

**The Ohio State University
Curriculum Vitae**

NAME Aleksander Skardal, Ph.D.

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EDUCATION

2005 Johns Hopkins University
Baltimore, Maryland
B.Sc. Biomedical Engineering

2010 Department of Bioengineering
University of Utah
Salt Lake City, Utah
Ph.D.

Ph.D Research Advisor: Glenn D. Prestwich, Ph.D.
Thesis: *Hyaluronan and Gelatin Biomaterials for Bioprinting Engineered Tissues*

POSTDOCTORAL TRAINING

2010 – 2014 Postdoctoral Fellow, Wake Forest School of Medicine, Wake Forest Institute for Regenerative Medicine.
Research Advisor: Shay Soker, Ph.D.
Research Project: *Implementation of biomaterial technologies in regenerative medicine and tissue engineering applications.*

EMPLOYMENT

Academic Appointments

The Ohio State University

2019 – 2023 Assistant Professor, Department of Biomedical Engineering
2023 – Present Associate Professor, Department of Biomedical Engineering

Wake Forest School of Medicine

2014 – 2019 Assistant Professor, Wake Forest Institute for Regenerative Medicine
2014 – 2019 Assistant Professor, Department of Biomedical Engineering
2015 – 2019 Assistant Professor, Department of Cancer Biology
2015 – 2019 Member, Comprehensive Cancer Center of Wake Forest University,
Tumor Progression and Recurrence Program

2018 – 2019 Assistant Professor, Department of Molecular Medicine and Translational Science

Professional Experience

- 2003 Intern, AlphaGenics, Rockville, MD.
Research Project: Data mining biomedical publication databases to create nutrient, protein, and gene mechanistic pathways.
- 2004-2005 Research Assistant – Jan Hoh Lab, Department of Physiology, Johns Hopkins School of Medicine, Baltimore Maryland
Research Project: Development of a harmonic resonance-based thin film biosensor.
- 2005-2010 Research Assistant – Prestwich Lab, Center for Therapeutic Biomaterials, University of Utah, Salt Lake City, UT
Research Project: Synthesis, development, and implementation of hyaluronic acid and gelatin-based biomaterials for biofabrication of engineered tissues constructs.
- 2010-2014 Postdoctoral Fellow – Wake Forest Institute for Regenerative Medicine, Wake Forest School of Medicine, Winston-Salem, NC
Research Focus: Design and implementation of customized biomaterials in tissue engineering and regenerative medicine

Professional Interest Groups

- 2014-2019 Member, Tumor Microenvironment Interest Group, Wake Forest Baptist Medical Center
- 2015-2019 Member, Drug Discovery Interest Group, Wake Forest Baptist Medical Center and Wake Forest University
- 2015-2019 Member, Brain Tumor Center of Excellence, Comprehensive Cancer Center at Wake Forest Baptist Medical Center
- 2018-2019 Member, Signaling and Biotechnology Program, Comprehensive Cancer Center at Wake Forest Baptist Medical Center
- 2018-2019 Member, Center for Functional Materials, Wake Forest University and Wake Forest Baptist Medical Center
- 2018-2019 Member, Breast Cancer Center of Excellence, Comprehensive Cancer Center at Wake Forest Baptist Medical Center
- 2019-Present Member, Solid Tumor Biology Group, The Ohio State University Comprehensive Cancer Center
- 2019-Present Member, Cancer Biology Research Program, The Ohio State University Comprehensive Cancer Center
- 2019-Present Founder and Director, Organoid Technology Program, The Ohio State University Comprehensive Cancer Center

ADMINISTRATIVE SERVICE

Wake Forest School of Medicine

Institutional Service

2018-2019 Chair, Biomaterials Track Curriculum Committee, Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences

Departmental Service

2011-2018 Scientific Mentor – Wake Forest Institute for Regenerative Medicine Summer Scholars Research Program

2013-2014 Wake Forest Institute for Regenerative Medicine, All Hands Retreat Committee

2014-2015 Wake Forest Institute for Regenerative Medicine, Faculty Recruitment Committee

2014-2019 Liaison, Graduate Student Program for Introductions of Visiting Faculty Seminars

2016 Course Director – Decellularization Biomaterials Workshop, Regenerative Medicine Essentials Short Course

2016-2017 Wake Forest Institute for Regenerative Medicine, Faculty Recruitment Committee

2017 Course Director – Decellularization Biomaterials Workshop, Regenerative Medicine Essentials Short Course

2017-2019 Faculty Advisor – Weekly Research Progress Update Seminar Series, Wake Forest Institute for Regenerative Medicine Summer Scholars Research Program

2018 Course Founder and Director – Organ-on-a-Chip/Body-on-a-Chip and Supporting Technologies, Regenerative Medicine Essentials Short Course

2018 Judge, Medical Student Research Program, Wake Forest School of Medicine

The Ohio State University

Institutional Service

2020-Present Member, Center for Cancer Engineering Steering Committee

2021-Present Member, College of Engineering, Biomedical and Materials Engineering Complex Phase 2 Planning Committee

2021 Judge, Engineering in Healthcare: Industry and Research Symposium

2022-Present Co-Chair, Research Committee, Center for Cancer Engineering

2022 Judge, Denman Undergraduate Research Forum

2022 Judge, Engineering in Healthcare: Industry and Research Symposium

Departmental Service

- 2019-2021 Member, Department of Biomedical Engineering Graduate Studies Committee
- 2021-Present Chair, Department of Biomedical Engineering Space and Facilities Committee
- 2021-Present Member, Department of Biomedical Engineering Space and Facilities Committee
- 2021-Present Member, Department of Biomedical Engineering Biomedical Research Committee (BERC)
- 2023-Present Member, Department of Biomedical Engineering Executive Advisory Committee

EXTRAMURAL APPOINTMENTS AND SERVICE

Funding Agency Reviewer

- Human Frontier Science Program (October 2014)
- Health Research Board (2015)
- NSF: Graduate Research Fellowship Program, Bioengineering (2015)
- European Research Council (2017)
- French National Alliance for Life and Health Sciences (AVIESAN)/French National Cancer Institute (INCa) (2017)
- NIH NCI Cancer Tissue Engineering Collaborative – Special emphasis panel ad hoc reviewer (2017)
- NSF: Graduate Research Fellowship Program, Bioengineering (2018)
- NIH NHLBI – Cardiovascular and Pulmonary Research on e-Cigarettes – Special emphasis panel ad hoc reviewer (2018)
- Austrian Science Fund (2018)
- NSF: Graduate Research Fellowship Program, Bioengineering (2019)
- NIH NINDS – Bioengineering of Neuroscience, Vision Technologies Study Section Member (2021-2023)
- NSF: Engineering of Biomedical Systems Review Panel Member (2022)
- NIH NCI – Cancer Target Discovery and Development (CTD2) Study Section Member (2023)

Editorial Boards

- 2016-Current Bioprinting
- 2017-Current Microphysiological Systems
- 2019-Current Micromachines
- 2022-Current Frontiers in Bioengineering and Biotechnology – Biofabrication Section

2023-Current

Frontiers in Bioengineering and Biotechnology – Organoids and Organ-on-a-Chip Section – *Special Section Editor aka Editor-in-Chief*

Journal Reviewer

Biofabrication
Biomedical Materials
Journal of Physics: Condensed Matter
Advanced Functional Materials
Small
Journal of Biomedical Materials Research Part A
Stem Cells Translational Medicine
Journal of Biomaterials Applications
Acta Biomaterialia
Chemical Communications
RSC Advances
Stem Cell Research
Journal of Micromechanics and Microengineering
Materials
Analytical Chemistry
PLOS One
Biotechnology and Bioengineering
Tissue Engineering
Bioprinting
Nature Protocols
Lab-on-a-Chip
Nanoscale
ACS Biomaterials Science & Engineering
Scientific Reports
Advanced Healthcare Materials
Biomaterials
Biotechnology Advances
Science Advances
APL Bioengineering
Gels
Trends in Biotechnology
Advanced Biosystems
Tissue Engineering and Regenerative Medicine
Frontiers in Bioengineering and Biotechnology
Cancer Cell
Materials Today

Conference Activities

Abstract Reviewer, 2015 BMES Annual Meeting, Cancer Technologies Track

Abstract Reviewer, 2016 BMES Annual Meeting, Biomaterials Track

Abstract Reviewer, 2016 BMES Annual Meeting, Undergraduate Abstracts

Abstract Reviewer, 2016 Biofabrication Conference

Session Chair and Organizer, 2016 Biofabrication Conference, Microphysiological Systems

Award Committee, Young Investigator Award, 2016 Biofabrication Conference

Abstract Reviewer, 2016 Tissue Engineering and Regenerative Medicine International Society (TERMIS) Annual Meeting

Award Committee, WFIRM Young Investigator Award, 2016 TERMIS AM Conference

Session Chair, 2016 BMES Annual Meeting, *Engineered Models of Glioma and the Tumor Microenvironment*

Session Chair and Organizer, 2016 Tissue Engineering and Regenerative Medicine International Society (TERMIS) Annual Meeting, *Tissue Organoids for In Vitro Screening Session*

Session Chair and Organizer, 2017 Tissue Engineering and Regenerative Medicine International Society (TERMIS) Annual Meeting, *Cancer Session; Tissue Chips and Organoids Session*

Award Committee, WFIRM Young Investigator Award, 2017 TERMIS AM Conference

Abstract Reviewer, 2018 BMES Annual Meeting, Biomaterials Track

Award Committee, WFIRM Young Investigator Award, 2018 TERMIS World Congress

Session Chair, 2019 World Stem Cell Summit, Bioengineering Track, Bioprinting and Bioinks

Chair, Young Scientist Forum, and Member, Conference Organizing Committee, Biofabrication 2019 Conference.

Judge, 2020 Engineering in Healthcare: Industry and Research Symposium.

Judge, 2021 Engineering in Healthcare: Industry and Research Symposium.

Judge, 2022 Engineering in Healthcare: Industry and Research Symposium.

Judge, 2022 Hayes Forum, The Ohio State University.

