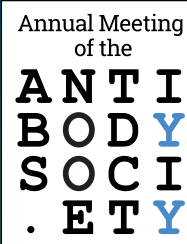


Antibody Engineering & Therapeutics

December 9-13, 2019
Marriott Marquis San Diego
San Diego, CA



LONGEST-RUNNING AND MOST-TRUSTED ANTIBODY ENGINEERING CONFERENCE FOR ACCELERATING NEXT GENERATION ANTIBODIES TO COMMERCIAL SUCCESS



KEYNOTES SHARE PERSPECTIVES TO FAST-TRACK YOUR R&D



Inspired by Nature: Translating Basic Science to Antibody Therapeutics

Janine Schuurman, Ph.D.

Vice President, Research, Genmab, The Netherlands



The Adaptive Immune Receptor Repertoire (AIRR) in Human Disease and for Drug Discovery

George Georgiou, Ph.D.

Professor, Laura Jennings Turner Chair in Engineering, Department of Chemical Engineering, The University of Texas at Austin



Trispecific Antibodies for Treating Cancer and AIDS

Gary Nabel, M.D., Ph.D.

Chief Scientific Officer and Senior Vice President, Head, North America R&D Hub, Sanofi



Immunoglobulin A: Trojan Horse or Magic Bullet?

Marjolein van Egmond, Ph.D.

Professor, Amsterdam University Medical Center, The Netherlands

Register by October 4 and Save Up to \$200 www.antibodyeng.com

THE LARGEST MEETING BRINGING YOU THE LATEST ANTIBODY SCIENCE, TECHNOLOGIES AND PARTNERS NEEDED TO ACCELERATE NEXT GENERATION ANTIBODIES TOWARDS COMMERCIAL SUCCESS



1000+

GLOBAL ANTIBODY SCIENTISTS AND EXECUTIVES

Fast-track your antibody research to the clinic and beyond by collaborating with leading pharma, biotech, academia and solution providers from North America, Asia and Europe.

135+

GLOBAL SPEAKER PRESENTATIONS

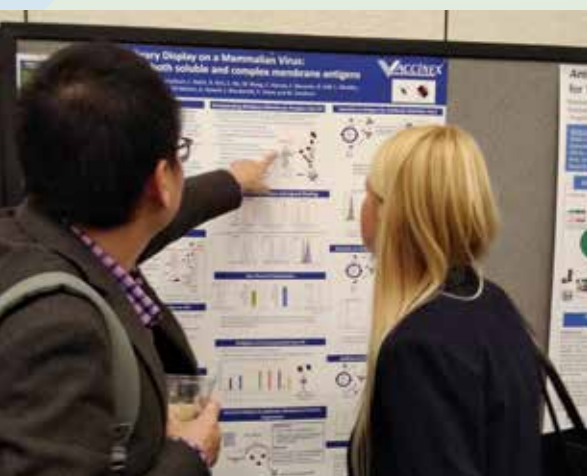
Expand your pipeline of antibody therapeutics by hearing case studies, new data and industry updates from leading experts working across the entire spectrum of antibody discovery and development.



125+

SCIENTIFIC POSTERS

Stay at the forefront of antibody innovation by accessing cutting-edge and unpublished data from fellow attendees.



75+

EXHIBITORS

Accelerate your promising therapeutic towards commercial success by connecting with leading technology and service providers.



NEW CONTENT AND SESSIONS FOR 2019!



- ▶ Expanded **Conference Advisory Board** and Guest Session Chairs
- ▶ **Bispecifics and ADCs: Accelerating Next-Generation Therapeutics** Workshop
- ▶ **Machine Learning** Workshop
- ▶ **Tumor-conditional Immunotherapy** Half-Day session
- ▶ **Tissue Specific Delivery of Antibodies** Half-Day session
- ▶ **Targeting Subcellular Trafficking Pathways to Generate Antibodies** Half-Day Session
- ▶ **Reverse Translation: Antibody Engineering and Clinical Data** Half-Day Session



POSTER SESSIONS: PRESENT YOUR COMPANY'S CUTTING-EDGE ANTIBODY RESEARCH

Any registered attendee may submit a scientific poster for display in the exhibit & poster hall during the event. Presenting a poster is a great way to share your company's innovative research with 1000+ global antibody scientists and executives. Visit the website to submit your poster abstract. Poster submission deadline: **Friday, November 8, 2019**

ANTIBODY ENGINEERING & THERAPEUTICS STUDENT/POSTDOC POSTER COMPETITION

To recognize the research activities of promising student and postdoctoral attendees of the Antibody Engineering & Therapeutics conference, The Antibody Society is sponsoring a student/postdoc poster competition. Two winners will be selected to receive:

- 1) Complimentary registration to attend the conference and pre-conference sessions;
- 2) An opportunity to give a short oral presentation of their work in a conference session; and
- 3) Support for travel expenses (up to \$400 for domestic or \$800 for international flights, 3 nights at the hotel, ground transportation).

In order to be considered for this poster competition, you must be a student or postdoc member of The Antibody Society.

If you are not already a member, you may register here for a free student or postdoc membership:

<https://www.antibodysociety.org/membership-account/membership-levels/>

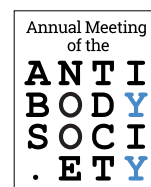
You must also check the box on the poster submission form indicating that you want your abstract to be considered for the poster competition. Your poster abstract must be submitted using the poster submission form at: www.antibodyeng.com

The deadline for submission of your poster abstract is October 15, 2019.

Winners will be notified by Friday, October 25, 2019.

Poster abstracts may be submitted and accepted for presentation at the conference after October 15, but any submissions received after October 15 will not be considered for the poster competition.

Sponsored by:



AGENDA AT-A-GLANCE

MONDAY, DECEMBER 9, 2019

9:00 am - 5:00 pm	Pre-Conference Training Course Introduction to Antibody Engineering	
1:00 pm - 5:00 pm	NEW Pre-Conference Workshop A: Bispecific Antibodies: New Strategies and Case Studies	NEW Pre-Conference Workshop B: Machine Learning in Antibody and Protein Engineering

TUESDAY, DECEMBER 10, 2019

Exhibit Hall & Poster Viewing Hours 4:00pm-7:15pm

KEYNOTE PRESENTATIONS

8:15 am - 8:25 am	Chairwoman's Opening Remarks	
8:25 am - 9:10	Inspired by Nature: Translating Basic Science to Antibody Therapeutics Janine Schuurman, Ph.D., Genmab, <i>The Netherlands</i>	
9:15 am - 10:00 am	The Adaptive Immune Receptor Repertoire (AIRR) in Human Disease and for Drug Discovery George Georgiou, Ph.D., The University of Texas at Austin	
10:35 am-11:20 am	Trispecific Antibodies for Treating Cancer and AIDS Gary Nabel, M.D., Ph.D., Chief Scientific Officer and Senior Vice President, Head, North America R&D Hub, Sanofi	
11:25 am-12:10 pm	Immunoglobulin A: Trojan Horse or Magic Bullet? Marjolein van Egmond, Ph.D., Amsterdam University Medical Center, <i>The Netherlands</i>	
12:15 pm - 1:15 pm	Scientific Luncheon Briefings: ATUM, Ablexis, Carterra, Charles River, Ligand	
1:15 pm - 1:45 pm	Scientific Briefings: Prolimmune, Abzena, ImmunoPrecise, MaxCyte	
1:45 pm - 2:15 pm	Scientific Briefings: Geneious Biologics, Trianni, Fusion Antibodies, Abcellera	
2:25 pm - 6:15 pm	Track 1: ANTIBODY LIBRARIES, SELECTION, SCREENING AND ENGINEERING	Track 2: NOVEL THERAPEUTIC TARGETS AND NON-CANCER INDICATIONS
4:00 pm -4:45 pm	Opening of Poster and Exhibit Hall	
6:15 pm-7:15 pm	Networking Reception, Exhibit and Poster Viewing	

WEDNESDAY, DECEMBER 11

Exhibit Hall & Poster Viewing Hours 9:45 am-7:15 pm

7:30 am - 8:00 am	Scientific Breakfast Briefings: PerkinElmer, Single Cell Technology, Inc.	
8:10 am -12:05 pm	NEW Track 1: BIOINFORMATICS AND COMPUTATIONAL TOOLS FOR ANTIBODY OPTIMIZATION AND ENGINEERING	NEW Track 2: REVERSE TRANSLATION: ANTIBODY ENGINEERING, CLINICAL DATA AND LESSONS FROM CANCER IMMUNOTHERAPY
12:05 pm - 12:35 pm	Scientific Briefings: Schrodinger, Harbour Biomed, Isogenica, LakePharma, Ligand	
1:45 pm - 2:15 pm	Scientific Briefings: Chemical Computing Group, Twist Bioscience, Syngene, Sphere Fluidics, Genscript	
2:25 pm - 6:15 pm	NEW Track 1: EMERGING TECHNOLOGIES AND APPROACHES FOR ANTIBODY ENGINEERING	Track 2: ENGINEERING AND APPLICATION OF THERAPEUTIC ANTIBODIES FOR NEURODEGENERATIVE DISEASES
6:15 pm - 7:15 pm	Networking Reception, Exhibit and Poster Viewing	

THURSDAY, DECEMBER 12, 2019

Exhibit Hall & Poster Viewing Hours 9:45 am-2:10 pm

7:30 am - 8:00 am	Scientific Breakfast Briefings: Roche, Ablexis	
8:10 am - 12:00 pm	NEW Track 1: SYSTEMS IMMUNOLOGY FOR THERAPEUTIC TARGET DISCOVERY	NEW Track 2: TISSUE SPECIFIC DELIVERY OF ANTIBODIES
12:00 pm - 12:30 pm	Scientific Briefings: Abveris Antibody, Berkeley Lights, GenScript, Fujifilm Diosynth	
2:10 pm - 5:45 pm	Track 1: EFFECTOR FUNCTIONS OF THERAPEUTIC ANTIBODIES	Track 2: PRECLINICAL DEVELOPMENT OF ANTIBODY-BASED THERAPEUTICS
5:45 pm - 6:30 pm	Special Session of the Antibody Society – "Antibodies to Watch in 2020"	

FRIDAY, DECEMBER 13, 2019

8:25 am - 12:00 pm	NEW Track 1: TARGETING SUBCELLULAR TRAFFICKING PATHWAYS TO GENERATE ANTIBODY THERAPEUTICS	NEW Track 2: TUMOR-CONDITIONAL IMMUNOTHERAPY
1:25 pm - 5:00 pm	NEW Track 1: SPECIAL JOINT SESSION WITH THE CHINESE ANTIBODY SOCIETY	NEW Track 2: LOOKING AT TARGETS DIFFERENTLY

INTRODUCTION TO ANTIBODY ENGINEERING

Add-on this pre-conference training course to your main conference registration package for an additional fee and gain a comprehensive overview of antibody engineering in an easy-to-follow classroom setting to help you prepare for the main conference program. Training course registration begins at 8:30am.

Break Schedule: AM Break: 10:30-11:00;

Lunch: 12:30-1:30; PM break: 3:00-3:30

TRAINING COURSE OVERVIEW

Today's wealth of knowledge of protein structures will be reviewed along with the genetics of diversity generation of antibodies, to give insights into the best strategies for improving protein function. There is particular emphasis on the choice of a functional assay to monitor effectively the changes in a desired property, and the use of functional enrichment steps where a library approach is employed. Not only is amino acid sequence amenable to engineering, but glycan structures and other modifications may also be engineered. The course will focus on the engineering and enhancement of antibodies and antibody-like scaffolds. Examples will include work on antibody fragment affinity improvement by 100-fold to low pM affinity. Also the engineering of bispecific antibodies by diverse approaches and the adaptation to generate Chimeric Antibody Receptor (CAR) constructs will be discussed. Expression platforms for producing antibodies for testing and for manufacture will also be covered. A background in biochemistry and molecular biology is useful, as the course is designed to progress rapidly from simple to advanced concepts.

