RNA MEDICINE
2021

April 29, 2021, 8:30 am–4:30 pm EST
Virtual Presentation

6th Annual RNA Symposium sponsored by the HMS Initiative for RNA Medicine and the Cancer Center at Beth Israel Deaconess Medical Center
Welcome and Opening Remarks

Frank J. Slack, PhD
Director, Harvard Medical School Initiative for RNA Medicine
Shields Warren Mallinckrodt Professor of Medical Research
Departments of Pathology and Medicine
Beth Israel Deaconess Medical Center, Harvard Medical School

George Q. Daley, MD, PhD
Dean of the Faculty of Medicine
Caroline Shields Walker Professor of Medicine
Professor of Biological Chemistry and Molecular Pharmacology
Harvard Medical School

Gyongyi Szabo, MD, PhD
Professor of Medicine and Faculty Dean for Academic Affairs
Harvard Medical School
Mitchell T. Rabkin Chair and Chief Academic Officer
Beth Israel Deaconess Medical Center

Jeffrey E. Saffitz, MD, PhD
Mallinckrodt Professor of Pathology, Harvard Medical School
Chair, Department of Pathology, Beth Israel Deaconess Medical Center

Richard I. Gregory, PhD
Co-Director, Harvard Medical School Initiative Initiative for RNA Medicine
Professor, Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School
Department of Pediatrics Stem Cell Biology Chair, Boston Children’s Hospital

Session I Moderator: Richard I. Gregory, PhD

9:00 AM  A timely confluence: Stories behind Moderna’s COVID-19 vaccine
Melissa J. Moore, PhD
Chief Scientific Officer, Platform Research
Moderna

9:30 AM  Development of mRNA for therapy
Katalin Karikó, PhD
Senior Vice President
BioNTech SE

10:00 AM  MicroRNAs in Liver Disease
Gyongyi Szabo, MD, PhD
Professor of Medicine and Faculty Dean for Academic Affairs
Harvard Medical School
Mitchell T. Rabkin Chair and Chief Academic Officer
Beth Israel Deaconess Medical Center

10:30 AM  Break
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<td>10:45 AM</td>
<td>Elsa Flores, PhD</td>
<td>Unveiling therapeutic opportunities to target the p53 pathway in cancer through understanding the regulatory network of IncRNAs</td>
<td>Chair, Department of Molecular Oncology&lt;br&gt;Leader, Cancer Biology and Evolution Program&lt;br&gt;H. Lee Moffitt Cancer Center and Research Institute</td>
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<td>11:15 AM</td>
<td>Ioannis Vlachos, PhD</td>
<td>Integration of Spatial Technologies and Single Nucleus Sequencing to Decipher COVID-19 Phenotypes across Tissues</td>
<td>Assistant Professor, Department of Pathology, Harvard Medical School&lt;br&gt;Co-Director of the Bioinformatics Program, Cancer Research Institute&lt;br&gt;Beth Israel Deaconess Medical Center&lt;br&gt;Director of Bioinformatics, Precision RNA Medicine Core&lt;br&gt;HMS Initiative for RNA Medicine, BIDMC&lt;br&gt;Associate Member, Broad Institute of MIT and Harvard</td>
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<td>11:45 AM</td>
<td>Brett P. Monia, PhD</td>
<td>Recent Progress in Antisense Therapeutics</td>
<td>Chief Executive Officer&lt;br&gt;Ionis Pharmaceuticals, Inc.</td>
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<td>12:15 PM</td>
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Session III Moderator: Frank J. Slack, PhD