Session Chair and Organizer, 2023, Tissue Engineering and Regenerative Medicine International Society (TERMIS) Annual Meeting, *Bioengineered in Vitro Cancer Models: Modeling the Complexity of Cancer in Tumor Organoids, Tumor Constructs, and Tumor-on-a-chip Session*

PROFESSIONAL MEMBERSHIPS AND SERVICE

Service

2016 Perinatal Stem Cell Society
Web Content Manager

2017 International Society for Biofabrication
Web Content Committee

2020-Present Tissue Engineering and Regenerative Medicine International Society (TERMIS) Membership Committee

Memberships

2008-Present Tissue Engineering and Regenerative Medicine International Society (TERMIS)

2007-2010, 2018-2019 Society for Biomaterials
2015-2019, 2020-2022 Biomedical Engineering Society
2016-2017 Perinatal Stem Cell Society
2016-Present International Society for Biofabrication

HONORS AND AWARDS

2006 University of Utah Graduate School Student Travel Award
2010 Society for Biomaterials Achievement Recognition
2011 Tissue Engineering and Regenerative Medicine International Society SYIS
Session Co-Chair – “Scaffold Design”
2012 Best Podium Presentation Award – North Carolina Tissue Engineering and
Regenerative Medicine Society 14th Annual Conference
2013 Golfers Against Cancer Research Funding Award
2013 Edison Awards “Game Changer Award” for Bioprinters for Regenerative
Medicine in Science/Medical category
2013 Tissue Engineering and Regenerative Medicine International Society SYIS
Session Co-Chair – “Biomaterials for Cell Delivery & Recruitment”
2014 1st Place – Wake Forest Institute for Regenerative Medicine 2014 Retreat Poster
Session
2014 Wake Forest Institute for Regenerative Medicine – Promoting Innovative
Discoveries Funding Award
2015 Wake Forest Baptist Medical Center Research Excellence Award
2015 Comprehensive Cancer Center at Wake Forest Baptist Medical Nominee for the
V Foundation for Cancer Research Award
2015 2015 IQ Consortium and AAALAC International Global 3Rs Award - for non-
animal cancer models
2015 Wake Forest Baptist Medical Center Nominee for the Pew Biomedical Scholar
Program Award
2016 Clinical and Translational Science Institute Academy Scholar – Wake Forest
School of Medicine
2017 Wake Forest Baptist Medical Center Research Excellence Award
2018 Wake Forest Baptist Medical Center Research Excellence Award

GRANT FUNDING

Currently Funded Grants

Grant Number: 1 R21 CA277083-01

Source: NIH NCI

Title: A matrix metalloproteinase biosensor-functionalized metastasis-on-a-chip platform for evaluating adrenocortical carcinoma progression

Role: PI

Performance Period: 10/01/2022 – 9/30/2024

Total Costs: \$398,498

Time Commitment: 0.9 calendar months (7.5% effort)

Goal: Adrenocortical carcinoma (ACC) is an aggressive malignancy with a poor 5-year survival rate of 6% for patients with metastatic disease and there are no targeted therapies for these patients. The failure to identify more effective treatments can partially be attributed to the lack of appropriate preclinical research models that accurately model ACC metastasis and support the key biological pathways implicated in ACC progression. To address these critical research gaps, we will use our newly developed patient-derived organoid (PTO) model of ACC from patient samples as well as an ACC PTO metastasis-on-a-chip (MOC) microfluidic platform with onboard biosensing of cell migration to determine the roles of IGF, Wnt, and cell cycle regulation-based signaling on ACC metastasis.

Grant Number: 1 R21 CA259766-01

Source: NIH NCI

Title: Organoid modeling of pre-metastatic niche formation in the liver by primary colorectal tumor secreted factors

Role: PI

Performance Period: 8/23/2022 – 7/31/2024

Total Costs: \$399,150

Time Commitment: 1.2 calendar months (10% effort)

Goal: Colorectal cancer often leads to metastasis in the liver and the ultimate cause of death in the majority of these patients is metastatic disease. Recently, the concept of the pre-metastatic niche (PMN) has gained clinical importance in which soluble mediators secreted from primary tumors result in cellular and tissue changes in distant organs to promote future engraftment and growth of circulation tumor cells. In this proposal, we aim to use novel bioengineered 3D organoid technologies in the form of a unique metastasis-on-a-chip platform, paired with *in silico* computational models of the dynamic changes in the PMN microenvironment, to quantitatively investigate how colorectal tumors induce PMN formation in the liver, which subsequently impacts the likelihood of metastasis.

Grant Number: 1 R21 CA263137-01

Source: NIH NCI

Title: Ex vivo generation of tumor-reactive T cells for adoptive cell transfer using an immune enhanced, patient derived tumor organoid-on-a-chip (iTOC)

Role: PI

Performance Period: 2/14/2022 – 1/31/2024

Total Costs: \$433,125

Time Commitment: 1.2 calendar months (10% effort)

Goal: While the adoptive transfer of tumor infiltrating lymphocytes has been used as an effective immunotherapy in some cancers, many patients are unable to have their T cells effectively isolated and expanded to reach numbers sufficient for infusion. In addition, tumor reactive T cells are found in peripheral blood, but previous attempts to isolate and expand these T cells to numbers sufficient for therapy have been futile. To overcome this limitation, we will employ our bioengineered immune-enhanced tumor-on-a-chip platform (iTOC) to enrich and expand a population of tumor-reactive T cells from the peripheral blood capable of mounting a robust immune response to a patient's tumor.

Grant Number: CA210556: W81XWH-21-PRCRP-IPA

Source: DOD CDMRP PRCRP

Title: Mechanisms of Metastasis Suppression and Translational Applications in Thyroid Cancer

Role: Co-PI

Performance Period: 6/01/2022 – 5/31/2026

Total Costs: \$1,937,341

Time Commitment: 1.5 calendar months (12.5% effort)

Goal: To define the mechanism for RCAN 1.4/NFE2L3 pathway immune suppression using a novel metastasis-on-a-chip (MOC) system to recapitulate the complex biology of differentiated thyroid cancer (DTC) and utilize these data to develop biomarkers and potential therapeutic targets to improve outcomes for veterans, wartime fighters, and their family members with DTC.

Grant Number: n/a

Source: AstraZeneca

Title: GPC3-targeted CAR T screening in patient-derived tumor organoids

Role: PI

Performance Period: 02/2023 – 01/2025

Total Costs: \$549,755

Time Commitment: 0.5 calendar months (6% effort)

Goal: To utilize organoid models of several cancers to test AstraZeneca's experimental T cell therapy platform.

Grant Number: R01DC021070

Source: NIH (Subaward from Creighton University)

Title: Identification and characterization of novel functions for the Usher proteins in the inner ear

Role: Co-I

Performance Period: 05/2023 – 04/2025

Total Costs: \$126,641

Time Commitment: 0.84 calendar months (7% effort)

Goal: The perception of our surrounding environment depends on proper sensory organ function. Mutations in Pcdh15 affect the function of hair cells and photoreceptors resulting in deafness and progressive retinitis pigmentosa. The involvement of an integrin in the formation of a functional complex with Pcdh15 in hair cells has never been described. This proposal tests the hypothesis of a key role for Pcdh15-Itga8 complex in inner ear development and function, through Yap/ERM proteins activation and cytoskeletal dynamics. This work will define a common mechanism for Pcdh15-Itga8 complex in ear with the corresponding implications for Usher syndrome pathology.

Grant Number: n/a

Source: OSU Center for Cancer Engineering

Title: Organoid-Enabled Discovery of Therapies for Primary Liver Cancer

Role: Co-I

Performance Period: 04/2023 – 3/2024

Annual Direct Costs: \$25,000

Time Commitment: 0 calendar months (0% effort)

Past Grant History

Grant Number: n/a

Source: Pelotonia

Title: Ex vivo generation of tumor reactive T cells using an immune enhanced, patient derived tumor organoid-on-a-chip (iTOC)

Role: PI

Performance Period: 01/01/2021 – 12/31/2022

Annual Direct Costs: \$100,000

Time Commitment: 0 calendar months (0% effort)

Goal: Enhancing the capabilities of T cells to recognize and kill tumor cells by flowing them through an organoid-containing microfluidic device.

Grant Number: n/a
Source: Neuroscience Research Institute
Title: *Extracellular Vesicles and miRNA in in multiple sclerosis pathogenic blood-brain-barrier dysfunction*
Role: MPI (Magana, Skardal, and Higueta-Castro)
Performance Period: 01/01/2021 – 12/31/2022
Annual Direct Costs: \$25,000
Time Commitment: 0 calendar months (0% effort)
Goal: Evaluation of the effect of multiple sclerosis-derived extracellular vesicles on blood brain barrier functionality

Grant Number: n/a
Source: President's Research Excellence Accelerator Award
Title: Enhanced Glioblastoma Subpopulation Classification Based On Label-Free ECM Binding
Role: PI
Performance Period: 07/01/2021 – 06/30/2022
Annual Direct Costs: \$50,000
Time Commitment: 0 calendar months (0% effort)
Goal: Molecular and genetic subtyping of glioblastoma (GBM) has largely failed to yield clinical benefits. Instead, we aim to recategorize GBM tumors into new subpopulations through extracellular matrix (ECM) binding affinities, after which we will test these subpopulations phenotypically and genotypically for parity within each subpopulation.

Grant Number: 1 R21 CA229027-01
Source: NIH NCI IMAT
Title: Predicting Tumor Heterogeneity Evolution After Therapy in Patient-Derived Ex Vivo Glioblastoma Organoids
Role: PI
Performance Period: 8/09/2018 – 12/31/2021
Total Direct Costs: \$400,000
Time Commitment: 1.8 calendar months (15% effort)
Goal: Glioblastoma (GBM) is a lethal, incurable form of cancer in the brain that universally recurs more aggressively even with maximally aggressive surgery followed by chemoradiotherapy. These tumors are extremely heterogenous with regions of genetically distinct subclones that evolve differently over time and in response to treatments making designing effective therapies for each individual patient difficult. Here we propose to deploy a patient-specific ex vivo tumor-on-a-chip system to analyze tumor heterogeneity and drift over time to predict clonal evolution for patients, which could subsequently have substantial impact on treatment decisions.

Grant Number: n/a
Source: OSUCCC Translational Therapeutics Program
Title: A metastasis-on-a-chip platform to evaluate matrix metalloproteinase (MMP) expression and sort metastatic and non-metastatic tumor cell subpopulations for molecular and genetic analysis
Role: PI
Performance Period: 01/01/2021 – 12/31/2021
Annual Direct Costs: \$30,000
Time Commitment: 0 calendar months (0% effort)
Goal: Use a microfluidic metastasis-on-a-chip device to sort tumor cells into those capable of metastasis and those not capable of metastasis for biological evaluation to identify biomarkers to target to prevent metastasis.

Grant Number: n/a
Source: OSUCCC Translational Therapeutics Program
Title: Biomimetic precision immune-oncology models to study tumor immune evasion and develop therapies that promote anti-tumor immunity.
Role: MPI
Performance Period: 01/01/2021 – 12/31/2021
Annual Direct Costs: \$25,000

Time Commitment: 0 calendar months (0% effort)

Goal: Enhancing the ability of natural killer cells to home to and kill tumor cells

Grant Number: W81XWH-15-9-001

Source: s/RegenMed Development Organization (ReMDO) via MTEC

Title: Development of a Universal Bioink with Tunable Mechanical Properties for Regenerative Medicine Additive Manufacturing of Clinical Products

Role: PI

Performance Period: 11/04/2016 – 10/30/2021

Total Costs: \$5,000,001

Time Commitment: 1.8 calendar months (15% effort)

Goal: To develop and engineer a modular system allowing for customization of bioink biomaterials for bioprinting that can be deployed in all common bioprinting hardware modalities and be tailored to create and support the majority of the tissue types in the human body – both for regenerative applications and organoid technologies for diagnostics, personalized medicine, and drug development.