INSTRUCTOR

David Bramhill, Ph.D., Founder, **Bramhill Biological Consulting, LLC** and **Research Corporation Technologies**

COURSE AGENDA

- Functions amenable to engineering: affinity, specificity, stability, solubility, immunogenicity
- The measure of success: functional assays
- Engineering by design
- Engineering by random mutation
- Designed libraries
- Display technologies
- Improving manufacturing by protein engineering methods
- Glycosylation engineering – function and homogeneity
- Other protein modifications
- Immunogenicity engineering
- Bispecific antibodies
- Antibody-drug conjugates (ADCs)
- CAR-T strategies
- Expression of antibodies and fragments for discovery and testing
- Manufacturing platforms for antibodies and fragments

Antibody Engineering & Therapeutics Advisory Board and Planning Committee

Gregory Adams, Ph.D., Industry Expert

Andrew Bradbury, M.D., Ph.D., Chief Scientific Officer, **Specifica**

Dennis R. Burton, Ph.D., Professor, Department of Immunology and Microbiology, **The Scripps Research Institute**

Paul J. Carter, Ph.D., Senior Director and Senior Staff Scientist, Antibody Engineering, **Genentech, Inc.**

Kerry A. Chester, Ph.D., Professor of Molecular Medicine, UCL Cancer Institute, **University College London, United Kingdom**

James S. Huston, Ph.D., Chairman, **The Antibody Society**; Managing Member, **Huston BioConsulting, LLC**

James Larrick, M.D., Ph.D., Managing Director and Chief Medical Officer, **Panorama Research Institute and Velocity Pharmaceutical Development**

Paul W.H.I. Parren, Ph.D., Professor, Department of Immunohematology and Blood Transfusion, **Leiden University Medical Center** and EVP and Head of R&D, **Lava Therapeutics, The Netherlands**

Andreas Plückthun, Ph.D., Professor and Director, Department of Biochemistry, **University of Zürich, Switzerland**

Janice M. Reichert, Ph.D., Executive Director, **The Antibody Society**; Editor-in-Chief, mAbs; Managing Director, **Reichert Biotechnology Consulting LLC**

Janine Schuurman, Ph.D., Vice President, Research, **Genmab, The Netherlands**

Jamie K. Scott, M.D., Ph.D., Professor Emeritus, Department of Molecular Biology & Biochemistry and Faculty of Health Sciences, **Simon Fraser University, Canada**

Sally Ward, Ph.D., Professor, **University of Southampton and Texas A&M University Health Science Center**

K. Dane Wittrup, Ph.D., C.P. Dubbs Professor of Chemical Engineering and Biological Engineering, Koch Institute for Integrative Cancer Research, **Massachusetts Institute of Technology**

Guest Session Chairs

Nima Aghaepour, PhD, Assistant Professor, Department of Anesthesiology, Perioperative and Pain Medicine, **Stanford University School of Medicine**

Daniel S. Chen, M.D., Ph.D., Chief Medical Officer, **IGM Biosciences**

Jennifer Cochran, Ph.D., Professor and Department Chair of Bioengineering, **Stanford University**

James Ernst, Ph.D., Senior Director and Head of Protein Sciences, **Amphivena Therapeutics**

Mitchell Ho, Ph.D., Senior Investigator, Laboratory of Molecular Biology, **NIH NCI**

Aran Labrijn, Ph.D., Principal Scientist, Antibody Research and Technology, **Genmab, The Netherlands**

Anne Messer, Ph.D., Professor of Biomedical Sciences, **University at Albany** and Principal Investigator, Neural Stem Cell Institute, **Regenerative Research Foundation**

Matthew Robinson, Ph.D., VP, Research & Development, **Immunome, Inc.**

Sai Reddy, Ph.D., Associate Professor, Department of Biosystems Science and Engineering, **ETH Zurich/Swiss Federal Institute of Technology, Switzerland**

David Shen, Ph.D., SVP, Biologics Research and CMC, **NGM Biopharmaceuticals**

Workshop A: **BISPECIFIC ANTIBODIES: NEW STRATEGIES AND CASE STUDIES**1:00 **Workshop Co-Moderators' Remarks**

Aran Labrijn, Ph.D., Principal Scientist, Antibody Research and Technology, **Genmab**, *The Netherlands*

1:15 **Bispecific Antibodies: History and (Future) Promises**

Since the concept of a man-made bispecific antibody was originally described (almost 60 years ago), many technical and conceptual advances have led to the extensive bispecific antibody landscape known today. A short historical perspective will be given, including discussion of the different bispecific antibody classes, the unique opportunities for dual-targeting and the (current) challenges facing the (pre-)clinical development of bispecific antibodies.

Aran Labrijn, Ph.D., Principal Scientist, Antibody Research and Technology, **Genmab**, *The Netherlands*

1:45 **Accessing Novel Functionalities of Bispecific Antibodies - Target Pair Discovery by Screening a Large "Select, Mix and Assay" Combinatorial Library**

To discover unique functionalities of bispecific antibodies, we have developed technology to facilitate unbiased target pair identification by functional screening of 1000's of bispecific antibodies to 100's of different target combinations. Our screening format & growing library allows immediate generation of assay-ready bispecific antibodies by simple mixing of selected specificities. Screening campaigns and examples of the discovery of unique obligate bispecific functions for multiple therapeutic applications will be described.

Helene Finney, Ph.D., Head of Bispecific Target Discovery, **UCB**, *United Kingdom*

2:15 **Benchmarking T Cell-Redirecting Therapies for Cancer: Comparing CD3-engaging Bispecifics and CAR T Cells**

The two leading platforms for redirecting a patient's T cells to recognize tumors, CD3-binding bispecific molecules and chimeric antigen receptor (CAR) T cells, both show clinical activity. We have developed pre-clinical in vitro and in vivo models to mechanistically compare these two technologies and will discuss our findings as well as the clinical implications.

David DiLillo, Ph.D., Senior Staff Scientist, Immuno-Oncology, **Regeneron Pharmaceuticals**

2:45 **Networking Refreshment Break**3:15 **A Biparatopic Agonist Antibody for OX40 That Exhibits Superior Activity Without Secondary Crosslinking**

The development of agonistic antibodies that activate T-cell co-stimulatory pathways represents a therapeutic strategy with significant clinical potential. However, challenges remain for the translation from in vitro efficacy to clinical success. OX40 and other tumor necrosis factor receptor (TNFR) superfamily members are notorious for requiring high-order receptor clustering in order to achieve full activity. For monoclonal antibodies, this high-order clustering is generally achieved through secondary cross-linking strategies. In vivo, this secondary cross-linking is often supplied through immune effector cells via Fc engagement. Bispecific and biparatopic antibodies represent an emerging class of drug molecules that enable unique mechanisms of action relative to their monoclonal counterparts. Here, we describe the use of our bispecific B-body™ platform for the generation of biparatopic OX40 agonistic antibodies. These agonist antibodies have been characterized using primary T cell assays to monitor the kinetics of growth proliferation and cytokine secretion, outperforming cross-linked antibodies currently being tested in clinical trials. In co-culture systems, these agonist antibodies were effective in inhibiting the immuno-suppressive properties of Tregs and M2 macrophages. In addition, we have shown in vivo efficacy in mouse tumor cell models. Our lead OX40 agonist antibody has been optimized for activity and developability and has entered stable cell line development to further support pre-clinical activities.

Jonathan Davis, Ph.D., Head of Discovery, **Invenra, Inc.**

3:45 **Bispecifics and Blood Brain Barrier**

Mihalis Kariolis, Ph.D., Scientist, Antibody and Protein Engineering, **Denali Therapeutics**

4:15 **Developing Bi-/tri-specific Antibodies for Prevention and Treatment of HIV-1 Infection**

We have engineered two types of bi-/tri-specific antibodies that can be used for prevention and treatment of HIV-1 infection. The first type is where all specificities target HIV-1, which we have shown to provide expanded protection against infection. The second type incorporates T cell engaging specificities in addition to an arm targeting HIV-1 that will be used to activate and target the latent reservoir of HIV-1 infected cells for elimination.

Amarendra Pegu, Ph.D., Head, Antibody Research, Virology Core, **VRC, NIAID, NIH**

4:45 **Concluding Remarks and Discussion**5:00 **Close of Workshop**

Workshop B: **MACHINE LEARNING IN ANTIBODY AND PROTEIN ENGINEERING**

1:00 Workshop Co-Moderators' Remarks

Sai Reddy, Ph.D., Associate Professor, Department of Biosystems Science and Engineering, **ETH Zurich/Swiss Federal Institute of Technology, Switzerland**

Andrew Bradbury, M.D., Ph.D., Chief Scientific Officer, **Specifica**

1:15 Machine Learning for Protein Engineering

Machine learning, as a part of a family of tools related to artificial intelligence, is an emerging field of information and computer science that uses large data sets to extract features and representations. Protein engineering is reliant on experimental platforms of high-throughput expression and screening of libraries. Here, I will describe how researchers are using machine learning to assist in protein engineering experiments and thus move beyond experimental screening.

Sai Reddy, Ph.D., Associate Professor, Department of Biosystems Science and Engineering, **ETH Zurich/Swiss Federal Institute of Technology, Switzerland**

1:45 Directed Evolution Guided by Machine Learning: An Application to Combinatorial Libraries

Directed evolution, limited by throughput, often proceeds through the iterative accumulation of single or pairwise mutations. We describe an approach that embraces the epistatic nature of proteins by directly exploring combinatorial sequence space, a space that is intractable experimentally but accessible with machine learning. This approach is validated on an empirical fitness landscape, and we also demonstrate an application in evolving enzymatic enantiodivergence.

Zachary Wu, PhD Candidate in Frances Arnold Group, **California Institute of Technology**

2:15 Antibody Complementarity Determining Region Design Using High-Capacity Machine Learning

We show that machine learning methods can design human Immunoglobulin G (IgG) antibodies with target affinities that are superior to candidates directly derived from phage display panning experiments. We also show that machine learning can improve specificity by identifying antibodies that bind to a specific epitope.

David Gifford, Ph.D., Professor of Electrical Engineering and Computer Science and Professor of Biological Engineering, **Massachusetts Institute of Technology**

2:45 Networking Refreshment Break

3:15 Deep Learning for Antibody-specific Epitope Prediction

We have developed a deep learning approach that enables efficient and effective large-scale antibody epitope prediction by learning the determinants of specific recognition implicitly encoded in sequence and structure. Our method leverages several insights: (1) graph convolution aggregates the effects of coherent groups of residues in mediating interactions; (2) an attention mechanism promotes consistency of inferred interfaces across both interacting partners; (3) transfer learning allows an antibody-specific model to leverage the relatively much larger database of general protein-protein interactions. We show that our data-driven approach achieves a higher precision and recall at predicting antibody epitopes than current state-of-the-art methods, including those using explicit docking. Our method can thus support rapid characterization of potential epitope specificities of large panels of discovered antibodies, guiding further selection and experimental characterization.

Chris Bailey-Kellogg, Ph.D., Professor, Computer Science, **Dartmouth**

3:45 Deciphering Interaction Fingerprints from Protein Surfaces for the Optimization of Biologics

Predicting interactions between proteins and other biomolecules purely based on structure is an unsolved problem in biology. A high-level description of protein structure, the molecular surface, displays patterns of chemical and geometric features that fingerprint a protein's modes of interactions with other biomolecules. Fingerprints may be difficult to grasp by visual analysis but could be learned from large-scale datasets. We present MaSIF, a conceptual framework based on a new geometric deep learning method to capture fingerprints that are important for specific biomolecular interactions. We anticipate that our conceptual framework will lead to improvements in our understanding of protein function and design.

Bruno Correia, Ph.D., Tenure Track Assistant Professor, Laboratory of Protein Design & Immunoengineering, **EPFL, Switzerland**

4:15 Identifying Antigen-specificity Patterns in Antibody Repertoires by Deep Learning

Deep sequencing of antibody repertoires has become a promising and powerful tool in basic immunology, immunodiagnostics and the drug discovery process. However, identification of relevant information in these large datasets remains challenging. I will explain how we are using deep learning to identify patterns of antigen-specificity from the antibody repertoires of immunized mice. Deep generative modeling is then used to elucidate the antibody sequence space by generating thousands of novel and functional variants in-silico, highlighting how deep learning can be directly used for antibody discovery and engineering.

Simon Friedensohn, Ph.D. Student, **ETH Zurich/Swiss Federal Institute of Technology, Switzerland**

4:45 Concluding Remarks and Discussion

5:00 Close of Workshop



7:15 **Registration and Coffee**

8:15 **Chairwoman's Opening Remarks**

8:25 **Inspired by Nature: Translating Basic Science to Antibody Therapeutics**

Antibody biology research can be a huge source of inspiration. Besides giving a detailed understanding of structure-function relations of the antibody with other molecules (e.g. other antibodies, targets, Fc-receptors, complement factors), it can drive ideation to invent format technologies. In addition, such knowledge might move antibody product ideation from technologically-focused to more biologically-focused processes in which disease biology, its underlying mechanisms and targets, combined with the antibody format are all regarded as critical components for a transformative product.

