 with TCR mimic single chain diabody for cancer immunotherapy.

SHIBIN ZHOU, M.D., PH.D.

Professor of Oncology. Director, Experimental Therapeutics Ludwig Center for Cancer Genetics and Therapeutics at Johns Hopkins

AREAS OF SPECIALIZATION

Molecular Genetic Analysis of Cancer, Targeted Cancer Immunotherapy

SUMMARY OF WORK

Dr. Zhou's research has focused on combination therapies combining liposomal formulation of chemotherapeutic drugs, bacterial immunotherapy, and radiation for the treatment of several experimental tumor models. More recently, they have developed targeted immunotherapies based on discovered cancer neoantigens.

PUBLICATIONS

- TRBC1-targeting antibody–drug conjugates for the treatment of T cell cancers
- Hydrophobic interactions dominate the recognition of a KRAS G12V neoantigen
- Structural engineering of chimeric antigen receptors targeting HLA-restricted neoantigens
- Bispecific antibodies targeting mutant *RAS* neoantigens
- C. novyi for the treatment of solid tumors in humans
- An engineered antibody fragment targeting mutant β-catenin via major histocompatibility complex I neoantigen presentation
- Targeting loss of heterozygosity for cancer-specific immunotherapy

CHIEN-FU HUNG, PH.D.

Professor of Pathology, Associate Professor of Gynecology and Obstetrics

AREAS OF SPECIALIZATION

Cancer immunology, cancer vaccines, Gene therapies, ovarian cancer immunotherapy

SUMMARY OF WORK

Dr. Hung's research has led to the generation of clinical-grade vaccines for HPV-associated precancerous and cancerous lesions. Of special note, two of Dr. Hung's technologies, DNA vaccines based on HSP70 and calreticulin fusion technologies, have also been licensed and are under active development by biotechnology companies. Additionally, they develop universal immunotherapeutic molecules that can target and expand dendritic cells and enhance antigen-specific immune responses.

PUBLICATIONS

- Salmonella immunotherapy engineered with highly efficient tumor antigen coating establishes antigen-specific CD8+ T cell immunity and increases in antitumor efficacy with type I interferon combination therapy
- Arginine-linked HPV-associated E7 displaying bacteria-derived outer membrane vesicles as a potent antigen-specific cancer vaccine
- Electroporation-mediated novel albumin-fused Flt3L DNA delivery promotes cDC1-associated anticancer immunity
- In situ vaccination via tissue-targeted cDC1 expansion enhances the immunogenicity of chemoradiation and immunotherapy
- Control of spontaneous HPV16 E6/E7 expressing oral cancer in HLA-A2 (AAD) transgenic mice with therapeutic HPV DNA vaccine

ELIZABETH M. JAFFE, M.D.

Deputy Director, The Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins; Co-Director, Skip Viragh Center for Pancreas Cancer; Deputy Director, Institute of Clinical and Translational Research; Co-Director, Immunology Cancer Program; Associate Director, Bloomberg Kimmel Institute for Cancer Immunotherapy; Professor of Oncology; Professor of Pathology

AREAS OF SPECIALIZATION

Medical Oncology, Pancreatic Cancer, Immunotherapy, Cancer vaccines

SUMMARY OF WORK

Dr. Jaffe's laboratory focuses on mechanisms of sensitivity and resistance to immune based therapies in mouse models and human models of pancreatic cancer. Areas of specific interest include understanding the inflammatory responses that are associated with cancer development and progression in pre-clinical and clinical models, and development of interventions. Dr. Jaffe currently holds six vaccine patents.

PUBLICATIONS

- Combining STING-based neoantigen-targeted vaccine with checkpoint modulators enhances antitumor immunity in murine pancreatic cancer.
- Multi-omic analyses of changes in the tumor microenvironment of pancreatic adenocarcinoma following neoadjuvant treatment with anti-PD-1 therapy
- Systemic inhibition of PTPN22 augments anticancer immunity

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TECHNOLOGY VENTURES

GENE & CELL THERAPIES

JORDAN GREEN, PH.D.

Director, Biomaterials and Drug Delivery Laboratory; Professor of Biomedical Engineering; Professor of Neurosurgery; Professor of Oncology; Professor of Ophthalmology

AREAS OF SPECIALIZATION

Gene Delivery, Nanobiotechnology, Biomaterials, Immunoengineering, Drug Delivery

SUMMARY OF WORK

Dr. Green's Biomaterials and Drug Delivery Laboratory ("Green Group") focuses on the study of cellular engineering and in nanobiotechnology—with a focus on biomaterials, controlled drug delivery, stem cells, gene therapy and immunobioengineering.