Grant Number: n/a

Source: Wake Forest Breast Cancer Center of Excellence

Title: An Immuno-Organoid Platform for ex vivo Testing of Novel Immunotherapies for TNBC Patients

Role: PI

Performance Period: 1/01/2019 – 12/31/2019

Annual Direct Costs: \$100,000

Time Commitment: 0.6 calendar months (5% effort)

Goal: Utilize parallel murine models and murine organoid triple negative breast cancer models to direct immune-enhancing of patient-derived breast cancer tumor organoids and subsequent techniques to reduce immune-suppression in triple negative breast cancer, enabling immune checkpoint blockade therapies.

Grant Number: n/a

Source: Myeloma Crowd Foundation

Title: Rapid and Personalized Prediction of Myeloma Response to Chemotherapy Using CD Organoids

Role: Co-PI

Performance Period: 1/01/2019 – 12/31/2019 (option to renew)

Annual Direct Costs: \$150,000

Time Commitment: 1.2 calendar months (10% effort)

Goal: Develop supportive microenvironment conditions to support difficult to maintain ex vivo myeloma cell populations. Deploy organoids created in personalized chemosensitivity screening studies and correlate with patient outcomes.

Grant Number: n/a

Source: Wake Forest Clinical and Translational Science Institute

Title: A tunable thixotropic hydrogel bioink for bioprinting of functional tissue analogs

Performance Period: 4/01/2018 – 3/31/2019

Role: PI

Annual Direct Costs: \$40,000

Time Commitment: no salary

Goal: We propose to employ, query, and quantify the contributions of inter-polymer/protein forces (hydrogen bonding versus covalent bonding) in generating thixotropic hydrogel bioinks, subsequently assessing how these forces influence bioprinting parameters during tissue construct biofabrication. We will characterize and optimize contributions of non-covalent, hydrogen bond-based interactions within thixotropic extracellular matrix (ECM)-based hydrogel bioinks. Subsequently we will employ and validate bioinks by bioprinting viable and functional tissue constructs (liver construct and heart patch).

Grant Number: n/a

Source: Comprehensive Cancer Center at Wake Forest Baptist

Title: Patient tumor-derived tumor-on-a-chip technology for determining metastatic potential and response to chemotherapy prior to initiation of treatment

Role: PI

Performance Period: 5/01/2017 – 11/30/2019

Annual Direct Costs: \$10,000

Time Commitment: no salary

Goal: Employ genetic screening to identify drugable biomarkers in patient gastrointestinal tumor biopsies. Use cells from these biopsies to create 3D tumor organoids with which to test biomarker-driven drugs for efficacy for each patient case.

Grant Number: 2017-614-001

Source: Medical Technology Enterprise Consortium (MTEC)

Title: Pre-clinical Assessment of Bioprinted Human Skin for Wound Healing and Skin Regeneration

Role: Co-I

Performance Period: 11/28/2017 – 11/19/2018

Annual Direct Costs: \$193,548

Time Commitment: 0.84 calendar months (7% effort)

Goal: The overall goal of the project is to bioprint full-thickness human skin with hair follicle appendages, microvasculature, immune cells and pigmentation and use it as a skin graft in immunodeficient rats.

Grant Number: 1 R33 CA202822-01

Source: NIH

Title: Bioengineered Lung Tumor Organoids for Development of Personalized Medicine

Role: Co-I

Performance Period: 04/12/2016 – 03/31/2019

Annual Direct Costs: \$248,983

Time Commitment: 0.96 calendar months (8% effort)

Goal: Personalized oncology, whereby tumor DNA is sequenced to identify actionable gene mutations, is poised to become a standard process in cancer treatment, but is dependent on the availability of sufficient amounts of intact tumor cell DNA. We propose to bioprint lung organoids that will recapitulate the in vivo lung microenvironment in order to successfully expand a small number of freshly isolated lung cancer cells in vitro.

Grant Number: W81XWH-13-2-0054

Source: DOD USAMRAA

Title: Amniotic Fluid-Derived Stem Cells for Enhanced Wound Healing

Role: Co-I

Performance Period: 09/23/2013 – 09/22/2019 (NCE)

Annual Direct Costs: \$250,000

Time Commitment: 2.64 calendar months (22% effort)

Goal: The goal of this work is to develop a method that will permit the use of allogeneic source of fetal stem cells, and novel hydrogels for clinical management of burn wounds, allowing wound healing treatment to achieve fast and comprehensive wound coverage that results in functional and cosmetically superior skin.

Grant Number: 1 R21 CA28933-01A1

Source: NIH

Title: Development of a CF10 Predictive Gene Signature in CRC Organoids

Role: Co-I

Performance Period: 02/02/2018 – 01/31/2020

Annual Direct Costs: \$130,000

Time Commitment: 0.96 calendar months (8% effort)

Goal: This project investigates whether a new polymeric fluoropyrimidine, CF10, is effective for treating colorectal cancer (CRC) that is non-responsive to 5-fluorouracil (5-FU). Our preliminary studies show CF10 is much more potent than 5-FU and is effective in models of CRC sub-types that are non-responsive to 5-FU. We will systematically evaluate response of CRC cells and patient tumors using novel tumor organoid technology to establish in what CRC sub-types CF10 treatment provides a therapeutic advantage.

Title: Integrated Organoid Testing System, (INGOTS)

Role: Co-I

Supporting Agency: Defense Threat Reduction Agency/SPAWAR

Performance Period: 03/28/2013 – 10/01/2018

Level of Funding (total costs): \$17,750,269

Goals: INGOTS will be comprised of four interconnected microscale bioreactors, each containing fully-functional, three dimensional (3D) human tissue constructs (organoids). INGOTS will allow for the application of test agents at the individual organoid or whole body system level and will employ both commercially available human cells and blood substitutes.

Title: Patient-specific 3D tumor organoids for glioblastoma multiforme precision medicine

Role: Principal Investigator

Supporting Agency: Wake Forest Brain Tumor Center of Excellence

Performance Period: 05/01/2016 – 06/30/2017

Level of Funding (total costs): \$30,000

Goals: The goal is to demonstrate and implement a GBM organoid system within the framework of clinical precision medicine, by demonstrating biomarker- and mutation-based drug targeting in 3D patient-derived GBM tumor models. To accomplish this goal, patient-derived GBM organoids will be fabricated, and genetic profiles will be used to inform customized drug screening. These customized GBM treatments will be assessed for responsiveness using quantitative analysis of tumor growth, reduction, and migration in 3D space, and viability/apoptosis.

Title: Patient-specific Bioengineered Lung Tumor Organoids to support personalized medicine

Role: Co-Investigator

Supporting Agency: Center for Public Health Genomics

Performance Period: 08/01/2015 – 08/01/2016

Level of Funding (total costs): \$25,000

Goal: To employ bioprinted lung organoids to support growth of non-small cell lung cancer biopsies in order to increase cellular yield that can be used for genetic screens for precision medicine.

Title: A Three-Dimensional Liver Microtumor Organoid Platform for Anti-Cancer Drug Development

Role: Principal Investigator

Supporting Agency: Golfers Against Cancer

Performance Period: 03/01/2013 – 03/01/2015

Level of Funding (total costs): \$40,000

Goals: In a rotating bioreactor, liver organoids will be created, inside of which reside metastatic colon carcinoma cells. In this 3-D environment, cancer cells behave as they would when in the body, providing a superior human cell-based in vitro testing platform for screening potential drug candidates in comparison to traditional 2-D cultures or animals.

Title: CTSI Translational Pilot - A patient-specific tumor-on-a-chip platform for screening precision medicine-driven therapies

Role: Principal Investigator

Supporting Agency: Wake Forest Baptist Medical Center – Clinical and Translational Science Institute

Performance Period: 02/01/2016 – 04/01/2017

Level of Funding (total costs): \$40,000

Goals: To demonstrate the utility of using tumor models created using cells from actual patient tumor biopsies to screen drug therapies for a given patient, thereby identifying the most effective treatment. Single colorectal cancer tumor organoids are created within colon constructs and screened using drugs commonly employed against colorectal cancer.

Title: WFIRM – Promoting Innovative Discoveries – Intramural Pilot Funding Program

Role: Principal Investigator

Supporting Agency: Wake Forest Institute for Regenerative Medicine

Performance Period: 10/01/2014 – 10/01/2015

Level of Funding (total costs): \$25,000

Goals: To merge microfluidic device technology with photo-patterned hydrogel biomaterials to create a high-throughput system of 3-D tumor and tissue organoids for drug testing and metastasis exploration. Initial pilot work focuses on colon carcinoma metastases in liver organoids. Post-pilot work will expand to other tissue/tumor types and the biological mechanisms that play important roles in cancer that can potential therapeutic targets for intervention.

PATENTS

1. Schultz Z, Rist D, **Skardal A**, Venere M. Compositions and methods of use thereof.
2. **Skardal A.**, Swindle-Reilly K.E., Veeraghavan R., Sustained Adjunct Therapy to Improve Chemotherapy Efficacy in Glioblastoma. US Patent Application 63/268,025, Feb. 15, 2022.
3. **Skardal A.**, Swindle-Reilly K.E., Veeraghavan R., Cerebrovascular-Tumor-On-A-Chip. PCT/US23/62628.
4. **Skardal A.** A Scalable Human Cell-derived Extracellular Biomaterial Suitable for Translational Medicine. US Patent Application 63/264,994, Dec. 6, 2021.
5. Welker ME, **Skardal A**, Weissenfluh AN, and Banks S. Hydrogen-bonding compounds, compositions comprising the same, and methods of preparing and using the same. US Patent Application No. 16/344452.
6. **Skardal A** and Clark C. Immersion Deposition Methods and Compositions for Use in the Same. US Provisional Patent Application No. 62/715,548.
7. **Skardal A** and Clark C. Compositions Including Gelatin Nanoparticles and Methods of Use Thereof. US Provisional Patent Application No. 62/718,662.
8. **Skardal A** and Votanopoulos K. Organoids Related to Immunotherapy and Methods of Preparing and Using the Same. US Patent Application PCT/US2019/016236.
9. **Skardal A.** Bioink compositions and methods of preparing and using the same. US201762570825P.
10. **Skardal A** and Sivakumar H. Compositions, Cell Constructs and Methods of Making and Using the Same. US Patent Application PCT/US2017/056558.
11. **Skardal A**, Porada C, Almeida-Porada G. Niches-On-a-Chip. US Patent Application PCT/US2018/044791.
12. **Skardal A**, Shupe T, and Atala A. Multi-Organ "Body on a Chip" Apparatus Utilizing a Common Media. US Patent Application PCT/US2017/055823.
13. **Skardal A** and Votanopoulos K. Cancer Modeling Platforms and Methods of Using the Same. US Patent Application PCT/US2017/045277. Licensed and then rights relinquished.
14. **Skardal A.** Evaluation of Two Novel Colorectal Cancer Modeling Platforms. WFIRM 17-901.
15. **Skardal A.** Methods and Apparatus for Modeling Metastasis In Vitro. US Patent Application PCT/US2016/054611.
16. **Skardal A.** Spontaneously Beating Cardiac Organoid Constructs and Integrated Body-on-Chip Apparatus Containing the Same. US Patent Application PCT/US2016/054607.
17. **Skardal A**, and Soker S. Tissue Mimicking Hydrogel Compositions for Biofabrication. Patent Application No. 62/068,218.
18. Murphy S, **Skardal A**, and Atala A. Amniotic Membrane Powder and Methods of Making. Patent Application No. 14/449,705.
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Description of Quality Indicators of Your Research, Scholarly or Creative Work Such as Citations, Publication Outlet Quality Indicators Such as Acceptance Rates, Ranking or Impact Factors of Journal or Publisher