Janine Schuurman, Ph.D., Vice President, Research, **Genmab, The Netherlands**

9:10 **Keynote Questions**

9:15 **The Adaptive Immune Receptor Repertoire (AIRR) in Human Disease and for Drug Discovery**

This presentation will first summarize a suite of technologies our lab has developed for determining and the antigen-specific B cell, T cell and importantly, the circulating antibody repertoires. Second, the utility of delineating serological, BCR and TCR repertoire for the understanding how adaptive immune responses confer to protection against infectious diseases and alternatively how they contribute to pathophysiology in autoimmune conditions will be discussed

George Georgiou, Ph.D., Professor, Laura Jennings Turner Chair in Engineering, Department of Chemical Engineering, **The University of Texas at Austin**

10:00 **Keynote Questions**

10:05 **Networking Refreshment Break**

10:35 **Trispecific Antibodies for Treating Cancer and AIDS**

Gary Nabel, M.D., Ph.D., Chief Scientific Officer and Senior Vice President, Head, North America R&D Hub, **Sanofi**

11:20 **Keynote Questions**

11:25 **Immunoglobulin A: Trojan Horse or Magic Bullet?**

Immunoglobulin A (IgA) is a very potent stimulus to trigger neutrophil activation and migration through interaction with the IgA Fc receptor (Fc α R1). Neutrophil activation can be beneficial in mucosal infections, as this will help to clear potential infectious threats. However, abnormal or excessive IgA immune complexes induce disproportionate neutrophil recruitment and activation, which ultimately leads to significant tissue damage in autoimmunity. Conversely, unleashing the destructive capacity of neutrophils in tumors may represent an attractive opportunity in anti-cancer therapy.

Marjolein van Egmond, Ph.D., Professor, **Amsterdam University Medical Center, The Netherlands**

12:10 **Keynote Questions**

12:15 pm Scientific Luncheon Briefings



Building Better Antibodies from Genes to Cell Lines

ATUM combines recent developments in genome engineering, automation, big data and product analytics to increase efficiency of engineering and developability of biologics and cell lines. Cell lines generated using the LeapIn® transposase combined with optimized vector constructs, proprietary codon optimization and QSAR-based antibody engineering allow for an information rich and efficient optimization of the increasingly complex biologics approaching the market place.

Claes Gustafsson, Ph.D.,
Co-founder and Chief
Commercial Officer, **ATUM**



Implementing High-Throughput SPR in Recombinant Antibody Discovery and Library Development

SPR-based technologies are catching up with the throughput required for the rapidly expanding field of antibody therapeutics, so becoming an invaluable support for many aspects of recombinant antibody development. This presentation will offer an overview of the kinetic analyses and epitope binning experiments that are routinely implemented at Specifica using the Carterra LSA in affinity maturation campaigns, lead prioritization from selection campaigns, and characterization of our next generation antibody libraries.

Sara D'Angelo, Ph.D.,
VP of Library Development,
Specifica, Inc.



CAR-T, GPCRs, Antiviral bnAbs, Antivenom bnAbs: Precision Epitope Selection at Distributed Bio

In biologic discovery, epitopes dictate function. Here we present a series of case studies on engineering tools we have developed to guide discovery towards rare and valuable epitopes. With CAR-Ts, we describe the importance of epitope and orientation for function, and present a novel discovery technology that enables rapid identification of scFv and VHH CAR-T binders directly by function at ultra high-throughput. With GPCRs, we present a generalized solution towards functionally active fully human antibodies against GPCRs. With rapidly mutating viruses, we share a series of case studies illustrating a method for rapid recovery of broadly neutralizing antibodies against any polymorphic virus. With antivenom, we present a case study for recovering broad spectrum antivenom antibodies from a hyperimmune individual with a unique venom exposure history. Collectively, the case studies demonstrate practical advantages of computational immuno-engineering methods in raising antibodies against rare epitopes in challenging target scenarios.

Jacob Glanville, Founder, CEO
and President, **Distributed Bio**



1:15 pm Scientific Briefings



An Integrated Approach to Managing Immunogenicity Risk and Optimum Protein Design

Integrated platforms can be used to mitigate immunogenicity risk and characterize immune responses during the drug design and development stages. ProImmune offers mutational activity mapping for optimal protein design, DC-T/T cell proliferation assays for biologic lead selection/optimization, a Mass Spectrometry assay for characterization of antigen presentation; HLA-peptide binding assays to characterize individual epitopes & undiluted whole blood cytokine storm assays.

Emilee Knowlton, Ph.D., Immunology
Sales Specialist, **ProImmune, Inc.**



Developability: Evaluating Specificity, Immunogenicity, Functionality, and Manufacturability for Lead Candidate Selection

Developability assessment is based on multiple readouts that capture the fundamental characteristics of successful drug design: specificity, functionality, safety and manufacturability. Developability assessment can severely reduce the time and expenditure required to take multiple lead candidates through expensive cell line development and manufacturing runs when the molecule has inherent liabilities that will inhibit its progress. Why do it: 1) Identify liabilities and risk factors in drug candidates early in the development process; 2) Scope to apply design alterations to fix/reduce liabilities; 3) Select the best drug candidate(s) for development; 4) Reduces risk and expenditure on later costly stages of development: production cell line generation and manufacture.

Arron Hearn, Ph.D., Group Leader,
Protein Engineering, **Abzena,**
United Kingdom



1:45 pm Scientific Briefings



Reproducing Results from 5 papers in 25 minutes! Rapid Analysis of NGS Data for Therapeutic Drug Discovery

NGS is accelerating the field of therapeutic antibody research and scientists face a growing need for software that enables them to efficiently and accurately analyze and mine rapidly growing data sets. We here present an easy to use, versatile bioinformatics software platform to analyze antibody and immune repertoire data. We focus on data from five scientific publications which require a large toolbox for UMI handling, merging and clustering of NGS reads, comparison of immune repertoires, searching against public and patent data, associating assay data and much more.

Jannick Bendtsen, Ph.D., Vice President of Technology Services, **Geneious Biologics**, New Zealand

TRIANNI Exceptional Human Antibody Discovery with a Best-in-Class Transgenic Mouse

The Trianni Mouse® is a transgenic antibody discovery platform that expresses the entire human antibody repertoire in a single organism. Sequence optimized, human heavy, kappa and lambda repertoires were gene-targeted in place of the deleted mouse immunoglobulin gene segments. In the transgenic immunoglobulin loci, mouse non-coding, regulatory elements drive optimal expression of the human variable domains. As a result, somatic hypermutation, heavy chain class switching and B cell development are as robust as in the wild type mouse. Building on the Trianni Mouse human antibody repertoire, the company is also developing novel transgenic mouse strains that simplify and accelerate antibody discovery, and mice that generate special types of immunoglobulins. The Trianni Mouse is the platform of choice for over thirty global pharma and biotech companies for the development of novel medicines.

Linda Masat, Ph.D., Vice President of Business Development, **Trianni, Inc.**



Comparison of in silico and Mammalian Display Technologies for Affinity Screening

We present a case study comparing in silico and mammalian display technologies. A library of variants for Trastuzumab was designed using both methods and the results were compared to achieve lead candidate selection.

Leona McGirr, Ph.D., Team Leader-Affinity Maturation, **Fusion Antibodies**, United Kingdom



Uncovering Critical Receptors and Assessing Target Specificity of Biotherapeutics

Cell microarray screening of plasma membrane and tethered secreted proteins that are expressed in human cells enables rapid discovery of primary receptors as well as potential off-targets for a variety of biologics including: peptides, antibodies, proteins, CAR T and other cell therapies. Case studies will demonstrate the utility of the technology in identifying novel, druggable targets as well as in specificity screening to aid safety assessment and provide key data to support IND submissions.

Alex Kelly, US Business Development Manager, **Retrogenix Limited**, United Kingdom



Track 1: ANTIBODY LIBRARIES, SELECTION, SCREENING AND ENGINEERING

2:25 Chairman's Remarks

Andrew Bradbury, M.D., Ph.D., Chief Scientific Officer, **Specifica**

2:30 Next Generation Platforms for Antibody Discovery

Antibody display libraries have served as a rich source of therapeutic antibodies. However, antibody leads selected from display libraries usually require downstream affinity and developability optimization, extending lead development timelines and costs. Specifica has established a unique antibody discovery display platform based on natural antibody sequences in which subnanomolar antibodies, requiring minimal optimization, are routinely selected.

Andrew Bradbury, M.D., Ph.D., Chief Scientific Officer, **Specifica**

3:00 Immune Checkpoint Inhibitor Antibody Discovery, Optimization and Developability Enhancement by Mammalian Display

Optimised methods for the integration of IgG genes into HEK293 and CHO cells by CRISPR/Cas9 and TALE nucleases were developed to create large mammalian antibody display libraries. Multi-parametric FACS was used to discover anti- PD-L1 and anti- PD1 antibodies with desired specificity, binding affinity, species cross-reactivity and expression level. Mammalian display selection enabled ultra-high throughput developability screening. Mammalian display was also employed for CAR-T discovery.

Michael Dyson, Ph.D., Chief Technology Officer, **IONTAS Ltd.,** United Kingdom

Track 2: NOVEL THERAPEUTIC TARGETS AND NON-CANCER INDICATIONS

2:25 Co-Chairs' Remarks

James Larrick, M.D., Ph.D., Managing Director and Chief Medical Officer, **Panorama Research Institute and Velocity Pharmaceutical Development**

David Shen, Ph.D., SVP, Biologics Research and CMC, **NGM Pharmaceuticals**

2:30 A Microbially Produced Antibody Format Formulated in Food for Modulating GI Tract Targets

Until recently it has been difficult to harness the specificity of antibody drugs to modulate gastro-intestinal tract biology, as the GI tract has evolved to efficiently degrade proteins. We have developed a molecular format, VHH-IgAFC that can be secreted from yeast and which can be freeze- or spray-dried to a food-admixable powder. All unit processes in this manufacturing scheme have previously been fully scaled in the food/feed enzyme industry. In the pig model of the human GI tract, such antibody products potentially blocked ETEC colonization, a first application of veterinary medicine value.

Nico Callewaert, Ph.D., Professor, Biochemistry and Biotechnology, **VIB-UGent Center for Medical Biotechnology**, Belgium

Track 1: ANTIBODY LIBRARIES, SELECTION, SCREENING AND ENGINEERING (continued)

Antibody-clonotype (DPAC)

We have developed a method we have termed "DPAC" that allows us to target antibodies against antigens at a nearly amino acid resolution. We will demonstrate the utility of the method in identifying: (i) functional antibodies against enzyme active sites, (ii) clonotypes of antibodies that can recognize non-modified and modified amino acids, and (iii) splice sites in proteins. Additional utility of DPAC2 and extensions of it to other platforms will be discussed.

Michael Weiner, Ph.D., VP, Molecular Sciences, **Axiomx**, an **Abcam Company**

4:00 Networking Refreshment Break and Opening of Exhibit and Poster Hall

4:45 Antigen Discovery Driven by Efficient and Differential Phage Display Selection of Antibody Libraries on Cells

The selection of antibody libraries displayed on phage against cells is notoriously challenging due to the stickiness of bald phage. A new method, termed Fab biotinylation and capture (FBC), was developed to address this shortcoming. Following proof-of-concept (www.ncbi.nlm.nih.gov/pubmed/30213726), FBC was used for differential selection on target cells versus non-target cells followed by next-generation sequencing (NGS). Combining FBC and NGS was applied to antigen discovery in multiple myeloma.

Christoph Rader, Ph.D., Professor, Department of Immunology and Microbiology, **The Scripps Research Institute**

5:15 Unbiased Specificity Assessment of Antibodies

NEW DATA

An important aim in antibody development is to identify all binding proteins. We have tested monoclonal antibodies in three assays with near-proteome-wide coverage: immuno-precipitation and mass spectrometry, phage-immunoprecipitation and for binding to protein arrays. The results show that most antibodies are oligo-specific and that cross-reactivity is application-dependent.

Fridtjof Lund-Johansen, M.D., Ph.D., Senior Scientist, Immunology, **Oslo University Hospital, Rikshospitalet, Norway**

5:45 Triple Vector for Discovery of Antibody Molecules in Therapeutic Format

Phage display technology is a very powerful tool widely used to select antibody fragments such as Fabs, scFvs and VHHs. When envisioned for, mainly, therapeutic purposes the phage display selected antibody fragments are converted to immunoglobulins or to Fc fusion proteins and expressed in mammalian cells. The resulting final molecules are bivalent, possess Fc effector function and a half-life comparable to natural immunoglobulins. This conversion process is a bottleneck in antibody discovery as this is labor intensive and time-consuming. Moreover, for some antibody fragments (i.e. scFvs) the conversion to Fc fusion proteins result in loss of activity. To circumvent all these drawbacks, we have generated a vector ("triple vector") containing the elements necessary not only for phage display and the production of soluble antibody fragments fused to human Fc in bacteria, but also for production in mammalian cells. Ultimately the selection of immunological effector function bearing bivalent molecules, bypassing the cloning into mammalian expression vectors, will also accelerate the drug discovery process. The selection of anti-human CXCR4 VHH-human Fc molecules from naïve repertoires using the generated triple vector as well as other case studies will be presented.

