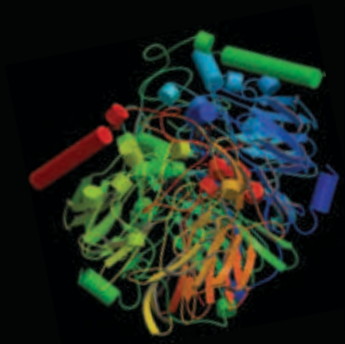

Eighth Annual PEGS

April 30 - May 4, 2012

the essential protein engineering summit

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DISCOVERY

- Phage & Yeast Display
- Engineering Antibodies
- Antibody Optimization

EXPRESSION

- Difficult to Express Proteins
- Optimizing Protein Expression
- Purifying Antibodies

ANALYTICAL

- Characterization of Biotherapeutics
- Protein Aggregation and Stability
- Immunogenicity

ANTIBODIES

- Antibodies for Cancer Therapy
- Bispecific Antibodies
- Antibody-Drug Conjugates

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PHARMA-BIO PARTNERING —FORUMS—

BIOLOGICS PARTNERING FORUM

NEW April 28 – April 29

Organized by Cambridge Healthtech Institute
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WELCOME TO THE 2012 PEGS SUMMIT

Cambridge Healthtech Institute is proud to present the **Eighth Annual PEGS**: *protein engineering summit*. This comprehensive event encompasses 12 tracks, 15 short courses, and a pre-conference partnering forum for showcasing early stage companies. Topics span from early stage discovery of new methods for protein expression and antibody engineering, to improved analytical techniques, and clinical results in the most promising areas of biotechnology. There is tremendous momentum and investment in biologics, and **PEGS** offers an unparalleled view of the field.

EVENT-AT-A-GLANCE

Saturday			Biologics Partnering Forum*	
Sunday	PRE-CONFERENCE SHORT COURSES*			
	DISCOVERY	EXPRESSION	ANALYTICAL	ANTIBODIES
Monday	Phage & Yeast Display	Difficult to Express Proteins	Characterization of Biotherapeutics	Antibodies for Cancer Therapy
Tuesday	Phage & Yeast Display	Difficult to Express Proteins	Characterization of Biotherapeutics	Antibodies for Cancer Therapy
	DINNER SHORT COURSES*			
Wednesday	Engineering Antibodies	Optimizing Protein Expression	Protein Aggregation	Bispecific Antibodies
Thursday am	Engineering Antibodies	Optimizing Protein Expression	Protein Aggregation	Bispecific Antibodies
Thursday pm	Antibody Optimization	Purifying Antibodies	Immunogenicity	Antibody-Drug Conjugates
	DINNER SHORT COURSES*			
Friday	Antibody Optimization	Purifying Antibodies	Immunogenicity	Antibody-Drug Conjugates

** Separate Registration Required*

KEYNOTE SPEAKERS INCLUDE

Alain Beck, Ph.D., *Centre d'Immunologie Pierre Fabre*

William H. Brondyk, Ph.D., *Genzyme – A Sanofi Company*

Kurt A. Brorson, Ph.D., *Food and Drug Administration*

Anthony J. Coyle, Ph.D., *Pfizer, Inc.*

Rakesh Dixit, Ph.D., *DABT, MedImmune*

Michael Gross, Ph.D., *Washington University*

David R. Liu, Ph.D., *Harvard University*

John McCafferty, Ph.D., *University of Cambridge*

Ira H. Pastan, M.D., *National Cancer institute*

David J. Roush, Ph.D., *Merck Research Labs*

Ivor Royston, M.D., *Forward Ventures*

Gregory A. Weiss, Ph.D., *University of California, Irvine*

PHARMA-BIO PARTNERING —FORUMS—

BIOLOGICS PARTNERING FORUM

Emerging Antibody & Protein Engineering

APRIL 28 - 29, 2012
The Boston Park Plaza Hotel & Towers | Boston, MA

REASONS TO ATTEND:

NETWORK AND FOSTER BUSINESS with the companies that are going drive biologics growth over the next decade, as well those interested in funding its expansion

IN-DEPTH PRESENTATIONS focused on promising technology platforms and innovative approaches in antibody therapies and protein engineering

LEADING EARLY-STAGE COMPANIES hand-picked to present by top biologics experts on our Program Advisory Board

BIG PHARMA, INDUSTRY EXECUTIVES, INVESTORS' representatives in attendance, open to further business collaborations

COVERAGE INCLUDES:

- *In Vivo* Transgenic Antibody Platforms
- *In Vitro* Antibody Development Platforms
- Antibody Tools
- Novel Antibody Products in Development
- Bi-Specific and Multi-Specific Antibody Technologies
- Fusion Proteins
- Protein Diversity
- Human-Derived Antibodies
- Novel Protein Scaffolds
- Screening and Design Platforms for Protein Engineering

To view the complete Partnering Forum agenda and other details, please visit:
PEGSummit.com/Antibody-Engineering-Partnering

PROGRAM ADVISORY BOARD:

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PRE-CONFERENCE SHORT COURSES*

MORNING

SUNDAY, APRIL 29 - 10:00 AM - 1:00 PM

SC1 - PHAGE AND YEAST DISPLAY LIBRARIES

- Phage display and construction of phage-displayed scFv and Fab libraries
- Yeast display and construction of yeast-displayed scFv and Fab libraries
- Selection and screening technologies that are compatible with phage and yeast-display libraries

Instructors: Andrew M. Bradbury, M.B., B.S., Ph.D., Staff Scientist, Biosciences, Los Alamos National Laboratory
James D. Marks, M.D., Ph.D., Professor, Anesthesia & Pharmaceutical Chemistry, University of California, San Francisco; Chief of Anesthesia and Vice Chairman, Anesthesia & Perioperative Care, San Francisco General Hospital

SC2 - TECHNIQUES FOR ANTIBODY SELECTION & SCREENING

- Integrated single-cell analysis for antibody discovery
- A method for selection of anti-peptide monoclonal antibodies for use in immunoproteomics
- Comparing tools for antibody selection and screening

Instructors: Moonsoo Jin, Ph.D., Assistant Professor, Biomedical Engineering, Cornell University
J. Christopher Love, Ph.D., Associate Professor, Chemical Engineering, Massachusetts Institute of Technology (MIT)

SC4 - ENGINEERING OPTIMIZED BIOTHERAPEUTICS

- Engineering approaches to optimize biophysical characteristics of therapeutic molecules
- Optimization of scFvs to improve stability and activity
- Assembly of candidates (scFv) into an optimized final therapeutic molecule

Instructors: Jonathan Davis, Ph.D., Principal Scientist, Protein Design, Adnexus, A Bristol-Myer Squibb R&D Company
Brenda Stevens, Scientist, Protein Engineering, ZymoGenetics, A Bristol-Myer Squibb Company

SC5 - TRANSLATIONAL STRATEGIES FOR DEVELOPMENT OF MONOCLONAL ANTIBODIES PART I: FOCUS ON EARLY DISCOVERY

- Considerations for target selection, antibody screening and mAb pre-clinical development
- Antibody affinity and biophysical characterization: Biacore, Kinexa, and FACS
- Pre-clinical considerations - a science based approach: design goal, MOA, choice of species, and pre-clinical plans

Instructors: Mohammad Tabrizi, Ph.D., Head, PK/PD & Senior Fellow, Merck
Gadi Bornstein, Ph.D., Principal Scientist, AstraZeneca R&D Director, Biology, Centers for Therapeutic Innovation (CTI), Pfizer, Inc.
Cherryl Funelas, Manager, Bioanalytical Development, Takeda San Francisco California
Scott Klakamp, Ph.D., Research Fellow, Biophysical Chemistry and Research Informatics, Takeda San Francisco California
Randall Brezski, Ph.D., Senior Research Scientist, Biotechnology Center of Excellence, Janssen R&D Inc.

AFTERNOON

SUNDAY, APRIL 29 - 2:00 - 5:00 PM

SC6 - ALTERNATE DISPLAY TECHNOLOGIES

- Development of new display systems to address shortcomings of phage and yeast display
- Constructing libraries and assessing library quality
- Screening and selection methods for generation of new affinity proteins as well as for epitope mapping purposes

Instructors: John Löfblom, Ph.D., Assistant Professor, Molecular Biotechnology, AlbaNova University Center, Royal Institute of Technology (KTH)
Patrick S. Daugherty, Ph.D., Professor & Vice Chair, Chemical Engineering, & BioMolecular Science & Engineering Program, University of California, Santa Barbara
Birgit Dreier, Ph.D., Senior Scientist, Laboratory of Professor Dr. A. Plückthun, Department of Biochemistry, University of Zurich

SC7 - USE OF HT SEQUENCING FOR ANTIBODY LIBRARY GENERATION & SELECTION

- Improved library generation strategies including synthetic antibody library generation
- Sequencing antibody libraries
- High-throughput immune repertoire analysis

Instructors: Jacob Glanville, Principal Scientist, Pfizer
François Rousseau, Ph.D., Head, Protein Engineering, Research, NovImmune SA
Zoltán Konthur, Ph.D., Group Leader, Max Planck Institute for Molecular Genetics

SC8 - ENGINEERING OF BISPECIFIC ANTIBODIES

- Rationale for "resurgence" of these molecules
- Current state-of-the-art
- Breaking down engineering challenges

Instructor: Raffi Tonikian, Ph.D., Scientist I, Protein Engineering, Biogen Idec

SC9 - BIOSIMILARS: DEVELOPMENT, REGULATION AND PROSPECTS

- The approval pathway, strategies & defining 'similar'
- Tools for characterizing biologics
- Where are biosimilars headed and how will they affect the biologics field?

Instructors: Magdalena Leszczyniecka, Ph.D., President & CEO, STC Biologics Inc.
Thomas H. Wintner, J.D., Associate, Edwards Wildman Palmer LLP
Svein Valla, Ph.D., Co-Founder, Vectron Biosolutions, and Professor, Biotechnology, Norwegian University of Science & Technology

SC10 - TRANSLATIONAL STRATEGIES FOR DEVELOPMENT OF MONOCLONAL ANTIBODIES PART II: FOCUS ON NON-CLINICAL DEVELOPMENT TO CLINIC

- Considerations for immunoassay development in support of pharmacokinetic, immunogenicity & biomarker evaluation
- Antibody safety, species selection, introduction to surrogate approaches in development of monoclonal antibodies
- Translation of exposure-response data from discovery into the clinic in support of FIH dosing

Instructors: Mohammad Tabrizi, Ph.D., Head, PK/PD & Senior Fellow, Merck
Gadi Bornstein, Ph.D., Principal Scientist, AstraZeneca R&D Director, Biology, Centers for Therapeutic Innovation (CTI), Pfizer, Inc.
Cherryl Funelas, Manager, Bioanalytical Development, Takeda San Francisco California
Scott Klakamp, Ph.D., Research Fellow, Biophysical Chemistry and Research Informatics, Takeda San Francisco California
Randall Brezski, Ph.D., Senior Research Scientist, Biotechnology Center of Excellence, Janssen R&D Inc.

SC11 - MOLECULAR IMAGING ON TISSUES USING MASS SPEC

- Learn about the technology and how it is applying to the pharmaceutical industry
- Learn about the techniques and "tricks-of-the-trade" for MALDI-TOF tissue imaging process
- Learn how others are applying the technology to answer questions and drive science

Instructors: Jennifer Nemeth, Ph.D., Principal Research Scientist & Head, Discovery Mass Spectrometry, Janssen R&D
Pierre Chaurand, Ph.D., Associate Professor, Chemistry, Université de Montréal
Michelle Reyzer, Ph.D., MSRC Mass Spectrometry Research and Development, Vanderbilt University Medical Center

** Separate Registration Required*

DINNER SHORT COURSES*

EVENING

TUESDAY, MAY 1 - 6:00 - 9:00 PM

SC12 - ASIA-U.S. BIOTECH ALLIANCES: OPENING UP NEW OPPORTUNITIES FOR PRE-CLINICAL DEVELOPMENT OF BIOLOGICS

- Exchange and transfer of IP, materials, know-how
- Understanding export-import laws
- Review of currency laws and cultural divide

Instructors: Kathleen Madden Williams, Ph.D., Partner, Edwards Wildman Palmer LLP
Jim Weissman, CBO, Dicerna Pharmaceuticals, Inc.
Jun Ouyang, Ph.D., Senior Product Manager, Pharma Technical Regulatory, Genentech

SC13 - LIGHT SCATTERING – THEORY, DO'S & DON'TS, AND DATA INTERPRETATION

- This workshop covers the basic theory behind static, dynamic, and electrophoretic light scattering, with a focus on the do's & don'ts when it comes to data interpretation
- How is the mass distribution determined in DLS & what is the accuracy?
- Can light scattering be used for particle counting?
- How do I convert zeta potential to surface charge?

Instructors: Kevin Mattison, Ph.D., Principal Scientist – Bioanalytics, Malvern Instruments
Ulf Nobbmann, Ph.D., GPC/SEC Product Manager – Americas, Malvern Instruments
Jean-Luc Brousseau, Ph.D., SEC & Light Scattering Specialist, Malvern Instruments

For additional short course information, please visit the short course page of our conference website at www.PEGSummit.com.

THURSDAY, MAY 3 - 5:30 - 8:30 PM

SC14 - ANTIBODY CONJUGATE THERAPEUTICS: POTENTIAL AND CHALLENGES

- Antibody-small molecule conjugates
- Antibody-radionuclide conjugates
- Antibody-protein toxin (or antibody fragment-protein toxin fusion) conjugates
- Antibody-enzyme conjugates with small-molecule prodrugs
- Antibody to drug-containing liposomes or nanoparticles
- Regulatory approval

Instructors: Mahendra Deonarain, Ph.D., Head, Antibody Technology, Life Sciences, Imperial College London
Robert J. Kreitman, M.D., Principal Investigator, Clinical Immunotherapy, NIH, NCI
Saurabh Sharma, Ph.D., Assistant Professor, Neurosurgery, Children's Memorial Hospital at the Northwestern University
Gregory P. Adams, Ph.D., Co-Leader, Developmental Therapeutics Program Fox Chase Cancer Center

SC15 - ADVANCES IN IMMUNOGENICITY ASSAYS

- Understanding pre-existing anti-drug antibodies
- Coping with seemingly insurmountable interference: Back to the basics
- Case study on development and validation of assays for the detection of anti-drug neutralizing antibodies
- Development of an immunogenicity testing program
- Different technology platforms that address challenges faced for the development of fit-for-purpose immunogenicity assays

Instructors: Stephen Keller, Ph.D., Associate Director II, Pre-Clinical and Clinical Development Sciences, Abbott Biotherapeutics
Michele Fiscella, Ph.D., Director, Clinical Immunoassays, Human Genome Sciences
Boris Gorovits, Ph.D., Director, Pharmacokinetics, Pharmacodynamics & Metabolism, Pfizer, Inc.
Maureen Deehan, Ph.D., Head, Pharmacology, Experimental Science & Translational Medicine, NovImmune SA
Deborah Finco, Ph.D., Senior Principal Scientist, Immunotoxicology COE, Pfizer, Inc.

