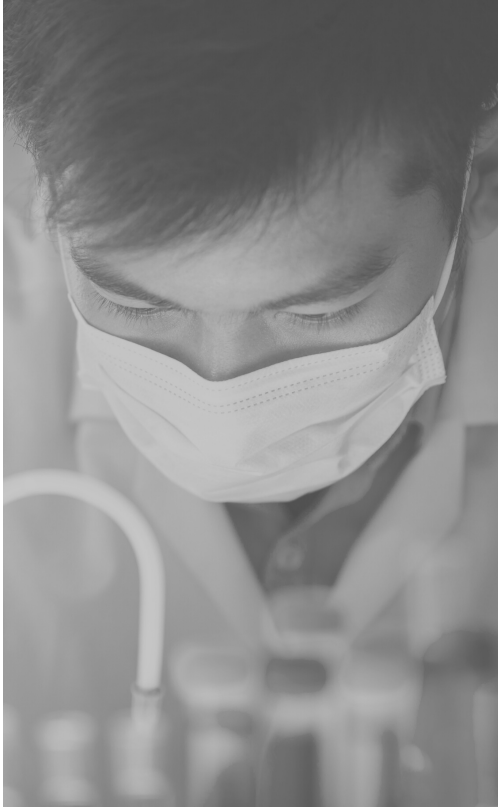

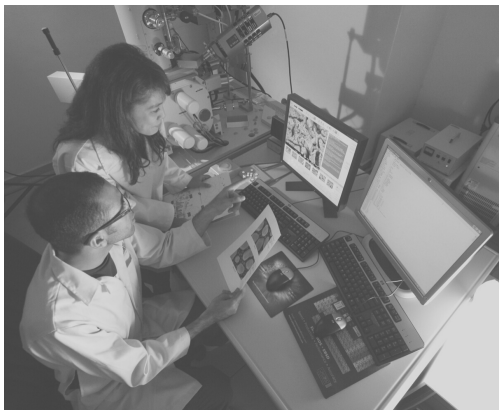

Viral Vector Development

Pre-Meeting Workshop

Monday, May 10

3 - 7: p.m. ET

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DYNO SESSIONS @ ASGCT 2021

Eric Kelsic, PhD - Co-founder & CEO
Tuesday May 11th - 5:45-6pm - Abstract #23
Efficient design of optimized AAV capsids using multi-property machine learning models trained across cells, organs and species

Lauren Wheelock, PhD - Scientist I, Machine Learning
Tuesday May 11th - 6-6:15pm - Abstract #24
Risk-Adjusted Selection for Validation of Sequences in AAV Design Using Composite Sampling

Kathy Lin, PhD - Sr. Scientist, Computational Biology
Thursday May 13th - 6:15-6:30pm - Abstract #190
AAV Capsid Property Estimation Is Improved by Combining Single-Molecule ID Tags and Hierarchical Bayesian Modeling of Experimental Processes

Building Dyno Therapeutics - Industry Symposium
Thursday May 13th - 5:15-6:45pm

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Viral Vector Development

Co-Chairs: Daniel Lipinski, MSc, D.Phil., and Lauriel Earley, Ph.D.

3:05 - 3:25 p.m.
Applications of Enzyme-tagging to Improve Gene Therapy Treatment Efficiency
Brian Bigger, Ph.D., University of Manchester

3:25 - 3:45 p.m.
Lentiviral and Alpha-retroviral Vectors for Gene Therapy of Stem Cells and Immunotherapies
Axel Schambach, M.D., Ph.D., Hannover Medical School

3:45 - 4:05 p.m.
Choosing the Right Promoter and Other Means to Modulate Transgene Expression
Christian Brendel, Ph.D., Boston Children's Hospital, Dana-Farber Cancer Institute, Harvard Medical School

4:05 - 4:25 p.m.
Applications of Replication Competent and Non-Integrating Lentivirus Vectors
Semih Tareen, Ph.D., Sana Biotechnology

Viral Vector Development

4:25 - 4:55 p.m.
Panel Discussion

- Brian Bigger, Ph.D., University of Manchester
- Axel Schambach, M.D., Ph.D., Hannover Medical School
- Christian Brendel, Ph.D., Boston Children's Hospital, Dana-Farber Cancer Institute, Harvard Medical School
- Semih Tareen, Ph.D., Sana Biotechnology