Maria Gonzalez-Pajuelo, Ph.D., Chief Scientific Officer, **FairJourney Biologics, Portugal**

Track 2: NOVEL THERAPEUTIC TARGETS AND NON-CANCER INDICATIONS (continued)

3:00 Development of anti-NKA Antibody for Heart Failure

The Na⁺/K⁺ ATPase (NKA) catalyzes active transport of Na⁺ and K⁺ ions across the cardiomyocyte plasma membrane, and plays a key role in homeostasis. An NKA antiserum markedly augmenting NKA catalytic activity has been shown to be inotropic and more importantly cardioprotective in vivo. We have developed a human monoclonal antibody against NKA as a novel therapy for acute and chronic heart failure. It exhibits a positive cardioprotective effect and initiates cardioprotection via activation of ERK1/2 and PI3K/Akt pathways.

Bo Yu, Ph.D., Co-founder and Chief Scientific Officer, **Larix Bioscience LLC**

3:30 The Long Journey: From Mouse Linkage Studies to a Novel Therapeutic Target in Human Autoimmunity

Linkage studies in murine spontaneous Type 1 Diabetes identified Tnfrsf9, encoding the protein CD137, as a candidate gene preventing Type 1 Diabetes (T1D). We discovered that CD137 was expressed on a subset of T regulatory (Treg) cells; an anti-CD137 agonist antibody prevented T1D. The anti-CD137 antibody increased Treg secretion of an alternately spliced, soluble CD137, which was decreased in T1D-susceptible mice; administration of recombinant sCD137 prevented T1D. Soluble CD137 induces classic T cell anergy, and we have now shown it can halt acute T1D. Human T1D patients have decreased serum sCD137; human Tregs are the main source of sCD137, and recombinant human sCD137 suppresses human T cells. These studies provide a rationale for further studies of human sCD137 in human T cell mediated autoimmune diseases.

William Ridgway, M.D., Alice W. and Mark A. Brown Professor and Director, Division of Immunology, **Allergy and Rheumatology University of Cincinnati College of Medicine**

4:00 Networking Refreshment Break and Opening of Exhibit and Poster Hall

4:45 VasSF As a New Drug Development for Vasculitis including Blood Vessel Diseases - Recombinant Single-chain Fragment Variable Region of Human IgG

We developed VasSF a novel single clone of recombinant human scFv for vasculitis including blood vessel diseases with therapeutic efficacy in an SCG/Kj mouse model of ANCA-associated vasculitis. VasSF improved urinary scores, crescent formation and biomarkers. Its target molecule was identified as vasculitis-associated apolipoprotein A-II which confirmed with its antibody showing therapeutic efficacy. VasSF will be developed as an antibody drug eliminating heterodimer VAP2 and apolipoprotein A-I in HDL.

Kazuo Suzuki, Ph.D., CEO and President, **A-CLIP Institute Co., Ltd.** and Professor, **Teikyo University, Japan**

5:15 Antibody-mediated Targeting of Factor XII: Potential for Safe Anticoagulation and More

FXIIa-mediated activation of the contact system can result in both proinflammatory and procoagulant activities via the kallikrein kinin-system and the intrinsic coagulation pathway, respectively. CSL312, a potent FXIIa antagonist antibody is currently being investigated in a phase 2 clinical study in patients with hereditary angioedema. In this talk, the preclinical evaluation of anti-FXII antibodies in thrombotic and inflammatory indications will be present.

Con Panousis, Ph.D., Senior Director and Head of Molecular Biology, **CSL, Australia**

5:45 Characterization of Critical Quality Attributes of mRNA, A Novel Modality for Therapeutic Antibody Engineering

Huijuan Li, Ph.D., Head, Analytical Development, **Moderna**

6:15-7:15

Opening Night Networking Reception, Exhibits and Poster Viewing

Please join your fellow attendees in the exhibit hall for an evening of networking while enjoying beverages and appetizers.



Advances in Automated Microfluidic Capillary Electrophoresis for Rapid Analysis of Biologics

James White, Ph.D., Senior Application Scientist, PerkinElmer



Antigen to Preclinical Leads in 180 Days

Reduce risk and plan for success with AbTheneum. Our roadmap starts at antigen immunization and delivers quality leads with biophysical, functional, and in vivo data. SCT's AbTheneum antibody discovery technology identifies unparalleled diversity, offering expansive epitope coverage and de-risking finding the best leads. A diverse set of antibodies are reconstructed and validated by functional and in vivo tests.

Chun-Nan Chen, Ph.D., Chief Executive Officer, Single Cell Technology, Inc.

NEW Track 1: BIOINFORMATICS AND COMPUTATIONAL TOOLS FOR ANTIBODY OPTIMIZATION AND ENGINEERING

8:10 Chairman's Remarks

Sai Reddy, Ph.D., Associate Professor, Department of Biosystems Science and Engineering, ETH Zurich/Swiss Federal Institute of Technology, Switzerland

8:15 Improving Antibody Selection Pipelines with NGS

Selection of potential antibody leads from display libraries is usually carried out by random colony picking, an approach biased by dominant clones, and which explores rare clones inefficiently. In order to produce a diverse antibody panel capable of binding many of the potential "hot spots" on a target surface, we have developed an unsupervised machine-learning approach to the PacBio sequencing platform to maximally explore epitope space.

M. Frank Erasmus, Ph.D., Head of Bioinformatics, Specifica

8:45 Functional Anti-tumor Antibodies from Cancer Patients

By analyzing monoclonal antibodies derived from plasmablast IgG sequences of non-progressing cancer patients, we have identified more than 1,400 antibodies that bind to non-autologous human tumor tissue. These data, along with binding data from both human and mouse tumor cell lines, suggest that these antibodies target public tumor antigens. Among these antibodies, we have antibodies that show anti-tumor functional activity in vitro and that show activity in mouse tumor models. Our research on mechanism of action reveals potential for novel immuno-oncology targets and treatments.

Daniel Emerling, Ph.D., Senior Vice President, Research, Atreca

9:15 Deep Sequencing of Natural Antibody Repertoires for Antibody Discovery and Optimization and Elucidation of Repertoire Properties

Hybridoma and B cell cloning remain the main technologies for antibody discovery based on mining of natural immune repertoires. Deep sequencing technologies are now used to enhance repertoire sampling of these technologies for rapid identification of optimized antibody leads and de novo discovery. The application of deep sequencing to repertoire mining coupled to high-throughput characterization of antibody panels also provides a broader view of how natural immune repertoires are structured.

Isidro Hotzel, Ph.D., Senior Scientist, Antibody Engineering, Genentech

9:45 Networking Refreshment Break, Exhibit and Poster Viewing

10:30 High Throughput Functional Profiling of Immune Repertoires

Here we present the xPloration platform for rapid antibody discovery based on binding and functional activity readouts. Our micropore array technology enables high throughput screening of antibody secreting cells in a wide variety of assay formats, including cell surface binding assays, reporter cell stimulation, and cross-reactivity screening. This platform combined with single cell sequencing enables deep profiling of immune repertoires.

Bob Chen, Ph.D., Director of Engineering, Co-Founder, xCella Biosciences

NEW Track 2: REVERSE TRANSLATION: ANTIBODY ENGINEERING, CLINICAL DATA AND LESSONS FROM CANCER IMMUNOTHERAPY

8:10 Chairman's Remarks

Daniel S. Chen, M.D., Ph.D., Chief Medical Officer, IGM Biosciences

8:15 Tumor in the Crossfire: Targeting PD-L1 and TGF-beta with Bintrafusp Alfa

This presentation will discuss early clinical data of bintrafusp Alfa (M7824), an anti-PD-L1 antibody that has been engineered to trap TGF-beta, from first in human studies to preliminary promising results in several clinical indications with response rates that appear favorable compared with targeting PD-1 or PD-L1 alone.

James L. Gulley, M.D., Ph.D., Chief, Genitourinary Malignancies Branch, Director, Medical Oncology Service, Center for Cancer Research, NCI, NIH

8:45 Conditionally Active Biologics (CABs) Antibodies for Combination Immunotherapy, T cell Recruiting Bispecifics and Drug Conjugates (ADCs)

NEW DATA

The presentation will cover preclinical and clinical highlights of Conditionally Active Biologic (CABs) antibodies that reversibly bind to targets based on the difference between the microenvironment conditions on the surface of tumor cells versus normal cells. Specifically, immunotherapy and bispecific data from IND enabling studies demonstrating efficacy and enhanced safety will be presented, as well as a snapshot of both BioAtla's CAB-AXL-ADC (BA3011) and CAB-ROR2-ADC (BA3021) P1/P2 dose escalation and expansion studies.

William Boyle, Ph.D., Chief of Translation Medicine, BioAtla

9:15 Defining the Light at the End of the Tunnel: Biologic Problems and Engineering Solutions in Cancer Immunotherapy

Over fifteen years after the Human Genome Project was completed, the targets for therapeutics are largely known. However, data and insights emerging from clinical studies in cancer immunotherapy have started to define next order problems for which solutions are needed. The spatial temporal coordination of modulating different biologies and cell types through protein/cellular engineering approaches will be explored.

Daniel S. Chen, M.D., Ph.D., Chief Medical Officer, IGM Biosciences

9:45 Networking Refreshment Break, Exhibit and Poster Viewing

10:30 Biology and Biomarkers from Clinical Studies

Priti Hegde, Ph.D., Senior Director, Oncology Biomarker Development, Genentech

Track 1: BIOINFORMATICS AND COMPUTATIONAL TOOLS FOR ANTIBODY OPTIMIZATION AND ENGINEERING (continued)

11:00 Finding Therapeutic Antibodies in Naturally-sourced Next Generation Sequencing Repositories

Recently it has become possible to query the great diversity of natural antibody repertoires using Next Generation Sequencing (NGS). These methods are capable of producing millions of sequences in a single experiment. Here we compare Clinical Stage Therapeutic antibodies to the ~1b sequences from 60 independent sequencing studies in the Observed Antibody Space Database. Of the 242 post Phase I antibodies, we find 16 with sequence identity matches of 95% or better for both heavy and light chains. There are also 54 perfect matches to therapeutic CDR-H3 regions in the NGS outputs, suggesting a nontrivial amount of convergence between naturally observed sequences and those developed artificially. This has potential implications for both the discovery of antibody therapeutics and the legal protection of commercial antibodies.

Konrad Krawczyk, D.Phil., Chief Scientific Officer, **NaturalAntibody, Germany**

11:30 Antigen Targets of Antibody Repertoires in Health and Disease Via Serum Epitope Repertoire Analysis

The antigens that elicit humoral immunity are mostly unidentified. Yet, the target epitopes of antibodies are embedded within their three-dimensional structures. Methods enabling identification of antigens and epitopes targeted by the serological repertoire using computational bioinformatic and statistical methods will be presented, along with specific applications in diagnostics, specificity characterization, and therapeutic target discovery.

Patrick Daugherty, Ph.D., Chief Scientific Officer, **Serimmune**

Track 2: REVERSE TRANSLATION: ANTIBODY ENGINEERING, CLINICAL DATA AND LESSONS FROM CANCER IMMUNOTHERAPY (continued)

11:00 Heme T cell Engagers in the Clinic Including CD20xCD3

Elizabeth Budde, M.D., Assistant Professor, **City of Hope**

11:30 Panel Discussion with Session Speakers

12:05 pm Scientific Briefings

SCHRÖDINGER Improved Scoring Function to Reliably Detect Antigen Binding Sites

The progress of genomics and proteomics has provided a great deal of information on the sequences, thermodynamics, kinetics, biological functions, and structures of an ever-growing number of protein complexes. However, these techniques can be expensive and time-consuming. Although the reliable detection of antigen binding sites has proven to be a severe computational challenge, we introduce an improved scoring function based on the well-established PIPER protein-protein docking engine that factors in terms specific to the binding of antibodies to antigens. The method was benchmarked on more than 300 publicly available antibody/antigen structures revealing a success rate of more than 90%.

Johannes Maier, Ph.D., Principal Scientist, **Schrodinger**

HARBOUR BIOMED

isogenica

LakePharma The Biologics Company

Integrated Solutions for Antibody Engineering and Beyond

Hua Tu, Ph.D., Chief Executive Officer, **LakePharma**

Ligand

12:35 Networking Luncheon, Exhibit and Poster Viewing

1:45 pm Scientific Briefings



Synthetic DNA Technologies Enable Single Domain Antibody Discovery

Utilizing its proprietary DNA writing technology to create oligo pools, genes, and synthetic libraries, Twist Pharma, a division of Twist Bioscience, provides the biotechnology industry with an end-to-end antibody discovery solution. One solution is our panel of high-quality human single domain libraries (sdAb). We will show proof-of-concept screens with these libraries and examples of how modular these sdAb's are for bispecific antibody development.