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PHAGE AND YEAST DISPLAY OF ANTIBODIES AND RECOMBINANT PROTEINS

Leading Innovation in Protein Science

SUNDAY, APRIL 29

4:00 - 6:00 pm Main Conference Registration

MONDAY, APRIL 30

7:00 am Registration and Morning Coffee

KEYNOTE SESSION

8:30 Chairperson's Opening Remarks

Aaron K. Sato, Ph.D., Senior Director, OncoMed Pharmaceuticals, Inc.

8:40 Display Antibodies against Interesting Targets: Partnerships with Academia

Anthony J. Coyle, Ph.D., Vice President & CSO, Centers for Therapeutic Innovation, Pfizer, Inc.

Centers for Therapeutic Innovation have been established in four US-based sites, signing 19 academic partners and are poised to be a transformational force, employing an entrepreneurial R&D model that accesses the best science in the world to deliver mechanistically-relevant clinical studies that can translate into differentiated, clinically-validated candidates. Highlights include innovative science and technology science in the Oncology and Autoimmune disease fields.

9:10 Generation of Receptor-Blocking Human Antibodies by Phage Display

John McCafferty, Ph.D., Research Director, Biochemistry, University of Cambridge

B CELL CLONING

9:40 B Cell Display: Screening the Native Human B Cell Repertoire for Broadly Crossreactive Antibodies against the Influenza A Virus

Minha Park, Ph.D., Scientist, Antibody Discovery & B Cell Immunology, Trellis Bioscience

The low frequency of B cells expressing high quality antigen-specific antibodies has posed a barrier to discovery. Here, we show successful application of the Trellis Cellspot platform of single cell phenotyping to recover rare human B cells expressing high affinity and broadly crossreactive antibodies against the influenza A virus.

10:10 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing

IN VIVO HALF-LIFE EXTENSION

11:10 Engineering Super Albumin for Improving Serum Half-Life

G. Jonah A. Rainey, Ph.D., Scientist II, Antibody Discovery & Protein Engineering, MedImmune

FcRn mediated half-life extension through Fc has been engineered extensively, pH dependent affinity maturation of albumin to inprove serum half-life remains largely unexplored. We have engineered human albumin to improve its affinity for FcRn while retaining the pH dependence of binding through off rate engineering to extend lifespan of non-antibody therapeutics.

11:40 Use of pH Dependent Binding of Engineered Antibodies with Improved *in vivo* Half-Life Extension

E. Sally Ward, Ph.D., Paul and Betty Meek-FINA Professorship, Molecular Immunology, Cancer Immunobiology Center, University of Texas Southwestern

FcRn plays a central role in regulating the transport and distribution of IgG in the body. The presentation will cover recent developments in understanding FcRn function, combined with engineering FcRn-Fc interactions to generate therapies for autoimmune disease.

12:10 pm Advances in Albumin Half-Life Extension Platform Translates to Positive Pharmacokinetic Studies

Sponsored by novozymes

Mark Perkins, Ph.D., Technical Solution Specialist, Novozymes Biopharma

The ability to enhance the therapeutic half-life of drugs by conjugation or fusion to albumin is now well established. We have shown that albumin can be further enhanced for uses in drug delivery by manipulating its interaction with the neonatal Fc receptor (FcRn) via the introduction of specific amino acid changes in the albumin sequence. This talk will highlight a novel albumin platform and will include new pharmacokinetic data demonstrating the extended circulatory half-life of the albumin variants and protein drugs linked to such variants.

12:40 Luncheon Presentations *(Sponsorship Opportunities Available)* **or Lunch on Your Own**

EPITOPE MAPPING WITH CRYSTALLIZATION AND DISPLAY

2:00 Chairperson's Remarks

David Lowe, Ph.D., Fellow, R&D, MedImmune UK

2:05 Phage Selection of Bicyclic Peptides

Christian Heinis, Ph.D., Laboratory of Therapeutic Peptides and Proteins, Ecole Polytechnique Federal de Lausanne (EPFL)

My laboratory is generating bicyclic peptide ligands with high affinity and specificity for disease targets using a phage display-based approach that I had developed with Sir Greg Winter at the Laboratory of Molecular Biology (LMB) in Cambridge, UK. I will present the structure of a target-bound bicyclic peptide, new bicyclic peptide formats as well as first *in vivo* data.

2:35 Synthetic Antibodies: Structure and Function

Shane Miersch, Ph.D., Research Associates, Sidhu Lab, University of Toronto

Synthetic antibody libraries have simplified the discovery of antibodies for structural studies. Synthetic antibody libraries are highly versatile for generating antibodies against diverse antigens. Moreover, synthetic antibodies exhibit superior performance in crystallization studies due to their stable nature.

3:05 Optimizing Functional Modules of Bispecific Antibodies Using Yeast Display Platform

Lihui Xu, Ph.D., Principal Scientist & Group Leader, Antibody Technology, Merrimack Pharmaceuticals

We developed a yeast display platform that combines the features of surface display and soluble expression within the single system, in conjunction with small structure-guided antibody library and innovative screening strategy, we are able to discover optimal functional modules in single campaign for a bispecific antibody that targets two Growth Factor Receptors.

3:35 State of the Art Epitope Mapping and Insights Gained from mAb-Target Co-Crystal Structures

David Lowe, Ph.D., Fellow, R&D, MedImmune UK

Examples of co-crystal structures will be used to provide insight into the antibody mechanism of action, species cross reactivity and the characteristics of the antibody paratope. In addition, alternative methods of epitope mapping will be illustrated.

4:05 Refreshment Break in the Exhibit Hall with Poster Viewing

4:45 Problem Solving Breakout Discussions

5:45-6:45 Welcome Reception in the Exhibit Hall with Poster Viewing

TISSUE PENETRATION, BLOOD-BRAIN BARRIER AND DELIVERY SYSTEMS

8:25 am Chairperson's Remarks

K. Dane Wittrup, Ph.D., J.R. Mares Professor, Chemical Engineering & Bioengineering, Massachusetts Institute of Technology

8:30 Phage Library Panning for Selection of Blood-Brain Barrier-Transmigrating Antibodies: Overcoming Antigen Identification Bottleneck

Danica Stanimirovic, National Research Council, Ottawa

Panning of antibody phage-display libraries to isolate binders for specific function, organ- or disease-targeting properties is often faced with the downstream bottleneck in identification of antigenic epitopes driving the function of selected antibodies. The talk will discuss methods for identification of antibody-receptor interactions involved in blood-brain barrier transport using functional phage panning coupled with medium-throughput proteomic and yeast two hybrid screens for antigen identification.

9:00 Engineering Antibodies Against Membrane Protein Targets Including the Blood-Brain Barrier

Eric V. Shusta, Ph.D., Associate Professor, Chemical & Biological Engineering, University of Wisconsin, Madison

Membrane proteins are challenging to work with in terms of antibody selection, engineering, and antigen identification as a result of their insolubility in aqueous solutions. We have developed a platform for antibody engineering using either whole cells or cell lysates as antigen sources. In addition, a human pluripotent stem cell-based blood-brain barrier model offering potential advantages for antibody screens will be described.

9:30 Phylomer Libraries as a Rich Source of Peptides Targeting the Intracellular Space

Paul Watt, D.Phil., CEO, Phylogica Ltd.

Phylomers are a new class of peptide, derived from fragments of biodiverse microbial genomes. Phylomer libraries can also be used to identify new cell penetrating peptides for delivery of macromolecules into cells. Some of these cell penetrating Phylomers are specific for particular cell types. Phylomers themselves can be active against intracellular targets *in vivo* and can be used to discover and validate new targets.

10:00 Coffee Break in the Exhibit Hall with Poster Viewing

ALTERNATIVE DISPLAY METHODS

10:45 Display and Selection of Antigen-Binding Fc Domains (Fcabs™)

Sarah Batey, Ph.D., Senior Scientist, f-star GmbH

F-star's modular antibody technology will be presented with a focus on how yeast and phage display are used to select for antigen binding Fc domains (Fcabs™). The therapeutic potential of the Fcab format will be described in terms of its antigen binding, effector function, *in vivo* half-life and efficacy properties.

11:15 Bispecific DARPin-Based Adapters for Efficient Adenoviral Gene Transfer

Birgit Dreier, Ph.D., Senior Scientist, Department of Biochemistry, University of Zurich

We describe a universal approach for retargeting of Adenovirus serotype 5 (Ad5) from its natural tropism to any target cell of choice. DARPins binding the Ad5 trimeric knob protein with nanomolar affinity were selected by ribosome display. When these DARPin were fused to another DARPin recognizing HER2, the resulting bispecific adapter enabled Ad5 virions to deliver a luciferase reporter gene in a HER2-dependent manner.

11:30 Analyzing and Engineering MHC Class II Peptide Binding by Yeast Display

Eric T. Boder, Ph.D., Career Development Associate Professor, Chemical & Biomolecular Engineering, University of Tennessee, Knoxville

Adaptive immunity depends critically on peptide antigen binding by class II major histocompatibility (MHC-II) proteins, motivating the study of specificity-constraining mechanistic details. Here, we describe a yeast display platform to rapidly and quantitatively characterize MHC-II/peptide binding and to isolate MHC-II mutants with altered peptide-binding preferences by directed evolution.

11:45 Bacterial Display and Screening of Thioether-Stabilized Peptides

Tjibbe Bosma, Ph.D., Senior Research Scientist, Lanthio Pharma

We developed a unique cell surface display system of peptides which are post-translationally modified by thioether-bridge-installing enzymes inside *L. lactis*. This system allows the generation of combinatorial thioether-stabilized peptide libraries. Thioether bridges effectively protect therapeutic peptides against breakdown. Our biotechnological display and screening system can strongly improve the therapeutic potential of hundreds of medically and economically highly important therapeutic peptides.

12:15 pm Discovering Potent Antibodies to Challenging Targets

Sponsored by Dyax

Andy Nixon, Ph.D., Vice President of Discovery Research and Antibody Technologies, Dyax

The ability to identify potent and specific antibodies to a broad range of targets is dictated by a number of factors, which includes but is not limited to: A large and diverse antibody library; access to high quality target antigen, and a fluency with the technology to achieve success. Dyax's antibody phage display library was generated by combining natural diversity in the light chain and CDR3 of the heavy chain and targeted relevant diversity in heavy chain CDR1 and CDR2 resulting in 3x10E10 potential antibodies. This library has been used to great effect in over 100 selection campaigns resulting in high affinity antibodies without the need for affinity maturation. Using illustrative case studies we will examine strategies to identify antibodies that bind to difficult target antigens.

12:45 Luncheon Presentations *(Sponsorship Opportunities Available)* **or Lunch on Your Own**

NEW FRONTIERS IN PHAGE AND YEAST DISPLAY

» KEYNOTE SESSION

2:00 Chairperson's Remarks

Gregory A. Weiss, Ph.D., University of California, Irvine

2:05 Phage-Assisted Continuous Evolution (PACE)

David R. Liu, Ph.D., Professor of Chemistry and Chemical Biology, Howard Hughes Medical Institute Investigator, Harvard University

In contrast with conventional laboratory evolution approaches in which genes are mutated, translated, screened or selected, harvested, and replicated, phage-assisted continuous evolution (PACE) enables the rapid continuous evolution of proteins and nucleic acids without requiring researcher intervention during the evolutionary process. In this lecture I will present the development and early applications of PACE.

2:35 Targeting and Phage Display of Membrane Proteins

Gregory A. Weiss, Ph.D., Professor, Departments of Chemistry, Molecular Biology & Biochemistry, University of California, Irvine

3:05 Generation and Optimization of Fully Human VH Domain Antibodies and IgG Using dsDNA Display with Deep Sequence Hit Analysis

Yan Chen, M.D., Ph.D., Senior Vice President, Research and Development, X-BODY BioSciences

We describe a platform for generating and optimizing hMABs under mammalian folding conditions by dsDNA display of human libraries. Sequencing thousands of hits provides an early read on the function, affinity and specificity of leads. We have affinity matured VH domains using a rapid framework optimization that maintains their fully human character. A novel VL pairing method has been used to construct scFv and IgG with the biological functional activity that was predicted by deep sequencing.

3:35 Refreshment Break in the Exhibit Hall with Poster Viewing

APPLYING PHAGE DISPLAY TO

TOUGH TARGETS

4:15 Antibody Phage Display for Diagnostics and Therapy
Michael Hust, Ph.D., Research Group Leader, Institut für Biochemie und Biotechnologie, Technische Universität Braunschweig
Human, naive antibody gene libraries were constructed and a high-throughput compatible antibody selection pipeline including a transient mammalian expression system was set up. In this presentation, our antibody generation pipeline will be shown and detailed examples for diagnostics and neutralisation of toxins (botulinum toxins), bacteria (*Bacillus anthracis*) and viruses (venezuelan horse encephalitis).

4:45 AbTrap: Display and Selection of Large Diversity Antibody Libraries in Mammalian Cells
Christopher J. Bond, Ph.D., Senior Scientist, Antibody Engineering, OncoMed Pharmaceuticals, Inc.
We've developed an antibody capture format for display of full length antibodies on mammalian cells. Based on this method we are able to display 1E5-1E6 full length IgG's per cell. To select and identify individual antibodies within these pools we have developed a protocol encompassing selection, amplification and deconvolution. In several test examples this process has resulted in the identification of full length IgG clones with affinities in the range of 100pM-10nM.

5:15 End of Conference

ENGINEERING ANTIBODIES

Exploring Solutions for Antibody Discovery and Development

WEDNESDAY, MAY 2

7:00 am Registration and Morning Coffee

STABILITY AND AFFINITY

8:30 Chairperson's Opening Remarks

» 8:40 FEATURED PRESENTATION

Whole-Molecule Antibody Engineering: Generation of a High-Affinity Anti-IL-6 Antibody with Extended Pharmacokinetics
David G. Lowe, Ph.D., Fellow, Research & Development, MedImmune Ltd.
We describe here the generation of MEDI5117, a human anti-interleukin (IL)-6 antibody generated by variable domain engineering, to achieve subpicomolar affinity for IL-6, combined with Fc (fragment crystallizable) engineering to enhance pharmacokinetic half-life. MEDI5117 was shown to be highly potent in disease-relevant cellular assays. The half-life of MEDI5117 was extended by approximately 3-fold, and clearance was reduced by approximately 4-fold when compared to CAT6001. MEDI5117 therefore represents a potential 'next-generation' antibody.

9:10 Homogeneous Time Resolved Fluorescence - Multiple Applications in the Generation of Protein Therapeutics
Paula Harrison, Ph.D., Associate Director, Research, MedImmune
Often with protein therapeutics, use of unpurified sample material is beneficial to the cost and throughput of early campaigns but this brings associated challenges when designing assay cascades. The application of Homogeneous Time Resolved Fluorescence technology to enable 384 well throughput at multiple stages of an antibody drug discovery project will be presented. This includes biochemical and cell based assays to measure antibody function, specificity, mechanism of action and epitope.