Overall h-index: 43; total citations: 8960

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11. Mazzocchi A, Soker S, and Skardal A. "Biofabrication Technologies for Developing In Vitro Tumor Models." Review chapter for Tumor Organoids. Shay Soker and Aleksander Skardal. 2017.
12. Skardal A. "Principles and Applications of Bioprinting." Invited review chapter for 3D Bioprinting in Regenerative Engineering: Principles and Applications. Ali Khademhosseini and Gulden Camci-Unal. 2018.
13. Skardal A, Shupe T, and Atala A. "Body-on-a-chip: Regenerative Medicine for Personalized Medicine" Invited review chapter for Principles of Regenerative Medicine. Anthony Atala, Robert Lanza, James A. Thompson, and Roger Nerem. 2018.
14. Ivan C, Skardal A, and Murphy S. "Perinatal Cells and Biomaterials for Wound Healing." Invited review chapter for Perinatal Stem Cells. Anthony Atala, Kyle Cetrulo, Rouzbeh Taghizadeh, Curtis Cetrulo, and Sean Murphy. 2018.
15. Zarebinski T and Skardal A. HyStem®: A Unique Clinical Grade Hydrogel for Present and Future Medical Applications. Invited review chapter for Hydrogels – Smart Materials for Biomedical Applications. Lacramioara Popa, Mihaela Violeta Ghica, and Cristina Dinu-Pirvu. 2019.
16. Nairon KG, DePalma T, Sivakumar S, and Skardal A. Tunable Hydrogel Systems for Delivery and

Release of Cell-Secreted and Synthetic Therapeutic Products. Invited review chapter for Controlled Drug Delivery Systems. Emmanuel Opara. 2020.

PRESENTATIONS AT PROFESSIONAL MEETINGS

2006:

- Skardal A, Liu Y, Shu XZ, and Prestwich GD. Hyaluronic Acid-Based Hydrogels for Post-Surgical Adhesion Prevention. [Poster] Biomedical Engineering Society Annual Meeting 2006. Chicago, IL.
- Skardal A, Liu Y, Shu XZ, and Prestwich GD. Hyaluronic Acid-Based Hydrogels for Post-Surgical Adhesion Prevention. [Poster] 2nd Annual Mountain West Biomedical Engineering Conference. Snowbird, UT.

2007:

- Skardal A, Liu Y, Shu XZ, and Prestwich GD. Hyaluronic Acid-Based Hydrogels for Scar-Free Tendon Repair. [Poster] 7th International Conference on Hyaluronan. Charleston, SC.
- Skardal A, Liu Y, Shu XZ, and Prestwich GD. Hyaluronic Acid-Based Hydrogels for Scar-Free Tendon Repair. [Poster] Society for Biomaterials 2007 Annual Meeting. Chicago, IL.
- Skardal A and Prestwich G. Synthetic Extracellular Matrices as Tools for Bioprinting. [Podium Presentation] 3rd Annual Mountain West Biomedical Engineering Conference. Park City, UT.

2008:

- Skardal A and Prestwich GD. Extracel™-Coated Microbeads for Cell Culture, Recovery, and Formation of Spherical Micro Tissues. [Poster] The TERMIS North America 2008 Annual Conference and Exposition. San Diego, CA.
- Skardal A and Prestwich GD. Extracel™-Coated Microbeads for Cell Cluster Culture and Recovery. [Poster] 4th Annual Mountain West Biomedical Engineering Conference. Park City, UT.

2009:

- Skardal A, Zhang J, McCoard L, Oottamasathien S, Prestwich GD. Reversibly Crosslinked Gold Nanoparticle - Hyaluronan Hydrogels for Vessel Construct Bioprinting. [Podium Presentation] 5th Annual Utah Statewide Nanotechnology Conference. Salt Lake City, UT.
- Skardal A, Zhang J, McCoard L, Oottamasathien S, Prestwich GD. Reversibly Crosslinked Gold Nanoparticle - Hyaluronan Hydrogels for Vessel Construct Bioprinting. [Poster] 5th Annual Mountain West Biomedical Engineering Conference. Park City, UT.

2010:

- Skardal A, Zhang J, McCoard L, Xu X, Oottamasathien S, and Prestwich GD. Methacrylated Hyaluronic Acid Hydrogels for Two-Step Photocrosslink-Mediated Bioprinting. [Podium Presentation] Society for Biomaterials 2010 Annual Meeting and Exposition. Seattle, WA.
- Skardal A, Zhang J, McCoard L, Oottamasathien S, and Prestwich GD. Reversibly Crosslinked Gold Nanoparticle – Hyaluronan Hydrogels for Automated Vessel Construct Bioprinting. [Poster] Society for Biomaterials 2010 Annual Meeting and Exposition. Seattle, WA.
- Skardal A. Bioprinting: Three Hyaluronan-based Modalities. University of Utah, Department of Medicinal Chemistry, Department Seminar. Salt Lake City, UT.

2011:

- Skardal A, Smith L, Bharadwaj S, Zhang Y, and Soker S. Tissue Specific Synthetic ECM Hydrogels for *in vitro* Maintenance of Hepatocyte Function. [Podium Presentation] The TERMIS North America 2011 Annual Conference and Exposition. Houston, TX.
- Skardal A, Mack D, Kapetanovic E, Yoo J, and Soker S. Bioprinted Amniotic Fluid-Derived Stem Cells Accelerate Wound Healing in Skin. [Podium Presentation] The TERMIS North America 2011 Annual Conference and Exposition. Houston, TX.

- Skardal A, Mack D, and Soker S. The Impact of Substrate Elasticity on Amniotic Fluid-Derived Stem Cell Phenotype. [Poster] The TERMIS North America 2011 Annual Conference and Exposition. Houston, TX.
- Skardal A, Mack D, Kapetanovic E, Binder K, Yoo J and Soker S. Bioprinted Amniotic Fluid-Derived Stem Cells Accelerate Wound Healing in Skin. [Poster] North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Winston-Salem, NC.
- Skardal A, Mack D, and Soker S. The Impact of Substrate Elasticity on Amniotic Fluid-Derived Stem Cell Phenotype. [Poster] North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Winston-Salem, NC.
- Skardal A, Smith L, Bharadwaj S, Zhang Y, and Soker S. Tissue Specific Synthetic ECM Hydrogels for *in vitro* Maintenance of Hepatocyte Function. [Poster] North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Winston-Salem, NC.

2012:

- Skardal A, Mack D, Kapetanovic E, Markert C, Atala A, Yoo J, and Soker S. Bioprinted Amniotic Fluid-Derived Stem Cells Accelerate Wound Healing in Skin. [Poster] 2012 3rd TERMIS World Congress. Vienna, Austria.
- Skardal A, Smith L, Bharadwaj S, Atala A, Zhang Y, and Soker S. Tissue Specific Synthetic ECM Hydrogels for *in vitro* Maintenance of Hepatocyte Function. [Poster] 2012 3rd TERMIS World Congress. Vienna, Austria.
- Skardal A, Mack D, Kapetanovic E, Atala A, Yoo J and Soker S. Bioprinted Amniotic Fluid-Derived Stem Cells Accelerate Wound Healing by Improving Vascularization and ECM Quality in Skin. [Podium Presentation] North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Raleigh, NC. *Best Podium Presentation Award.*
- Skardal A, Devarasetty M, Mack D, and Soker S. Three-dimensional culture of placental multipotent progenitor cells on hyaluronic acid and solubilized amniotic membrane-coated microcarriers. [Poster] North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Raleigh, NC.
- Skardal A, Mack D, Kapetanovic E, Yoo J, and Soker S. Bioprinted Amniotic Fluid-Derived Stem Cells Accelerate Wound Healing in Skin. [Podium Presentation] 4th Annual Armed Forces Institute for Regenerative Medicine All Hands Meeting. St. Pete Beach, FL.

2013:

- Skardal A, Devarasetty M, and Soker S. Three-Dimensional Organoid Systems for Modeling Colon Carcinoma Metastasis and Anti-Cancer Drug Development. [Poster] 2013 TERMIS Americas Annual Conference and Exposition. Atlanta, GA.
- Skardal A, Murphy S, Mack D, and Soker S. Delivery of Amniotic Fluid-Derived Stem Cells in a Heparin-Functionalized Hyaluronic Acid Hydrogel Gel Accelerates Skin Regeneration. [Poster] 2013 TERMIS Americas Annual Conference and Exposition. Atlanta, GA.
- Skardal A, Murphy S, Mack D, and Soker S. A bioprinted photocrosslinkable heparin-hyaluronan hydrogel improves wound healing and extracellular matrix remodeling in skin through release of stem cell-secreted cytokines. [Podium Presentation] 2013 North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Winston-Salem, NC.
- Skardal A, Devarasetty M, Rodman C and Soker S. Three-dimensional liver organoid systems for modeling colon carcinoma metastasis and response to drugs. [Poster] 2013 North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Winston-Salem, NC.
- Devarasetty M, Skardal A and Soker S. Tissue self-organization within cellularized 3-D liver-specific hydrogel-tissue constructs. [Poster] 2013 North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Winston-Salem, NC.
- Murphy S, Skardal A, Haug R, Jackson J, Yoo JJ and Atala A. Amnion hydrogel accelerates wound healing. [Poster] 2013 North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Winston-Salem, NC.

- Skardal A. Modeling Metastasis in vitro within 3-D Host Tissue Organoids. [Podium Presentation] 2nd International Conference on Tissue Science and Regenerative Medicine. Raleigh, NC.

