**KEYSTONE SYMPOSIA**
on Molecular and Cellular Biology

**Immunometabolism at the Crossroads of Obesity and Cancer (J1)**

**Scientific Organizers:** Lydia Lynch and Hongbo Chi

**Sponsored by Cell Research and Regeneron Pharmaceuticals, Inc.**

**Tumor Metabolism (J2)**

**Scientific Organizers:** Eileen P. White, Joshua D. Rabinowitz and Marcia C. Haigis

**January 16-20, 2022 • Fairmont Banff Springs • Banff, AB, Canada**

**Sponsored by AstraZeneca**

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**SUNDAY, JANUARY 16**

Arrival and Registration

**MONDAY, JANUARY 17**

**Welcome and Keynote Address (Joint)**

*Lydia Lynch*, Harvard Medical School, USA

*Eileen P. White*, Rutgers Cancer Institute of New Jersey, USA

**Jeffrey C. Rathmell**, Vanderbilt University, USA

*Metabolic Checkpoints in the Tumor Microenvironment and Inflammation*

**Metabolic Regulation of the Anti-Cancer Immune Response (Joint)**

*Susan M. Kaech*, The Salk Institute, USA

*Erika L. Pearce*, Johns Hopkins University, USA

*Lydia Lynch*, Harvard Medical School, USA

**Erika L. Pearce**

*Metabolic Regulation of Immune Cells in Cancer*

*Marcia C. Haigis*, Harvard Medical School, USA

*The Role of Metabolites in Anti-Tumor Immunity*

*Murad R. Mamedov*, UCSF / Gladstone, USA

*Elena Piskounova*, Weill Cornell Medicine, USA

*Michael E. Pacold*, New York University Medical Center, USA

*Liron Bar-Peled*, Massachusetts General Hospital/Harvard Medical School, USA

*Identification of Compartmentalized ROS vulnerabilities in Cancer*

**Christopher Chidley**, Harvard Medical School, USA

*Systems-Wide Characterization of Amino Acid Transport*

**Brooke M. Emerling**, Sanford Burnham Prebys, USA

*Exploiting Peroxisome-Mitochondria Interplay by Targeting Phosphoinositide Kinases*

**David B. Shackelford**, University of California, Los Angeles, USA

*Three-Dimensional Imaging and Analysis of Mitochondrial Structure and Function in Lung Cancer*

**Fabricio Loayza-Puch**, German Cancer Research Center, Germany

*Dual Ribosomally Profiled Uncovers Metabolic Limitations in Distinct Cellular Populations of the Tumor Microenvironment*

**Marco Zocchi**, University of Rochester Medical Center, USA

*Glutathione Catabolism may be a Critical Amino Acid Source for Cancer Cell Survival*

**Yanxiang (Jessie) Guo**, Rutgers University, USA

*Autophagy Inhibition Sensitizes Lkb1-Deficient Kras-Driven Lung Tumors to MEK Inhibitor Trametinib via Ferroptotic Cell Death*

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**Workshop 1: Fundamentals of Immunometabolism (J1)**


*Michael Berger*, Hebrew University, Israel

*Enhanced Methionine Cycle Suppresses Naive CD8 T-Cell Maturation*

**Scott Widenmaier**, University of Saskatchewan, Canada

*Diet-Induced Hepatic Cholesterol Toxicity is Co-Counteracted by NRF1 and NRF2*

**Simon D. O’Shaughnessy**, Trinity Biomedical Science Institute, Ireland

*Proteomic Analysis of Metabolism of in vivo Conventional Murine Dendritic Cells*

**Bruno Guigas**, Leiden University Medical Center, Netherlands

*LKB1 Signaling in Dendritic Cells Controls Whole-Body Metabolic Homeostasis by Limiting T Helper 17 Priming*

**Carla Alicia Jaeger-Ruckstuhl**, Fred Hutchinson Cancer Research Center, USA

*CD27 Co-Stimulation Regulates Naive T Cell Fate Early During Priming and Improves Immunotherapeutic Potential of CAR-T Cells*

**Rosa Menjivar**, University of Michigan, USA

*Depletion of Arginase 1 in Myeloid Cells Alters the Pancreatic Cancer Tumor Microenvironment*