5:10 - 5:30 p.m.
Designing Vectors for Faithful Replication: Using NGS to Assess Vector Genome Integrity
Phillip Tai, Ph.D., University of Massachusetts Medical School

5:30 - 5:50 p.m.
The Role of AAV Vector Design in Influencing Outcomes in Hemophilia Gene Therapy
Denise Sabatino, Ph.D., The Children's Hospital of Philadelphia and The University of Pennsylvania

5:50 - 6:10 p.m.
Advances in Selection Strategies in AAV Capsid Bioengineering I
Leszek Lisowski, Ph.D., MBA, Children's Medical Research Institute

6:10 - 6:30 p.m.
Advances in Selection Strategies in AAV Capsid Engineering II
Hiroyuki Nakai, M.D., Ph.D., Oregon Health and Science University

Viral Vector Development

6:30 - 7:00 p.m.
Panel Discussion

- Phillip Tai, Ph.D., University of Massachusetts Medical School
- Denise Sabatino, Ph.D., The Children's Hospital of Philadelphia and The University of Pennsylvania
- Leszek Lisowski, Ph.D., MBA, Children's Medical Research Institute
- Hiroyuki Nakai, M.D., Ph.D., Oregon Health and Science University

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Brian Bigger, Ph.D.
University of Manchester

Professor Brian Bigger is Chair of Cell and Gene Therapy in the Division of Cell Matrix Biology and Regenerative Medicine at the School of Biological Sciences at Manchester University, UK. Brian's group works on pathology, diagnosis and clinical development of cell and gene therapies for lysosomal storage diseases. The lab has developed three haematopoietic stem cell gene therapies for MPSIIIA, MPSIIIB including a blood brain barrier targeted approach for MPSII. The lab has also developed an AAV gene therapy for MPSIIIC and continues to research new treatments and underpinning pathologies of neurological diseases. Brian is Chairman elect of the European Study Group for Lysosomal Diseases and part of the UK wide Advanced Therapies Treatment Centre network through iMATCH in Manchester.

Christian Brendel, Ph.D.

Boston Children's Hospital, Dana-Farber Cancer Institute, Harvard Medical School

Throughout my research career I have been involved in in the development and optimization of viral vectors for gene therapy applications, starting at a time where new insights led to a leap in the understanding of vector-host interactions. During my PhD and first Postdoc in Frankfurt, Germany (2005-2012) in the group of Dr. Manuel Grez the work focused on vector development for the treatment of X-linked chronic granulomatous disease, a severe immunodeficiency. This work ultimately contributed to the initiation of a phase 1 clinical study which is led by Don Kohn in the U.S. (NCT02234934). In 2013 I joined the laboratory of Dr. Williams at Boston Childrens Hospital to work on gene therapy for Sickle Cell Disease following a novel concept - the targeted modulation of the transcription factor BCL11A with the aim to reverse the fetal-to-adult hemoglobin switch. This work again formed the basis for a clinical trial which was initiated in 2018 with unprecedented clinical efficacy in sickle cell patients. In 2017 I started my own research group at the Blood Disorders Center of the Dana-Farber Cancer Center/Boston Children's Hospital. While the focus of my group's activities continues to be the development of cell and gene therapies for rare diseases, the technical repertoire has been extended to include cell therapy, gene editing and technology development for in vivo transduction in addition to viral vectors.

Lauriel Early, Ph.D.
Shape Therapeutics

Dr. Lauriel Earley is a Senior Scientist with Shape Therapeutics who has been studying the basic biology of adeno-associated virus for almost a decade. During her graduate studies at Oregon Health & Science University, she examined the role of assembly-activating protein under the mentorship or Dr. Hiroyuki Nakai. After receiving her PhD, she joined Dr. Jude Samulski's laboratory at the University of North Carolina, Chapel Hill and took on a project to characterize the intrinsic promoter ability of the intervered terminal repeat sequences from various AAV serotypes. Dr. Earley joined Shape Therapeutics in 2019 and is currently leading their vector optimization team. Her current focus is on vector design, packaging, and platform improvement. In addition, Dr. Earley has been an active member of ASGCT since 2012 and is currently serving on the Patient Outreach Committee and is Chair of the Ethics Committee.