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<td>1:15 PM</td>
<td>Harry F. Noller, PhD</td>
<td>Ribosomal RNA Function and Dynamics</td>
<td>Sinsheimer Professor of Molecular Biology&lt;br&gt;Director, Center for Molecular Biology of RNA&lt;br&gt;Department of MCD Biology&lt;br&gt;University of California, Santa Cruz</td>
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<td>1:45 PM</td>
<td>Daniel G. Anderson, PhD</td>
<td>Nucleic acid delivery systems for RNA therapy and gene editing</td>
<td>Professor, Department of Chemical Engineering&lt;br&gt;Institute for Medical Engineering and Science&lt;br&gt;Harvard-MIT Division of Health Sciences &amp; Technology&lt;br&gt;David H. Koch Institute for Integrative Cancer Research&lt;br&gt;Massachusetts Institute of Technology</td>
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What non-coding RNAs can teach us about metastasis and vice versa

Sohail Tavazoie, MD, PhD
Leon Hess Professor & HHMI Faculty Scholar
Meyer Laboratory of Systems Cancer Biology
Director, Black Family Metastasis Center
The Rockefeller University

2:45 PM
Break

Session IV Moderator: Carl D. Novina, MD, PhD

3:00 PM RNA splicing, intron-retention and cellular response to a dynamic environment
Tracy Johnson, PhD
Professor
Department of Molecular, Cell and Developmental Biology
Dean, Division of Life Sciences
University of California, Los Angeles

3:30 PM New tools for dissecting miRNAs function in vivo
Andrea Ventura, MD, PhD
Member, Cancer Biology and Genetics Program
Memorial Sloan Kettering Cancer Center

4:00 PM Alternate Structures in RNA
Victoria D’Souza, PhD
Professor of Molecular and Cellular Biology
Harvard University

4:30 PM Closing Remarks
Carl D. Novina, MD, PhD
Associate Professor of Medicine
Dana-Farber Cancer Institute, Harvard Medical School
Associate Member, Broad Institute of Harvard and MIT
Daniel G. Anderson, PhD
Professor, Department of Chemical Engineering
Institute for Medical Engineering and Science
Harvard-MIT Division of Health Sciences & Technology
David H. Koch Institute for Integrative Cancer Research
Massachusetts Institute of Technology

Nucleic acid delivery systems for RNA therapy and gene editing

Professor Daniel G. Anderson is a leading researcher in the field of nanotherapeutics and biomaterials. He is appointed in the Department of Chemical Engineering, the Institute for Medical Engineering and Science, the Koch Institute for Integrative Cancer Research, and the Harvard-MIT Division of Health Science and Technology at MIT. The research done in Prof. Anderson’s laboratory is focused on developing new materials for medicine. He has pioneered the development of smart biomaterials, and his work has led to advances in a range of areas, including medical devices, cell therapy, drug delivery, gene therapy and material science. Prof. Anderson received a B.A. in mathematics and biology from the University of California at Santa Cruz and a Ph.D. in molecular genetics from the University of California at Davis. His work has resulted in the publication of over 400 papers, patents and patent applications. These advances have led products that have been commercialized or are in clinical development, as well as to the foundation of companies in the pharmaceutical, biotechnology, and consumer products space including CRISPR Tx (Nasdaq: CRSP), Living Proof, Sigilon, Verseau Tx, and Olivo Labs.

George Q. Daley, MD, PhD
Dean of the Faculty of Medicine
Caroline Shields Walker Professor of Medicine
Professor of Biological Chemistry and Molecular Pharmacology
Harvard Medical School

Opening Remarks

George Q. Daley, MD, PhD, is the dean of Harvard Medical School and the Caroline Shields Walker Professor of Medicine. A physician-scientist and an authority on stem cell science and cancer biology, his discoveries have twice been cited in Science magazine’s Top 10 Breakthroughs of the Year. He has co-authored international guidelines for the conduct
and clinical translation of stem cell research and regenerative medicine and for ethical oversight of emerging biotechnologies. Daley’s priorities as dean of HMS include fostering innovative biomedical, computational and health care policy research, building a pipeline of novel therapeutics founded on basic science, nurturing the next generation of physician-scientists and advancing diversity in science, technology, engineering and medicine. Daley earned his AB and MD degrees from Harvard and a PhD in biology from MIT, and has worked as a trainee, fellow and staff physician at several HMS-affiliated hospitals.