Aaron K. Sato, Ph.D., Chief Scientific Officer, Twist Bioscience



Computational Approaches for Optimizing the Developability of Biotherapeutics

mAb candidates identified from high-throughput screening or binding affinity optimization often present liabilities for developability, such as aggregation-prone regions or poor solution behavior. In this work, we optimized an integrin $\alpha 11$ binding mAb for developability using homology modeling and rational design where reducing hydrophobic surface patches improved HIC behavior. A retrospective data analysis demonstrates that 3D descriptors, conformational sampling, stochastic titration, and multi-parameter models can screen candidates and enrich libraries with favorable developability properties for a range of biotherapeutics.

Nels Thorsteinson, Scientific Services Manager, Biologics, Chemical Computing Group



NEW Track 1: EMERGING TECHNOLOGIES AND APPROACHES FOR ANTIBODY ENGINEERING

2:25 Chairwoman's Remarks

Jennifer Cochran, Ph.D., Professor and Department Chair of Bioengineering, Stanford University

2:30 Deep Learning Enables Therapeutic Antibody Optimization in Mammalian Cells

Therapeutic antibody optimization is time and resource intensive, largely because it requires low-throughput screening (10^3 variants) of full-length IgG in mammalian cells, typically resulting in only a few optimized leads. Here, we use deep learning to interrogate and predict antigen-specificity from a massive diversity of antibody sequence space from mammalian cell IgG libraries. Deep neural networks are used to predict millions of antigen binders from an in silico library of $\sim 10^8$ variants. Finally, these variants are subjected to multiple developability filters, resulting in thousands of optimized lead candidates, which when a small subset of 30 are expressed, all 30 are antigen-specific. With its scalability and capacity to interrogate a vast protein sequence space, deep learning offers great potential for antibody engineering and optimization.

Sai Reddy, Ph.D., Associate Professor, Department of Biosystems Science and Engineering, ETH Zurich/Swiss Federal Institute of Technology, Switzerland

Track 2: ENGINEERING AND APPLICATION OF THERAPEUTIC ANTIBODIES FOR NEURODEGENERATIVE DISEASES

2:25 Co-Chairs' Remarks

Anne Messer, Ph.D., Professor of Biomedical Sciences, University at Albany and Principal Investigator, Neural Stem Cell Institute, Regenerative Research Foundation

James S. Huston, Ph.D., Chairman, The Antibody Society; Managing Member, Huston BioConsulting, LLC

2:30 Progress and Challenges Towards Developing Immunotherapeutics for Neurodegenerative Disorders of the Aging Population

Alzheimer's Disease, Dementia with Lewy bodies, Parkinson's Disease and Fronto-temporal lobar degeneration are common neurodegenerative disorders of the aging population characterized by the deposition of neuronal protein aggregates including Abeta, Tau, TDP43 and α -synuclein. Immunotherapy approaches targeting these abnormal protein aggregates have been tested for the past two decades, most prominently for Alzheimer's Disease with yet no promising results in phase III trials. Failures have been attributed to too low penetration of antibodies, lack of target engagement, late treatment in the stage of the disease or wrong target. The lecture will review some of these aspects and future prospects to move forward.

Eliezer Masliah, M.D., Director, Division of Neurosciences, National Institutes of Aging, NIH

Track 1: EMERGING TECHNOLOGIES AND APPROACHES FOR ANTIBODY ENGINEERING

(continued)

3:00 Discovery of Therapeutic Functional mAbs Targeting GPCR with a Unique Single Cell Analysis Technique

We are exploring promising lead mAbs targeting GPCRs for fibrosis, infection, ocular and immune-oncology with proprietary DNA immunization, a single cell analysis technique and CDRxTM for humanization platform. A unique optofluidic-based single cell handling system, which has potential applications for the screening of mAb targeting various membrane proteins, is introduced to the GPCR mAb discovery instead of microfluidics-base single cell handling.

Kiyoshi Takayama, Ph.D., Founder and President, **NB Health Laboratory Co., Ltd., Japan**

3:30 Continuous Enzyme and Antibody Evolution with OrthoRep

NEW DATA

This talk will describe the construction of a yeast orthogonal replication system that rapidly and durably mutates user-selected genes without any elevation in genomic mutation rates. Applications in scalable, rapid, and continuous enzyme and antibody evolution will be discussed.

Chang Liu, Assistant Professor, **University of California, Irvine**

4:00 Networking Refreshment Break, Exhibit and Poster Viewing

4:45 Single-cell RNA Sequencing Enables Dissection of High-affinity, Allergen-specific Antibodies

IgE is the least abundant antibody class and is poorly understood despite mediating potentially fatal allergic reactions. I discuss how monoclonal IgE antibodies, discovered through single-cell RNA sequencing (scRNA-seq), provide insight into the molecular origins of high-affinity and allergen-specificity.

Derek Croote, Graduate Student, Bioengineering, Quake Lab, **Stanford University**

5:15 Functional Screening of the B-cell Repertoire and Rapid Production of mAb Using Cell Fusion

The B-cell repertoire generated against an antigen, such as during an infection, can comprise over one million unique B-cells, which is approximately an order of magnitude larger than current screening capacity of cell sorters, limiting dilution techniques, and microfluidic systems. Repertoire DNA or RNA library generation can capture the entire repertoire, but absent is functional information of each monoclonal antibody in the library. Thus an unmet challenge is how to screen the entire B-cell repertoire for binding and select rare, highly neutralizing mAbs that patients may generate against the antigen. A second challenge is how to quickly manufacture the mAb from the selected B-cell, without going through the time-consuming steps involved in recombinant mAb expression and manufacturing (e.g. without using CHO or NS0 cell-based recombinant processes). To overcome these challenges, we developed a nanoculture array that is able to comprehensively screen the B-cell repertoire, assess mAb binding at single cell level, and engineered a fusion partner cell line designed to immortalize the selected B-cell, effectively enabling mAb production without the need for a recombinant step.

Vu Truong, Ph.D., Founder, Chief Executive Officer and Director, **Aridis Pharmaceuticals**

5:45 Optimization of Common Light Chain Bispecific Antibodies

Compass has developed in vitro and in vivo platforms to generate diverse antibody panels against over 40 targets that share a common light chain. This allows for facile generation of multispecific antibodies with favorable drug-like properties at high yields. While heavy chain optimization is typically sufficient for affinity maturation, in some cases there is additional benefit to introducing light chain variants. Here we describe two approaches for affinity optimization of common light chain bispecific antibodies, leveraging either deep mutational scanning (DMS) or mammalian display of bispecific libraries to identify light chain mutations compatible with both heavy chains

Alan Leung, Ph.D., Senior Scientist, **Compass Therapeutics**

Track 2: ENGINEERING AND APPLICATION OF THERAPEUTIC ANTIBODIES FOR NEURODEGENERATIVE DISEASES (continued)

3:00 ScFv Reagents to Detect Morphology Specific Protein Variants as Biomarkers for Neurodegenerative Diseases

Oligomeric forms of beta-amyloid, tau, alpha-synuclein and TDP-43 play important roles in many neurodegenerative diseases including Alzheimer's and Parkinson's diseases (AD) and have promise as early biomarkers to diagnose and distinguish these diseases. We have generated a panel of antibody based reagents (scFvs) that selectively bind different disease related conformational variants of these four key neuronal proteins. Using these reagents to analyze blood samples of post-mortem and ante-mortem human cases, we can distinguish between different neurodegenerative diseases and presymptomatically diagnose disease. Since neurodegenerative diseases share overlapping pathologies, there is a need to diagnose disease by identifying which key toxic protein pathologies are present.

Michael Sierks, Ph.D., Professor, Chemical Engineering, **Arizona State University**

3:30 Engineering of a Brain Shuttle Moiety to Increase Brain Penetration of Therapeutic Antibodies

NEW DATA

The potential of Biologics to treat neurological diseases has been hampered by the blood brain barrier. Receptor mediated transcytosis (RMT) is a unique mechanism to increase delivery of Biologics to the brain. We show how we engineered a modular platform which addresses both the Biology of the target and of Transferrin receptor (RMT receptor), in the design of a brain shuttle moiety.

Alain C. Tissot, Ph.D., Program Manager, Large Molecules Roche Innovation Center Munich, **Roche Diagnostics GmbH, Germany**

4:00 Networking Refreshment Break, Exhibit and Poster Viewing

4:45 Targeting RAN Proteins in C9orf72 ALS/FTD BAC Transgenic Mice

The most common genetic cause of ALS and FTD is a G4C2 expansion in C9orf72. Six dipeptide RAN proteins accumulate in patient tissues, but their role in disease and the therapeutic potential of targeting them are unclear. We show that targeting RAN proteins with human antibodies improves behavior, decreases neurodegeneration and increases survival in C9orf72 BAC mice. These data describe a novel approach for treating C9-ALS/FTD and other RAN-protein diseases.

Laura P.W. Ranum, Ph.D., Director, Center for NeuroGenetics, Kitzman Family Professor of Molecular Genetics and Microbiology, College of Medicine, **University of Florida**

5:15 Intra-neuronal Antibody Immunity to Target TDP-43 Proteinopathy

NEW DATA

Cytoplasmic aggregates of TDP-43 are a pathological hallmark of amyotrophic lateral sclerosis (ALS) and frontotemporal lobar degeneration (FTLD). We have generated full length and single chain scFv antibodies that can target cytoplasmic TDP-43. Our studies with cultured cell systems and mouse models with TDP-43 pathology demonstrate the feasibility to mitigate intraneuronal TDP-43 pathology by either AAV-mediated delivery of scFv antibody or by antibody injection into cerebrospinal fluid.

Jean-Pierre Julien, Ph.D., Professor, Department of Psychiatry and Neuroscience, **Laval University, Canada**

5:45 Tau Antibodies to Target Tau in Alzheimer's Disease: From Proof of Concept to Translational Strategies

Alzheimer's disease (AD) is a devastating neurodegenerative disease, with huge impact on the affected patients, their families and society as a whole. Immunotherapy has emerged in the past few years as a potential disease-modifying strategy to target tau pathology in AD. We have recently demonstrated the efficacy of an engineered tau conformational antibody upon hippocampal injection, in a tauopathy animal model. Different therapeutic protocols and routes of administrations are under investigation.

Cristina D'Abramo, Ph.D., Assistant Professor, The Litwin-Zucker Research Center for the Study of Alzheimer's Disease, **The Feinstein Institute for Medical Research**

6:15-7:15 Networking Reception, Exhibit and Poster Viewing

The first half of the conference may have flown by, but the fun is just getting started! Enjoy another opportunity to interact with fellow industry professionals while enjoying cocktails and appetizers!



In vitro Glycoengineering (IVGE): A Targeted Method to Control Glycosylation of Therapeutic Proteins with a Potential for Higher Protein Yields with Optimized Glycosylation

Optimization of the glycosylation patterns is of paramount importance in the safety and efficacy of therapeutic proteins production. Using specific glycosyl transferases and cognate substrates, Roche has developed a cost-effective methodology to glycosylate therapeutic proteins in large scale (gram quantities). In close collaboration with Lake Pharma, using TunaCHO and GH0-GSN platforms, protocols are developed which result in significantly increased protein yields with optimized glycosylation. Case studies will be presented comparing IVGE data to traditional methods of optimization.

Hua Tu, Ph.D., Chief Executive Officer, **LakePharma**



NEW Track 1: SYSTEMS IMMUNOLOGY FOR THERAPEUTIC TARGET DISCOVERY

8:10 Co-Chairs' Remarks

Jamie K. Scott, M.D., Ph.D., Professor Emeritus, Department of Molecular Biology & Biochemistry and Faculty of Health Sciences, **Simon Fraser University, Canada**

Nima Aghaepour, Ph.D., Assistant Professor, Department of Anesthesiology, Perioperative and Pain Medicine, **Stanford University School of Medicine**

8:15 "Heterogeneity" in "Dirty" Data: A Blessing in Disguise for Accelerating Translational Medicine

This talk will focus on how heterogeneity across independent experiments can lead to identification of disease signatures that are diagnostic, prognostic, therapeutic and mechanistic across a broad spectrum of diseases including infections, autoimmune diseases, cancer, organ transplant, and vaccination. It will also discuss how biological and technical heterogeneity in publicly-available data can be leveraged to make translational medicine better, faster, cheaper, and more generalizable.