Speakers

Daniel Lipinski, MSc, D.Phil.
Medical College of Wisconsin

Daniel M. Lipinski, DPhil earned a bachelor's degree (BSc) in Biology (2008) and a master's degree (MSc) in Virology (2009) from Imperial College London, UK, where he developed an interest for the structure of viruses and how they can be used as gene transfer vectors. Dr Lipinski completed his doctoral training (DPhil) under the supervision of Dr Robert E. MacLaren at the University of Oxford, UK, where his research focused on the development of gene independent approaches to prevent cone photoreceptor degeneration in retinitis pigmentosa. Dr Lipinski is the recipient of numerous awards, including a 2011 Young Investigator Award from the Association for Research in Vision and Ophthalmology (ARVO), the 2012 Ruskell Medal from the Worshipful Company of Spectacle makers and the inaugural 2013 Fulbright-Fight for Sight Research Scholarship, which allowed him to relocate to the University of Florida to work in the laboratory of Dr William W. Hauswirth on the design of capsid mutant rAAV vectors for vascular targeting. In 2016, Dr Lipinski joined the faculty at the Medical College of Wisconsin as an Assistant Professor of Ophthalmology and Visual Sciences, Cell Biology, Neurobiology and Anatomy, where he founded the Ocular Gene Therapy Laboratory (OGTL), which specializes in the development of gene therapy treatments for neurodegenerative and vascular diseases affecting the eye.

Leszek Lisowski, Ph.D., MBA
Children's Medical Research Institute

I am a molecular biologist specialising in developing and optimising novel viral vector technologies to deliver gene therapies to treat, and potentially cure, serious (often life-threatening) genetic diseases in children and adults. There are more than 6,000 genetic diseases (mostly rare individually, but collectively numerous in the population) - which account for 30% of admissions to children's hospitals - posing an enormous burden for children, their families and the health system. Until recently many genetic diseases were undiagnosable. Now, the genomic revolution has brought us to the juncture where, for many genetic conditions, the precise gene defect can be pinpointed, which provides an exciting basis for developing gene-based cures for these difficult, previously untreatable conditions. My research focuses on the development of safe and efficient viral vectors targeted to specific cell types, tissues, or organs - based on a virus called Adeno-Associated Virus (AAV). AAV-based vectors are the vehicle used most often to deliver a healthy copy of a gene to replace one that is defective in the organ(s) affected by the disease, correcting the disease at its source. This offers the potential not just to treat but cure life-threatening genetic diseases. Throughout my career I have worked with world-leading researchers who have fostered my scientific and leadership skills - starting with my PhD training under Professor Michel Sadelain, M.D., Ph.D., Cornell University/Memorial Sloan Kettering Cancer Center, New York - where I gained expertise in all aspects of vector design, production, transduction, transgene expression and analysis in vitro and in vivo.

My postdoctoral training was with Prof. Mark A. Kay M.D., Ph.D., Stanford University, who was Principal Investigator on the first recombinant AAV-based clinical trial targeting liver for the treatment of Haemophilia B. In late 2015, I was recruited to Children's Medical Research Institute, Westmead, Sydney to establish an independent research team, the Translational Vectorology Unit (TVU), and to establish and manage an Australian-first academic facility dedicated to the development, distribution and promotion of viral vectors and genome engineering technologies for fundamental and preclinical research - the Vector and Genome Engineering Facility (VGEF). My current research interests are related to liver biology, AAV biology and vectorology; development of novel bioengineered AAV variants using techniques such as Directed Evolution, in silico design, or directed genetic drift; development of novel AAV vectors for <i>in vitro and in vivo genome engineering without the use of endonucleases (an alternative to CRISPR technology), development of novel biologically predictive animal models, including dual-xenograft models, development and improvement of viral vector manufacturing technologies, including upstream production and downstream purification, which includes bespoke technologies and protocols required for efficient manufacturing of the next-generation, bioengineered AAVs.