2014:

- Devarasetty M, Atala A, Soker S, and Skardal A. A Metastasis-on-a-Chip System for Modeling Colon Carcinoma Migration and Invasion *In Vitro*. [Poster] 2014 North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Durham, NC.
- Skardal A, Devarasetty M, Soker S, and Hall AR. *In Situ* Patterned Micro 3-D Liver Constructs for Parallel Toxicology Testing in a Fluidic Device. [Poster] 2014 North Carolina Tissue Engineering and Regenerative Medicine Society Conference. Durham, NC.
- Skardal A, Mead I, Kang HW, Devarasetty M, Pendergraft S, Shupe T, and Bishop C. X.C.E.L. Body-on-a-Chip Program: A Convergent Team Model. [Podium Presentation] Wake Forest Institute for Regenerative Medicine 2014 Annual Retreat. Pinehurst, NC.
- Skardal A, Devarasetty M, Soker S, and Hall AR. *In Situ* Patterned Micro 3-D Liver Constructs for Parallel Toxicology Testing in a Fluidic Device. [Poster] 2014 TERMIS Americas Annual Conference and Exposition. Washington, DC.
- Devarasetty M, Atala A, Soker S, and Skardal A. A Metastasis-on-a-Chip System for Modeling Colon Carcinoma Migration and Invasion *In Vitro*. [Podium Presentation] 2014 TERMIS Americas Annual Conference and Exposition. Washington, DC.
- Skardal A, Mead I, Devarasetty M, Kang HW, Shupe T, Lee SJ, Bishop C, Jackson J, Yoo J, Soker S, and Atala A. Integration of 3-D Organoid Bioprinting and Microfluidic Device Technology for Functional Primary Cell-Based Liver-on-a-Chip Operation. [Podium Presentation] 2014 TERMIS Americas Annual Conference and Exposition. Washington, DC.
- Skardal A, Devarasetty M, Rodman C, Atala A, and Soker S. An *In Vitro* 3-D Tumor Hybrid Organoid System for Modeling Metastasis and Drug Resistance. [Podium Presentation] 2014 TERMIS Americas Annual Conference and Exposition. Washington, DC.

2015:

- Skardal A. Engineering 3-D in vitro tumor model systems for mechanistic and diagnostic applications. Tumor Microenvironment Interest Group [Internal]. June 16, 2015. Winston-Salem, NC.
- Aleksander Skardal. Engineered tumor models for drug screening and personalized medicine. Brain Tumor Center of Excellence Seminar Series. Wake Forest Baptist Medical Center and Wake Forest School of Medicine. March 22, 2016.
- Aleksander Skardal. Bioengineered tissue and tumor organoids for drug screening and personalized medicine applications. Drug Discovery Interest Group Seminar Series. Wake Forest School of Medicine and Wake Forest University. April 22, 2016.
- Mahesh Devarasetty, Anthony Atala, Shay Soker, and Aleksander Skardal. A Metastasis-on-a-Chip System for Modeling Colon Carcinoma Metastasis *In Vitro*. 2015 Biomedical Engineering Society Annual Meeting. Tampa, FL. October 2015.

- Edina Wang, Mahesh Devarasetty, Shay Soker, and Aleksander Skardal. A 3-D Primary Hepatocyte and Tumor Organoid Platform for Metastasis Research and Drug Screening. 2015 Biomedical Engineering Society Annual Meeting. Tampa, FL. Tampa, FL. October 2015.
 - Aleksander Skardal. Models of Cancer and Metastasis. 2015 Biomedical Engineering Society Annual Meeting. Tampa, FL. Tampa, FL. October 2015. *Invited Talk*.
 - Mahesh Devarasetty, Aleksander Skardal, and Shay Soker. Modeling the intestine-tumor microenvironment using cellularized hydrogel strata. North Carolina Tissue Engineering and Regenerative Medicine Society Annual Meeting. Winston-Salem, NC. October 16, 2015
 - Aleksander Skardal. 3D Designs and Smart Biomaterials. North Carolina Tissue Engineering and Regenerative Medicine Society Annual Meeting. Winston-Salem, NC. October 16, 2015
 - Mahesh Devarasetty, Aleksander Skardal, and Shay Soker. A 3D Stratified Colon Model for Colorectal Cancer Progression. Tissue Engineering and Regenerative Medicine Society Annual Meeting. Boston, MA. September 2015.
 - Mahesh Devarasetty, Steven Forsythe, Shay Soker, Adam Hall, and Aleksander Skardal. Ultra-thin Tissue-Tumor Organoid Microfluidic Platforms for *In Vitro* Diagnostics. Tissue Engineering and Regenerative Medicine Society Annual Meeting. Boston, MA. September 2015.
 - Aleksander Skardal, Mahesh Devarasetty, Hyun-Wook Kang, Ivy Mead, Colin Bishop, Thomas Shupe, Sang Jin Lee, John Jackson, James Yoo, Shay Soker, and Anthony Atala. A Hydrogel Bioink Toolkit for Bioprinting Tissue Constructs while Mimicking Native Tissue Biochemical and Mechanical Properties. Tissue Engineering and Regenerative Medicine Society Annual Meeting. Boston, MA. September 2015.
 - Aleksander Skardal, Andre Kleensang, Mahesh Devarasetty, Hyun-Wook Kang, Ivy Mead, Colin Bishop, Thomas Shupe, Sang Jin Lee, John Jackson, James Yoo, Thomas Hartung, Shay Soker, and Anthony Atala. Physiologically Relevant Drug Testing *In Vitro* - An Integrated Multiple Organoid-on-a-Chip Approach. Tissue Engineering and Regenerative Medicine Society Annual Meeting. Boston, MA. September 2015.
- 2016:
- May 3, 2016. "Bioprinting and Biomaterial-based Solutions for Skin Regeneration", American Burn Association, Las Vegas, NV.
 - June 16, 2016. "Bioengineered 3D Tissue and Tumor Models for Drug Screening and Personalized Medicine", World Preclinical Congress – 3D Cellular Models, Boston, MA.
 - July 12, 2016. "Hydrogel Biomaterials in Regenerative Medicine and Tissue Engineering Applications", Regenerative Medicine Essentials: The Fundamentals to the Future, Winston-Salem, NC, Wake Forest University Health Sciences.
 - September 14, 2016. "Metastasis-on-a-Chip", Swiss Laboratory Animal Science Association SGV 2016 Meeting, Basel, Switzerland.
 - October 31, 2016. "Hydrogel bio-ink biomaterials in bioprinting and biofabrication", Biofabrication 2016, Winston-Salem, NC.
 - Aleksander Skardal. A bioengineered multi-organoid body-on-a-chip platform for drug screening. Biofabrication 2016, Winston-Salem, NC. October 2016.

- Steven Forsythe, Katherine McMurray, Naren Mehta, Mahesh Devarasetty, and Aleksander Skardal. A tumor-on-a-chip platform for screening precision medicine-driven therapies. Biofabrication 2016, Winston-Salem, NC. October 2016.
- Katherine McMurray, Naren Mehta, Julio Aleman, Steven Forsythe, Mahesh Devarasetty, and Aleksander Skardal. A Tumor-on-a-Chip Microfluidic Device for Capturing and Quantifying Metastasizing Tumor Cells. Biofabrication 2016, Winston-Salem, NC. October 2016.
- Steven Forsythe, Naren Mehta, Angela Alistar, Adam Hall, and Aleksander Skardal. A tumor-on-a-chip platform for screening precision medicine-driven therapies. 2016 Biomedical Engineering Society Annual Meeting. Minneapolis, MN. October 2016.
- Hemamylammal Sivakumar, Mahesh Devarasetty, and Aleksander Skardal. An In Vitro Model of Glioblastoma Multiforme. 2016 Biomedical Engineering Society Annual Meeting. Minneapolis, MN. October 2016.
- Mahesh Devarasetty, Steven Forsythe, Sean Murphy, Thomas Shupe, Sang Jin Lee, John Jackson, James Yoo, Shay Soker, Colin Bishop, Anthony Atala, and Aleksander Skardal. A bioengineered multi-organoid body-on-a-chip platform for advanced drug screening. 2016 Biomedical Engineering Society Annual Meeting. Minneapolis, MN. October 2016.
- Julio Aleman, Yu Shrike Zhang, Aleksander Skardal, and Ali Khademhosseini. Lego-inspired organ-on-a-chip gelatin methacryloyl microfluidic system. 2016 Biomedical Engineering Society Annual Meeting. Minneapolis, MN. October 2016.
- Julio Aleman and Aleksander Skardal. Multiple Organ-on-a-Chip platform for Metastasis Dynamic Studies. 2016 Biomedical Engineering Society Annual Meeting. Minneapolis, MN. October 2016.
- Shiny Amala Priya Rajan, Parker Hambright, Aleksander Skardal, and Adam, R Hall. Microfluidic device for motility and biochemical assessment in parallel drug testing. Tissue Engineering and Regenerative Medicine Society Annual Meeting. San Diego, CA. December 2016
- Julio Aleman, Yu Shrike Zhang, Aleksander Skardal, and Ali Khademhosseini. Lego-inspired organ-on-a-chip gelatin methacryloyl microfluidic system. Tissue Engineering and Regenerative Medicine Society Annual Meeting. San Diego, CA. December 2016
- Julio Aleman and Aleksander Skardal. Multiple Organ-on-a-Chip platform for Metastasis Dynamic Studies. Tissue Engineering and Regenerative Medicine Society Annual Meeting. San Diego, CA. December 2016
- Steven Forsythe, Naren Mehta, Angela Alistar, Adam Hall, and Aleksander Skardal. A tumor-on-a-chip platform for screening precision medicine-driven therapies. Tissue Engineering and Regenerative Medicine Society Annual Meeting. San Diego, CA. December 2016
- Hemamylammal Sivakumar, Mahesh Devarasetty, and Aleksander Skardal. An In Vitro Model of Glioblastoma Multiforme. Tissue Engineering and Regenerative Medicine Society Annual Meeting. San Diego, CA. December 2016
- Mahesh Devarasetty, Steven Forsythe, Sean Murphy, Thomas Shupe, Sang Jin Lee, John Jackson, James Yoo, Shay Soker, Colin Bishop, Anthony Atala, and Aleksander Skardal. A bioengineered multi-organoid body-on-a-chip platform for advanced drug screening. Tissue Engineering and Regenerative Medicine Society Annual Meeting. San Diego, CA. December 2016

2017:

- March 4, 2017. "Biofabrication of Tissue Constructs for Drug Screening, Disease Models, and Personalized Medicine", Regenerative Medicine Workshop, Hilton Head, SC.
- April 6, 2017. "Biofabricated Tissue and Tumor Organoid Systems for Disease Modeling, Drug and Toxicology Screening, and Personalized Medicine", Providence College, Providence, RI.
- June 6, 2017. "Hydrogel Biomaterials in Regenerative Medicine and Tissue Engineering Applications", Regenerative Medicine Essentials: From the Fundamentals to the Future, Winston-Salem, NC, Wake Forest University Health Sciences.
- December 5, 2017. Mazzocchi, A., S. Rajan, K. Votanopoulos, A. Hall, and A. Skardal. "Primary Patient Mesothelioma Organoids for Genetic Mutation-Driven Experimental 3-Deazaneplanocin A Treatment." Tissue Engineering and Regenerative Medicine – Americas. Charlotte, NC.
- December 4, 2017. Mazzocchi, A., R. Huntwork, S. Soker, and A. Skardal. "Hyaluronan-Collagen Type I Hybrid Bioink for 3D Printed Microenvironments." Tissue Engineering and Regenerative Medicine International Society - Americas. Charlotte, NC.
- Mazzocchi, A., K. Votanopoulos, S. Soker, and A. Skardal. "Primary Patient Tumor Organoids for Personalized Drug Treatment." Tissue Engineering and Regenerative Medicine International Society – Americas. Charlotte, NC. 3 Dec 2017.
- Mazzocchi, A., K. Votanopoulos, S. Soker, and A. Skardal. "Primary Patient Tumor Organoids for Personalized Drug Treatment." North Carolina Tissue Engineering and Regenerative Medicine Society. Winston-Salem, NC. 10 Nov 2017.
- Mazzocchi, A., K. Votanopoulos, S. Soker, and A. Skardal. "Primary Patient Tumor Organoids for Personalized Drug Treatment." Biomedical Engineering Society Annual Meeting. Phoenix, AZ. 12 Oct 2017.
- Mazzocchi, A., R. Huntwork, S. Soker, and A. Skardal. "Collagen-I Hybrid Bioink for 3D Printed Microenvironments." Biomedical Engineering Society Annual Meeting. Phoenix, AZ. 12 Oct 2017.

2018:

- April 13, 2018. Aleksander Skardal. "Development of a Universal Bioink Platform Technology for Cross-Platform Compatibility Across Bioprinter Hardware and Support of Multiple Tissue Construct Types." Society for Biomaterials 2018 Annual Meeting.
- May 2, 2018. Aleksander Skardal. "Universal Bioink for Accelerating the Realization of Biomanufacturing of Tissue Products" Wake Forest Baptist Medical Center's Dean's Symposium Seminar Series.
- Mazzocchi, A., A. Skardal, and S. Soker. "Patient Derived Lung Cancer Model for the Study of Disease and Drug Response." NIH NIBIB Training Grantees Meeting. Bethesda, MD. 21-22 June 2018.
- Mazzocchi, A., A. Skardal, and S. Soker. "Characterization of Laminin and Fibronectin Driving Matrix Remodeling Kinetics in Liver Models." SBES Symposium. Winston-Salem, NC. 9 May 2018.
- Mazzocchi, A., A. Skardal, and S. Soker. "Characterization of Laminin and Fibronectin Driver Matrix Remodeling Kinetics in Liver Models." Society for Biomaterials. Atlanta, GA. 13-14 Apr

2018.

- Huntwork, R.C., Mazzocchi, A., Sivakumar, H., Clark, C., Aleman, J., Devarasetty, M., and Skardal, A. "Development of a Universal Bioink Technology for Cross-Platform Compatibility Across Bioprinter Hardware and Support of Multiple Tissue Construct Types for Tissue Biomanufacturing." 2018 Military Health System Research Symposium. Kissimmee, FL. 20-23 Aug.
- Clark, C., Sivakumar, H., and Skardal A. "Development of a Thixotropic Collagen—Hyaluronic Acid Hydrogel for Improved Bioprinting." 2018 Biomedical Engineering Society Annual Meeting. Atlanta, GA. 17-20 Oct 2018.
- Maloney, A., Clark, C., Mazzocchi, A., and Skardal A. "Immersion bioprinting organoid constructs in multi-well plates for increasing throughput of 3D drug screening." 2018 Biomedical Engineering Society Annual Meeting. Atlanta, GA. 17-20 Oct 2018.
- Waits, C., Mazzocchi, A., Sivakumar, H., Sergeant, S., Skardal, A., and Rahbar, E. "Development of Liver Organoids to Study FADS and ELOVL Gene-Diet Interactions." 2018 Biomedical Engineering Society Annual Meeting. Atlanta, GA. 17-20 Oct 2018.
- Mazzocchi, A., Skardal, A., and Soker, S. "Primary Patient Lung Cancer Model for Study of Disease and Drug Treatment Response." 2018 Biomedical Engineering Society Annual Meeting. Atlanta, GA. 17-20 Oct 2018.
- Rivas Duarte, F., Hall, A., Rahbar, E., Skardal, A., Zahid, O., Reesink, H., and DeAngelis, P. "Analysis of Physiological Hyaluronan Size Distribution with a Solid-state Nanopore Sensor." 2018 Biomedical Engineering Society Annual Meeting. Atlanta, GA. 17-20 Oct 2018.
- Ekem, L., Sivakumar, H., Waits, C., Skardal, A., and Rahbar, E. "Development of a Dynamic 3D Blood Brain Barrier Model" 2018 Biomedical Engineering Society Annual Meeting. Atlanta, GA. 17-20 Oct 2018.

2019:

- Skardal, A. "Development of a Universal Bioink Technology for Multi-Modality Bioprinting Compatibility and Support of Multiple Tissue Construct Types." Biofabrication 2019. Columbus, OH.
- Skardal, A. "Model of Patient-Specific Immune Enhanced Tumor Organoids for Immunotherapy Screening." Biofabrication 2019. Columbus, OH.
- Nairon, K and Skardal, A. "Evaluation of Laminin and Fibronectin Impact on Metastasis in a Tumor-on-a-Chip Microfluidic Platform." Biofabrication 2019. Columbus, OH.
- DePalma, T and Skardal, A. "Development Of An In Vitro Functional 3D Blood Brain Barrier Model For Use In A Brain Microfluidic Model." Biofabrication 2019. Columbus, OH.
- Forsythe, S, Sivakjumar, H, Mazzocchi, A, Aleman, J, Rajan, S, Hall A, Strowd, R, Votanopoulos, K, and Skardal, A. "Personalized chemotherapy and immunotherapy drug screening in ex vivo patient-specific 3D micro-tumor constructs." TERMIS AM Annual Meeting 2019. Orlando, FL.
- Votanopoulos, K, Forsythe, S, Sivakjumar, H, Mazzocchi, A, Aleman, J, and Skardal, A. "Model of Patient-Specific Immune Enhanced Tumor Organoids for Immunotherapy Screening." TERMIS AM Annual Meeting 2019. Orlando, FL.
- Clark, C, Aleman, J, and Skardal, A. "Hydrogel Bioink Rheological Parameters for Guiding

Development of Inkjet Bioinks.” TERMIS AM Annual Meeting 2019. Orlando, FL.

- Bedell, ML, Melchiorri, AJ, Aleman, J, Skardal, A, and Mikos, A. “A High-throughput Approach To Compare The Biocompatibility Of Candidate Bioink Formulations.” TERMIS AM Annual Meeting 2019. Orlando, FL.
- Mazzocchi, A, Sivakumar, H, Enck, K, Aleman, J, and Skardal, A. “Tunable Bioink For Support Of Multiple Type 2 Diabetes Specific Tissue Constructs.” TERMIS AM Annual Meeting 2019. Orlando, FL.
- Forsythe, S and Skardal, A. “Utilization Of Patient Derived Micro-tumor Constructs For Clinical Testing Of Chemotherapies.” TERMIS AM Annual Meeting 2019. Orlando, FL.
- Mazzocchi, A, Yoo, KM, Soker, S, and Skardal, A. “Biomimetic Hyaluronic Acid - Peptide Hydrogel To Model Liver Fibrosis.” TERMIS AM Annual Meeting 2019. Orlando, FL.

2020:

- Nairon KG, Zent J, Leight J, Skardal A. “Colorectal Cancer Secretome Alters Pericyte Morphology and Matrix Remodeling in 3D Tissue Constructs.” 2020 Biomedical Engineering Society Annual Meeting. Virtual. October 2020.
- Nairon KG, Duarte-Sanmiguel S, Dodd D, Gallego-Perez D, Skardal A. “Myeloid-Derived Suppressor Cells Show Cancer-Specific Invasion In A Tumor-On-A-Chip Device.” 2020 Biomedical Engineering Society Annual Meeting. Virtual. October 2020.
- **DePalma TJ**, Sivakumar H, Skardal A. “In Vitro Model Of The Blood Brain Barrier (BBB) To Study Tumor-BBB Interactions In Glioblastoma”. *Biomedical Engineering Society Annual Meeting*, Virtual Meeting. October 2020. *Poster*.
- Rodriguez MA, DePalma T, Brasky TM, Skardal A. “Docosahexaenoic acid inhibition of tumor cell growth in in vitro endometrial tumor organoids.” Biomedical Engineering Society Annual Meeting. Virtual. October 2020.

2021:

- Nairon KG, Skardal A “Tumor Secretome Induces Myofibroblast Activation and ECM Remodeling in 3D Premetastatic Niche Model.” 2021 Biomedical Engineering Society Annual Meeting. Orlando, FL. October 8, 2021.
- Rodriguez MA, Chakraborty S, Albanna M, Skardal A. “The Effect of 5-Fluorouracil and Regorafenib on Human Skin and Human ECM-Derived Hydrogel-Supported Tumor Organoids.” Biomedical Engineering Society Annual Meeting. Orlando, FL. October 2022.
- Chakraborty S, Bharti V, Vilgelm A, Davies A, and Skardal A. "Evaluation of natural killer cell homing through ECM hydrogels to drug-treated Melanoma organoids." 2021 Biomedical Engineering Annual Meeting, Orlando, FL. Oct. 6-9, 2021.
- Rodriguez MA, Sivakumar H, Kheradmandi M, Sassi S, Ilyas F, Beane J, Skardal A. “Using a bioengineered immune-enhanced tumor-on-a-chip (iTOC) platform to improve T cell tumor-killing capabilities.” Ohio State University Comprehensive Cancer Center Annual Scientific Meeting. Columbus, OH. October 2021.
- Nairon KG and Skardal A. “Colorectal Cancer Secretome Promotes Myofibroblast Activation and Fibrotic Matrix Remodeling in 3D Model of the Premetastatic Niche.” 2021 Ohio State University Comprehensive Cancer Center – James Annual Meeting. Columbus, OH. October 11, 2021.