Purvesh Khatri, Ph.D., Associate Professor, Department of Medicine, Assistant Professor, Stanford Center for Biomedical Informatics Research, **Stanford University**

8:45 Machine Learning for Multiomics Analysis of the Immune System in Preterm Birth

Recent technological advances in science provide novel opportunities to unravel the complex biology of pregnancy. Immunological changes during pregnancy are highly dynamic and involve multiple interconnected biological systems. An ongoing cohort study by the March of Dimes Prematurity Research Center at Stanford University exploits recent technological advances to examine the transcriptomic, microbiome, and proteomic events associated with normal and pathological pregnancies. We will discuss a machine learning algorithm that will integrate mass cytometry data into this multiomics setting. This computational pipeline can increase predictive power and reveal new biology, by combining datasets of various sizes and modularities in a balanced manner. We expect this approach to be applicable to a wide range of studies beyond the field of pregnancy.

Nima Aghaepour, Ph.D., Assistant Professor, Department of Anesthesiology, Perioperative and Pain Medicine, **Stanford University School of Medicine**

9:15 Single Cell Multiomic Characterization of Antigen Specific CD8 T cells at Scale

Multiomic analysis of over 150,000 individual CD8+ T cells allowed us to examine the behavior and antigen specificity of these cells with unprecedented breadth, depth, and precision. Our findings identified TCR pairs for 23 antigens that have not previously been reported and suggest that the gene expression profile and antigen specificity of cells are linked.

Sarah Taylor, Ph.D., Staff Scientist, Product Development Lead, **10X Genomics**

9:45 Networking Refreshment Break, Exhibit and Poster Viewing

NEW Track 2: TISSUE SPECIFIC DELIVERY OF ANTIBODIES

8:10 Chairman's Remarks

Paul J. Carter, Ph.D., Senior Director and Senior Staff Scientist, Antibody Engineering, **Genentech, Inc.**

8:15 Device Technologies for Tissue-Specific Delivery of Antibodies

Successful treatment using antibody drugs depends on both the drug delivered and the application site. With the use of implants and other targeted drug delivery devices, it is possible to increase local concentrations of an antibody drug and prolong the exposure duration in the target tissue. This talk will provide an overview of the use of medical devices to overcome tissue-specific drug delivery challenges, including presentation of several case studies.

Joshua Horvath, Ph.D., Associate Director, Device and Packaging Development, **Genentech**

8:45 Development of a Novel Bispecific Platform for Treatment of Eye Disease

Currently, back-of-the-eye-specific delivery of biotherapeutics requires intraocular injection. The standard of care for nAMD and DME are anti-VEGF treatments (Lucentis, Eylea), but there remains a high unmet medical need for both improved efficacy and less frequent dosing. This presentation discusses molecular requirements enabling this specific administration route, at the example of the bispecific antibody Faricimab. It also provides an outlook on a novel bispecific platform, the Dutafabs.

Jörg Moelleken, Ph.D., Principal Scientist, **Roche pRED RICM LMR, Germany**

9:15 Improving Antibody Efficacy by Putting Antibodies at the Site of Action

Bio-therapeutics administered systemically become broadly distributed throughout the body with only a fraction of dosed drug reaching the intended organ or tissue target. By targeting existing transport systems in the lungs (and other organs), we can improve both the delivery and efficacy of therapeutics that act within these tissues while concurrently reducing unintended interactions in tissues not being targeted.

M. Jack Borrok, Ph.D., Scientist II, Antibody Discovery and Protein Engineering, **AstraZeneca**

9:45 Networking Refreshment Break, Exhibit and Poster Viewing

Track 1: SYSTEMS IMMUNOLOGY FOR THERAPEUTIC TARGET DISCOVERY (continued)

- 10:30 **Multiparameter Single-cell Analyses**
Pratip K. Chattopadhyay, Ph.D., Associate Professor, Pathology, Perlmutter Cancer Center, **NYU-Langone Medical Center**
- 11:00 **Late Breaking Presentation**
- 11:30 **Late Breaking Presentation**

Track 2: TISSUE SPECIFIC DELIVERY OF ANTIBODIES (continued)

- 10:30 **Novel Antibody Engineering to Improve Therapeutic Index of Antibody Targeting Solid Tumor**
 One of the remaining issues of antibody therapeutics is on-target off-tumor toxicity induced by binding to target antigens expressed in normal tissues. To overcome this problem, we have established novel antibody engineering to enable antibody binding to the antigen selectively at tumor site but not at normal tissues.
Futa Mimoto, Ph.D., Research Manager, Oncology Pharmacology Unit, **Chugai Pharmabody Research Pte. Ltd., Singapore**
- 11:00 **Design and Characterization of a T cell Targeted IL-21 Cytokine to Improve Anti-tumor Immunity in Cancer**
 Cytokines can improve anti-tumor immunity, but their use has been limited by dose limiting toxicity and short-half life. Using structure guided engineering we have designed cytokine-antibody fusion proteins which can selectively deliver cytokine signaling to cell surface receptors expressed on T cells, with minimal activation of signaling in trans. This approach can potentially improve the safety and serum half-life of short acting cytokines and improves anti-tumor activity in a preclinical mouse model.
Khaled Ali, Ph.D., Senior Scientist, **Amgen**
- 11:30 **Assessment of Delivery and Cellular Distribution of Therapeutic Antibodies in Early Phase Clinical Trials by Fluorescent Labeling**
 Heterogeneous drug distribution within solid tumors is a barrier to successful antibody-based therapies. To address this, we infused a fluorescently labeled antibody (panitumumab-IRDye800CW) in patients with head and neck cancers (n=24), and then quantified antibody concentration and identified tumor size and collagen as key predictors of intratumoral antibody.
Eben Rosenthal, M.D., Ann & John Doerr Director of Cancer Services, **Stanford Comprehensive Cancer, Stanford University**

12:00 pm Scientific Briefing

abveris
Antibody Discovery for Traditionally Difficult Targets: *in vivo*, *in vitro*, or both?

Leveraging the natural immune repertoire for antibody discovery has distinct advantages for positive downstream outcomes, including efficacy, developability and safety; however, traditional techniques typically fail to produce a productive response in situations where, for example, the target epitope has poor immunogenicity or is a rare, cryptic site. While some *in vitro* platforms can overcome these difficulties through careful guiding selection methods, significant downstream engineering is often required to ensure lead candidates harbor appropriate development qualities. Fortunately, recent advancements in protein engineering and antibody discovery have enabled improved drug development to these traditionally difficult targets. Using the AbX platform, the power of the immune system is harnessed to exemplify the breadth and comprehensive nature of the B cell repertoire. When applied to the most difficult target classes, lead candidates can be uncovered where traditional *in vivo* platforms typically fail, or significant engineering is required for *in vitro* discovery.

Tracey Mullen, Chief Operating Officer, **Abveris Antibody**



12:30 **Networking Luncheon, Last Chance for Exhibit and Poster Viewing**

Track 1: EFFECTOR FUNCTIONS OF THERAPEUTIC ANTIBODIES

2:10 Co-Chairs' Remarks

Paul W.H.I. Parren, Ph.D., Professor, Department of Immunohematology and Blood Transfusion, **Leiden University Medical Center** and EVP and Head of R&D, **Lava Therapeutics, The Netherlands**

Dennis R. Burton, Ph.D., Professor, Department of Immunology and Microbiology, **The Scripps Research Institute**

2:15 Engineering Effector Enhanced HIV Broadly Neutralizing Antibodies for HIV Cure

Anti-HIV broadly neutralizing antibodies (bNAbs) can recruit innate immune effector cells and mediate killing of HIV infected T-cells in vitro. Such bNAbs have recently shown evidence of in vivo efficacy in a simian-HIV infected non-human primate model for HIV Cure. Engineering strategies to enhance the effector function, improve pharmacokinetics and optimize drug-like properties of selected anti-HIV bNAbs will be discussed.

Nathan D. Thomsen, Ph.D., Senior Research Scientist II, **Gilead Sciences**

2:45 The Role of Fc Receptors in Antibody-mediated Protection against HIV Infection

The interaction of neutralizing antibodies with Fc receptors (FcRs) is widely thought to contribute to antibody-mediated protection from HIV infection. NK cell-mediated antibody dependent cellular cytotoxicity (ADCC) and antibody dependent cellular phagocytosis (ADCP) have been suggested to be of particular importance. Our recent experiments, however, suggest that not all broadly neutralizing antibodies to HIV benefit from FcR interactions and the contribution of individual FcRs is more complex than originally anticipated.

Lars Hangartner, Ph.D., Associate Professor of IMS, **The Scripps Research Institute**

3:15 Modulating in vivo Antiviral Effects of HIV Broadly Neutralizing Antibodies through Fc Modification

Passive neutralizing antibody (NAb) infusion leads to a reduction of HIV plasma viremia in infected people as well as in SHIV-infected rhesus macaques. Potential mechanisms of viral reduction include neutralization of free virus as well as Fc-dependent effector functions that can clear infected cells. Here we present how Fc modifications of the human IgG1 NAb VRC07-523LS influence its antiviral activity in vitro and in vivo.

Richard Koup, M.D., Senior Investigator, Immunology Lab, NIAID, **NIH**

3:45 Networking Refreshment Break

Track 2: PRECLINICAL DEVELOPMENT OF ANTIBODY-BASED THERAPEUTICS

2:10 Co-Chairs' Remarks

Gregory Adams, Ph.D., Industry Expert

Matthew Robinson, Ph.D., VP, Research & Development, **Immunome, Inc.**

2:15 Synthetic DNA-encoded Monoclonal Antibody (dMAbTM) for in vivo Antibody Production: From Mouse to Human

Though passive immunoprophylaxis has been proven to be an effective therapy for the treatment of viral infections, relying on the injection of recombinant antibodies, several hurdles remain to be made more cost effective, easier to administer while increasing the window of therapeutic benefit. Toward this goal, Inovio has developed a non-viral, DNA plasmid based approach to directly produce in human monoclonal antibodies. This approach is currently being tested in a first-in-class, first-in-human clinical study. Developments of this innovative therapeutic modality will be presented.

Laurent M. Humeau, Ph.D., CSO and EVP of Research, Engineering and Clinical Developments, **Inovio Pharmaceuticals**

2:45 Using the Cancer Patient's Functional B Cell Repertoire to Change the Treatment Paradigm

Immunome is a biotechnology company focused on using its outcome-based discovery engine to capture and deeply interrogate patient immune responses to uncover novel tumor antigens and fully-human antibodies with therapeutic potential against those targets. Efforts to leverage that platform will be discussed.

Matthew Robinson, Ph.D., VP, Research & Development, **Immunome, Inc.**

3:15 Antibody-Enzyme Fusions to Target Siglec Glycans for Rx Effect in Cancer

There is a strong need to identify novel mechanisms of cancer immune evasion and explore novel therapeutic modalities. Here we described a novel technology, named EAGLE, for releasing tumor sialoglycans-mediated immunosuppression to potentiate both innate and adaptive immune responses to treat cancer. EAGLE treatment led to 50% complete regressions of established tumors as a monotherapy and 100% cures in combination with anti-PD1 mAb in a syngeneic EMT6 tumor model.

James Broderick, M.D., CEO and Founder, **Palleon Pharmaceuticals**

3:45 Networking Refreshment Break

Track 1: EFFECTOR FUNCTIONS OF THERAPEUTIC ANTIBODIES (continued)

4:15 Regulation of Human IgG Immune Responses through Fc-glycosylation

Mammalian IgG require the presence of the conserved N-linked Fc-glycan at position 297 for its Fc-gamma-receptor (FcγR)- and complement mediated effect functions. Normally, this glycan contains an invariant core fucose (found in ~95% of plasma IgG) that reduces binding affinity to FcγRIIIa and FcγRIIIb by ~40x. However, some immune responses result in most IgG being devoid of fucose, which is strongly regulated, bearing all hallmarks of immunological memory.

Gestur Vidarsson, Ph.D., Head of Immunoglobulin Research/PI, Experimental Immunohematology, **Sanquin Research, The Netherlands**

4:45 Glutaminyl Cyclase (QC) Inhibition Improves Myeloid Effector Cell Recruitment for Antibody-mediated Tumor Immunotherapy by Interfering with CD47/SIRPα Interactions

Interference with CD47/SIRPα interactions provides a novel option to increase the therapeutic activity of tumor-directed antibodies by improving myeloid effector cell activation. Recent data demonstrated that this interaction is affected by a post-translational modification of CD47 involving glutaminyl cyclase (QC) mediated pyro-glutamine formation. Here, we demonstrate that small molecule QC inhibitors reduced binding of soluble SIRPα to CD47 expressed on solid and B-cell lymphatic tumor cells. Reduced affinity of CD47 for SIRPα translated into enhanced antibody-dependent phagocytosis (ADCP) by macrophages and antibody-dependent cellular cytotoxicity (ADCC) by PMN, respectively. ADCC by PMN was particularly effective with antibodies of human IgA isotype e.g. CD20 or EGFR. QC inhibition did not interfere with other potential effector mechanisms of EGFR or CD20 antibodies like direct growth inhibition, complement-dependent cytotoxicity or ADCC by NK cells. Together, these results suggest a broadly applicable approach to specifically enhance myeloid effector cell-mediated activity of therapeutic antibodies by small molecule QC inhibitors.