9:40 Engineered VH and CH2 Antibody Domains as Candidate Therapeutics
Dimiter S. Dimitrov, Ph.D., Protein Interactions Group, Center for Cancer Research Nanobiology Program, National Institutes of Health
Isolated single engineered antibody domains are small and can access targets and epitopes that are not accessible by larger molecules. We have constructed libraries based on soluble VH and stabilized CH2 from which binders against HIV and cancer-related proteins were identified and characterized with potential use as therapeutics. An update on further engineering to confer additional functions will be discussed.

10:10 Coffee Break in the Exhibit Hall with Poster Viewing

11:10 *In silico* Antibody Design and Affinity Maturation
Samuel Flores, Ph.D., Assistant Professor, Cell and Molecular Biology, Uppsala University
MMB addresses issues by allowing full flexibility in tightly restricted regions of the antibody, thus obtaining accurate sampling at low cost. The package also permits modeling of large scale domain motions, allowing the structure and dynamics of interaction to be probed well beyond the binding interface. The results demonstrate an effective and practical paradigm for biological therapy development.

11:40 Developing the Next Generation Designer Cell Lines as a Customized Approach for Optimized Therapeutic Protein Production
Sponsored by SELEXIS
Armelle Gaussin, Ph.D., Chief Technology Officer, Selexis SA
The Chinese Hamster Ovary cell line is the predominant host for the production of therapeutic proteins. However, its capacity to provide high levels of certain classes of products such as fusion proteins remains limited. In order to overcome the specific expression bottlenecks associated with these difficult-to-express proteins, we have developed new designer CHO cell lines. These next generation cell lines have been metabolically engineered to over-express key components of the cell secretion network.

12:10 Protein Aggregation and Stability: A Case Study for the use of Computational Algorithms for Biotherapeutics Design
Sponsored by accelrys
Francisco G. Hernandez-Guzman, Ph.D., Sr. Product Manager, Life Sciences, Accelrys, Inc.
Over the past decade we have seen a significant rebalancing in the pharmaceutical drug portfolio towards the development of new biologics based therapies. Though small molecule development remains a critical area of interest, biotherapeutics based therapies continue to gain acceptance and importance as more biologics drugs gain FDA approval. Given that the development of biotherapeutics has been classically driven by in-vitro and in-vivo studies, there is a great opportunity for computational algorithms to support this effort. Undeniably, the use of in-silico tools has the potential for reducing the experimental burden by providing speed and insight into the drug development process. In this presentation, we will show case well validated computational algorithms used in the areas of Protein Aggregation and Stability that are being used in the industry for hypothesis generation and validation, as well as workflow improvements.

DESIGNING AND SCREENING

1:30 Chairperson's Remarks

1:35 NHLBI-AbDesigner: An Online Tool for Design of Peptide-Directed Antibodies
Mark Knepper, Ph.D., Cell Biology and Physiology, National Institutes of Health
Here we describe a new, web-based software tool called NHLBI-AbDesigner that allows the user to visualize the information needed to choose optimal peptide sequences for peptide-directed antibody production (http://helixweb.nih.gov/AbDesigner/). Several examples of the use of AbDesigner for the display of such trade-offs are presented, including production of a new antibody to Slc9a3.

2:05 A Screening Tool for Therapeutic Monoclonal Antibodies: Identifying the Most Stable Protein and its Best Formulation based on Thioflavin T Binding
Veysel Kayser, Ph.D., Research Engineer, Chemical Engineering,

Massachusetts Institute of Technology
We present an alternative method for initial screening of aggregation propensity of proteins, using monoclonal antibodies (mAb) as an example, with Thioflavin T binding. The major advantage of ThT binding is the short duration of testing compared with SEC measurements that can take 6 months or more even under accelerated conditions. ThT binding can determine the propensity of proteins to aggregate in a few days, illustrating that ThT binding would be a valuable screening tool.

2:35 The Use of DNA Immunization Technology to Create Antibodies against Targeted Conformational Epitopes

Sponsored by sdix

Ross Chambers, Ph.D., Senior Scientist, SDIX
DNA immunization-based approaches provide efficient access to conformational epitopes for antibody development. Our Genomic Antibody Technology™ represents a highly optimized form of DNA immunization. Antigen design is key to the success of the process and allows specific regions to be targeted, overcome expression problems, and avoid immune dominance from undesired epitopes.

3:05 Refreshment Break in the Exhibit Hall with Poster Viewing

3:50 Problem Solving Breakout Discussions

4:50-6:00 Networking Reception in the Exhibit Hall with Poster Viewing

THURSDAY, MAY 3

BREAKING NEWS: CASE STUDIES

8:30 am Chairperson's Remarks

8:35 Llama Antibodies: Progress and New Data

Ellen R. Goldman, Ph.D., Research Biologist, Center for Biomolecular Science & Engineering, U.S. Naval Research Lab
We will discuss the latest developments in our research with llama antibodies.

9:05 Generation and Characterization of Antibodies Specific for Caspase-Cleaved Neo-Epitopes: A Novel Approach

Huseyin Mehmet, Ph.D., Director, Exploratory Biomarkers, Merck Research Laboratories
The aim of this project was to create antibodies which could identify caspase-cleaved proteins without *a priori* knowledge of the cleavage sites or even the proteins themselves. These antibodies have the potential to identify novel neo-epitopes produced by caspase cleavage and so can be used to identify pathway-specific caspase cleavage events in a specific cell type. Additionally this methodology may be applied to generate antibodies against products of other proteases, which have a well-defined and non-promiscuous cleavage activity.

9:35 Implementation of a Fully Automated High-Throughput Antibody Engineering Process

Christoph Freiberg, Ph.D., Senior Scientist, Global Drug Discovery GB-BRG-C&PS, Bayer HealthCare Pharmaceuticals
We have implemented an automated HT-biologics screening process for the discovery and optimization of monoclonal antibody leads. We will describe examples of our laboratory workflows from Fab screening to IgG reformatting with focus on data management support using Genedata's Biologics software platform.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

11:05 An Immunotherapeutic Approach to Amyloid Light Chain Disease

Robin Barbour, Director, Antibody Technology, Neotope Biosciences, a division of Elan Pharmaceuticals
Certain plasma cell dyscrasias result in the overproduction, mis-folding and pathological accumulation of immunoglobulin light chain in the form of amyloid. We have generated an antibody with specificity for light chain in the context of amyloid. Progress in characterizing the unique reactivity of this antibody and steps towards its clinical development as an immunotherapy for AL amyloidosis will be summarized.

11:35 Phenolics and Chlorophyll Pigments in Transgenic Lemna minor Extracts: Their Removal and Impact on mAb Purification Cost

Zivko L. Nikolov, Ph.D., Professor, Biological and Agricultural Engineering Department, Texas A&M University
Plant phenolics and pigments are of potential concern in downstream processing of plant-derived monoclonal antibodies. Given the tendency of phenolics to foul costly protein A and other affinity-type resins, their removal prior to affinity chromatography is desirable. The cost impact of a phenolics pretreatment step before protein A chromatography using *Lemna minor*-expressed MAb was investigated. Economic analysis indicated that the cost of a pretreatment step would be offset by increasing the lifespan of protein A resin.

12:05 pm End of Conference

MAY 3-4 | DISCOVERY STREAM 13th ANNUAL

ANTIBODY OPTIMIZATION

Improving Performance through Innovative Methods

THURSDAY, MAY 3

12:00 pm Registration

A CLOSER LOOK

1:30 Chairperson's Opening Remarks

» 1:40 KEYNOTE PRESENTATION

Industry and Regulatory Experience of the Glycosylation of Monoclonal Antibodies

Kurt A. Brorson, Ph.D., Division of Monoclonal Antibodies, Office of Biotechnology Products, Center for Drug Evaluation and Research, Food and Drug Administration

2:10 High-Throughput Analysis of Concentration-Dependent Antibody Self-Association

Joseph Perchiacca, Graduate Student, Tessier Laboratory, Department of Chemical and Biological Engineering, Rensselaer Polytechnic Institute
Using this methodology, we find that the antibodies display a complex pH-dependent self-association behavior that is strongly influenced by the solution ionic strength. Importantly, we find that a polyclonal human antibody is nonassociative for all solution conditions evaluated in this work, suggesting that antibody self-association is more specific than previously realized. We expect that our findings will guide rational manipulation of antibody phase behavior, and enable studies that elucidate sequence and structural determinants of antibody self-association.

2:40 The EB66 Cell Line for the Industrial Production of High Potency Antibodies and Analytical Methods for Low-Fucosylated Clones Screening.

Sponsored by cisbio

Stéphane Olivier, Ph. D., Scientist, Protein Department, VIVALIS
The EB66 cell line, derived from duck embryonic stem cells, can be efficiently engineered to produce mAbs at yields beyond 1g/L, in serum-free suspension culture. Furthermore, mAbs produced in EB66 cells display a naturally reduced fucose content resulting in strongly enhanced ADCC activity. Analytical methods have been implemented to support low-fucosylated cell line development, including a CD16a cellular binding assay from Cisbio.

3:10 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00-5:00 Problem Solving Breakout Discussions

5:30-8:30 Recommended Dinner Short Courses*
- SC14 - Antibody Conjugate Therapeutics Challenges
- SC15 - Advances in Immunogenicity Assays

**Separate registration required, see page 5 for details.*

FRIDAY, MAY 4

7:45 am Continental Breakfast in the Exhibit Hall with Poster Viewing

EARLY PLANNING FOR LATER SUCCESS

8:30 Chairperson's Remarks

8:35 Mitigation of Monoclonal Antibody Viscosity by Modification of Protein Surface Charge

Randal Ketchem, Ph.D., Scientific Director, Therapeutic Discovery, Amgen
Antibodies exhibit varying degrees of viscosity, even within a single subtype, particularly at protein concentrations approaching 100 mg/ml or higher. We have found that in many cases the level of viscosity is related to Fv surface charge patch area. We have selected a parental antibody with high viscosity and have made several alanine variants, measured viscosity and pI of the variants and related this to computed sizes of the charge patch areas. We demonstrate that reducing the size of the surface charge patch lowers viscosity.

9:05 Physico-Chemical Determinants of Soluble Intrabody Expression in Mammalian Cell Cytoplasm

Anne Messer, Ph.D., Research Scientist, Molecular Genetics, New York State Department of Health

Sponsored by SCHRÖDINGER.

9:35 From Antibody Sequence to Structure: Promising Results for De Novo Prediction of Hypervariable Loop Conformation

David A. Pearlman, Ph.D., BioLuminate Product Manager, Schrödinger, Inc.
Rational design approaches hold the promise of more narrow focus and faster antibody/antigen optimization, but require a crystallographic structure or homology model of the hypervariable region. Although approaches based on curated crystal data and rules have been applied with success toward the prediction, from sequence, of the structures of many of the loops in the hypervariable region of an antibody, prediction of the H3 loop has remained problematic. We applied Prime de novo loop prediction method to the H3 loops of a set of 53 native benchmark antibody structures (with H3 lengths ranging between 22 and 54 residues) and have obtained very promising results: The average RMS deviation between the predicted loops and the crystal structure is 0.5Å, and 91% of the loops are with 2.0Å of the crystal structure.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

OVERCOMING PK AND GLYCOSYLATION CHALLENGES

10:50 Glycoengineering to Enhance the Efficacy of Antibodies Targeting CD20 and EGFR

Christian Klein, Ph.D., Expert Scientist, Head, Oncology Programs, Roche Glycart AG, pRED Pharma Research and Early Development
This presentation will discuss the pre-clinical properties of the glycoengineered Type II CD20 antibody GA101 (obinutuzumab) and provide a clinical update. We will also present the pre-clinical activity of the EGFR antibody GA201 and clinical update.

11:20 A pH-Sensitive Anti-PCSK9-Antibody: Improving PK and Cholesterol Lowering by Increasing Antibody-Antigen Binding Cycles and Reducing Target-Mediated Clearance

Javier Chaparro-Riggers, Ph.D., Senior Principal Scientist, Protein Engineering, Rinat, Pfizer, Inc.
We improve the PK and extend cholesterol lowering in rodents and non-human primates by engineering a pH-sensitive antibody. The proposed mechanism of this pH sensitive antibody is that it binds with high affinity to PCSK9 in the plasma at pH 7.4, while the antibody-antigen complex dissociates at the endosomal pH of around 5 in order to escape from target-mediated degradation and enabling the antibody to bind to another PCSK9 after FcRn-dependent recycling.

11:50 Glycooptimized Antibodies for Cancer Treatment

Steffen Goletz, Ph.D., CEO, Glycotope
Optimized Fc-effector function for highest patient coverage irrespective of FcγRIIIa allotype, reduced immunogenicity for limited unwanted side effects and optimized serum half-life for improved bioavailability should be characteristics for antibodies of the 21st century. Furthermore, reproducibility and high productivity is a major prerequisite for up to date production processes. We will present novel production technologies as well as pre-clinical and clinical data for antibodies that meet these criteria.

12:20 pm From Antibody Sequence to Structure: Promising Results for De Novo Prediction of Hypervariable Loop Conformation

David A. Pearlman, Ph.D., BioLuminate Product Manager, Schrödinger, Inc.
Rational design approaches hold the promise of more narrow focus and faster antibody/antigen optimization, but require a crystallographic structure or homology model of the hypervariable region. Although approaches based on curated crystal data and rules have been applied with success toward the prediction, from sequence, of the structures of many of the loops in the hypervariable region of an antibody, prediction of the H3 loop has remained problematic. We applied Prime de novo loop prediction method to the H3 loops of a set of 53 native benchmark antibody structures (with H3 lengths ranging between 22 and 54 residues) and have obtained very promising results: The average RMS deviation between the predicted loops and the crystal structure is 0.5Å, and 91% of the loops are with 2.0Å of the crystal structure.

12:50 Luncheon Presentation *(Sponsorship Opportunity Available)*
or Lunch on Your Own

ANTIBODIES AND BEYOND: THE FUTURE OF THE FIELD

1:35 Chairperson's Remarks

1:40 Beyond Current Drug Paradigms Using DARPins

H. Kaspar Binz, Ph.D., Vice President & Co-Founder, R&D, Molecular Partners AG
The favorable properties of DARPin drug candidates enable applications beyond antibody possibilities. We will present the DARPin drug platform along with examples taken from our drug pipeline candidates in clinical and pre-clinical development. The examples illustrate the power of DARPins in optimizing drugs regarding efficacy, PK, and mechanism of action.

2:10 Targeting Ion Channels with Monoclonal Antibodies

Matthew Gardener, Ph.D., Senior Scientist, ADPE, MedImmune
Ion channels represent attractive drug targets for a wide variety of disease states. Modulatory monoclonal antibodies would allow specific targeting of ion channel subtypes, provide selectivity over structurally similar family members and thus avoid potential off-target effects. The key requirements for the generation of modulating antibodies, for both voltage- and ligand-gated ion channels, will be discussed, with the primary focus on early stage lead generation and optimization.

2:40 Highly Specific Off-Target Binding Identified and Eliminated During the Humanization of an Antibody Against FGF Receptor 4

Mark S. Dennis, Ph.D., Early Development PKPD, Genentech, Inc.