Victoria D’Souza, PhD
Professor of Molecular and Cellular Biology
Harvard University

Alternate Structures in RNA

Dr. D’Souza received her PhD and post-doctoral training at the University of Maryland Baltimore County. She is a professor in the Department of Molecular and Cellular Biology at Harvard University since 2006. Dr. D'Souza was a Damon Runyon Fellow and is currently a HHMI faculty scholar. Her group has a structural virology focus with an expertise in tackling large RNA structures by Nuclear Magnetic Resonance. Her interests include understanding molecular mechanisms used in retroviral reverse transcription, non-canonical translation, and retroviral mRNA transcription.

Elsa R. Flores, PhD
Chair, Department of Molecular Oncology
Leader, Cancer Biology and Evolution Program
H. Lee Moffitt Cancer Center and Research Institute

Unveiling therapeutic opportunities to target the p53 pathway in cancer through understanding the regulatory network of IncRNAs

Dr. Flores is Chair of the Department of Molecular Oncology and CCSG Leader of the Cancer Biology and Evolution Program at the H. Lee Moffitt Cancer Center and Research Institute and an NCI Outstanding Investigator. The long-term goals of her laboratory are to understand the
interplay between p53, p63, p73 and other tumor suppressive pathways in cancer to improve patient therapy. Her lab aims to accomplish this goal by gaining a mechanistic understanding of the function of p63 and p73, p53 family members, in the suppression of tumorigenesis, metastasis, the DNA damage response, and metabolism using in vivo mouse models and whole genome and proteome approaches. She obtained her Ph.D. in Cancer Biology and completed a postdoctoral fellowship funded by the Leukemia and Lymphoma Society of America at MIT. She has published several landmark papers showing that p63 and p73 are genes that suppress tumorigenesis and metastasis. Her laboratory has engineered mouse models allowing for conditional, tissue-specific deletion of the TA or ΔN isoforms of p63 or p73. These tools have led to key discoveries with therapeutic potential for the p53 pathway. Importantly, her lab demonstrated regulation of non-coding RNAs by the p53 family and that TAp63 suppresses tumorigenesis and metastasis through regulation of Dicer and microRNAs. Her lab has also identified novel methods for drugging the p53 pathway through manipulation of the p53 family members, p63 and p73.

Richard I. Gregory, PhD
Co-Director, Harvard Medical School Initiative Initiative for RNA Medicine
Professor, Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School
Department of Pediatrics Stem Cell Biology Chair, Boston Children’s Hospital

Opening Remarks and Moderator

Richard I. Gregory, PhD’s undergraduate studies were at the University of Liverpool, UK, and he received a PhD from Cambridge University in 2001 for research performed at the Babraham Institute. He did his postdoctoral work at the Fox Chase Cancer Center and the Wistar Institute, Philadelphia. His postdoctoral research focused on microRNAs, and was supported by a Jane Coffin Childs Research Fellowship. Since its establishment in 2006 research in the Gregory laboratory has focused on understanding molecular and cellular mechanisms of RNA regulation and the relevance of these pathways in stem cell biology, development, and human diseases including cancer. He is committed to exploiting basic
knowledge of RNA regulation for the development of new and effective therapies and is a co-founder and scientific advisory board member of Twentyeight-Seven Therapeutics, and Theon Therapeutics, two new biotechnology companies that are developing cancer drugs that target different oncogenic RNA pathways.

Tracy Johnson, PhD
Professor
Department of Molecular, Cell and Developmental Biology
Dean, Division of Life Sciences
University of California, Los Angeles

RNA splicing, intron-retention and cellular response to a dynamic environment

Tracy Johnson is a Professor in the department of Molecular, Cell and Developmental Biology at UCLA where she holds the Keith and Cecilia Terasaki Presidential Endowed Chair in the Life Sciences and is a Howard Hughes Medical Institute Professor. Dr. Johnson earned her bachelors degree from UCSD in Biochemistry and Cell Biology and her Ph.D. in Molecular and Cell Biology from UC Berkeley while working in the laboratory of Dr. Michael Chamberlin. She was a Jane Coffin Childs postdoctoral research fellow at Caltech where she worked with Dr. John Abelson and joined the Biological Sciences faculty at UCSD in 2003. Dr. Johnson joined the faculty at UCLA in 2013, where her lab focuses on understanding mechanisms of gene regulation, particularly RNA splicing, chromatin modification and the intersection between these reactions.