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**Workshop 1 (J2)**

*Elena Piskounova*, Weill Cornell Medicine, USA

*Michael E. Pacold*, New York University Medical Center, USA

*Liron Bar-Peled*, Massachusetts General Hospital/Harvard Medical School, USA

*Identification of Compartmentalized ROS vulnerabilities in Cancer*

**Christopher Chidley**, Harvard Medical School, USA

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**Metabolic Reprogramming for Improved Immunotherapy (J1)**

*Hongbo Chi*, St. Jude Children’s Research Hospital, USA

*Susan M. Kaech*, The Salk Institute, USA

*Immunometabolism of Long-Term Immunity*

**Ping-Chih Ho**, University of Lausanne, Switzerland

*Fat Fuels Tumor Tregs*

**Russell G. Jones**, Van Andel Research Institute, USA

*How Metabolic Fuels Regulate T Cell Function*

**Sagar P. Bapat**, University of California, San Francisco, USA

*Short Talk: Obesity Rewires Immunological Responses to Inflammatory Disease*

**Hanna S. Hong**, University of Michigan, USA

*Short Talk: OXPHOS Promotes Apoptotic Resistance and Persistence in TH17 Cells*

**Lukas A. J. O’Neill**

*Trinity Biomedical Sciences Institute, Ireland*

*Identifying Metabolic Regulators of CD4+ T cells Using Mendelian Disease*

**Gloria Asantewaa**, University of Rochester, USA

*The Interplay of Glutathione and Lipid Homeostasis in vivo*

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Metabolic Regulation by Kinases (J2)
*Karen H. Vousden*, Francis Crick Institute, UK
Reuben J. Shaw, The Salk Institute for Biological Studies, USA
Brendan D. Manning, Harvard School of Public Health, USA
John Bennis, Weill Cornell Medical College, USA
Anni Zhang, University of British Columbia, Canada
Mike Uretz John Oliphant, Harvard Medical School, USA

Poster Session 1
TUESDAY, JANUARY 18

Amino Acid Metabolism and Nutrient Balance (Joint)
*Janelle S. Ayres*, The Salk Institute for Biological Studies, USA
*Heather Christofk*, University of California, Los Angeles, USA
M. Celeste Simon, University of Pennsylvania, USA
Karen H. Vousden, Francis Crick Institute, UK
Matthew G. Vander Heiden, Massachusetts Institute of Technology, USA
Hongbo Chi, St. Jude Children's Research Hospital, USA
Konrad Aden, University Hospital Kiel, Germany
Juan J. Apiz Saab, University of Chicago, USA
Santosh Vardhana, Memorial Sloan Kettering Cancer Center, USA

Career Development (Joint)

Microbial Metabolites, Nutrients and Cancer (J1)
*Russell G. Jones*, Van Andel Research Institute, USA
Dan R. Littman, HHMI/New York University School of Medicine, USA
Janelle S. Ayres, The Salk Institute for Biological Studies, USA

Poster Session 2
WEDNESDAY, JANUARY 19

Immune Interactions with Systemic and Tissue Metabolism (J1)
*Daniela F. Quail*, McGill University, Canada
Catherine Postic, INSERM Institut Cochin, France
Douglas R. Green, St. Jude Children's Research Hospital, USA
Zuri Sullivan, Harvard University, USA

Career Development (Joint)

Microbial Metabolites, Nutrients and Cancer (J1)

**Mark A. Febbraio**, Monash Institute of Pharmaceutical Sciences, Australia
*Role of the Gut Liver Axis in NASH Driven Cancer*

**Sean Spencer**, Stanford University, USA
*Short Talk: Fermented Food-Derived Bacterial Metabolites Participate in a Transkingdom Metabolic Network to Regulate Intestinal Immunity and Diet Induced Obesity*

**Greg M. Delgoffe**, University of Pittsburgh, USA
*Short Talk: Media Based on the Metabolic Composition of Tumor Intestinal Fluid Reveals Nutrient Dependencies and Novel Oncometabolites that Drive T Cell Dysfunction*

**Metabolic Control of Differentiation and Immune Escape (J2)**
*Erika L. Pearce*, Johns Hopkins University, USA
Lydia Finley, Memorial Sloan Kettering Cancer Center, USA
Alec Kimmelman, New York University Langone Medical Center, USA
Wilbert P. Vermeij, Princess Máxima Center for Pediatric Oncology and Oncode Institute, Netherlands
Mara Mennuni, Karolinska Institutet, Sweden