Thomas Valerius, M.D., Professor, Faculty of Medicine, **University Hospital Schleswig-Holstein, Germany**

5:15 Influence of the Bispecific Antibody IgG Subclass on T cell Redirection

The functional activity of Bispecific antibodies for T cell redirection can be modulated by engineering molecules different Fc and F(ab)2 domains.

Mark Chiu, Ph.D., Associate Director, Process Analytical Support of Large Molecule Analytical Development, **Janssen Research & Development**

Track 2: PRECLINICAL DEVELOPMENT OF ANTIBODY-BASED THERAPEUTICS (continued)

4:15 Therapeutic Antibody Discovery: From Molecular Targets to Functional Antibody Leads

Radiation therapy translocates intracellular proteins to the cell surface. We developed antibodies against radiation-inducible antigens for specific targeting of cancer. Preclinical characterization of these antibodies involves flow cytometry for cell surface binding, in vivo cancer specific binding and biodistribution. I will summarize the stages of the preclinical development of anti-TIP1 antibodies before it enters clinical trials.

Vaishali Kapoor, Ph.D., Instructor, Department of Radiation Oncology, **Washington University School of Medicine**

4:45 Anti-Galectin-9 Antibodies as Novel Immunotherapy Against Solid Tumors

Galectin-9 is an immunoregulatory lectin that plays a significant role in creating and facilitating a tumor-permissive immune microenvironment. Galectin-9 modulates immunosuppression via binding to multiple partner molecules including TIM-3, Dectin-1, CD44 and CD206. To examine the potential of immunotherapy targeting Galectin-9, we have developed first-in-class human antibodies that potently and selectively bind to Galectin-9 from human, cynomolgus monkey and rodents. Our lead antibody reduced the size of orthotopic pancreatic tumors in mice, and increased T cell activation in mice as well as in patient-derived organotypic tumor spheroids (PDOTS) of multiple tumor types. Our results validate Galectin-9 as a cancer immunotherapy target.

Shohei Koide, Ph.D., Professor of Biologics Design, Department of Biochemistry and Molecular Pharmacology, **New York University School of Medicine**

5:15 Presentation Title TBA

Gregory Adams, Ph.D., Chief Scientific Officer, **Elucida Oncology**

5:45pm-6:30pm SPECIAL SESSION OF THE ANTIBODY SOCIETY

ANTIBODY
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5:45 Recognition of the Student/Postdoc Poster Competition Winners

6:00 Antibodies to Watch in 2020

This "Antibodies to watch" talk will summarize data for antibody therapeutics in regulatory review and recently approved in the US and EU, and project which may be approved in 2020. Trends in the burgeoning early-stage pipeline, such as the popular formats, mechanisms of action, and targets, will also be discussed.

Janice M. Reichert, Ph.D., Executive Director, **The Antibody Society**; Editor-in-Chief, **mAbs**; Managing Director, **Reichert Biotechnology Consulting LLC**

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www.antibodysociety.org

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 - Monitoring and reporting advances in the commercial pipeline for antibody and CAR-T therapeutics;
 - Creating standards for characterizing antibody and T-cell receptor repertoires, and engaging this field;
 - Engaging government and international agencies on matters concerning the antibody community;
- Please join us!

NEW Track 1: TARGETING SUBCELLULAR TRAFFICKING PATHWAYS TO GENERATE ANTIBODY THERAPEUTICS

8:25 **Chairwoman's Remarks**

Sally Ward, Ph.D., Professor, **University of Southampton and Texas A&M University Health Science Center**

8:30 **Isoelectric Point Engineering to Enhance the Potency of Therapeutic Antibody**

Isoelectric point (pI) engineering is an attractive way to enhance the potency of an antibody. First, decreasing the pI of the CDR and selecting human framework with lower pI in the process of humanization can improve the half-life of the antibody. Second, increasing the pI of the variable region and constant region can enhance the therapeutic potency of pH dependent antigen binding antibody by eliminating the antigen from plasma, while maintaining good pharmacokinetics of the antibody. Case study will be presented.

Taichi Kuramochi, Research Manager, Protein Production and Protein Analysis Unit, **Chugai Pharmabody Research Pte. Ltd., Singapore**

9:00 **Design and Preclinical Characterization of ULTOMIRIS**

The talk will cover the background, rationale, hypotheses and design of ULTOMIRIS (ALXN1210), the first therapeutic antibody specifically engineered for long acting inhibition of complement. The authors will discuss the preclinical experimental data leading to candidate selection and its translatability to observations in the clinic.

Douglas Sheridan, Ph.D., Executive Director, Global Program Team Leader, **Alexion Pharmaceuticals**

9:30 **Rozanolixizumab, A Subcutaneously Delivered IgG4 mAb Targeting FcRn for the Treatment of IgG Autoantibody-driven disorders**

The neonatal Fc receptor, FcRn is responsible for rescuing IgG from lysosomal degradation and is responsible for the long half-life of this protein in vivo, but FcRn is also responsible for recycling pathogenic IgG autoantibodies. Rozanolixizumab is a subcutaneously delivered, high affinity IgG4P monoclonal antibody targeting FcRn, developed to specifically inhibit the recycling of IgG and is demonstrating clinical efficacy in patients with IgG autoantibody-driven diseases such as myasthenia gravis (MG) and immune thrombocytopenia (ITP). Rozanolixizumab is currently in development for MG, ITP and Chronic Inflammatory Demyelinating Polyneuropathy.

Tony Shock, Ph.D., Director, **UCB, United Kingdom**

10:00 **Networking Refreshment Break**

10:30 **Efgartigimod, A Novel FcRn Antagonist, For the Treatment of Patients with Severe Autoimmune Diseases**

The neonatal Fc Receptor (FcRn) plays a central role in rescuing immunoglobulin G (IgG) from degradation in the lysosome through a recycling pathway. This pathway results in the high concentration of IgG in the circulation and the long half-life of IgG compared to other immunoglobulins, which are not recycled by FcRn. Inhibition of FcRn to reduce IgG has therefore been proposed as a logical therapeutic approach for the management of various IgG-driven autoimmune indications, including myasthenia gravis (MG), primary immune thrombocytopenia (ITP), pemphigus vulgaris, and chronic inflammatory demyelinating polyneuropathy. This hypothesis formed the basis for development of the FcRn antagonist efgartigimod (ARGX-113), a human IgG1 antibody Fc-fragment. Efgartigimod binds in the same way as endogenous IgG, the natural ligand of FcRn, and has been engineered with ABDEG™ mutations (in its CH2 and CH3 domains), which increase affinity for FcRn while preserving the characteristic pH-dependent binding. The pH-dependent binding contributes to efgartigimod's long serum half-life, pharmacodynamic effect and may promote tissue penetration. In Phase 1 and 2 studies, efgartigimod treatment induced a rapid, substantial, and targeted reduction in IgG (total and all subtypes) and was well-tolerated. Proof-of-concept of efficacy was observed in MG and ITP patients. Results from these studies will be discussed during the presentation.

Hans de Haard, Ph.D., Chief Scientific Officer, **Argenx, Belgium**

NEW Track 2: TUMOR-CONDITIONAL IMMUNOTHERAPY

8:25 **Chairman's Remarks**

K. Dane Wittrup, Ph.D., C.P. Dubbs Professor of Chemical Engineering and Biological Engineering, Koch Institute for Integrative Cancer Research, **Massachusetts Institute of Technology**

8:30 **Hot is Not Enough. Using In Situ Vaccine to Make Cold Tumors Hot and Cross-Priming**

Checkpoint-blockade has had tremendous impact on cancer therapy, but only subsets of patients respond. While non-response may be due to low tumoral mutational burden (TMB) and tumor-associated antigen (TAA) load, we and others suggest that –even with sufficient TAA– if TAA cross-presentation is lost, anti-tumor effects of PD1-blockade are abolished. If lack of intratumoral DC prevents TRT cross-priming, then methods to measure and increase cross-priming are critical to improving PD1-blockade. We can increase TRT priming with an in situ vaccination (ISV) combining: (i) Flt3L to recruit DC (ii) radiotherapy (XRT) to load DC with TAA, and (iii) TLR agonists to activate TAA-loaded DCs. We tested this ISV (Flt3L/XRT/polyI:CLC) in advanced-stage NHL patients and observed dramatic regressions of untreated tumors. A mouse model of the ISV recapitulated the clinical findings and also increased the PD1-blockade cure rate from 0% to ~75%. This prompted a new trial (NCT03789097) using ISV plus PD1-blockade for patients with lymphoma, breast cancer, and head and neck cancer.

Joshua Brody, M.D., Director, Lymphoma Immunotherapy Program, **Icahn School of Medicine at Mount Sinai**

9:00 **Intratumoral Collagen-retained Immunotherapy**

Despite broad efforts, delivery of immune agonistic antibodies and cytokines via systemic administration is plagued by poor therapeutic indices, due to extensive off-target exposure. We are examining the fundamental micropharmacokinetic issues of intratumoral administration and find that intratumorally-injected immune agonists retained on collagen can exert profound therapeutic effects while largely sparing from systemic exposure or toxicity.

Noor Momin, Biological Engineering Doctoral Candidate, **Massachusetts Institute of Technology**

9:30 **Localized Delivery of a CD47 Blocking Nanobody Enhances Immunotherapy Responses**

Inhibitors of the antiphagocytic ligand CD47 improve antitumor responses by enhancing antibody-dependent cellular phagocytosis (ADCP) in xenograft models. CD47 on non-malignant tissues creates a formidable antigen sink for CD47 blocking therapeutics, and can result in toxicity. We generated a CD47 blocking nanobody that synergizes with other immunotherapies in syngeneic mouse models, but found that nearly complete ligand blockade in the tumor microenvironment was necessary to achieve optimal therapeutic results.

Michael Dougan, M.D., Ph.D., Assistant Professor of Medicine, **Massachusetts General Hospital**

10:00 **Networking Refreshment Break**

10:30 **Overcoming Transport Barriers in the Tumor Immune Microenvironment to Enhance Cancer Immunotherapy**

The transport of fluids, biomolecules and cells into the tumor microenvironment and out of it to draining lymph nodes and into the circulation is facilitated by the concerted influence of the blood and lymphatic vascular systems. Our efforts to characterize the impact of these transport processes on disease progression as well as to develop therapeutic approaches for tumor therapy that leverage these processes will be described.

Susan Thomas, Ph.D., Associate Professor, **Georgia Institute of Technology**

Track 1: TARGETING SUBCELLULAR TRAFFICKING PATHWAYS TO GENERATE ANTIBODY THERAPEUTICS (continued)

11:00 Cytokine-mediated Enhancement of FcγRI Clustering and Signaling

Fc receptors (FcRs) are an important bridge between the innate and adaptive immune system. Fc gamma receptor I (FcγRI; CD64), the high-affinity receptor for immunoglobulin G (IgG), plays roles in inflammation, autoimmune responses, and immunotherapy. Stimulation of myeloid cells with cytokines, such as tumor necrosis factor-α (TNFα) and interferon-γ (IFNγ), increases the binding of FcγRI to immune complexes (ICs), such as antibody-opsonized pathogens or tumor cells, through a process known as "inside-out" signaling. Using super-resolution imaging, we found that stimulation of cells enhanced the clustering of FcγRI, whereas inhibition of the phosphatase PP1 reduced FcγRI inside-out signaling, although the phosphorylation of FcγRI itself was unaffected. Furthermore, the antibody-dependent cytotoxic activity of human neutrophils toward CD20-expressing tumor cells was increased after stimulation with TNFα and IFNγ. We conclude that nanoscale reorganization of FcγRI enhances FcγRI cellular effector functions.

Jeanette L. Leusen, Ph.D., Associate Professor, Head Immunotherapy Group and UMAB Facility, Laboratory for Translational Immunology, UMC Utrecht, The Netherlands

11:30 Roles of FcγRIIB in Regulating Antibody Therapy

It is clear that Fc receptors mediate and modulate the efficacy of antibody immunotherapeutics. In particular, the sole inhibitory Fc gamma receptor, FcγRIIB has multiple roles in this modulation. I will discuss data relating to how FcγRIIB impinges on mAb efficacy and how blocking mAb may help to deliver more effective immunotherapy.