Dr. Johnson has served on a variety of scientific boards including the RNA Society Board of Directors, Chair of the RNA Society Nominations Committee, the HHMI Professors Executive board, the National Cancer Institute Board of Scientific Counselors for Basic Research, Jonsson Comprehensive Cancer Center and recently served as Chair of the Molecular Genetics NIH study section. She is the recipient of numerous awards including the NSF CAREER Award, the Presidential Early Career Award for Scientists and Engineers (PECASE), and the Chancellor’s Associates Award for Excellence in Undergraduate Teaching. Dr. Johnson
has directed a number of successful programs at UCLA aimed at imbedding research into the undergraduate curriculum and enhancing diversity in the sciences. In the Fall of 2020, she was named Dean of Life Sciences at UCLA.

Katalin Karikó, PhD  
*Senior Vice President*  
*BioNTech SE*

**Development of mRNA for therapy**

Katalin Karikó is Senior Vice President at BioNTech RNA Pharmaceuticals from 2013. She is also Adjunct Associate Professor at the Perelman School of Medicine, University of Pennsylvania, where she worked for 24 years. She received her Ph.D. in biochemistry from University of Szeged, Hungary, in 1982. For four decades, her research has been focusing on RNA-mediated mechanisms with the ultimate goal of developing in vitro-transcribed mRNA for protein therapy. She investigated RNA-mediated immune activation and co-discovered that nucleoside modifications suppress immunogenicity of RNA, which widened the therapeutic potentials of mRNA. She has 10 patents granted by US for application of non-immunogenic, nucleoside-modified RNA. She co-founded and from 2006-2013 served as CEO of RNARx, a company dedicated to develop nucleoside-modified mRNA for therapy. She is a founding member of the scientific planning committee for the International mRNA Health Conference, an annual non-profit meeting for advancements of mRNA technology, inaugurated in 2013. She served as guest editor of the Molecular Therapy special issue on mRNA Therapy, in 2019. She is elected member of Academia Europaea, and recipient of the Rosenstiel Award, Research!America’s Public Health Award. Her patent, co-invented with Drew Weissman on nucleoside-modified uridines in mRNA is used to create the anti-SARS-CoV-2 mRNA vaccines by BioNTech/Pfizer and Moderna/NIH.
**Anna M. Krichevsky, PhD**  
*Associate Professor of Neurology/Neurobiology, Brigham and Women’s Hospital, Harvard Medical School*

**Moderator**

Dr. Krichevsky received her PhD degree from the Hebrew University of Jerusalem, Israel, and completed postdoctoral training at Harvard Medical School in Boston. As a postdoctoral fellow, Dr. Krichevsky isolated neuronal RNA granules and pioneered the work that led to the recognition of microRNA functions and RNA interference mechanisms in brain physiology and pathology. She performed the first successful RNA interference in mammalian neurons; contributed to the identification of miRNAs in mammalian brain; developed the first high-throughput arrays for miRNA expression profiling; and discovered one of the first oncogenic miRNA, miR-21, that is currently a promising target for various human diseases. Krichevsky’s laboratory identified and studied key miRNAs involved in brain tumors and neurodegenerative disorders such as Alzheimer’s disease and multiple sclerosis. Her laboratory also pioneered the identification of miRNA biomarkers for diagnostics and monitoring of primary and metastatic brain tumors. Dr. Krichevsky’s work is geared towards RNA medicine and based on multiple successful collaborations. She also serves on the Executive Committee of the HMS Initiative for RNA Medicine, established to translate RNA research to clinical practice.