PUBLICATIONS

- Nanoparticle-mediated delivery of miR-590-3p decreases recurrent GBM tumor growth by inhibits multiple oncogenic nodes
- Biomaterial-Mediated Genetic Reprogramming of Merkel Cell Carcinoma and Melanoma Leads to Targeted Cancer Cell Killing *In Vitro* and *In Vivo*
- Polymeric nanoparticle gel for intracellular mRNA delivery and immunological reprogramming of tumors
- Biodegradable Polyester Nanoparticle Vaccines Deliver Self-Amplifying mRNA in Mice at Low Doses
- Nanoparticles for Correction of a Rare Cystic Fibrosis Variant

HAI-QUON MAO, PH.D.

Professor, Department of Materials Science and Engineering; Director, Institute of NanoBioTechnology (INBT)

AREAS OF SPECIALIZATION

Biomaterials, therapeutic delivery, regenerative engineering, immunoengineering

SUMMARY OF WORK

Dr. Mao's work focuses on developing novel biomaterials for therapeutic delivery through therapeutic engineering, regenerative engineering, and immunoengineering.

PUBLICATIONS

- Optimization of lipid nanoparticles for gene editing of the liver via intraduodenal delivery
- Screening for lipid nanoparticles that modulate the immune activity of helper T cells towards enhanced antitumour activity
- In Vivo Expansion of Endogenous Antigen-Specific CD8+ T cells using Artificial T-Cell Stimulating Microparticles
- Multi-step screening of DNA/lipid nanoparticles and co-delivery with siRNA to enhance and prolong gene expression

CHALLICE BONIFANT, PH.D.

Assistant Professor, Oncology

AREAS OF SPECIALIZATION

Engineering cellular immunotherapies, Chimeric antigen receptors, Acute Myeloid Leukemia

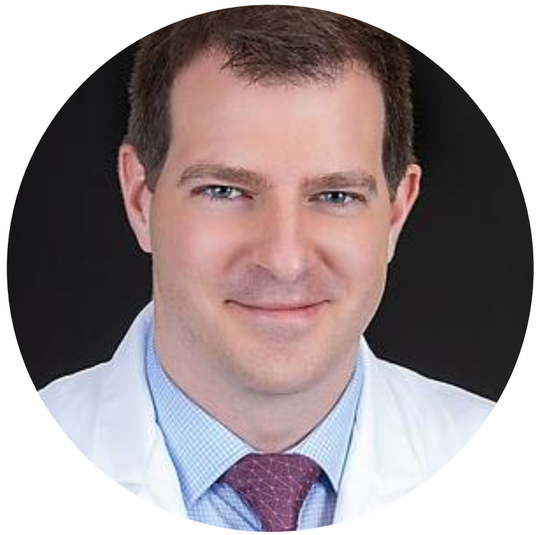
SUMMARY OF WORK

Dr. Bonifant's research focuses on the design and development of immune therapies as a treatment for poor-prognosis cancers, including development of engineered CAR immunotherapies for the treatment of Acute Myeloid Leukemia. They study T and NK cell biology and have experience in selection, activation, engineering, and functional analysis of these cells.

PUBLICATIONS

- Anti-B7-H3 chimeric antigen receptor NK cells suppress the growth of atypical teratoid/rhabdoid tumor orthotopic xenografts
- Longitudinal plasma proteomics in CAR-T cell therapy patients implicates neutrophils and NETosis in the genesis of CRS
- CD4+/CD8+ Selection of Anti-AML ENG-T Cells Affects Long-Term T-Cell Persistence in Vitro and Survival in an AML Xenograft Model
- Improving the anti-acute myeloid leukemia activity of CD123-specific engager T cells by MyD88 and CD40 co-stimulation
- Novel banana lectin CAR-T cells to target pancreatic tumors and tumor-associated stroma

MAX KONIG, M.D.



Assistant Professor, Medicine. Director, Cellular Therapy Program (Autoimmunity), Department of Medicine

AREAS OF SPECIALIZATION

Autoimmune and rheumatic diseases, chimeric antigen receptor therapy, CRISPR/Cas-engineered immune cells

SUMMARY OF WORK

Dr. Konig's work focuses development of antigen-specific and personalized immunotherapies for autoimmune diseases. This includes the development of CRISPR/Cas-engineered chimeric autoantigen-T cell receptor (CATCR)-T cells, to reprogram a patient's T cells so they can selectively target self-reactive immune cells while preserving normal immune populations

PUBLICATIONS

- Chimeric Autoantigen-T Cell Receptor (CATCR)-T Cell Therapies to Selectively Target Autoreactive B Cells
- Structural engineering of chimeric antigen receptors targeting HLA-restricted neoantigens
- Targeting a neoantigen derived from a common TP53 mutation.
- TCR β chain-directed bispecific antibodies for the treatment of T cell cancers
- Bispecific antibodies targeting mutant RAS neoantigens

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RADIOTHERAPY

SUDATH S.H. HAPUARACHCHIGE, PH.D., M.S.