Mark Cragg, Ph.D., Chair in Experimental Cancer Biology, Center for Cancer Immunology, University of Southampton, United Kingdom

Track 2: TUMOR-CONDITIONAL IMMUNOTHERAPY (continued)

11:00 COBRA – A Novel Class of Conditionally Active, T-cell Engaging Bispecifics for the Treatment of Solid Tumors

T-cell engaging bispecific antibodies have demonstrated highly potent cytotoxicity against cancer cells. This potency can engender off-tumor, on-target toxicity problems when targeting solid tumors in humans. To address this, Maverick Therapeutics has developed a novel recombinant bispecific platform called COBRA™ (Conditional Bispecific Redirected Activation), which includes two active tumor targeting domains, a half-life extension domain and inactive T cell engaging domains, that become fully active within the tumor microenvironment in a protease dependent manner. This presentation will discuss the development of these molecules and demonstrate their efficacy against human tumor cells in vitro and in vivo.

Bob Dubridge, Ph.D., EVP of Research, Maverick Therapeutics

11:30 Redirection of Immunity Against Cancer using Antibody Circuits

Immune-engaging antibodies such as bispecific antibodies are able to redirect immunity against cancer and represent an alternative therapeutic modality to gene-edited immune cells. Yet the paucity of cancer-specific antigens and toxicity of agents that directly activate T-cells, limits the clinical potential and utility of these agents. Here we present a novel antibody engineering approach that facilitates dual-targeting of surface antigens using antibodies that can recombine domains and achieve ultra-high precision targeting and restrict target engagement to lymphocyte subpopulations.

Mark Cobbold, M.D., Ph.D., Associate Professor of Medicine, Center for Cancer Immunology, MGH Cancer Center

12:00 Networking Luncheon

NEW Track 1: SPECIAL JOINT SESSION WITH THE CHINESE ANTIBODY SOCIETY

1:25 Co-Chairs' Remarks

Kerry A. Chester, Ph.D., Professor of Molecular Medicine, UCL Cancer Institute, University College London, United Kingdom

Mitchell Ho, Ph.D., Senior Investigator, Laboratory of Molecular Biology, NIH NCI

1:30 China/UK Development of a FDC Tailored for Difficult to Treat Solid Tumors

Fragment Drug Conjugate (FDC) technology developed by Antikor empowers scFvs with high drug:antibody ratios (DAR), high therapeutic ratios and favorable PK. Antikor has two lead FDC products for solid tumors. Anti-HER2 FDC (ANT-043) has excellent tumor killing and superior tolerability in rat toxicology studies. In partnership with a premier Hong Kong-based biopharma, ANT-043 is being taken forward into IND-enabling studies. The talk will present in vivo, toxicology and manufacturing preclinical data supporting these studies. New data will also be presented on ANT-045, which has emerged from the FDC discovery engine. The data will illustrate how FDCs can succeed where ADCs have failed to deliver.

Mahendra Deonarain, Ph.D., Chief Executive and Science Officer, Antikor Biopharma Ltd., United Kingdom

NEW Track 2: LOOKING AT TARGETS DIFFERENTLY

1:25 Co-Chairs Remarks

Janine Schuurman, Ph.D., Vice President, Research, Genmab, The Netherlands

James Ernst, Ph.D., Senior Director and Head of Protein Sciences, Amphivena Therapeutics

1:30 Antibody-mediated Inhibition of MICA/B Shedding by Tumor Cells Promotes NK Cell Recognition

Tumor cells frequently express MICA/B surface proteins that are recognized by NK cells with the NKG2D activating receptor. However, MICA/B is downregulated via proteolytic cleavage, thus interfering with NKG2D recognition. We recently generated monoclonal antibodies against the alpha-3 domain of MICA/B that potently inhibit MICA/B shedding. MICA/B-stabilized tumor cells that were treated with the antibodies were highly susceptible to NK cell-mediated killing. Such antibodies hold promise for cancer immunotherapy.

Lucas Ferrari de Andrade, Ph.D., Assistant Professor, Department of Oncological Sciences, Precision Immunology Institute, Icahn School of Medicine at Mount Sinai

Track 1: SPECIAL JOINT SESSION WITH THE CHINESE ANTIBODY SOCIETY (continued)

2:00 WuXiBody™, An Innovative and Versatile Bispecific Antibody Format Opens a New Era for Therapeutic Antibody Development

A lot of protein engineering efforts have been put into designing the bispecific formats, however, there still is great need to design bispecific molecules with desirable developability profile. WuXi Biologics has generated WuXiBody™, an innovative and potentially one-size-fit-all bispecific antibody format. It can be easily produced like normal IgG from CHO cell with high expression level (up to 35g/L), high purity (>95% from a single step purification), high solubility (>100 mg/ml in PBS), high stability (> 2 weeks at 37 °C in serum) and with normal T1/2 in monkey. This innovative bispecific antibody format opens a new era for therapeutic bispecific antibody development.

Jing Li, M.D., Ph.D., Senior Vice President, Biologics Discovery, WuXi Biologics, China

2:30 TCR-mimic Antibodies in T-cell Immunotherapy for Solid Tumors: Targeting MHC/AFP Peptide for Hepatocellular Carcinoma by T-cell therapy

Cheng Liu, Ph.D., President & CEO, Eureka Therapeutics

3:00 Networking Refreshment Break

3:30 Durable Blockade of PD-1 Signaling Links Preclinical Efficacy of Sinitilimab to its Clinical Benefit

Sinitilimab is a fully human anti-PD-1 antibody approved for Hodgkin's lymphoma in China in 2018. With a unique binding epitope, sinitilimab interacts with PD-1 through a large binding domain with strong hydrophobic patches, which explains sinitilimab's high affinity to and slow disassociation from PD-1. As a result, sinitilimab displays high receptor occupancy. By potent activation of immune system, specifically CD8 cytotoxic T cells, sinitilimab demonstrated significant efficacy in suppression of tumor growth in mouse models. The antibody was well tolerated in phase I trials. In ORIENT-1, a phase II trial for relapsed or refractory classical Hodgkin's lymphoma, sinitilimab demonstrated an ORR at 80.4% and DCR at 97.8%. Currently sinitilimab is being investigated in multiple trials for NSCLC, gastric cancer, advanced liver cancer, esophageal carcinoma, etc.

Junjian Liu, Ph.D., VP, Head of Drug Discovery & Preclinical Development, Innovent Biologics, Inc., China

4:00 Development of Cancer-reactive Antibodies Focused to the 287-302 Amino Acid Loop of the Human Epidermal Growth Factor Receptor

The 287-302 loop from EGFR is exposed on EGFRvIII (deletion of exons 2-7), partially exposed on some cancers but cryptic on cells expressing WT EGFR. Each of seven antibodies to this loop reacted with EGFRvIII but not EGFR WT. However, one antibody, 40H3, also exhibited binding to MDA-468 and A431 cells but not to non-cancerous WI-38 cells. The 40H3 antibody was engineered as a potent recombinant immunotoxin and could be developed as an antibody-based therapeutic for treating tumors with abnormal EGFR.

David Fitzgerald, Ph.D., Chief Biotherapy Section, Laboratory of Molecular Biology, CCR, National Cancer Institute

4:30 Late Breaking Presentation

Track 2: LOOKING AT TARGETS DIFFERENTLY (continued)

2:00 HexElect® Technology: Therapeutic IgG Antibody Combinations Acting as Bio-Logic AND Gates

Robert de Jong, Ph.D., Associate Director Antibody Research & Technology, Genmab, The Netherlands

2:30 CD16A, NK Cell Targeting

Redirection of immune cells to efficiently eliminate tumor cells holds great promise. Natural killer cells, macrophages, or T cells are specifically engaged with target cells expressing markers after neoplastic transformation, resulting in their activation and subsequent killing of those targets. Our new ROCK® platform is designed to enable the activation of innate immunity for the effective lysis of tumor cells and holds the promise of overcoming limitations of other approaches that redirect immune cells by widening the therapeutic window.

Michael Tesar, Ph.D., Research Program Head, Affimed, Germany

3:00 Networking Refreshment Break

3:30 Potent and Selective Mimics of IL-2 and IL15

Daniel Adriano Silva Manzano, Ph.D., Scientist, University of Washington

4:00 Determinants of Tumor Neoantigen Immunogenicity NEW DATA

A major challenge to develop novel approaches that select cancer neoantigens is that only a small fraction of the mutations generate T cell responses. For a mutant peptide to be immunogenic, the source protein has to be processed, the resulting mutant peptide needs to bind MHC1, and finally T cells must recognize the MHC1/peptide complex. We investigated the determinants of neoantigen immunogenicity to improve the neoantigen selection methods.

Lelia Delamarre, Ph.D., Senior Scientist, Cancer Immunology Research, Genentech

4:30 T-cell Targets – Identification and Clinical Use

This presentation will discuss the following topics: XPRESIDENT®: Quantitative HLA ligandomes in cancer and normal tissues; XCEPTOR®: TCR discovery guided by knowledge about potential on- and off-target side effects: the high value of normal ligandomes; Levels of personalization in Adoptive Cellular Therapy (ACT); IMADTECT®: A CDx for patient inclusion and target selection; ACTolog®, a personalized multi-target Adoptive Cellular Therapy (ACT); ACTengine®, Adoptive Cellular Transfer of T cells with engineered T-cell receptors; GAPVAC – Glioma Actively Personalized Vaccine Consortium: A personalized peptide vaccination trial

Toni Weinschenk, Ph.D., Chief Technology Officer, Immatics Biotechnologies, Germany

5:00 Close of Conference

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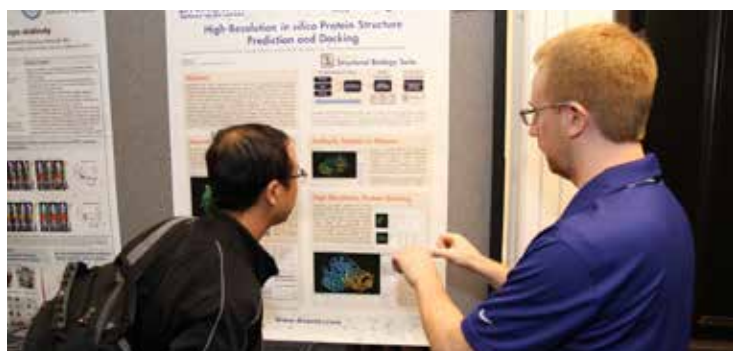
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MAIN CONFERENCE (Tuesday-Friday)	Register by October 4, 2019 SAVE \$200	Standard Rate
Industry - Individual	\$2,599	\$2,799
Academic/Govt. - Individual	\$899	\$1,099
ADD-ON OPTIONS		
Half Day Workshop (Mon PM) Industry	\$599	
Half Day Workshop (Mon PM) Acad/Govt	\$299	
Full Day Training Course (Mon) Industry	\$899	
Full Day Training Course (Mon) Acad/Govt	\$599	
Poster - Industry	\$150	
Poster - Acad/Govt	\$0	

*Academic/Government rates are extended to full-time employees of government, universities and university-affiliated hospitals only.

REGISTER A GROUP OF 4+ AND SAVE UP TO \$200/PERSON

Companies that register 4+ attendees are eligible to receive up to an additional \$200 savings per person off the current registration rate. Register your group today at the lowest rate by contacting our Group Bookings Team at Email: sales@informa-ls.com; Tel: +44 (0) 203 377 3903.



Present a Poster to Showcase Your Company's Latest Research

Highlight your company's exciting research by presenting a scientific poster, which will be displayed in the exhibit & poster hall during the event. You must be a registered attendee to present a poster. Poster fee is \$150 for industry attendees and free for academic/government attendees. The deadline to submit your poster is November 8, 2019.



Sponsorship/Exhibition Opportunities

Highlight your expertise directly to 1000+ scientists and high level decision makers and influencers working across antibody engineering, antibody therapeutics and protein discovery and development by becoming an event sponsor or exhibitor.

Contact **Kristin Skahan**, Kristin.Skahan@KNect365.com, **+1.857.504.6730** for pricing and package details, or to see a sample attendee list from Antibody Engineering 2018. Reserve your spot early to ensure company placement in our printed brochure.



Venue Information:

Marriott Marquis San Diego

333 West Harbor Drive, San Diego, CA 92101

Phone: (619) 234-1500

Reservations: +1-877-622-3056

Special Attendee Room Rate: \$239 per night + taxes/fees

Please call the hotel directly at the number above or book online and reference "Antibody Engineering" to receive the reduced room rate. Special hotel rates are good through Sunday, November 17, 2019 or until room block is sold-out.