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Santiago Valle Torres, Peter Doherty Institute, Australia
Short Talk: Inflammation Dependent Differentiation of Two Distinct Adipose Tissue Treg Populations Shape Systemic Metabolism

Andrea Keller, Ohio State University, USA
Short Talk: Intestinal Gasdermin C Expression is Dependent on Nutrient Status and Immune Environment

Redox Metabolism (J2)
* Jared Rutter, University of Utah, USA
Gina DeNicola, Moffitt Cancer Center, USA
Cysteine Metabolism in Cancer
Navdeep S. Chandel, Northwestern University, USA
Mitochondrial Metabolism in Cancer
Christina Towers, The Salk Institute for Biological Studies, USA
Circumventing Autophagy Inhibition in Cancer Cells
Thales Papagiannakopoulos, New York University School of Medicine, USA
KEAP1/NRF2 Pathway in Cancer
Madeleine Louisa Hart, Fred Hutch Cancer Center, USA
Short Talk: Mitochondrial Redox Adaptations are Essential for Aspartate Synthesis in SDH Deficient Cancer Cells
Rebecca Louise Westbrook, University of Birmingham, UK
Short Talk: Proline Synthesis through PYCR1 is Required to Support Cancer Cell Proliferation and Survival in Oxygen-Limiting Conditions
Myriam Cerezo-Magaña, Lund University, Sweden
Short Talk: Hypoxic Induction of Exosome Uptake through Proteoglycan Dependent Endocytosis Fuels the Lipid Droplet Phenotype in Glioma

Tumor Interaction with Host and Microbes (Joint)
* Konrad Aden, University Hospital Kiel, Germany
* M. Celeste Simon, University of Pennsylvania, USA
Yasminel Belkaid, NIAID, National Institutes of Health, USA
NUTRITIONAL CONTROL OF IMMUNITY
Eileen P. White, Rutgers Cancer Institute of New Jersey, USA
Immune Response Regulation by Autophagy in Cancer
Joshua D. Rabinowitz, Princeton University, USA
NADPH and Fat Sources in Tissues and Tumors
Julian J. Lum, BC Cancer, Canada
Short Talk: Duality of Metabolites in T cell Antitumor Function
Oliver Jonas, Brigham & Women’s Hospital, USA
Short Talk: In Situ Manipulation of Metabolic Pathways to Examine Nutrient Competition Between Immune Cells and Malignant Cells in Tumors

Poster Session 3
THURSDAY, JANUARY 20
High-Fat Diet, Lipids and Cancer (J1)
* Lydia Lynch, Harvard Medical School, USA
Salvador Aznar Benítez, ICREA and Institute for Research in Biomedicine, Spain
Targeting Metastasis through Lipid Metabolism
Rachel J. Perry, Yale University, USA
Breaking the Link between Obesity and Cancer
Weiping Zou, University of Michigan, USA
Improving Metabolic Responses to Immunotherapy
Semir Beyaz, Cold Spring Harbor Laboratory, USA
Dietary Control of Tumor Metabolism
Jacqueline A. Turner, University of Colorado Anschutz School of Medicine, USA
Short Talk: Lipid Modulation of CD8 T Cell Immunosurveillance, Metabolism, and Anti-tumor Immunity
Nathalie M. Schmidt, University College London, UK
Short Talk: Targeting Cholesterol Metabolism as a Novel Immune Checkpoint in Viral Infections and Cancer

Targeting Metabolism (J2)
* Matthew G. Vander Heiden, Massachusetts Institute of Technology, USA
Ralph J. DeBerardinis, University of Texas Southwestern Medical Center, USA
Metabolic Dependencies in Tumors in Humans
Maria Yuneva, Francis Crick Institute, UK
Identifying Metabolic Vulnerabilities and Flexibilities of Tumours
Ayelet Erez, Weizmann Institute of Science, Israel
Targeting the Urea Cycle
Barbara S. Fox, Rheos Medicines, USA
Leveraging Immunometabolism for the Treatment of Autoimmune Disease
Brooks P. Leitner, Yale University, USA
Short Talk: Systemic Nutrient Partitioning and Tumor Immunometabolic Reprogramming Underlie Exercise’s Anti-Cancer Effects
Philippa Burns, University of Illinois at Chicago, USA
Short Talk: Investigating the Response of Breast Cancer Cells to Serine Starvation
Milan R. Savani, University of Texas Southwestern Medical Center, USA
Short Talk: Divergent Pyrimidine and Purine Nucleotide Synthesis Programs Underlie Sensitivity to De Novo Pyrimidine Synthesis Inhibition in IDH1 Mutant Glioma