3:10 Engineered High-Affinity Affibody Molecules Targeting Platelet-Derived Growth Factor Receptor β *in Vivo*

Fredrik Y. Frejd, Ph.D., Project Manager, Biopharmaceuticals, Affibody AB
Here we describe the isolation of PDGFRβ-specific Affibody molecules with subnanomolar affinity. The binders were highly specific, as verified by dot blot showing staining reactivity only with human and murine PDGFRβ, but not with human PDGFRβ, or a panel of control proteins including 16 abundant human serum proteins. The final binder recognized the native conformation of PDGFRβ expressed in murine NIH-3T3 fibroblasts and human AU565 cells, and inhibited ligand-induced receptor phosphorylation in PDGFRβ-transfected porcine aortic endothelial cells.

3:40 Chemically Self-Assembled Antibody Nanorings (CSANs): Design and Characterization of an Anti-CD3 IgM Biomimetic

Carston R. Wagner, Ph.D., Professor, Director of the Chemical Biology Initiative, Endowed Chair in Medicinal Chemistry, Department of Medicinal Chemistry, University of Minnesota College of Pharmacy
We developed a methodology for the design of bivalent Chemically Self-Assembled Antibody Nanorings (CSANs). We now report the crystal structure of the nanoring subunit composed of the *E. coli* DHFR dimer and a methotrexate dimerizer (MTX2-C9). Taken together, our results demonstrate that anti-CD3 CSANs with valencies ranging from 2 to 8 could be employed for radionuclide, drug, or potentially oligonucleotide delivery to T-cells without the deleterious effects of activation observed for mAbs.

4:10 Panel Discussion "What Does the Future Hold for Antibody Therapeutics?"

4:40 End of Conference

DIFFICULT TO EXPRESS PROTEINS

Harnessing Innovation to Improve Expression and Function

SUNDAY, APRIL 29

4:00 - 6:00 pm Main Conference Registration

MONDAY, APRIL 30

7:00 am Registration and Morning Coffee

SOLVING MEMBRANE PROTEIN PROBLEMS

8:30 Chairperson's Opening Remarks

» 8:40 FEATURED PRESENTATION

Overcoming Challenges of Difficult to Express Proteins

Jeff Culp, Ph.D., Associate Research Fellow, Primary Pharmacology Group, Pfizer Worldwide Research and Development

We will examine the production of an 80 amino acid protein (or peptide) and As our understanding of Biology and Disease evolves, challenges increase to deliver biologically relevant proteins for use with all Drug Discovery tools. Mammalian, insect and bacterial expression systems must be leveraged. Proper protein characterization is critical to eliminate potential mistakes. Successful examples will be presented for proteins intended for use in target screens, NMR, crystallization and biophysical characterization.

9:10 Peptide Surfactants for Cell-Free Production of Functional G Protein-Coupled Receptors

Shuguang Zhang, Ph.D., Associate Director, Center for Biomedical Engineering, Massachusetts Institute of Technology

We report using peptide surfactants in commercial *E. coli* cell-free systems to rapidly produce milligram quantities of soluble G protein-coupled receptors (GPCRs). The GPCRs expressed in the presence of the peptide surfactants were soluble and had α-helical secondary structures, suggesting that they were properly folded. These short and simple peptide surfactants may be able to facilitate the rapid production of GPCRs, or even other membrane proteins, for structure and function studies.

9:40 Expression of the Transmembrane Domain of the Human APP Binding Protein LR11 for "*in Situ*" NMR Structural Analysis

Fang Tian, Ph.D., Assistant Professor, Department of Biochemistry and Molecular Biology, College of Medicine, Pennsylvania State University

Information about protein structure in biological environment is scarce. To date, most membrane structure determinations have been carried out in detergent preparations and synthetic lipid bilayers. Using a new MBP expression vector, we successfully expressed the transmembrane domain of the human APP binding protein LR11 at high yields for a direct structural characterization in native *Escherichia coli* membranes.

10:10 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing

11:10 Engineering Membrane Proteins for Better Expression in *E. coli*

Morten Nørholm, Ph.D., Senior Scientist, Novo Nordisk Center for Biosustainability, Technical University of Denmark

In this study we show that fusion of an N-terminal peptide to a poorly-expressed membrane protein of *E. coli* or human origin, can significantly improve over-expression levels. Further, we could mimic the effect of the N-terminal peptide by re-engineered the 5' mRNA with favorable synonymous mutations. These simple changes significantly improve over-expression of the native protein and provide a design principle for engineering better expressing membrane proteins.

11:40 Crystallization Chaperone Strategies for Membrane Proteins

Jennifer A. Maynard, Ph.D., Assistant Professor, Chemical Engineering, University of Texas Austin

From G protein-coupled receptors to ion channels, membrane proteins represent over half of known drug targets, yet structure-based drug discovery is hampered by the lack of available three-dimensional models. Here, we present a novel, generic solution: development of a toolbox of engineered antibodies recognizing short peptides to chaperone crystallization of membrane proteins presenting the peptide ligand in a permissive loop.

12:10 pm Maximizing Recombinant Protein Expression through Systematic Gene Design

Sponsored by DNA 2.0

Mark Welch, Ph.D., Director of Gene Designs, DNA2.0 Inc.

Advances in gene design and synthesis have enabled greater insight into the workings of the genetic code. Full control over features such as codon bias and mRNA structure allows systematic study of how gene sequence impacts expression of encoded proteins. We present studies on how gene design variables affect heterologous protein expression for a wide range of protein targets and host organisms, including mammalian, yeasts, bacteria, etc. We show predictive relationships between gene sequence features and expression that provide the basis for gene design algorithms that far outperform previous methods.

12:25 Biochemical and Pharmacological Interrogation of Membrane-Associated Enzymes using Template-Directed Assembly (TDATM)

Norman Garceau, Ph.D., President & CSO, Blue Sky BioServices

Membrane proteins are difficult to study because they function within the hydrophobic environment of a lipid bilayer, so they are frequently studied as isolated domains in aqueous buffer lacking a physiological context that is important for proper function. We present studies using specially-formulated lipid vesicles (TDATM) to dock membrane proteins and accessory factors and demonstrate that TDA-enabled kinase assays exhibit improved biochemical activity and identify compounds with unique or altered potency.

12:40 Luncheon Presentations *(Sponsorship Opportunities Available)* **or Lunch on Your Own**

NOVEL HOSTS AND PLATFORMS

2:00 Chairperson's Remarks

Paul Wengender, Founder & CEO, Blue Sky BioServices

2:05 Retention of Thrombin Inhibitory Activity by Recombinant Serpins Expressed as Integral Membrane Proteins Tethered to the Surface of Mammalian Cells

William P. Sheffield, Ph.D., Professor, Departments of Pathology and Molecular Medicine, McMaster University

Both TR- and AR-α(1) PI M358R were enriched in the integral membrane fraction of transfected COS-1 or HEK 293 cells, and formed inhibitory complexes with thrombin, although less rapidly than soluble α(1) PI M358R. Two of three thrombin-inhibitory serpins retained functionality when expressed as integral membrane proteins. Our findings could be applied to create and screen hypervariable serpin libraries expressed in mammalian cells, or to confer protease resistance on engineered cells *in vivo*.

2:35 A Novel Expression and Purification Platform for the Production of Soluble Human Lysozyme in *E. coli*

John Lamppa, Chemical and Biomolecular Engineering, Thayer School of Engineering, Dartmouth College

Pre-clinical assessment of novel lysozyme variants requires a robust, efficient, and scalable expression system. *E. coli* is accessible, efficient and a scalable platform, but expression of soluble lysozyme is toxic to these cells. To capitalize on the numerous benefits of this bacterial host, we have developed an anti-toxin co-expression system that yields a 1000-fold increase in soluble lysozyme relative to prior reports.

3:05 Daedalus: A Robust, Turnkey Platform for Rapid Production of Decigram Quantities of Active Recombinant Proteins in Human Cell Lines Using Novel Lentiviral Vectors

Ashok Bandaranayake, Ph.D., Associate, Department of Biochemistry, Albert Einstein College of Medicine

We describe a novel system for the rapid production of recombinant mammalian proteins, including immune receptors, cytokines and antibodies,

in a human cell line culture system. The inclusion of minimized ubiquitous chromatin opening elements in the transduction vectors is key for preventing genomic silencing and maintaining the stability of decigram levels of expression.

3:35 Expression of a Self Assembling Immune Adjuvant and Antigen Targeting Fusion Protein to Accelerate the Development of New Vaccines for Emerging Infectious Diseases

Sponsored by Pfenex Inc.

Mark C. Poznansky, M.D., Ph.D., Director, Vaccine and Immunotherapy Center, Massachusetts General Hospital

This case study will describe the production of a difficult to express MTBHsp70-avidin fusion protein using the Pfenex Expression Technology platform. Successful production of this protein is critical in the quest for a platform technology that allows accelerated development and preclinical testing of new vaccines for emerging infectious diseases.

4:05 Refreshment Break in the Exhibit Hall with Poster Viewing

4:45 Problem Solving Breakout Discussions

5:45-6:45 Welcome Reception in the Exhibit Hall with Poster Viewing

TUESDAY, MAY 1

GLYCOSYLATION, SOLUBILITY, AND OTHER THINGS THAT GO BUMP IN THE NIGHT

8:25 am Chairperson's Remarks

8:30 A Simple Platform for Addressing Protein Aggregation During Protein Expression and Purification Steps

Mario Lebendiker, Ph.D., Head, Protein Purification Facility, Wolfson Centre for Applied Structural Biology, The Hebrew University of Jerusalem

I will discuss a screening methodology we developed for producing a very difficult to express protein known as "naturally unfolded proteins". These proteins are often difficult to over-express in soluble and non-aggregated forms.

9:00 Physicochemical Properties of Secretory Cargo Play Critical Roles in Shaping the Maximum Secretory Capacity

Haruki Hasegawa, Ph.D., Senior Scientist, Department of Protein Science, Amgen, Inc.

What will determine the maximum secretory capacity of a cell? Is it simply the collective ability of intrinsic cellular machinery? By analyzing a striking cellular phenotype that inadvertently illustrates the limits of protein synthesis, trafficking, and secretion, we will highlight the importance of physicochemical properties of secretory cargo that shape the maximum secretory capacity of CHO cells.

9:30 Data Mining High-Throughput Studies to Establish the Influence of RNA Sequence on Protein Expression

Grégory Boel, Ph.D., Senior Scientist, Department of Biological Sciences, Cornell University; Northeast Structural Genomics Consortium

While codon usage can strongly influence protein expression level, most exercises in codon optimization fail to yield any improvement. We used the large-scale experimental database of the Northeast Structural Genomics Consortium to evaluate the influence of RNA sequence on protein expression level in *E. coli*. This analysis has provided a variety of new insights in addition to verifying some previously inferred principles. Analytical metrics have been developed to predict whether redesign of RNA sequence is likely to improve expression.

10:00 Coffee Break in the Exhibit Hall with Poster Viewing

ISSUES OF FOLDING AND OVEREXPRESSION

10:45 Physiological Response to Membrane Protein Overexpression in *E. coli*

John F. Hunt, Ph.D., Associate Professor, Department of Biological Sciences, Columbia University

We present evidence that, at least for the target proteins included in our study, there is no inherent obstacle to IMP overexpression in *E. coli* at moderate levels suitable for structural studies and that the biochemical and conformational properties of the proteins themselves are the major obstacles to success. Toxicity associated with target protein activity produces selective pressure leading to preferential growth of cells harboring expression-reducing and inactivating mutations, which can produce chemical heterogeneity in the target protein population.

11:15 Computational Protein Design to Re-Engineer Stromal Cell-Derived Factor-1α (SDF) Generates an Effective and Translatable Angiogenic Polypeptide Analog

John McArthur, Jr., Ph.D., Post Doctoral Researcher, Woo Laboratory, Hospital of the University of Pennsylvania

Exogenous administration of recombinant SDF enhances neovasculogenesis and cardiac function after MI. Smaller analogs of SDF may provide translational advantages including enhanced stability and function, ease of synthesis, lower cost, and potential modulated delivery via engineered biomaterials. In this study, computational protein design was used to engineer an SDF polypeptide analog that more efficiently induces EPC migration and improves post-MI cardiac function, and thus offers a more clinically translatable neovasculogenic therapy.

11:45 Production of Human Multi-Subunit Transcription Factors in the Baculovirus Expression System

Arnaud Poterszman, Ph.D., Research Director, Integrative Structural Biology, IGBMC

We present recent developments for the production of multi-subunit com-plexes in the baculovirus expression system using human transcription factors such as nuclear hormone receptor complexes or the basal transcription/DNA repair factor TFIIH as model systems. Selected examples illustrate recent developments and their impact on the structural biology of human protein.

12:15 pm Luncheon Presentations *(Sponsorship Opportunities Available)* **or Lunch on Your Own**

ENHANCING THE APPLICATION OF EXISTING TECHNOLOGIES

2:00 Chairperson's Remarks

2:05 Virus-Like Particles (VLPs) as a Novel and Effective Display System for Intramembrane Protein

Lorenz Mayr, Ph.D., Executive Director & Head, Biology & Protease Platform, Novartis Pharma Services AG

This presentation describes the (successful) expression of functionally active transmembrane proteins (such as GPCRs, transporters, ion channels, intramembrane proteases, etc.) via the generation of Virus-like particles (VLPs) formed by budding out of mammalian HEK293 cells. Similar technologies have been developed by others, but we have developed the technology further over the last years and see this technology as a real enabler. We could generate antibodies on transmembrane proteins where other technologies failed.

2:35 Utilization of Large Scale Lentivirus Expression System as a Platform for the Expression of Difficult Protein Therapeutic Candidates

Liang Tang, Ph.D., Senior Scientist, Molecular Biology and Protein Expression, Bayer HealthCare

Our studies indicated that large scale lentivirus expression system could reduce time from months to weeks in production of functional protein therapeutic candidates from mammalian cells at the mg level for some difficult proteins, such as blood coagulation factors.

3:05 Discovery and Epitope Mapping of Antibodies Targeting Membrane Proteins

Sponsored by integral

Benjamin Doranz, Ph.D., President and CSO, Integral Molecular, Inc.

Lipoparticles containing high concentrations of structurally-intact GPCRs, ion channels, transporters, and oligomeric proteins have been used to elicit high-titer serum responses (>1:1000) and identify specific monoclonal antibodies against these conformationally complex membrane proteins. Upon mAb isolation, Shotgun Mutagenesis Epitope Mapping has been used to identify conformational epitopes on structurally diverse proteins, including GPCRs and viral Envelope proteins, by mapping their interactions with mAbs directly within cells in the proteins' native structures.

3:35 Refreshment Break in the Exhibit Hall with Poster Viewing

4:15 Expression of an Inflammation Modulatory Protein for Delivery to the Brain to Reduce the Progression of Alzheimer's Disease in ApoE Allele Positive Individuals

Girish J. Kotwal, Ph.D., President and CEO, InFlaMed, Inc.