**Brett P. Monia, PhD**  
*Chief Executive Officer, Ionis Pharmaceuticals, Inc.*

**Recent Progress in Antisense Therapeutics**

Dr. Monia is the chief executive officer and a founding member of Ionis Pharmaceuticals. His contributions at Ionis include research into the medicinal chemistry and mechanisms of action of RNA-targeting modalities to treat human diseases, most notably antisense-based therapeutic strategies. Dr. Monia has extensive experience across a range of therapeutic areas, including oncology, metabolic disease, inflammation, neurological disease and cardiovascular disease, which have resulted in a broad range of successful clinical achievements and in marketing approvals for new medicines. Dr. Monia
has published more than 200 primary research manuscripts, reviews and book chapters, and is an inventor on more than 100 issued patents. He serves as a senior editor for the journal Nucleic Acid Therapeutics, is on the board of directors for Dynacure and Cognition Therapeutics, and has served as president of the Oligonucleotide Therapeutics Society (OTS). Dr. Monia is also an adjunct professor of biology at San Diego State University where he lectures at the graduate level on pharmacology. Dr. Monia received his Ph.D. in Pharmacology from the University of Pennsylvania and B.S. degrees in Molecular Biology and Analytical Chemistry from Stockton University in Pomona, New Jersey.

Melissa J. Moore, PhD
Chief Scientific Officer, Platform Research
Moderna

A timely confluence: Stories behind Moderna’s COVID-19 vaccine

In her role as Chief Scientific Officer, Platform Research, Dr. Melissa Moore is responsible for leading mRNA biology, delivery and computation science research at Moderna. She joined Moderna in 2016 from the University of Massachusetts Medical School (UMMS), where she served as Professor of Biochemistry & Molecular Pharmacology, Eleanor Eustis Farrington Chair in Cancer Research and a long-time Investigator at the Howard Hughes Medical Institute (HHMI). Dr. Moore was also a founding Co-Director of the RNA Therapeutics Institute (RTI) at UMMS, and was instrumental in creating the Massachusetts Therapeutic and Entrepreneurship Realization initiative (MassTERi), a faculty-led program intended to facilitate the translation of UMMS discoveries into drugs, products, technologies and companies. Dr. Moore is a elected member of the National Academy of Sciences (2017) and a Fellow of the American Academy of Arts and Sciences (2019).

Dr. Moore holds a B.S. in Chemistry and Biology from the College of William and Mary, and a Ph.D. in Biological Chemistry from MIT, where she specialized in enzymology under Prof. Christopher T. Walsh. She began working on RNA metabolism during her postdoctoral training.
with Phillip A. Sharp at MIT. During her 23 years as faculty member, first at Brandeis and then at UMMS, her research encompassed a broad array of topics related to the roles of RNA and RNA-protein (RNP) complexes in gene expression, and touched on many human diseases including cancer, neurodegeneration and preeclampsia.

Harry F. Noller, PhD
Sinsheimer Professor of Molecular Biology
Director, Center for Molecular Biology of RNA
Department of MCD Biology
University of California, Santa Cruz

Ribosomal RNA Function and Dynamics

Harry Noller was an undergraduate at UC Berkeley and received his Ph.D. in Chemistry in the Institute of Molecular Biology at the University of Oregon. He began working on ribosomes as a postdoc in Alfred Tissières’ lab in the Institut de Biologie Moléculaire at the University of Geneva. After starting his own lab at UCSC in 1968, his group began to get puzzling results suggesting that functions of the ribosome were based on ribosomal RNA, rather than ribosomal proteins. This proposal, widely viewed as a ‘crackpot idea’ at the time, has turned out to be correct. The finding that the ribosome is a ribozyme explains the chicken-or-the-egg paradox raised by Francis Crick and others concerning the molecular evolution of the ribosome. Work in Noller’s lab then mapped the binding sites for the tRNAs, initiation factors, elongation factors, antibiotics and ribosomal proteins on ribosomal RNA. This was followed by sequencing of the 16S and 23S rRNAs and determination of their secondary structures in collaboration with Carl Woese, and the first x-ray crystal structures of the ribosome. In recent years, research in the Noller lab has included studies on the mechanism of coupled translocation of mRNA and tRNA in the ribosome and the role of elongation factor EF-G in maintaining the translational reading frame.
SPEAKERS