- Nairon KG, Rajan N, Ringel M, Skardal A. "In Vitro Metastasis-on-a-Chip Model Offers Insight Into RCAN1-4's Activity As A Metastasis Suppressor in Thyroid Cancer." 2021 Ohio State University Comprehensive Cancer Center – James Annual Meeting. Columbus, OH. October 11, 2021.
- Nairon KG, Rajan N, Ringel M, Skardal A. "Modeling RCAN1-4 Relation to Thyroid Metastasis Suppression In A 3D Metastasis-on-a-Chip Platform." Ohio State University Organoid Technology Group Meeting. Columbus, OH. October 27, 2021.
- DePalma TJ, Sivakumar H, Skardal A. "Investigating The Mechanisms Of Blood Brain Barrier Dysfunction In Glioblastoma Using In Vitro Models". *Biomedical Engineering Society Annual Meeting*, Orlando, FL. October 2021. *Oral Presentation*.
- DePalma TJ, Sivakumar H, Che J, Zhutshi A, Skardal A. "In Vitro Blood-Brain Barrier Model For Studying Glioblastoma Progression and Treatment". *OSUCCC Annual Scientific Meeting*. Columbus, OH. October, 2021. *Poster*.
- Zutshi A and Skardal A. "In vitro model of glioblastoma to study subpopulation induced extracellular matrix changes." 2021 Autumn Undergraduate Research Festival. Columbus, OH. November 15-19, 2022.
- Skardal A. "Engineering complexity into 3D in vitro tumor models." Molecular Carcinogenesis and Chemoprevention Program Meeting. December 17, 2021.

2022:

- Chakraborty S and Skardal A. "Evaluation of Natural Killer Cell Homing through ECM Hydrogels to Drug-Treated Melanoma Organoids." 2022 Engineering in Healthcare: Industry and Research Symposium. Columbus, OH.
- Nairon KG and Skardal A. "Colorectal Cancer Secretome Promotes Fibroblast Activation and Suppresses Pericyte Function in 3D Premetastatic Niche Model." 2022 Engineering in Healthcare: Industry and Research Symposium. Columbus, OH.
- Rodriguez MA, Sivakumar H, Kheradmandi M, Sassi S, Ilyas F, Beane J, Skardal A. "Using a bioengineered immune-enhanced tumor-on-a-chip (iTOC) platform to improve T cell tumor-killing capabilities." Engineering in Healthcare: Industry and Research Symposium. Virtual February 19, 2022
- Zutshi A and Skardal A. "In vitro model of glioblastoma to study subpopulation induced extracellular matrix changes." 2022 Engineering in Healthcare: Industry and Research Symposium. Columbus, OH. February 19, 2022.
- Nairon KG, Skardal A. "Colorectal Cancer Secretome Promotes Fibroblast Activation and Suppresses Pericyte Function in 3D Premetastatic Niche Model." 2022 Engineering in Healthcare: Industry and Research Symposium. Columbus, OH. February 19, 2022.
- Nairon KG and Skardal A. "3D Premetastatic Niche Model Shows Tumor Secretome-Induced Myofibroblast Activation and Collagen Remodeling." 2022 Ohio State University Comprehensive Cancer Center Cancer Biology Program Annual Retreat. Columbus, OH. April 1, 2022.
- Nairon KG and Skardal A. "Engineering complexity into tumor organoid and tumor-on-a-chip technologies." 2022 Ohio State University Comprehensive Cancer Center Cancer Biology Program Annual Retreat. Columbus, OH. April 2, 2022.

- DePalma TJ, Skardal A. "Studying Glioblastoma -Blood Brain Barrier Interactions Using In Vitro Models". *Engineering in Healthcare: Industry and research Symposium*. Columbus, OH. February 2022. *Poster*.
- Chakraborty S, Bharti V, Vilgelm A, Davies A, and Skardal A.. "Evaluation of natural killer cell homing through ECM hydrogels to drug-treated Melanoma organoids." 2022 Engineering in Healthcare: Industry and Research Symposium. Columbus, OH. Feb. 18-19, 2022.
- Chakraborty S, Bharti V, Vilgelm A, Davies A, and Skardal A. "Enhancing natural killer cell homing to melanoma organoids in a tumor-on-a-chip platform via induction of tumor cell-secreted chemokines". 2022 Hayes Graduate Research Forum. Columbus, OH. March 4, 2022.
- Che J, DePalma T, Mezache LS, Veeraraghavan R, Swindle-Reilly KE, Skardal A. "Sensitizing Glioma Stem Cells to Temozolomide in Hyaluronan Hydrogel-Based Glioblastoma Organoids". *Biophysical Society Annual Meeting*. San Francisco, CA. February 2022. *Poster*.
- DePalma TJ, Skardal A. "Studying Glioblastoma Induced Blood Brain Barrier Changes Using an In Vitro Tissue Engineered Model". *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Toronto, ON. July 2022. *Poster*.
- Che J, DePalma TJ, Mezache LS, Veeraraghavan R, Swindle-Reilly KE, Skardal A. "Sensitizing Glioma Stem Cells to Temozolomide in Hyaluronan Hydrogel-Based Glioblastoma Organoids". *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Toronto, ON. July 2022. *Poster*.

2023:

- DePalma TD, Skardal A. Investigating Glioblastoma Tumor Cell Invasion And Treatment Using A Blood Brain Barrier On A Chip. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Podium Presentation*.
- Nairon KG, Rajan N, Ringel M, Skardal A. RCAN1-4 Suppresses Metastatic Invasion and Tumor Cell Proliferation in a 3D Thyroid Metastasis-on-a-Chip Model. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Podium Presentation*.
- Nairon KG, Rajan N, Ringel M, Skardal A. Development of a Multi-Tissue Metastasis-on-a-Chip Platform to Study Metastasis Initiation and Invasion Kinetics. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Podium Presentation*.
- DePalma TD, Hughes K, Tawfic M, Hisey C, Skardal A. Engineered Hydrogel for Studying Astrocyte Response to Glioblastoma Derived Extracellular Vesicles. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Podium Presentation*.
- Chakraborty S, Vilgelm A, Davies A, Bharti V, Skardal A. Enhancing Immunotherapy via Chemokin-driven Natural Killer Cells in 3D Melanoma Organ-on-a-Chip Platform. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Podium Presentation*.
- DePalma TD, Skardal A. Investigating Glioblastoma Tumor Cell Invasion And Treatment Using A Blood Brain Barrier On A Chip. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
- Nairon KG, Rajan N, Ringel M, Skardal A. RCAN1-4 Suppresses Metastatic Invasion and Tumor Cell Proliferation in a 3D Thyroid Metastasis-on-a-Chip Model. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
- DePalma TD, Hughes K, Tawfic M, Hisey C, Skardal A. Engineered Hydrogel for Studying Astrocyte Response to Glioblastoma Derived Extracellular Vesicles. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
- Rodriguez MA, Kheradmandi Beane J, Skardal A. An Immune Enhanced Tumor-on-a-Chip Platform (iTOC) for Personalized T Cell Immunotherapy. *Tissue Engineering and Regenerative*

- Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
- Sivakumar H, Skardal A. Generation of Microglial Organoids for Studying Tumor-Immune Interactions. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
 - Patient-derived Tumor Glioblastoma Organoids that Maintain Drug Response and Genomic Parity. Sivakumar H, Strowd RE, Skardal A. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
 - Shah A, Stagner E, Skardal A. Using an In Vitro Colorectal Cancer Construct Platform to Investigate the Potential Genetic Modifications that Occur due to Hyperthermic Intraperitoneal Chemotherapy. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
 - Nairon KG, Skardal A. Premetastatic Liver Conditioning Impacts Colorectal Cancer Invasion and Micrometastasis Formation in 3D PMN-on-a-Chip Model. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
 - Chakraborty S, Skardal A, Mukherjee D, Mace T. Novel Drug Tomatidine Increases Chemosensitivity of Standard-of-care Gemcitabine in 3D Pancreatic Tumor Organoids. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
 - Chakraborty S, Skardal A. Comparing Role of Fibroblasts in Chemotherapy and Immunotherapy. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
 - Sivakumar H, Dedhia PH, Skardal A. Establishment of an Organoid Model for Adrenal Cortical Carcinoma. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
 - Rodriguez MA, Sivakumar H, Zheng X, Dedhia PH, Skardal A. Pathway Inhibition of Adrenocortical Carcinoma Organoids for the Development of Combinatorial Therapies. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.
 - DePalma TD, Rist D, Tallman M, Venere M, Schultz ZD, Skardal A. A Novel Magnetic Sorting Platform for Characterizing Glioma Heterogeneity by Extracellular Matrix Affinity. *Tissue Engineering and Regenerative Medicine Society Americas Annual Meeting*. Boston, MA. April 2023. *Poster*.

INVITED EXTRAMURAL PRESENTATIONS AND SEMINARS

1. July 22, 2014. "Hydrogel Biomaterials in Regenerative Medicine and Tissue Engineering Applications", Regenerative Medicine Essentials: The Fundamentals to the Future, Winston-Salem, NC, Wake Forest University Health Sciences.
2. July 21, 2015. "Hydrogel Biomaterials in Regenerative Medicine and Tissue Engineering Applications", Regenerative Medicine Essentials: The Fundamentals to the Future, Winston-Salem, NC, Wake Forest University Health Sciences.
3. October 8, 2015. "Models of Cancer and Metastasis", 2016 Biomedical Engineering Society Annual Meeting. Tampa, FL. Tampa, FL.
4. October 16, 2015. "3D Designs and Smart Biomaterials", North Carolina Tissue Engineering and Regenerative Medicine Society Annual Meeting. Winston-Salem, NC.
5. May 3, 2016. "Bioprinting and Biomaterial-based Solutions for Skin Regeneration", American Burn Association, Las Vegas, NV.
6. June 16, 2016. "Bioengineered 3D Tissue and Tumor Models for Drug Screening and Personalized Medicine", World Preclinical Congress – 3D Cellular Models, Boston, MA.
7. July 12, 2016. "Hydrogel Biomaterials in Regenerative Medicine and Tissue Engineering Applications", Regenerative Medicine Essentials: The Fundamentals to the Future, Winston-Salem, NC, Wake Forest University Health Sciences.
8. September 14, 2016. "Metastasis-on-a-Chip", Swiss Laboratory Animal Science Association SGV 2016 Meeting, Basel, Switzerland.