Assistant Professor, Radiology and Radiological Science. Assistant Professor, Oncology

AREAS OF SPECIALIZATION

Cancer imaging agents, Antibody drug conjugates

SUMMARY OF WORK

Dr. Hapuarachchige's research focuses on the development of image-guided drug delivery systems for theranostic applications in cancer therapy. This includes Novel chemical strategies for smart-release of drugs, and antibody-drug conjugates for efficacious drug delivery.

PUBLICATIONS

- PET-MR Guided, Pre-targeted delivery to HER2(+) Breast Cancer Model
- Bioorthogonal two-component drug delivery in HER2(+) breast cancer mouse models
- Dual-Modality PET–SPECT Image-Guided Pretargeting Delivery in HER2(+) Breast Cancer Models
- Development of 5D3-DM1: A Novel Anti-Prostate-Specific Membrane Antigen Antibody-Drug Conjugate for PSMA-Positive Prostate Cancer Therapy

SANGEETA RAY, PH.D., M.S.

Associate Professor of Radiology and Radiological Science

AREAS OF SPECIALIZATION

Radiopharmaceuticals, cancer imaging agents, radiometal conjugates

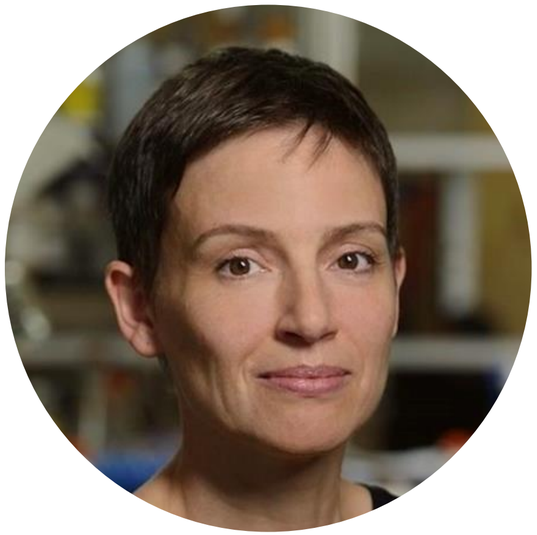
SUMMARY OF WORK

Dr. Ray's research focuses on developing new agents for noninvasive molecular imaging and therapy and targeted radionuclide therapy for prostate cancer and other solid tumor malignancies.

PUBLICATIONS

- Preclinical Evaluation of a New Series of Albumin-Binding 177Lu-Labeled PSMA-Based Low-Molecular-Weight Radiotherapeutics
- An Improved 211At-Labeled Agent for PSMA-Targeted α-Therapy
- Preclinical Evaluation of 213Bi- and 225Ac-Labeled Low-Molecular-Weight Compounds for Radiopharmaceutical Therapy of Prostate Cancer
- Preclinical Development in Radiopharmaceutical Therapy for Prostate Cancer
- A Series of PSMA-Targeted Near-Infrared Fluorescent Imaging Agents
- Triazole conjugated ureas, thioureas, carbamates, and reversed carbamates for PSMA-targeted imaging agents and uses thereof

STAVROULA SOFOU, PH.D.



Professor, Department of Chemical and Biomolecular Engineering

AREAS OF SPECIALIZATION

Heterogenous lipid bilayers, nanobiomaterials, targeted chemotherapy, alpha-particle therapy, transport

SUMMARY OF WORK

Dr. Sofou's research focuses on engineering strategies to enable uniform and prolonged distributions of therapeutics in established solid tumors, particularly to combat difficult-to-kill cancers in diffusion-limited environments. These materials are engineered for targeted delivery of chemotherapies and alpha-particles.

PUBLICATIONS

- Combined, yet Separate: cocktails of carriers (not drugs) for α-particle therapy of solid tumors expressing moderate-to-low levels of targetable markers
- Combination of Carriers with Complementary Intratumoral Microdistributions of Delivered α-Particles May Realize the Promise for 225Ac in Large, Solid Tumors
- Two diverse carriers are better than one: A case study in α-particle therapy for prostate specific membrane antigen-expressing prostate cancers
- Transport-driven engineering of liposomes for delivery of α-particle radiotherapy to solid tumors: effect on inhibition of tumor progression and onset delay of spontaneous metastases
- Alpha-particle Nanotherapeutics Against Recurrent, Metastatic Triple Negative Breast Cancer