Carl D. Novina, MD, PhD
Associate Professor of Medicine
Dana-Farber Cancer Institute, Harvard Medical School
Associate Member, Broad Institute of Harvard and MIT

Moderator and Closing Remarks

Carl D. Novina MD, PhD is an Associate Professor of Medicine at the Dana-Farber Cancer Institute & Harvard Medical School and an Associate Member of the Broad Institute of Harvard and MIT. His lab has made several important discoveries about the fundamental biology of noncoding RNAs and their dysregulation in cancers. His lab has also developed platform technologies to discover and drug non-coding RNAs, and build tools for epigenetic engineering and Boolean logic gated cell therapies. He has founded three companies to accelerate the translation of these tools to the clinic. Dr. Novina is the recipient of numerous awards and honors including the W.M. Keck Distinguished Young Scholars Award, Department of Defense Idea Award, The NCI Director’s Provocative Questions Award, the National Science Foundation Collaborative Research Project Award and the NIH Director’s Pioneer Award.

Jeffrey E. Saffitz, MD, PhD
Mallinckrodt Professor of Pathology, Harvard Medical School
Chairman, Department of Pathology, Beth Israel Deaconess Medical Center

Opening Remarks

Jeffrey E. Saffitz, MD, PhD is the Mallinckrodt Professor of Pathology at Harvard Medical School, and Chairman of the Department of Pathology at Beth Israel Deaconess Medical Center. Dr. Saffitz is an experimental cardiac pathologist whose work is focused on sudden cardiac death and arrhythmia mechanisms in familial cardiomyopathies. However, since assuming leadership of the Department of Pathology in 2005, his main focus of research faculty recruiting has been cancer pathobiology. In 2012, he first proposed that BIDMC develop a research center for the study of non-coding RNAs at BIDMC. The Department of Pathology provided substantial funding to
catalyze the creation of the Institute for RNA Medicine at BIDMC and the subsequent recruitment of Frank Slack as its Director in 2014. Since then, this center has grown into the Harvard-wide Initiative for RNA Medicine, a vibrant and visionary research program encompassing scientists from across the Harvard medical community.

Frank J. Slack, PhD
Director, Harvard Medical School Initiative for RNA Medicine, Shields Warren Mallinckrodt Professor of Medical Research
Departments of Pathology and Medicine
Beth Israel Deaconess Medical Center, Harvard Medical School

Welcoming Remarks and Moderator

Frank Slack, PhD, is director of the Harvard Medical School Initiative for RNA Medicine at Beth Israel Deaconess Medical Center. He is also the Shields Warren Mallinckrodt Professor of Medical Research in the Departments of Pathology and Medicine at Harvard Medical School. Dr. Slack received his BSc from the University of Cape Town in South Africa before completing his PhD in molecular biology at Tufts University School of Medicine. He started his work on microRNAs as a postdoctoral fellow in Gary Ruvkun’s laboratory at HMS. Dr. Slack subsequently moved to the Department of Molecular, Cellular, and Developmental Biology at Yale University, where he was a program leader in the Yale Cancer Center and the director of the Yale Center for RNA Science and Medicine. There he discovered that microRNAs regulate key human oncogenes and have the potential to act as therapeutics. He also demonstrated the first role for a microRNA in the aging process. In 2014, he joined BIDMC as the director of the Institute for RNA Medicine.