Hiroyuki Nakai, M.D., Ph.D.
Oregon Health and Science University

Dr. Nakai received his M.D. from Kyoto Prefectural University of Medicine, Kyoto, Japan, in 1987. After completing his clinical residency and fellowship in Internal Medicine and receiving his Ph.D. in hematology-oncology in 1994, Dr. Nakai joined Avigen Inc., California, to develop recombinant adeno-associated virus (AAV) vectors for hemophilia gene therapy. In 1998, he joined Dr. Mark A. Kay's laboratory in the Departments of Pediatrics and Genetics, Stanford University School of Medicine, and studied the biology of AAV vectors in animals as a Postdoctoral Fellow and subsequently as a Senior Research Scientist. In 2005, Dr. Nakai joined the faculty in the Department of Microbiology and Molecular Genetics, University of Pittsburgh School of Medicine. In 2011, Dr. Nakai moved his lab to Oregon Health & Science University (OHSU) and joined the faculty in the Department of Molecular and Medical Genetics (MMG), OHSU. Dr. Nakai is currently School of Medicine Distinguished Professor in Molecular Medicine, in the Department of MMG and Molecular Microbiology and Immunology (MMI) and Senior Scientist in the Division of Neuroscience, Oregon National Primate Research Center (ONPRC). Dr. Nakai co-founded Capsigen Inc. in 2020. Dr. Nakai has been studying AAV vectors and gene therapy for 25 years in both academia and industry.

Denise Sabatino, Ph.D.

The Children's Hospital of Philadelphia and The University of Pennsylvania

Denise Sabatino, Ph.D. is a Research Associate Professor of Pediatrics at The Perelman School of Medicine at the University of Pennsylvania and The Children's Hospital of Philadelphia (CHOP). Dr. Sabatino graduated from The Ohio State University with a B.S. in Molecular Genetics. She earned her Ph.D. in Genetics at The George Washington University and the National Institutes of Health. During her postdoctoral fellowship at The Children's Hospital of Philadelphia, she investigated gene transfer for hemophilia B using AAV vectors. Dr. Sabatino joined the faculty at the University of Pennsylvania School of Medicine in 2008 in the Department of Genetics. In 2010 she became a member of the Division of Hematology and the Perelman Center for Cellular and Molecular Therapeutics at CHOP. Dr. Sabatino's research focuses on the coagulation factor VIII, gene-based therapeutics for hemophilia A and the immune response to factor VIII. The scope of her work includes characterization of novel FVIII variants with higher specific activity and improved secretion, development of factor VIII transgenes that augment factor VIII expression and studies to understand the fate of the AAV vector DNA after gene delivery.

Axel Schambach, M.D., Ph.D.
Hannover Medical School

Axel Schambach is Director of the Institute of Experimental Hematology at Hannover Medical School (Germany) and Professor for gene modification of somatic cells. Axel Schambach studied medicine in Hamburg, San Diego (UCSD), San Francisco (UCSF), Dallas, and Zürich. After his M.D. he moved to Hannover Medical School to join the Institute of Experimental Hematology (headed by Christopher Baum) and received his PhD in Molecular Medicine in 2005 from the Hannover Biomedical Research School. Since 2007 he is a group leader for hematopoietic gene and cell therapy in the Excellence cluster REBIRTH and co-guided a German-Chinese research group together with Prof. Duanqing Pei in the field of regenerative medicine and gene therapy. Since 2012 he is Associate Faculty and Lecturer at Boston Children's Hospital (in the Division of Hematology/Oncology (head: David Williams), Harvard Medical School) to develop new gene and cell therapies.

Phillip Tai, Ph.D.
University of Massachusetts Medical School

Phil graduated from UC Berkeley (BA, Molecular and Cellular Biology), and University of Washington (PhD, Biochemistry). His research focuses on the development of next-gen sequencing methodologies to profile AAV vector genome quality, and discovery and characterization of natural AAV capsid isolates for vectorization and gene therapy.

Semih Tareen, Ph.D.
Sana Biotechnology

Dr. Tareen is a virologist who has been developing gene and cell therapies for biotech start-ups. Originally from İzmir, Turkey, he has been living in Seattle since 1995. He completed his bachelors and PhD degrees from the University of Washington, with his thesis work taking place at the Fred Hutchinson Cancer Research Center under the guidance of Prof. Michael Emerman where he studied virus-host interactions. As a virologist, Dr. Tareen has been working with viruses for more than twenty years, focusing on viral vectors for the past eleven. During the Covid19 pandemic he has been an active speaker, both in English and Turkish, educating the public through his videos on his YouTube channel (Virus Fantom) and frequently presenting at academic institutions, scientific forums and on news outlets (branches of BBC, Deutsche Welle, and The Times). Currently he works as senior director at Sana Biotechnology developing viral vectors for gene and cell therapy against cancer and other diseases with his team.