Vaccinia virus complement control protein, a virally encoded protein with 8 disulphide bonds has been expressed in yeast in a fully functional form. The recombinant yeast expressed protein purified to homogeniety has been used in structure elucidation and several pre-clinical studies. The IP portfolio surrounding this unique molecule is robust and the translation path to development of this molecule as a biopharmaceutical is well mapped.

4:45 High Throughput Expression and Purification of Membrane Proteins in *E. coli*

Brian Kloss, Ph.D., Senior Scientist, NYCOMPS

The protein production facility of the New York Consortium on Membrane Protein Structure (NYCOMPS), located at the New York Structural Biology Center (NYSBC), employs high throughput methodologies for the cloning, expression and purification of integral membrane proteins in bacteria. With the goal of determining high-resolution protein structures, primarily by X-ray crystallography, these approaches have yielded 28 such structures to date.

5:15 End of Conference

6:00-9:00 Dinner Short Courses*

**Separate registration required, please see page 5 for available courses.*

MAY 2-3 | EXPRESSION STREAM 2nd ANNUAL

OPTIMIZING PROTEIN EXPRESSION

Enhancing Expression Systems

WEDNESDAY, MAY 2

7:00 am Registration and Morning Coffee

PROMOTING PROTEIN PRODUCTION

8:30 Chairperson's Opening Remarks

» 8:40 KEYNOTE PRESENTATION

Approaches to Maximize Protein Expression for Discovery and Development Efforts

William H. Brondyk, Ph.D., Senior Scientific Director, Therapeutic Protein Discovery, Genzyme – A Sanofi Company

Achieving sufficient expression levels of recombinant proteins to meet the needs for both discovery and development efforts are a goal for biotechnology and pharmaceutical companies. In this talk, a description of our currently used insect and mammalian expression systems will be presented. Specific information will be discussed regarding our optimization of vectors, strategy for the selection of the expression system, methods for generating high expressing CHO pools and clones, and gene design.

» 9:10 FEATURED PRESENTATION

Transient Expression of Proteins in HEK293 and CHO Cells – or is There an Alternative?

Sabine Geisse, Ph.D., Director, NLS, Novartis Pharma AG

We describe a novel cell line, CAP-T® derived from human amniocytes, as host in transient protein production, and the establishment of suitable protocols for transfection and expression of recombinant proteins. Moreover, we show comparative analyses of expression to the well-known HEK293 and CHO transient protein production platforms. In brief, the addition of the CAP-T® cells to the repertoire of cell lines amenable to transient protein production clearly enhances the chances of success.

9:40 Transient (HEK293) and Stable (CHO) Expression of Dual Variable Domain (DVD) - Ig™ Molecules

Gerald Carson, Senior Principal Scientist, Biologics, Abbott Bioresearch Center, Inc.

- Factors influencing drug-like properties (DLP) of DVD-Igs
- Transient (HEK293 cells) and Stable (CHO cells) expression of DVD-Igs
- Modulating inner target binding domain function

10:10 Coffee Break in the Exhibit Hall with Poster Viewing

PROTEIN EXPRESSION IN CHO CELLS

11:10 An Update on the International Community's Efforts at CHOgenome.org

Kelvin H. Lee, Gore Professor of Chemical Engineering & Director, Delaware Biotechnology Institute, University of Delaware

Today, a quarter of all FDA approved new drugs are biopharmaceuticals, most of which are produced in Chinese hamster ovary (CHO) cells. The CHO K1 cell line is an ancestor to many production cell lines and was recently fully sequenced. We will discuss the aspects of the international community's efforts at developing an infrastructure to support, host, and disseminate genome-scale data related to CHO cell lines.

11:40 Dynamic Model for CHO Cell Engineering

Kyongbum Lee, Ph.D., Associate Professor & Acting Chair, Chemical and Biological Engineering, Tufts University

CHO cell fed-batch processes have progressed significantly over the past decade, with protein titer consistently reaching the gram per liter level. Progress has largely resulted from separate advances in process and cell line development. We use a dynamic model to explore~104 combinations of process and cell modifications. Knockdowns in glycolysis were the most beneficial; however, depending on the process conditions, such knockdowns could reduce the antibody titer. Our results highlight the need to consider process and cell modifications together.

12:10 pm Luncheon Presentation *(Sponsorship Opportunities Available)* **or Lunch on Your Own**

PROTEIN EXPRESSION IN CHO CELLS AND AN ALTERNATIVE SYSTEM

1:30 Chairperson's Remarks

1:35 Maximizing Production of Soluble IL-15: Cytokine Receptor Superagonist Complexes by CHO Cells

Peter Rhode, Ph.D., Vice President, R&D, Altor BioScience Corp.

Interleukin-15 is a promising immunostimulatory cytokine for treatment of cancer and viral diseases. However, its development has been limited by poor expression in bacterial and mammalian systems. We have found that co-expression of an IL-15 superagonist variant with a soluble IL-15 receptor alpha - IgG1 Fc fusion leads to high level production of a fully active IL-15:IL-15Rα complex by CHO cells. A simple, scalable affinity and ion exchange chromatography method was conducted to highly purify this complex, enabling its clinical development.

2:05 The Microalgal Cell Line PTA: A Novel Host for the Expression of Therapeutic Glycosylated Proteins
Alexandre Lejeune, Ph.D., Business & Innovation Director,

The increasing importance of biologics as well as knowledge gained from decades of therapies led to challenges and opportunities in the field of biomanufacturing. The technological platform Algebiosys™ developed by Algenics leverages microalgae capabilities to achieve consistent and qualitative glycoproteins expression. To demonstrate the versatility offered by our microalgal cell line, proofs of concept including monoclonal antibodies and recombinant viral antigens will be presented with emphasis on glycosylation properties.

2:35 Transient Gene Expression: So You're Already Using PEI (polyethylenimine) – What Could be Better?
Sponsored by Polyplus transfection THE DELIVERY EXPERT!
Habib Horry, Ph.D., Strategic Marketing Manager, Polypus-transfection

With 10 years of "PEI for transfection" manufacturing experience, Polyplus-transfection® introduces the last generation of PEI for cost effective production of milligrams to grams amount of r-proteins in suspension-adapted mammalian cell lines.

2:50 High Throughput Analysis of Protein Quality in Biotherapeutics Development using Microfluidic-Based Technology
Sponsored by PerkinElmer
Brian Gerwe, Ph.D., PerkinElmer, Inc

3:05 Refreshment Break in the Exhibit Hall with Poster Viewing

3:50 Problem Solving Breakout Discussions

4:50-6:00 Networking Reception in the Exhibit Hall with Poster Viewing

THURSDAY, MAY 3

COMPARE/CONTRAST MULTIPLE EXPRESSION PLATFORMS

8:30 Chairperson's Remarks

8:35 Optimizing Protein Expression, a Technology Users Perspective in a Budget Limited World
Robert M. Petrovich, Ph.D., Head, Protein Expression Core Facility, Laboratory of Structural Biology, National Institute of Environmental Health Sciences, NIH

Each expression system has its advantages and disadvantages. Several "newer" technologies including the use of SF9-ET cells, TIPS protocols, bacmam technology, and lenti viruses are bringing the cost, and maybe more importantly, time involved in baculovirus and mammalian expression closer to those associated with *E.coli* expression. My talk will cover these considerations while I discuss our approach to expressing our target proteins.

9:05 Target-Tailored Expression & Purification Strategies in Drug Discovery – The Protease Case
René Assenberg, Ph.D., Investigator III, Expertise Platform Proteases (EPP), Novartis Pharma AG / NIBR

Proteases are a class of drug targets for which wide ranging approaches for production are required due to their heterogeneity. The Expertise Protease Platform has over the years gained significant experience in the production of often highly complex, human and viral proteases, using *E. coli*, insect and mammalian expression systems. This talk will attempt to provide an insight into our experiences, positive as well as negative.

9:35 Production of an AGC Kinase in the Pfizer La Jolla Parallel Protein Production Platform
Ciarán N. Cronin, Ph.D., Head, Parallel Protein Production Group, Pfizer Global Research & Development

The Parallel Protein Production Platform that has been established at Pfizer's La Jolla, California site was applied to the production of a recombinant AGC kinase. Multiple expression constructs of this AGC kinase were passaged through *E. coli*, baculovirus/insect cells, and mammalian expression systems in order to optimize protein production. An overview of the process and the results of this study will be presented.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

OPTIMIZING PROCESSES

11:05 Optimizing Effectiveness when Expressing Proteins for Drug Discovery
Krista Bowman, Ph.D., Senior Scientific Manager, Structural Biology, Genentech, Inc.

We have implemented a fairly high-throughput generic approach to increase not only our efficiency but also our effectiveness in successfully producing proteins for drug discovery. We have combined techniques such as small scale *E. coli* and baculovirus infections in multiwell blocks, analysis of expression level following single affinity capture and elution from Ni-NTA Phytips, and analytical fluorescent size exclusion chromatography to gain insight into protein aggregation and general behavior, multimerization, or complexation.

11:35 Applying a Platform Approach to Pre-Clinical Protein Production: Evaluating Options and Streamlining Processes
Anne London, Ph.D., Investigator II & Lab Head, Mid-Scale Protein Production, Novartis Institutes for BioMedical Research, Inc.

Pre-clinical protein production is a broad discipline, with expectations and goals differing from project to project. Fast and efficient production of recombinant proteins is necessary with all requests, but challenges arise with differing maturity of programs (initial antigen production to late-stage *in vivo* material) and QC specifications (how "pure" is pure enough?). Here we present case studies reflecting our approaches to develop a platform capable of adapting to fit all production requests, with emphasis on cell line evaluation and impurity clearance.

12:05 pm End of Conference

THURSDAY, MAY 3

12:00 pm Registration

THE BIG PICTURE

1:30 Chairperson's Opening Remarks

1:40 KEYNOTE PRESENTATION

Novel Molecules, Novel Purification Processes?

David J. Roush, Ph.D., Senior Investigator, BioProcess, Protein Purification Development, Merck Research Labs

Advances in cell culture/fermentation development and a plethora of options for expression systems have eliminated most of the upstream productivity bottleneck. The current challenge is to globally optimize the productivity of the entire process while maintaining product quality and cost targets and maximizing facility utilization. The increased diversity of molecular types and truncated development times require a reassessment of a platform purification approach and a collaborative, strategic evaluation of new purification modalities.

2:10 FEATURED PRESENTATION

Streamlining Processes and Process Development with High-Throughput Screening and Analytical Tools

Joey M. Studts, Ph.D., Director, Protein Science, Boehringer Ingelheim Pharma GmbH & Co.

To efficiently integrate technologies, the Protein Science Department has developed the BI-PurEx Strategy. This strategy ensures a rapid, effective and flexible development timeline and an efficient process to meet the demands at any stage in product development, from clinics to market. This presentation will demonstrate how the integration of data from high-throughput biophysical assays and automated screening is used to develop critical process knowledge and a fast track to success without impacting the critical path to clinical trial material.

Sponsored by EMERALD BIO

2:40 Parallel Protein Purification at the mg Scale

Robert Arduini, Senior Scientist, Biogen-Idec

Peter Nollert, Ph.D., Director, Membrane Protein Technologies, Emerald Bio

Many modern biologics discovery pipelines require the preparation of numerous variants of a particular target protein on the milligram scale. While conventional chromatographic methods can readily be applied to such protein targets, scaling up the number of purifications has become a bottleneck in many protein purification laboratories. In order to address this challenge, we have developed an automated protein purification system, the Protein Maker, for the simultaneous chromatographic purification of up to 24 different proteins. This instrument uses standard 1 mL or 5 mL bed volume chromatography columns, allows multiple load, wash, and elution buffers in independent lines for up to 24 different protein samples in parallel. This presentation explains the utility of this instrument within the Emerald Bio gene-to-structure workflow for target scouting, as well as for parallel protein purification. In a second portion of this presentation, the application of the Protein Maker instrument within the Biogen Idec Drug Discovery Department will be illustrated using results gained with 2 kinase targets and antibody Fab fragments.

3:10 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00-5:00 Problem Solving Breakout Discussions

FRIDAY, MAY 4

7:45 am Continental Breakfast in the Exhibit Hall with Poster Viewing

PURIFYING BISPECIFIC ANTIBODIES

8:30 Chairperson's Remarks

8:35 Efficient Discovery, Production and Purification of Human Bispecific IgG Antibodies

John de Kruif, Ph.D., CSO, Merus Biopharmaceuticals BV

MeMo® is a transgenic mouse with a humanized immune system which can be used to generate human bispecific antibodies. Transfection of cells with genetic constructs encoding 2 different single VL mAbs results in high yield production of bispecific antibodies that can be easily purified from production mixtures. This technology allows for efficient discovery and production of natural human bispecific IgG molecules with desirable features.

9:05 Purification of Monospecific or Bispecific Antibodies: Is there a Difference?

Nicolas Fouque, Head, Process Development, Manufacturing, NovImmune SA

NovImmune's novel bispecific antibody format, the Kappa/Lambda-body, has a molecular structure similar to standard monoclonal antibodies. This allows the design of a platform purification process applicable to all Kappa/Lambda-bodies, exploiting both established and emerging protein purification technologies. Results obtained with this novel approach will be presented and compared to conventional antibody purification processes.

9:35 Purification Strategies for Bispecific DART Proteins and Derivatives

Syd Johnson, Ph.D., Vice President, Antibody Engineering, MacroGenics, Inc.

Single domain antigen binding fragments or Nanobodies are well expressed in bacteria, easily purified, highly soluble, very stable and highly specific for their cognate antigen. Results will be presented where our Nanobodies are employed to purify their antigen from complex mixtures by affinity chromatography or in a one-step ChIP. The specific antigen capturing is practical in vivo as was demonstrated by non-invasive imaging, and in vivo detoxification experiments of envenomed mice.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

OPTIMIZING PURIFICATION PROCESSES

10:50 Purification of Recombinant Antibodies by Hydroxyapatite Chromatography – Potential and Pitfalls

Frank Hilbrig, Ph.D., Chair, Process Biotechnology, University of Bayreuth

Chromatographic hydroxyapatite is a highly biocompatible, non-toxic material that naturally presents a pattered structure of diverse interaction points on its surface. Highly selective "pseudo-affinity" binding of proteins including antibodies has been reported for this material. The talk will discuss the basis for this selectivity and how to exploit this knowledge for the set up of efficient antibody purification processes. The integration of such a hydroxyapatite step into a multi-step isolation scheme will also be discussed together with possible pitfalls.

11:20 Streamlining Simultaneous Development of Late Stage Purification Processes for Two Different Antibodies: A Case Study

Lilia Nunez, Ph.D., Associate Scientist, Purification Development, Genentech

Platform processes have become commonplace in the purification of monoclonal antibodies, particularly for proof of concept studies. More recently, high throughput screening has further accelerated early stages of process development, and has also started to play an important role in the development of late stage and commercial processes. When combined, both platform knowledge and high throughput screening can streamline process development where timelines are constricted or when only limited resources are available. Simultaneous development of two or more purification processes, however, has been rarely explored as a tool for the acceleration of development timelines. A case study will be presented for the simultaneous development of late stage purification processes of two antibodies with different purification properties.