Dr. Slack studies the roles and uses of microRNAs and their targets in development, disease, and aging. He has been at the forefront of the small RNA revolution. He was part of the team that discovered the first human microRNA, let-7, and subsequently showed that it is a tumor suppressor that controls key cancer genes, such as RAS, MYC, and LIN28. The team is developing let-7 and a second microRNA, miR-34, as novel cancer therapeutics with miR-34 already in Phase I clinical trials. They also proved
that microRNAs act as oncogenes and developed strategies to target these oncomiRs for cancer therapy. Their research also extends to the discovery of additional novel small RNAs in development, cancer, aging, and diabetes as well as the identification of novel single nucleotide polymorphisms (SNPs) in the non-coding portions of the genome with an eye to identifying the next generation of targets in cancer.

Dr. Slack was an Ellison Medical Foundation Senior Scholar and received the 2014 Heath Memorial Award from MD Anderson Cancer Center.

Gyongyi Szabo, MD, PhD
Professor of Medicine and Faculty Dean for Academic Affairs
Harvard Medical School
Mitchell T. Rabkin Chair and Chief Academic Officer
Beth Israel Deaconess Medical Center

**Opening Remarks**

**MicroRNAs in Liver Disease**

Gyongyi Szabo, MD, PhD is a physician scientist and an authority on liver biology, immunology and inflammation. Her laboratory studies the cellular and molecular mechanisms of inflammation and innate immunity in liver injury to identify therapeutic targets focused on non-alcoholic liver disease, NASH and alcoholic liver disease. Her investigations recently revealed the importance of micro-RNAs and extracellular vesicles in liver diseases. She showed that exosomes can not only be biomarkers but also vehicles of inter-cellular and inter-organ communication. Her studies identified microRNA-122 as a central player in steatohepatitis and showed that miR-155 regulates exosome release. Earlier, her group discovered that Interferon Regulatory Factor 3 regulates hepatocellular damage and represents a key molecule in alcoholic hepatitis. Dr. Szabo’s group also made the novel discovery that NLRP3 activation and the IL-1ß pathway are potential therapeutic targets in alcoholic hepatitis and NASH. Her t studies in preclinical model of alcoholic hepatitis with the use of IL-1 receptor antagonist provided basis for a subsequent first-time clinical trial in humans with alcoholic hepatitis. Dr. Szabo’s is member of the Hungarian Academy of Sciences, and fellow of the AASLD, AGA and the American College of Physicians (ACP). She serves on advisory
boards of several federal agencies, leading academic institutions and pharmaceutical companies. Dr. Szabo served on the Governing Board and as President of the American Association for the Study of Liver Diseases (AASLD) in 2015 and she the inaugural Editor-in-Chief of Hepatology Communications. Dr. Szabo was recipient of the Distinguished Scientist Award of the American Liver Foundation in 2020.

Sohail Tavazoie, MD, PhD
Leon Hess Professor & HHMI Faculty Scholar
Meyer Laboratory of Systems Cancer Biology
Director, Black Family Metastasis Center
The Rockefeller University

What non-coding RNAs can teach us about metastasis and vice versa

Sohail Tavazoie’s lab studies the molecular mechanisms underlying metastatic progression. His lab has found that alteration in small RNAs (such as specific microRNAs, transfer RNAs, and tRNA-derived fragments) enables establishment of gene expression programs that mediate metastatic progression. By using such small RNAs as molecular probes, conceptual insights into how metastases form have been uncovered and experimental therapeutics have been developed that are currently in clinical testing. These studies have also yielded basic insights into mechanisms underlying gene expression regulation in normal cells. Dr. Tavazoie received his undergraduate degree from UC Berkeley and his M.D. and Ph.D. degrees from Harvard-MIT. Following residency training at Brigham and Women’s Hospital and postdoctoral training at HMS, he conducted oncology fellowship training at Memorial Sloan Kettering. He is Professor and director of the Black Family Metastasis Center and an HHMI Faculty Scholar.
Andrea Ventura, MD, PhD
Member, Cancer Biology and Genetics Program, Memorial Sloan Kettering Cancer Center

**New tools for dissecting miRNAs function in vivo**

Dr. Ventura went to Medical School in Rome, obtained a PhD in molecular and cellular biology at the European Institute of Oncology in Milan, and was a postdoc in the laboratory of Tyler Jacks, at MIT. As an independent investigator at MSKCC, Dr. Ventura’s research interests have focused on the role of miRNAs in cancer and development, and on using novel approaches to generate mouse model of human cancer.