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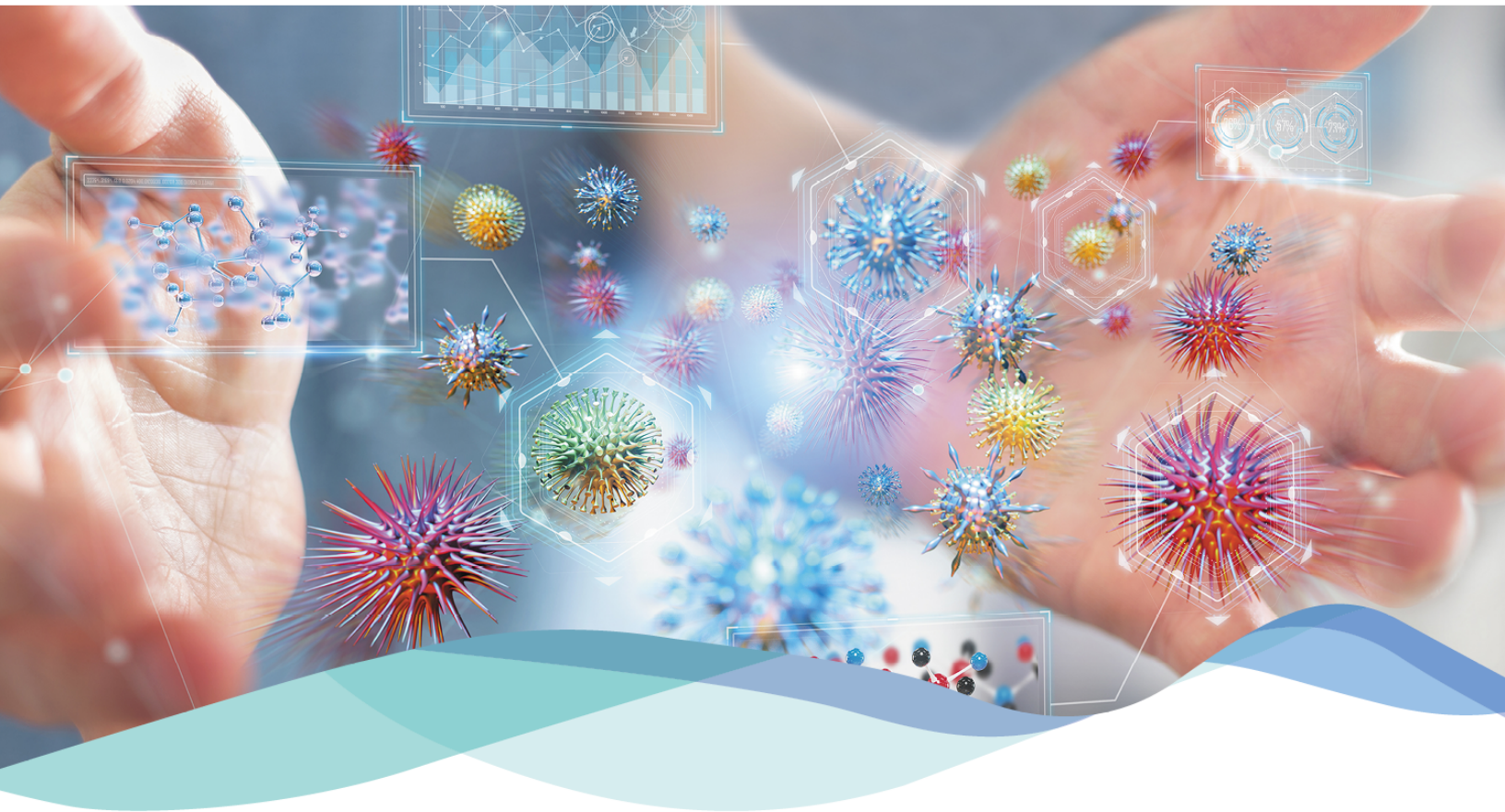

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