11:50 Purification Process Development of a Recombinant

Monoclonal Antibody Expressed in Glycoengineered *Pichia pastoris*

Sandra Rios, Ph.D., Senior Scientist, Downstream Process Development, Merck Research Laboratories

A robust and scalable purification process was developed to generate antibodies of high purity and sufficient quantity from glycoengineered *Pichia pastoris*. Protein A affinity chromatography and alternative chromatography steps were used to capture the antibody from the culture supernatant. Cation exchange and mixed mode chromatography using an optimized NaCl gradient efficiently removed process- and product-related impurities. Antibody produced from glycoengineered *P. pastoris* was comparable to its commercial counterpart in heterotetramer folding, physical stability and binding affinity.

12:20 pm Increasing Options to Meet Drug Development & Manufacturing Challenges

Sponsored by

Richard Pearce, M.Sc. DipM, Director of Strategy Development, EMD Millipore

In this presentation we introduce the concept of "Open-Sourcing", an alternative view of how knowledge, expertise and resources can be accessed and delivered to speed the journey to the clinic.

12:50 Luncheon Presentation *(Sponsorship Opportunity Available)*
or Lunch on Your Own

INSIGHTS INTO BIOPROCESSES

1:35 Chairperson's Remarks

1:40 Structural/Functional Tools Helping to Design Robust Purification Processes

Guy de Roo, Ph.D., Project Leader, DSP, Synthon BV

A combination of high-throughput screening, design of experiments and structural modeling was applied to study the impact of different pH, salt and buffer composition on the propensity of antibodies to form aggregates, degradation products and oxidized/deamidated species. The obtained information allows for selection of a more optimal design space resulting in the development of more robust purification processes.

2:10 Understanding Chromatography Fouling in Therapeutic Protein Manufacture

Daniel G. Bracewell, Ph.D., Senior Lecturer, The Advanced Centre for Biochemical Engineering, Department of Biochemical Engineering, University College London

Chromatography performance is inherently susceptible to feed stream characteristics and fouling processes. To understand the operation in a process context it is necessary to understand how fouling impacts performance and lifetime. In this work, scanning electron microscopy and confocal laser scanning microscopy are used to investigate fouling during the manufacture of a therapeutic protein.

OVERCOMING PURIFICATION CHALLENGES

2:40 Affinity Purification of a Framework 1 Engineered Mouse/ Human Chimeric IgA2 Antibody from Tobacco

Markus Sack, Ph.D., Senior Scientist, Fraunhofer Institut für Molekularbiologie und Angewandte Oekologie IME, RWTH Aachen

Despite their therapeutic potential, IgA formats are currently underexploited in the development of antiviral and anticancer drugs and for topical mucosal applications, mainly because they are difficult and expensive to purify. We engineered a protein-L binding site into the variable light chain domain of a chimeric IgA2 to simplify downstream processing. Transiently expressed IgA variants were efficiently recovered from tobacco leaves by protein-L affinity chromatography while retaining their antigen-binding affinity, making them more amenable to further process development.

3:10 Validation and Application of a Novel EF Hand Affinity Tag and Nanoparticle-Based Technology for Purification and Clean Up of Antibody Fragments and Whole IgG Proteins

David O'Connell, Ph.D., Senior Scientist, Conway Institute of Biomolecular & Biomedical Research, School of Medicine, University College Dublin

We have developed a novel EF hand-based fusion vector system that we have engineered to express scFv fusion proteins. We will present a case study data showing the enhanced functionality of the scFv when purified with nanoparticles bearing the second hand of the system. Stability, efficacy and multifunctionality of the purified protein will be addressed.

BREAKTHROUGH TECHNOLOGIES

3:40 Molecular Modeling of the Affinity Chromatography of Monoclonal Antibodies

Carlo Cavallotti, Ph.D., Associate Professor, Dipartimento di Chimica, Materialied Ingegneria Chimica "G. Natta," Politecnico di Milano

The critical step of purifying mAbs usually involves the efficient, but highly expensive, protein A affinity chromatography process. Recently, molecular modeling has been used to investigate at the microscopic scale the interaction between mAbs and affinity materials with the intent of understanding the nature of this process and determining rational guidelines for its optimization. The current status of these studies is the subject of this presentation.

4:10 ETRAP Selection of Specific Polyclonal Antibody Epitopes

Dan L. Crimmins, Ph.D., Senior Scientist, Department of Pathology and Immunology, Division of Laboratory and Genomic Medicine, Washington University School of Medicine

ETRAP (efficient trapping and purification) is a one-step affinity column procedure to isolate specific epitopes from GST-protein polyclonal antibodies. After spot-peptide membrane array linear epitope mapping, the intensely immunostained spots are decoded, the corresponding sequences synthesized to contain a non-native N-terminal cysteine, and a column then prepared. This purification removes antibodies to GST and selects antibodies specific to the peptide epitope.

4:40 End of Conference

STAY CONNECTED

#PEGSBoston

BIOPHYSICAL & BIOCHEMICAL CHARACTERIZATION OF BIOTHERAPEUTICS

SUNDAY, APRIL 29

2:00-5:00 pm Recommended Short Course*
- SC11 - Molecular Imaging on Tissues Using Mass Spec

**Separate registration required, please see page 4 for details.*

4:00 - 6:00 pm Main Conference Registration

MONDAY, APRIL 30

7:00 am Registration and Morning Coffee

PROTEIN PROFILING AND ITS ROLE IN TARGET IDENTIFICATION AND DRUG DEVELOPMENT

8:30 Chairperson's Opening Remarks

Micah Lieberman, Executive Director, Conferences, Cambridge Healthtech Institute (CHI)

Jennifer Nemeth, Ph.D., Principal Research Scientist, Biologics Mass Spectrometry & Allied Technologies, Janssen R&D

8:40 Tissue Imaging and its Applicability in the Development of Therapeutics

Jennifer Nemeth, Ph.D., Principal Research Scientist, Biologics Mass Spectrometry & Allied Technologies, Janssen R&D

The direct imaging for tissues using MALDI-TOF MS has been an emerging field over the past twelve years. This technology has opened up the possibility of tracking drugs and/or drug metabolites, within tissues for the purpose of localization and PK studies. Presented will be a historical perspective on the field and highlight possibilities for drug discovery.

9:10 Imaging Drug Distribution with Mass Spectrometry

Stacey Oppenheimer, Ph.D., Principal Scientist, World Wide Medicinal Chemistry, Pfizer

Mass spectrometry imaging is a useful tool for drug discovery studies due to its ability to elucidate the spatial distribution of non-labeled therapeutics. This technology offers a unique compliment to conventional LC-MS analysis of drugs in tissues, which requires sample homogenization, because it maintains the spatial localization of drugs and their metabolites and enables correlation with histochemistry techniques. This talk will highlight some impacts mass spectrometry imaging has had in pharmaceutical research ranging from oncology and neuroscience to environmental safety.

9:40 Towards Implementation of MALDI IMS into the Drug Development Workflow: Bridging Histology and Drug Tissue Distributions

Reid Groseclose, Ph.D., Investigator, DMPK, GlaxoSmithKline

We will present data that demonstrates the ability of IMA to link chemistry and biology and provide examples of how this is permitting us to examine the basis of drug toxicity and pharmacology and refine our understanding of pharmacokinetics and drug transport. Examples will include distribution analysis of a drug and its metabolites in liver tissue and the correlation with observed hepatotoxicity, assessment PK/PD relationship for a drug and key metabolites in tissues, and comparative CNS penetration and metabolism of a compound and its metabolites in different pre-clinical models.

10:10 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing

11:10 Use of Proteomics in Advancing Drug Discovery Programs

Steve Pomerantz, Senior Research Scientist, Biologics Mass Spectrometry & Allied Technologies, Janssen R&D

Mass spectrometry-based proteomics has tremendous potential to impact the entire product life cycle through commercial release. Pertinent proteomic techniques, interspersed with case histories, to support target discovery and target validation studies will be presented. Particular emphasis will be placed on the utility of multiple reaction monitoring (MRM) assays to drive drug development.

11:40 Proteomic Applications for Drug Discovery

Daniel Chelsky, Ph.D., Chief Scientific Officer, Caprion

12:10 pm Antibody Screening and Characterization Using Multiplexed SPR

Sponsored by BIO-RAD

Kevin Lindquist, Sr Principal Scientist, Rinat Pfizer

12:25 Sponsored Presentation *(Opportunity Available)*

12:40 Luncheon Presentations *(Sponsorship Opportunities Available)* **or Lunch on Your Own**

ANALYTICAL CHARACTERIZATION OF BIOPHARMACEUTICALS

2:00 Chairperson's Remarks

Steven Berkowitz, Ph.D., Principal Investigator, Analytical Development, Biogen Idec, Inc.

» 2:05 FEATURED PRESENTATION

Unformed Disulfide Bonds in Antibodies

Yung-Hsiang Kao, Ph.D., Principal Scientist and Senior Group Leader, Protein Analytical Chemistry, Genentech

We found several recombinant mAbs that contain unusually high amounts of variants missing one specific intra-chain disulfide bond (i.e. the cysteines remained in the reduced form) in the variable heavy or light chain domain. The characterization, impact and causes of these buried and unpaired cysteines will be discussed.

2:35 Rapid Profiling of N-linked Glycans from Monoclonal Antibodies Using Microfluidic-Based Chip NanoLC-MS

Niclas Tan, Ph.D., Scientist, Analytical Development, Biologics, Millennium: The Takeda Oncology Co.

Characterization of glycan post-translational modifications of therapeutic antibodies is of utmost importance due to their impact on efficacy, half-life, stability and mechanism of action. Traditional assays involving fluorophore-labeled glycans are tedious and typically require days to complete. Here we present a novel integrated microfluidic-based LC-MS chip for rapid online cleavage, purification, separation, identification and quantitation of label-free N-linked glycans from monoclonal antibodies based on accurate mass.

3:05 Improved Quantitation of Glycans Released from Biotherapeutics

Ron Orlando, Ph.D., Professor, Biochemistry and Molecular Biology, Complex Carbohydrate Research Center, University of Georgia

Glycosylation is one of the most common post-translational modifications encountered in eukaryotic systems. One of the analytical challenges facing scientists in the characterization of glycoproteins involves the ability to identify and quantify changes in the attached glycans. This topic is of importance to a variety of researchers that ranges from those involved in the batch to batch analysis of recombinant glycoproteins to those involved in glycomics.

3:35 Epitope Mapping by Amide Hydrogen/Deuterium Exchange Mass Spectrometry

Yoshitomo Hamuro, Ph.D., Senior Director, ExSAR Corporation

Mapping of antigen-antibody interface is a critical step for scientific, regulatory and intellectual property reasons, especially with increasing demand for monoclonal antibody therapeutic agents. Principle and examples of epitope mapping for therapeutic antibodies by protein backbone amide hydrogen/deuterium exchange coupled with proteolysis and mass spectrometry (HDX-MS) are described. The epitopes identified

for IL-13, IL-17A, and cytochrome c by HDX-MS are in good agreement with the epitopes identified by X-ray co-crystal structures.

4:05 Refreshment Break in the Exhibit Hall with Poster Viewing

4:45 Problem Solving Breakout Discussions

5:45-6:45 Welcome Reception in the Exhibit Hall with Poster Viewing

TUESDAY, MAY 1

USE OF BIOPHYSICAL TECHNIQUES FOR CHARACTERIZATION

8:25 am Chairperson's Remarks

Stacey Oppenheimer, Ph.D., Principal Scientist, World Wide Medicinal Chemistry, Pfizer

8:30 KEYNOTE PRESENTATION

Can Mass Spectrometry Play a Role in the Biophysical Characterization of Proteins?

Michael Gross, Ph.D., Professor, Chemistry & Immunology and Internal Medicine, Washington University

MS offers means of determining protein interactions, folding, and unfolding by using chemical footprinting. Driving this approach is the wide availability of mass spectrometers that can be used for footprinting as well as for analytical proteomics. To this end, we are developing fast photochemical oxidation of proteins (FPOP) and implementing HD exchange and other covalent modification approaches to interrogate protein interactions, interfaces, and dynamics of folding/unfolding.

9:00 Analytical and Structural Characterization of Protein-Protein Interactions in Therapeutic IgGs

Wayne Lilyestrom, Ph.D., Postdoctoral Fellow, Late Stage Pharmaceutical Development, Genentech

Small discrepancies in protein surface electrostatics and hydrophobic area can lead to large differences in the strength of non-specific interactions and a protein's structural stability, particularly at high concentrations. We have used biophysical, structural and analytical methods to improve our understanding of the issues encountered at high protein concentrations and their relationship to the macro-molecular surface. Our research on therapeutic antibodies has strong implications for using novel formulations to overcome common downstream drug product processing and delivery problems.

9:30 Case Study: Forced Oxidation Study for Antibody Product Characterization

Mei May Zhu, Ph.D., Senior Scientist, Analytical Development, Biologics, Millennium: The Takeda Oncology Co.

Protein oxidation is a key concern in the biopharmaceutical industry since proteins are sensitive to oxidation during manufacturing, formulation and storage, which may lead to loss of desired biologics activity. The current regulatory guidances governing forced degradation studies of biological pharmaceuticals are very general. They itemize broad principles and approaches with few practical instructions. This presentation gives a good example of forced oxidation studies with various practical considerations.

10:00 Coffee Break in the Exhibit Hall with Poster Viewing

10:45 FEATURED PRESENTATION

Assessment of Protein-Protein Interactions Using Biophysical Techniques

Mark Chiu, Ph.D., Principal Research Scientist, Biologics Research, Janssen R&D

Intravenous administration of monoclonal antibodies (mAbs) often requires the use of highly soluble mAbs for efficacious dosing. A high-throughput cross-interaction chromatography screening method to rapidly identify antibody candidates with poor solubility using microgram quantities of purified material will be presented. Alternative methods to screen mAb solubility in the presence of other proteins will be reviewed.

11:15 Biophysical and Biochemical Characterization of a Monoclonal Antibody: Drug Substance and Drug Product

Marina Kirkitadze, Ph.D., M.B.A., Deputy Director, Head, Biophysics and Conformation Unit, Analytical R&D, Sanofi Pasteur

Characterization package was developed for the Monoclonal Antibody Drug Substance (DS). The package that includes DSC, DLS,, AUC, SEC-MALS, Rheometry, Fluorescence, and Nanotrac was evaluated for the comparability of lots from different processes, and for characterization of Drug Product. This presentation demonstrates the use of novel technologies for the characterization of monoclonal antibodies (eg. Rheometry and Nanotrac) and established a baseline for the current process and link to the key product attributes.