The most recent findings include the functional characterization of the miR-17-92 cluster and its role in development and cancer, the identification — in collaboration with Jeanne Amiel’s group—of germline mutations of this miRNA cluster as the cause of Feingold Syndrome in humans, and the identification of miR-19 as a key oncogenic miRNA and a downstream effector of Myc. On the mouse modeling side, Dr. Ventura’s group pioneered the use of CRISPR for in vivo somatic chromosomal engineering, generating a series of mouse models of human cancers driven by chromosomal rearrangements.

Ioannis Vlachos, PhD
Assistant Professor, Department of Pathology, Harvard Medical School
Co-Director of the Bioinformatics Program, Cancer Research Institute
Beth Israel Deaconess Medical Center
Director of Bioinformatics, Precision RNA Medicine Core
HMS Initiative for RNA Medicine, BIDMC
Associate Member, Broad Institute of MIT and Harvard

**Integration of Spatial Technologies and Single Nucleus Sequencing to Decipher COVID-19 Phenotypes across Tissues**

Dr. Vlachos has continuously worked at the forefront of computational non-coding genome research, with a specific focus on non-coding RNAs such as microRNAs and long non-coding RNAs. The databases, models, and algorithms he has created empower researchers worldwide in decrypting ncRNA biogenesis, as well as in prioritizing ncRNAs as biomarkers or therapeutic targets. The systems and servers he has implemented are used by researchers in more than 55 countries worldwide,
in all continents, excepting Antarctica. Many of these tools are considered as reference resources and have been deemed as “Expert Databases” in RNACentral and are official data sources in the Ensembl database. In parallel, he continues his research in Machine Learning and AI, where he recently introduced Super Learning for the first time in next generation sequencing data analysis.

His research focuses on the effects of non-coding RNAs and non-coding variation on cancer initiation, progression and treatment, as well as immunosurveillance and immunoediting. Non-coding mutations and RNAs can be utilized as effective therapeutic targets or as biomarkers for diagnosis or patient stratification and management. The crosstalk between in silico, in vitro, and in vivo approaches, as well as between bench and bed-side have been central to Dr. Vlachos’s research. His long-term vision is to create the necessary methods and approaches that will enable the complete incorporation of the regulatory non-coding genome in personalized clinical decision making.
About the HMS Initiative for RNA Medicine

Directed by Frank J. Slack, PhD, the HMS Initiative for RNA Medicine (HIRM) is dedicated to harnessing the potential of RNA to revolutionize the way cancer and other diseases are treated and diagnosed. Founded in 2014 as the Institute for RNA Medicine under the leadership of BIDMC Cancer Center Director Pier Paolo Pandolfi, MD, PhD, and BIDMC Interim Chief Academic Officer, Jeffrey E. Saffitz, MD, PhD, the HIRM became a Harvard Medical School (HMS) Initiative in 2017 bringing together leading investigators in the field from the entire Harvard ecosystem to pursue new lines of inquiry into non-coding RNA.

HIRM Member’s research includes the study of blood cancers, prostate cancer, lung cancer, breast cancer, Alzheimer’s disease, diabetes, and heart disease. The HIRM is committed to making and translating RNA discoveries into novel therapeutics and diagnostics by enabling collaborations, providing tools, training, and new technologies, and by fostering a climate of outstanding basic, translational and clinical research with world-leading scientists and clinicians. In 2018, The HIRM opened a state-of-the-art ncRNA Precision Diagnostics and Therapeutics Core Facility which provides specialized technologies and services in delivery, detection, and bioinformatics analysis of ncRNAs.

For more information, please visit:

bidmc.org/research/research-centers/hms-initiative-for-rna-medicine

@irmdirector