Workshop 2: Translational Immunometabolism in Disease (J1)
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**Dirk Brenner**, Luxembourg Institute of Health, Luxembourg  
**Petya Apostolova**, Johns Hopkins University, USA  
*Targeting the Creatine Metabolism Crosstalk Between Malignant Cells and T Cells for the Treatment of Acute Myeloid Leukemia*

**Jackie Bader**, Vanderbilt University Medical Center, USA  
*Tumor Associated Macrophages Contribute to the Obesity Paradox of Immune Checkpoint Therapy*

**Peter J. Siska**, University Hospital Regensburg, Germany  
*Metabolic Imbalance of T Cells in COVID-19 is Hallmarked by Basigin and Mitigated by Dexamethasone*

**Alexandra L. Kuhlmann**, Yale, USA  
*Metabolic Adaptation of Tissue-Resident Macrophages in Cancer*

**Soo-Youl Kim**, National Cancer Center, South Korea  
*Blocking Obesity or Fatty Acid Oxidation Suggests a Potential New Therapeutic Approach for Pancreatic Cancer*

**Eva Tsoussidou**, Harvard T.H. Chan School of Public Health, USA  
*TIRR Suppression Mediates a Cancer-Preventive Tolerable p53 Activation with Metabolic Side Effects*

**Claire McIntyre**, Harvard Medical School, USA  
*Combined Diet of High Fat with High Cholesterol Enhances Tumor Growth and Alters Immune Function in a Diet-Induced Obesity Model*

**Jonathan L. Coloff**, University of Illinois at Chicago, USA  
*Targeting Lipid Droplets in Chemoresistant Triple Negative Breast Cancer*

**Mark Basik**, McGill University, Canada  
*Targeting Lipid Droplets in Chemoresistant Triple Negative Breast Cancer*

**Rebekah Brooks**, University of Pennsylvania, USA  
*PBAF-associated Circadian IncRNA ADIRF-AS1 Regulates Renal Clear Cell Tumorigenesis*

**Victoria da Silva Diz**, Rutgers University, USA  
*A Novel and Highly Effective Mitochondrial Uncoupling Drug in T-cell Leukemia*

**Jiangbin Ye**, Stanford University, USA  
*Deciphering the Warburg Effect: Redox is the Key to Tumor differentionation*

**Gregory S. Ducker**, University of Utah, USA  
*Altered Phosphatidicholine Metabolism Creates a Targetable Vulnerability in a β-catenin Driven Zebrafish Model of Hepatocellular Carcinoma*

**Aleksandra Filipovska**, University of Western Australia, Australia  
*An RNA-binding Protein Variant Predisposes to Prostate Cancer by Altering Immunometabolism via Mitochondria*

**Laura C. Kim**, University of Pennsylvania, USA  
*Competition for Arginine Between Tumor and Immune Cells in HCC*

**Amber Kleckner**, Univ of Maryland, Baltimore, USA  
*Associations Between Mitochondrial Function and Cancer-Related Fatigue among Patients Undergoing Chemotherapy*

**Erika L. Pearce**, Johns Hopkins University, USA  
*The Power of ONE: Immunology in the Age of Single Cell Genomics*

**Donal Brennan**, University College Dublin, Ireland  
*Intentional Weight Loss to Treat Cancer*

**Ido Amit**, Weizmann Institute, Israel  
*Warburg and Mitochondrial Metabolism in Inflammation*

**Dirk Brenner**, Luxembourg Institute of Health, Luxembourg  
*Short Talk: Regulatory T cell Metabolism: cROSsroads Between Glutathione, Serine and Immune Tolerance*

**Ayelet Erez**, Weizmann Institute of Science, Israel  
*Metabolic Dependencies of Cancer Cells in vivo*

**Kivanc Birsoy**, Rockefeller University, USA  
*Metabolic Transitions in Cancer*

**Heather Christofk**, University of California, Los Angeles, USA  
*Regulation of Cancer Metabolism by the Lysosome*

**Roberto Zoncu**, University of California, Berkeley, USA  
*Meeting Wrap-Up: Outcomes and Future Directions (Organizers) (J1)*

**Meeting Wrap-Up: Outcomes and Future Directions (Organizers) (J2)**

**FRIDAY, JANUARY 21**

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