11:45 Implementation of a Diffusion Tracer Based High-Throughput Viscosity Screening Approach to aid High Concentration Liquid Formulation Development: Effect of Formulation Parameters and Solution Conditions

Reza Esfandiary, Ph.D., Scientist, Formulation Sciences, MedImmune

12:15 Use of Chaperone Proteins and Octet Bio-Layer Interferometry in a High-Throughput Assay To Detect Protein Folding and Unfolding Events

Mark Fisher, Ph.D., Professor, Department of Biochemistry and Molecular Biology, University of Kansas Medical Center

Monitoring protein folding events is central to the majority of protein based experiment. A high-throughput assay to detect protein folding has been developed using chaperone proteins and ForteBio's Octet instrument, which operates in standard microtiter plates in a Dip and Read format. Examples of the approach are discussed, including detection of small molecules that correct folding for a cystic fibrosis protein and detection of a conformational change of a component of anthrax toxin.

12:45 pm Luncheon Presentations *(Sponsorship Opportunities Available)* **or Lunch on Your Own**

COMPARABILITY AND QUANTITATION IN DRUG DEVELOPMENT

2:00 Chairperson's Remarks

Wayne Lilyestrom, Ph.D., Postdoctoral Fellow, Late Stage Pharmaceutical Development, Genentech

2:05 Analytical and Process Challenges to Comparability: Strategies to Address and Overcome Changes to a Product Profile

Asenath Rasmussen, Ph.D., Research Associate, Analytical R&D, Pfizer

Process changes are challenging for biologics which demonstrate varying degrees of heterogeneity. These challenges are further exacerbated when products are in-licensed during late phase development, where product knowledge may be limited. In such cases, designing a successful strategy to address potential changes to a product profile requires preparation and a well-reasoned understanding around the criticality of specific product attributes. We will provide examples of how best to face process and product change and how to present them for regulatory review with minimal filing.

2:35 Improvement in our Capability to Assess the Biophysical Comparability of Protein Biopharmaceuticals by Using Hydrogen/Deuterium Exchange with Mass Spec Detection

Steven Berkowitz, Ph.D., Principal Investigator, Analytical Development, Biogen Idec, Inc.

Two of the most important attributes of a protein are its higher order structure and its associated structural dynamics. The analytical tools available to study and evaluate these two critical attribute areas of protein therapeutics in a practical and routine manner for the purpose of assessing the biophysical comparability in a biopharmaceutical setting are

greatly lacking in sensitivity and spatial resolutions in the case of higher order structure and non-existent in the case of structural dynamics. H/DX-MS offers significant hope to improve this situation.

3:05 Affinity Determinations of Therapeutic Antibodies to Soluble Native Antigens

Sponsored by Sapidyne Instruments

Christine Bee, Ph.D., Senior Scientist, Rinat-Pfizer

We show that the Kinetic Exclusion Assay (KinExA) can be used to characterize protein/protein interactions with equilibrium dissociation constants (KD values) spanning six orders of magnitude, from 100 fM to 100 nM. In addition to its wide dynamic range, the KinExA's ability to determine the active concentration of one binding partner relative to the other renders it particularly amenable to studying the interactions of therapeutic antibodies with unpurified recombinant or native antigens.

3:35 Refreshment Break in the Exhibit Hall with Poster Viewing

4:15 Incorporating Qualified Biophysical Assays into Product Comparability and Characterization Studies

Kristin O'Berry, M.S., Research Associate, Drug Product Sciences, Human Genome Sciences, Inc.

4:40 Evaluation of CEX, cIEF, and iCIEF as a Platform Charge Variant Assay for Monoclonal Antibodies

Paul Bigwarfe, Ph.D., Associate Director, Analytical Sciences, Regeneron Pharmaceuticals, Inc.

Charge variants are product related impurities that have been traditionally monitored by ion exchange HPLC. However newer techniques such as capillary isoelectric focusing (cIEF) and imaged capillary isoelectric focusing (iCIEF) have been developed that offer advantages over ion exchange. A side by side evaluation of the platform methods developed for the three techniques was conducted and the results will be presented.

5:05 Is Opalescence Always Associated with Aggregation in High-Concentration Protein Solutions? Case Studies Using Nanoparticle Tracking Analysis

Yin Luo, Ph.D., Director, Mass Spectrometry and Biophysical Characterization, Analytical Research & Development, BioTherapeutics Pharmaceutical Sciences, Pfizer, Inc.

High-concentration protein solutions have an increased propensity to appear opalescent. Opalescence has been perceived to indicate the presence of subvisible particles composed of protein aggregates, raising concerns of immunogenicity for protein therapeutics. This work shows capability of Nanoparticle Tracking Analysis to detect/quantify subvisible particles in opalescent protein solutions, and provides evidence that the opalescence in the case studies is NOT caused by subvisible particles.

5:30 End of Conference

6:00-9:00 pm Recommended Dinner Short Course*

- SC13 - Light Scattering – Theory, Do's & Don'ts, and Data Interpretation

Separate registration required, see page 5 for details.

MAY 2-3 | ANALYTICAL STREAM 5th ANNUAL

PROTEIN AGGREGATION AND STABILITY IN BIOPHARMACEUTICAL PRODUCTS

TUESDAY, MAY 1

6:00-9:00 pm Recommended Dinner Short Course*

- SC13 - Light Scattering – Theory, Do's & Dont's, and Data Interpretation

Separate registration required, see page 5 for details.

WEDNESDAY, MAY 2

7:00 am Registration and Morning Coffee

ANALTYICAL METHODS: DETECTION AND CHARACTERIZATION

8:30 Chairperson's Opening Remarks

Vineet Kumar, Ph.D., Senior Research Scientist, Global Formulation Sciences, Parenterals, Abbott

» 8:40 KEYNOTE PRESENTATION

Causes and Control of Aggregation and High Viscosity in High Concentration Formulations

Thomas Laue, Ph.D., Professor, Biochemistry and Molecular Biology; Director, Biomolecular Interaction Technologies Center (BITC), University of New Hampshire

9:10 Combining Raman Spectroscopy and DLS for the Physico-Chemical Characterization of Protein Therapeutics

Sponsored by Malvern

E. Neil Lewis, Ph.D., Chief Technology Officer, Malvern Instruments

The emergence of protein therapeutics has created a demand for new analytical methods because unlike small molecule pharmaceuticals their efficacy is also determined by their high order structure and conformation. Raman spectroscopy in combination with DLS can be used to measure these properties using small amounts of material under typical formulation conditions.

9:40 Characterization of Protein Aggregation in a Fusion Protein

James Strand, Staff Research Associate, Analytical Development, Acceleron Pharma

The mechanisms behind non-native aggregation of recombinant Fc-fusion protein therapeutics from mammalian expression systems was studied specifically in relation to highly glycosylated proteins. Both chromatographic as well as higher order structural tools were used to define protein changes that may influence aggregation kinetics. In addition, the impact of glycosylation state on aggregation was also investigated.

10:10 Coffee Break in the Exhibit Hall with Poster Viewing

11:10 Sub-Visible Particle Detection in a High Concentration Protein Formulation

Mary Beth Pelletier, Ph.D., Scientist, Analytical Technology, Biogen Idec

The development and qualification of a method for subvisible particle counting is described for a high concentration protein formulation.

Challenges for this method include the concentration of the product and the prefilled syringe container-closure system, leading to the presence of silicon oil droplets in the samples. Significant development was carried out to ensure that the resulting method was robust, reproducible, and suitable for use in a QC environment.

11:40 Novel Mass Spec-Based Approaches to Characterize Aggregation and Association of Protein Therapeutics

Igor Kaltashov, Ph.D., Professor, Department of Chemistry, University of Massachusetts, Amherst

Traditionally, aggregation has been monitored using relatively low-resolution techniques that do not characterize the process at desired detail. An alternative is now provided by electrospray ionization mass spectrometry (ESI MS). We will discuss several recent developments that allow ESI MS to be used both in combination with classical tools and as a stand-alone technique for characterization of both soluble protein aggregates and products of ordered protein association.

Sponsored by QUANTA BIODESIGN LIMITED

12:10 pm Luncheon Presentation I
Introducing dPEG®s as a New Paradigm in Addressing Protein Aggregation Issues

Paul D. Davis, Ph.D., President & CEO, Quanta BioDesign, Ltd.

Quanta has generated an abundance of data in working with proteins which suggests that its dPEG® technology could be a simple, yet flexible solution to solving or affecting many of the aggregation issues that are extant in biologics. In support, there are a number of key published references using the dPEG® technology to solve a wide range and variety of scenarios related to solubility, aggregation and elimination of non-specific binding. Data demonstrating these positive attributes of dPEG®s, as well as data on binding/activity and immunogenicity will be discussed.

12:40 Luncheon Presentation *(Sponsorship Opportunity Available)*

UNDERSTANDING MECHANISMS OF AGGREGATION: EXTRINSIC FACTORS AND EXCIPIENTS

1:30 Chairperson's Remarks

Thomas Laue, Ph.D., Professor, Biochemistry and Molecular Biology; Director, Biomolecular Interaction Technologies Center (BITC), University of New Hampshire

1:35 Mechanistic Links between Soluble Aggregate and Subvisible Particle Formation in Protein Therapeutics

Robert Simler, Ph.D., Staff Scientist, BioFormulations Development, Genzyme

Although a significant amount of recent work has focused on the quantification and characterization of subvisible particles, little is understood about the mechanism which links their formation to that of smaller, soluble aggregates. This talk will focus on agitation experiments designed to generate subvisible particles and soluble aggregates in an effort to identify a mechanistic relationship between the two higher order species. Practical consequences of this mechanism as they relate to formulation development will also be discussed.

» 2:05 FEATURED PRESENTATION

High Concentration Protein Formulations: Complexity of the Stabilization and/or Destabilization Effects of Sugars/Polyols on Aggregation

Vineet Kumar, Ph.D., Senior Research Scientist, Global Formulation Sciences, Parenterals, Abbott

Sugars are widely used in low/high concentration protein formulations. In fact, more than 70% marketed protein formulations have sugars as stabilizers and/or tonicity modifiers. The talk will focus on the stabilization/destabilization effects of sugars and the strategies to select the best and the most useful poyol for the formulation. Audience will learn methods to appropriately select and/or deselect sugars especially for high concentration formulations.

2:35 Sponsored Presentations *(Opportunities Available)*

3:05 Refreshment Break in the Exhibit Hall with Poster Viewing

3:50 Problem Solving Breakout Discussions

4:50-6:00 Networking Reception in the Exhibit Hall with Poster Viewing

THURSDAY, MAY 3

UNDERSTANDING MECHANISMS OF AGGREGATION: INTRINSIC FACTORS

8:30 Chairperson's Remarks

Devendra (Davy) Kalonia, Ph.D., Professor of Pharmaceutics, Department of Pharmaceutical Sciences, University of Connecticut

» 8:35 FEATURED PRESENTATION

Understanding the Interactions of mAbs at High Concentrations: Consequences and Mitigation Strategies

Thomas Scherer, Ph.D., Scientist, Late Stage Pharmaceutical Development, Genentech

The interactions of proteins at high concentrations are associated with several challenges of therapeutic mAb development, including solution opalescence, high viscosities, and undesirable phase transitions. Light scattering experiments and orthogonal characterization of solution behavior of mAbs will be presented to discuss the current state of understanding of the underlying biophysics. Protein-cosolute interactions will be discussed as mechanisms for tailoring formulations to achieve acceptable product properties.

9:05 Understanding the Impact of Solution pH Changes and Covalent Modifications on IgG1 Fc's Structure and Stability at High Resolution

Dingjiang (Dean) Liu, Ph.D., Fellow Scientist, Formulation Development Regeneron Pharmaceuticals, Inc.

This presentation will discuss the impacts of solution pH changes and covalent modifications on IgG1 Fc structure and stability. High resolution NMR method was used along with other biophysical methods, such as CD and DSC, to obtain high resolution structure information. Subsequently the storage stability studies were carried out with the covalently modified proteins to understand the structure and stability relationships. The work will improve our understandings of antibody instabilities and quality attributes.

UNDERSTANDING THE ROLE OF AGGREGATES IN IMMUNOGENICITY

9:35 Aggregates of Monoclonal Antibody-Based Biotherapeutics are Associated with Enhanced Innate and T-Cell Response

Vibha Jawa, Ph.D., Principal Scientist, Clinical immunology, Amgen, Inc.

Aggregated particles in formulations can have an immunogenic potential. The amount and size of the particles can drive the development of innate and adaptive immune response. We have optimized an *in vitro* human PBMC derived system where the impact of aggregated particles of different sizes can be evaluated using multiplexed cytokine signatures. These assays can help evaluate the risks associated with particles in formulation generated under manufacturing and packaging associated stress.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

ENGINEERING/MODELING BETTER THERAPEUTICS

11:05 The Influence of Charge Distribution on Self-Association and Viscosity Behavior of High Concentration Antibody Solutions

Sandeep Yadav, Ph.D., Post Doctoral Fellow, Late Stage Product Development, Genentech, Inc.

The work emphasizes role of electrostatic surface potential distribution on self-association and viscosity behavior of mAbs which represent two of the most critical consequences of developing a high concentration formulation. Two IgG1's with 92% sequence similarity but widely different

self-association and viscosity behavior were studied for charge residue differences in the primary sequence and subsequently the contribution of these sequence specific motifs to intermolecular interaction, structure factor, hydrodynamic interactions and consequently self-associating behavior have been investigated by making site specific mutations to modulate surface charge distribution.

11:35 Specific Interactions, Dipole Forces or Hydrophobic Attractions: What Complicates Aggregation at High Concentrations
Shubhadra Singh, Ph.D., Scientist, Pharmaceutics, University of Connecticut

Case studies will be presented which will show the role/importance of short range forces in governing aggregation at high concentrations. The studies will show that the forces governing association behavior (that manifests in the form of various issues such as aggregation and solubility) could be concentration dependent and hence measurements made at low concentrations may not provide a good approximation of behavior at high concentrations.

12:05 pm End of Conference

MAY 3-4 | ANALYTICAL STREAM 3rd ANNUAL

IMMUNOGENICITY OF PROTEIN THERAPEUTICS

THURSDAY, MAY 3

12:00 pm Registration

PREDICTIVE METHODS FOR IMMUNOGENICITY

1:30 Chairperson's Opening Remarks

1:40 Beyond *in silico:* Advancing Pre-Clinical Immunogenicity Testing
Jack Ragheb, M.D., Ph.D., Principal Investigator, Immunology, Therapeutic proteins, CDER/FDA
"Humanized" mice that fully recapitulate the human hematopoietic system may permit direct *in vivo* assessment of human immunogenicity to a therapeutic protein. This session will describe the nature, limitations, utility, and predictive value of *in vitro* and *in vivo* model systems. Case studies will illustrate how pre-clinical data and a risk-based assessment may help inform the probability of immunogenicity in humans.

2:10 Amgen's Perspective on Immunogenicity Prediction Tools and Efforts
Theresa J. Goletz, Ph.D., Senior Personalized Healthcare Leader, Clinical Immunology, Amgen, Inc.