9. October 31, 2016. "Hydrogel bio-ink biomaterials in bioprinting and biofabrication", Biofabrication 2016, Winston-Salem, NC.
10. March 4, 2017. "Biofabrication of Tissue Constructs for Drug Screening, Disease Models, and Personalized Medicine", Regenerative Medicine Workshop, Hilton Head, SC.
11. April 6, 2017. "Biofabricated Tissue and Tumor Organoid Systems for Disease Modeling, Drug and Toxicology Screening, and Personalized Medicine", Providence College, Providence, RI.
12. June 6, 2017. "Hydrogel Biomaterials in Regenerative Medicine and Tissue Engineering Applications", Regenerative Medicine Essentials: From the Fundamentals to the Future, Winston-Salem, NC, Wake Forest University Health Sciences.
13. November 15, 2017. "Biofabrication technologies in regenerative medicine and tissue engineering." Sanford Research Center. Souix Falls, ND
14. June 5, 2018. "Engineering Naturally Derived Hydrogels for Applications in Regenerative Medicine." Wake Forest Institute for Regenerative Medicine, 5th Annual Regenerative Medicine Essentials Short Course. Winston-Salem, NC.
15. September 27, 2018. "Bioengineered 3D organoids for disease modeling, drug screening, and personalized medicine." Womble Carlyle/Wake Forest School of Medicine Continuing Professional Development Program. Winston-Salem, NC.
16. November 29, 2018. "Bioengineered Lung Tumor Organoids for Development of Personalized Medicine." 19th Annual Innovative Molecular Analysis Technologies Principal Investigators Meeting. NCI/Rockville, MD.
17. June 11, 2019. "Engineering Naturally Derived Hydrogels for Applications in Regenerative Medicine." Wake Forest Institute for Regenerative Medicine, 6th Annual Regenerative Medicine Essentials Short Course. Winston-Salem, NC.
18. November 23, 2019. "Predicting Tumor Heterogeneity Evolution After Therapy In Patient-Derived Ex Vivo Glioblastoma Organoids." 19th Annual Innovative Molecular Analysis Technologies Principal Investigators Meeting. Cedar Sinai Medical Center. Los Angeles, CA
19. April 28, 2020. "A versatile extracellular matrix biomaterial-enabled patient-derived tumor organoid platform for personalized drug screening." AACR. San Diego, CA. Cancelled due to COVID 19.
20. December 3, 2020. "Evolution of tumor heterogeneity and drug response of patient-derived *ex vivo* glioblastoma organoids." 19th Annual Innovative Molecular Analysis Technologies Principal Investigators Meeting.
21. April 14, 2021. "Engineering ECM Bioinks to Biofabricate Micophysiological Systems for Disease Modeling and Precision Medicine." CELLINK Webinar.
22. October 21, 2021. "Replacing Basement Membrane Extracts in Biofabrication Applications." National Centre for the Replacement Refinement and Reduction of Animals in Research: Replacing Basement Membrane Extracts (BMEs) Webinar Series.

DIDACTIC/SYSTEMATIC INSTRUCTION

Wake Forest Baptist Medical Center

Courses:

BMES 631 – Intro to Regenerative Medicine
IPP 715 – Techniques in Physiology
IPP 702 – Systems Physiology and Pharmacology
MCB 701 – Molecular and Cellular Biosciences
CABI 723 – Advanced Topics in Cancer Biology

Additional educational activities:

WFIRM Summer Scholar Program

- Mentor (2014 - 2018)
- Summer Scholar Seminar Series Organizer (2017-2018)

Regenerative Medicine Essentials Course (weeklong summer course):

- Lecture in Biomaterials Session (2014 - 2018)
- Director for the Decellularization Biomaterials Intensive Workshop (2016 - 2017)
- Inventor/Director for the Organoid/Body-on-a-Chip Intensive Workshop (2018)

WFIRM Summer High School Student Program

- Mentor (2017-2018) – This year was so successful that we are planning a manuscript around the student's work

2017 NSF-ATE Bioscience Industrial Fellowship Project

- Lecture on Biomaterials in Regenerative Medicine and Biofabrication

The Ohio State University

Courses:

BIOMEDE 4510 – Molecular, Cell, and Tissue Engineering

- Fall 2020
- Fall 2021
- Fall 2022
- Fall 2023

BIOMEDE 5194.07 – Biofabrication of Microphysiological Systems

- Spring 2022

BIOMEDE 5310 – Advanced Biomaterials

- Spring 2023 (Redesigned course w/ Dr. Swindle-Reilly)

Guest Lectures:

- BIOMED 4510, Molecular, Cell, and Tissue Engineering, Spring 2020, "Engineering Approaches for Skin Regeneration"
- BIOMED 5359, Extracellular Matrix in BME, Spring 2020, "Hyaluronic Acid Hydrogels and Applications in Tissue Engineering and Regenerative Medicine"
- BIOMED 4610, Biomedical Micro/Nanotechnology, Spring 2020, "Organoids and Organ-on-a-Chip Technologies"
- BIOMED 4310, Biomaterials, Fall 2020, "Deployment of Biomaterials in Microphysiological Cancer Systems"
- BIOMED 4610, Biomedical Micro/Nanotechnology, Spring 2021, "Organoids and Organ-on-a-Chip Technologies"
- BIOMED 5560, Engineering Applications in Cancer Biology, Fall 2021, "Engineering Immune-competent Patient-Derived Tumor Models"
- BIOMED 4610, Biomedical Micro/Nanotechnology, Spring 2022, "Organoids and Organ-on-a-Chip Technologies"
- BIOMED 5560, Engineering Applications in Cancer Biology, Spring 2023, "Engineering Immune-competent Patient-Derived Tumor Models"

MENTORING RELATIONSHIPS:

The Ohio State University

Graduate Students

2019-2023

Kylie Nairon
BME PhD Program
Advisor

2019-present

Thomas DePalma
BME PhD Program

	Advisor
2019-present	Srija Chakraborty BME PhD Program Advisor
2019-present	Marco Rodriguez BME PhD Program Advisor
2019-present	Hema Sivakumar BME PhD Program Advisor
2021-present	Emerie Stagner BME PhD Program Advisor
2021-present	Sydney Anderson BME PhD Program Advisor
2021-present	Daniel Dodd BME PhD Program Ph.D. thesis committee member
2020-present	Nagashree Avabhrath University of Montana Division of Biological Sciences PhD Program Ph.D. thesis committee member
2020-2021	Liam Holzer BME MS Program Ph.D. thesis committee member
2020-present	Shreyas Hirways BME PhD Program Ph.D. thesis committee member
2021-present	Marco Mendez BME PhD Program Ph.D. thesis committee member
2022-present	Jonathan Adorno BME PhD Program Ph.D. thesis committee member
2020-present	Lindsay Madison Kirk Wake Forest PhD Program Ph.D. thesis committee member
Undergraduate Students	
2020-present	Aneesh Zutshi

	BME BSc Program Advisor
2021-present	Jingru Che BME BSc Program Advisor
2021	Bronson Frank BME BSc Program Advisor
2020-2021	Audrey Villanova BME BSc Program Advisor
2020-2021	Ana Minyayev BME BSc Program Advisor
2021-present	Abhishek Shah BME BSc Program Advisor
2022-present	Marie Tawfik BME BSc Program Advisor
2022-present	Katie Jones BME BSc Program Advisor
2022-present	Connor Durham BME BSc Program Advisor
2022-present	David Fraas BME BSc Program Advisor
2022-present	Kyle Borah BME BSc Program Advisor
2022-present	Kennedy Hughes BME BSc Program Advisor

Wake Forest Baptist Medical Center

Graduate Students

2014-2017	Mahesh Devarasetty Biomedical Engineering Graduate Program Co-Advisor
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2014-2022	Matthew Brovold Molecular Medicine and Translational Sciences Graduate Program Ph.D. thesis committee member
2014-2019	Kevin Enck Biomedical Engineering Graduate Program Master's thesis/PhD committee member
2014-2015	Edina Wang Wake Forest Medical School Medical Student Research Program Project Supervisor
2015-2016	Julio Aleman MMTS Masters Program Advisor
2015-2017	Hema Sivakumar MMTS Masters Program Advisor
2016-2020	Andrea Mazzocchi WFBMC BME PhD Program Advisor
2018-2021	Steven Forsythe WFBMC Cancer Biology PhD Program Advisor (2016-2018, MMTS Masters Program)
2016-2020	Shiny Rajan WFBMC BME PhD Program Co-advisor
2017-2022	Casey Clark WFBMC BME PhD Program Co-Advisor
2017-2019	Jonathon Howarth MCB Masters Program Advisor
2017-2020	Greg Gillespie Biomedical Engineering Graduate Program PhD committee member
2018-present	Thomas DePalma BME PhD Program Advisor
2018-2023	Kylie Nairon BME PhD Program Advisor

2018-2020	Charlotte Waits Biomedical Engineering Graduate Program PhD committee member
2018-present	Bryce McCarthy Biomedical Engineering Graduate Program PhD committee member
2015-2019	Carlos Kengla

Postdoctoral Fellows

2017 - 2019	Mahesh Devarasetty, PhD Postdoctoral research fellow Co-advisor
2017 - 2018	Samuel Herberg, PhD Postdoctoral research fellow Co-advisor Current position: Assistant Professor, SUNY Upstate

Undergraduate Students

2011	Edi Kapetanovic Cornell University Wake Forest Institute for Regenerative Medicine, Summer Scholars Research Program Current position: Medical Student, Yale Medical School
2012	Mahesh Devarasetty Columbia University Wake Forest Institute for Regenerative Medicine, Summer Scholars Research Program Current position: Postdoctoral Fellow, Wake Forest Institute for Regenerative Medicine
2012	Callie Turlington Tulane University Wake Forest Institute for Regenerative Medicine, Summer Scholars Research Program Current position: Graduate Student, Tulane University Biomedical Engineering Master's Program
2013	Christopher Rodman University of California Los Angeles Wake Forest Institute for Regenerative Medicine, Summer Scholars Research Program Current position: Research Technician, Wake Forest Institute for Regenerative Medicine
2014	Joseph Denman

- Appalachian State University
Wake Forest Institute for Regenerative Medicine, Summer
Scholars Research Program
- 2015 Josh Copus
Clemson University
Wake Forest Institute for Regenerative Medicine, Summer
Scholars Research Program
- 2015 Sarah Grebennikov
University of Oklahoma
Wake Forest Institute for Regenerative Medicine, Summer
Scholars Research Program
- 2015 Mikyaila Jaramillo
University of Notre Dame
Wake Forest Institute for Regenerative Medicine, Summer
Scholars Research Program
- 2015 Edcarlos de Souza
University of Arkansas
Wake Forest Institute for Regenerative Medicine, Summer
Scholars Research Program
- 2015-2016 Naren Mehta
Wake Forest University
Undergraduate Research Program
- 2016 Katherine McMurray
Tufts University
Wake Forest Institute for Regenerative Medicine, Summer
Scholars Research Program
- 2016-2017 Connor Huntwork
Guilford College
Undergraduate Research Program
- 2016-2018 KyungMin Yoo
Wake Forest University
Undergraduate Research Program
- 2018 Erin Maloney
University of Buffalo
Wake Forest Institute for Regenerative Medicine, Summer
Scholars Research Program