2:40 Conversion of Manual Acid Dissociation Assays into an Automated Format for Immunogenicity
Sponsored by GYROS
Robert A. Durham, Ph.D., Manager, Field Applications Scientist, Gyros US. Inc.
Detection of anti-drug antibodies (ADA) is challenging in the presence of the biotherapeutic drug in circulation. Particularly at high concentrations, ADA:drug complexes can interfere with the measurement of ADA in the sample matrix. Sample pretreatment using acid dissociation has been shown to improve drug tolerance and is typically a manual protocol that requires overnight incubation. Gyros has developed a new ADA CD solution to automate the acid dissociation pretreatment and the assay workflow for the measurement of anti-drug antibodies in serum. The development and evaluation of an automated, drug tolerant ADA immunoassay method on the Gyrolab nanoliter-scale immunoassay platform will be presented.

2:55 Sponsored Presentation *(Opportunity Available)*

3:10 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00-5:00 Problem Solving Breakout Discussions

5:30-8:30 pm Recommended Dinner Short Course*
- SC15 - Advances in Immunogenicity Assays

Separate registration required, please see page 5 for details.

FRIDAY, MAY 4

7:45 am Continental Breakfast in the Exhibit Hall with Poster Viewing

FACTORS THAT CONTRIBUTE TO IMMUNOGENICITY

8:30 Chairperson's Remarks
Stephen Keller, Ph.D., Associate Director II, Pre-Clinical and Clinical Development Sciences, Abbott Biotherapeutics

8:35 Relationship between Product Characteristics and Immunogenicity
Wim Jiskoot, Professor, Drug Delivery Technology, University of Leiden
In this presentation I will discuss product-related risk factors for protein immunogenicity (in particular aggregates, submicron particles and subvisible particles), show clinical and pre-clinical data illustrating the impact of the formulation on protein immunogenicity, and the use of animal models to assess which of these factors do or do not affect immunogenicity. The main focus will be on results of our transgenic immune tolerant animal models.

9:05 Aggregates, Epitopes and Immunogenicity: Innate and Adaptive Immune Responses to Protein Therapeutics
Matthew Baker, Ph.D., Chief Scientific Officer, Antitope Ltd.

9:35 Sub-Visible Particles Relating to Pre-Clinical Immunogenicity Risk Assessment – What Particles are Most Immunogenic and Can We Control Them?
Matthew Seefeldt, Ph.D., Vice President, Research, BaroFold, Inc.
The link between protein aggregates and subvisible particulates is becoming more apparent. This talk will review immunogenicity/particulate studies with murine growth hormone in mouse models and evaluate the effect of high pressure treatment on reducing particle counts with concomitant reduction in immunogenicity.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

IMMUNE TOLERANCE APPROACHES

» 10:50 KEYNOTE PRESENTATION

Immunogenicity Risk Assessment: When to Consider Immune Tolerance Induction
Amy Rosenberg, Director, Division of Therapeutic Proteins, CDER/FDA
Immune responses to therapeutic proteins, particularly for factor/enzyme deficiency states, can sabotage the efficacy of life saving replacement therapies, either by inhibiting/neutralizing product activity or by causing anaphylaxis. This seminar will inform as to prevention and treatment strategies for immune tolerance induction to allow patients to experience the full benefit of replacement and perhaps of more curative therapies.

11:20 A Case Study of Immune Tolerance Induction
Alexandra Joseph, Ph.D., Associate Scientific Director. Investigative Clinical Immunology, Genzyme, a Sanofi Company
This presentation will outline how methotrexate is used clinically in an immune tolerance regimen, how it affects immunogenicity of a range of products (enzyme-replacement therapies, Alemtuzumab and Thymoglobulin), and the mechanism of methotrexate-induced tolerance induction.

11:50 Characterizing Immune Responses to Therapeutic Antibodies

Fiona Harding, Ph.D., Senior Principal Research Scientist, Biologics Technologies, Abbott Biotherapeutics Corp.

Humanized and fully human antibodies are largely non-immunogenic when administered to patients. However, in some cases the development of neutralizing anti-drug antibodies can occur. The presence of anti-drug antibodies can impact safety and efficacy. I will discuss the development of immunological responses to what should be very tolerogenic proteins, and will provide insights into engineering immunologically risk-reduced antibody therapeutics.

12:20 pm De-Risking Protein Biotherapeutics. Predicting, Avoiding and Reducing Immunogenicity and Aggregates

Sponsored by Lonza

Yvette Stallwood, Ph.D., Head of Applied Protein Services, Lonza Biologics

We present the in silico and in vitro tools used to assess Immunogenicity and reduce Aggregation supported by case studies showing the application and benefit of these tools during the development of biotherapeutics.

12:50 Luncheon Presentation *(Sponsorship Opportunity Available)*
or Lunch on Your Own

PRE-CLINICAL AND CLINICAL IMMUNOGENICITY ASSESSMENT STRATEGY

1:35 Chairperson's Remarks

Boris Gorovits, Ph.D., Director, Pharmacokinetics, Pharmacodynamics & Metabolism, Pfizer, Inc.

1:40 Aligning Development Strategy with Regulatory Priorities for Immunogenicity Risk Assessment

Paul Chamberlain, NDA Advisory Board

Understanding the evolving regulatory environment, including differences between North America and Europe, is critical for making the right decisions for product quality control strategy to minimize immunogenicity-related risks, as well as for guiding the most effective use of bioanalytical resources to evaluate these risks during pre-clinical and clinical development. An integrated, multi-disciplinary approach to data presentation is a critical factor for successful regulatory submissions.

» 2:10 KEYNOTE PRESENTATION

Impact of Immune Complexes on Non-Clinical Studies

Steve J. Swanson, Ph.D., Executive Director, Medical Sciences, Clinical Immunology, Amgen, Inc.

When human therapeutics are used in non-clinical studies it is anticipated that the animals will mount a robust immune response. This immune response can result in a high concentration of circulating anti-therapeutic protein antibodies. When large doses of the protein therapeutic are administered, especially via the intravenous route, there is a potential for large immune complexes to rapidly form. Detecting these immune complexes can be challenging but is important in order to understand pathology findings in the animals.

2:40 Investigation of Monoclonal Antibody Drug Immunogenicity and Toxicity in Pre-Clinical Study Using a Drug Tolerant Method for Detection of Immune Complexes

Gennady Samokhin, Ph.D., Senior Principal Scientist, Non-Clinical Safety, Hoffmann-La Roche, Inc.

Safety, Drug Metabolism and Pharmacokinetics, Hoffmann-La Roche, Inc.

New anti-drug antibody (ADA) detection method based on the detection of immune complexes was developed. The method possesses significantly higher drug tolerance, as compared with traditional formats, allowing detection of ADA formation at high drug doses. It can be used to measure total ADA or immune complex. The assay principle, performance and its application in case studies will be presented.

3:10 Case Study on Immunogenicity Testing from Non-Clinical to Clinical Including Nab Assays

Jaya Goyal, Ph.D., Principal Investigator, Translational Medicine, Biogen Idec, Inc.

Immunogenicity testing is a prerequisite for the development and risk management of bio therapeutics. The testing strategy typically evolves starting preclinical development through the life cycle management of the product. The case studies presented will highlight the outcomes of proactive and reactive management of testing strategy during development of biotherapeutics. The impact of study population, dose levels and anticipated levels of circulating drug on the selection of assay configuration will be discussed. A ligand binding assay or Membrane based Delfia® fluorometric assay that provides ease of use may potentially be used for the detection of neutralizing antibodies in a healthy volunteer study but in studies with autoimmune disease population, cell based ECL assay format or a flow cytometry based assays that provides better matrix tolerance may be more appropriate.

3:40 T Cell Epitope Analysis for Incorporation into the Design of the Clinical Immunogenicity Program

Timothy Hickling, Ph.D., Associate Research Fellow, PDM Immunogenicity Sciences, Pfizer, Inc.

Characterization of the immune response to biotherapeutics is enhanced with recent advances in the science of immunology and the increasing availability of tools for studying immunogenicity potential. An emerging area is the study of T cell epitopes, which are crucial in driving immunoglobulin class switching and strong anti-drug antibody responses. Prediction and measurement of biotherapeutic specific T cell responses to aid determination of their contribution to the overall immunogenicity risk is now possible. Although translation between species is a major hurdle for T cell epitope prediction, non-clinical in silico, in vitro and ex vivo human studies can be applied to mitigate the risk of immunogenicity. Furthermore, these studies could influence the design of the clinical program to quantify T cell epitope risk to gain an early understanding of the risk of the immunogenicity of the biotherapeutic**4:10 Generation of Biologics with Improved Half-Life and Reduced Immunogenicity by XTENylation**

Volker Schellenberger, Ph.D., CSO Amunix, Inc.

Amunix has developed polypeptides, called XTEN, with PEG-like properties that can be directly fused to recombinant biopharmaceuticals. This offers improvements in half-life and reductions in immunogenicity that match or exceed those supplied by PEG. A number of approved pharmaceuticals have been fused to XTEN, resulting in proteins with high *in vivo* potencies and long half-lives. In multiple pre-clinical studies, this product has proved non- immunogenic.

4:40 End of Conference

"Good combination of new scientific findings with applied science and industry relevant activities."

Scientist, Roche Glycart AG

ANTIBODIES FOR CANCER THERAPY

Filling the Pipeline for the Next Blockbuster Drugs

SUNDAY, APRIL 29

4:00 - 6:00 pm Main Conference Registration

MONDAY, APRIL 30

7:00 am Registration and Morning Coffee

» KEYNOTE SESSION

8:30 Chairperson's Opening Remarks

Mitchell Ho, Ph.D., National Cancer Institute, NIH

8:40 Monoclonal Antibodies: The Origins of Cancer Targeted Therapy

Ivor Royston, M.D., Managing Partner, Forward Ventures

Monoclonal antibody-based therapeutics have a 30 year history and today are one of the major components of the oncologist's armament in treating cancer and the forerunner of today's targeted therapy of cancer. This talk will trace the evolution and ups and downs of these "magic bullets".

9:10 Strategies and Challenges for the Next-Generation of Therapeutic Antibodies

Alain Beck, Ph.D., Associate Editor, mAbs; Head, Physico-Chemistry Department, Centre d'Immunologie Pierre Fabre (CIPF)

By analyzing the regulatory approvals of antibodies and related structures in the past 10 years, insights into the successful strategies can be gained. Many challenges will have to be faced in the next decade to bring more efficient and affordable antibody-based drugs to the clinic and will be discussed.

» 9:40 FEATURED PRESENTATION

Anti-Cancer Antibody Development in China

Yajun Guo, M.D., Ph.D., Professor and Director, Shanghai International Joint Cancer Institute, Shanghai Second Military Medical University

10:10 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing

TUMOR PENETRATION

11:10 Discovery of Human Monoclonal Antibodies with Novel Functionality against Tumor Targets

Mitchell Ho, Ph.D., Head, Antibody Therapy Section, Laboratory of Molecular Biology, National Cancer Institute, NIH

My laboratory uses engineered antibody domains and *in vitro* tumor spheroid models to discover human antibodies that are (a) capable of neutralizing functionality of target by disturbing key signaling pathways, and (b) able to penetrate more effectively in solid tumors.

11:40 Co-Administration of Tight Junction Opener JO-1 Improves the Efficacy and Safety of Monoclonal Antibody Therapy of Cancer

Andre Lieber, M.D., Ph.D., Professor, Department of Medicine, University of Washington

Epithelial cells maintain several intercellular junctions, a feature which is often conserved in epithelial cancers. These junctions inhibit the penetration of anti-cancer drugs into tumors. We generated a small recombinant protein, which triggers transient opening of intercellular junctions in epithelial tumors through binding to desmoglein 2, and enhances the anti-tumor effects of several therapeutic monoclonal antibodies, including trastuzumab and cetuximab.

Sponsored by Vivalis

12:10 pm Human Primary B Lymphocytes for the Rapid High Throughput Discovery of Native Therapeutic Monoclonal Antibodies

Majid Mehtali, Ph.D., Managing Director & CSO, VIVALIS

VIVA|SCREEN is a microarray-based single cell screening technology for the rapid isolation from human primary B lymphocytes of native biologically active mAbs. The microarray chips have been designed to contain from 62,500 to 234,000 wells with size and shape optimized for a single cell per well, enabling the rapid single cell analysis and retrieval, and antibody gene cloning. This technology was successfully applied for a series of targets, including for the discovery of antibodies produced by very rare B lymphocytes (<1/100,000,000 PBMCs).

12:40 Luncheon Presentations *(Sponsorship Opportunities Available)*
or Lunch on Your Own

NOVEL FORMATS AGAINST CANCER: ANTI-BODY-DRUG CONJUGATES AND BISPECIFICS

2:00 Chairperson's Remarks

Horacio G. Nastri, Ph.D., Director, Biotherapeutics Center for Therapeutic Innovation, Pfizer, Inc.

2:05 DART Proteins for Cancer Therapy

Syd Johnson, Ph.D., Vice President, Antibody Engineering, MacroGenics

MacroGenics Dual-Affinity Re-Targeting (DART®) proteins are among the most highly stable, potent, and easily manufactured biologics in this therapeutic class. The pre-clinical development of several DART proteins that recruit effector cells to solid and liquid tumor targets will be described.

2:35 Fcμ-Receptor Mediated Internalization of Antibody-Drug Conjugates: A Novel Approach to Selectively Target Cancer Cells

Berengere Vire, Ph.D., Visiting Fellow, Hematology Branch, NHLBI, NIH

FcμR is consistently overexpressed at the cell surface of chronic lymphocytic leukemia (CLL) cells and rapidly internalizes upon IgM binding. We engineered an antibody-drug conjugate derived from the IgM-Fc portion as a novel agent for CLL immunotherapy.

3:05 Dual Targeting Multi-Functional DIG-Bodies Overcome Efficacy and Drug Resistant of Monospecific Antibody Therapeutics

Jin-San Yoo, Ph.D., CEO, PharmAbcine, Inc.

One of the leading pipeline from DIG-Bodies platform, DIG-KT neutralizing both VEGF-KDR and ANG-TIE2 pathways overcome Avastin resistant tumor. Overexpressing ANG2 in patients with Avastin longterm treatment is potential biomarker for Avastin resistant. In terms of efficacy, DIG-KT also performs superior to Tanibirumab, anti-KDR neutralizing fully human IgG in certain tumors.

3:35 An Efficient Route to Generate Bispecific Antibodies from Distinct Half-Antibodies

Christoph Spiess, Ph.D., Scientist, Antibody Engineering, Genentech

I will present on a technology to use the knobs-into-holes technology to generate bispecific antibodies with non-common light chains. The solution eliminates the need of linkers to prevent light chain mispairing. Each heavy chain is expressed with its corresponding light chain in separate *Escherichia coli* cultures. Individual half-antibodies are purified, combined and finally the bispecific antibody purified by conventional means.

4:05 Refreshment Break in the Exhibit Hall with Poster Viewing

4:45 Problem Solving Breakout Discussions

5:45-6:45 Welcome Reception in the Exhibit Hall with Poster Viewing

TUESDAY, MAY 1

IMMUNOTHERAPIES IN THE FIGHT AGAINST CANCER

8:25 Chairperson's Remarks

Soldano Ferrone, M.D., Ph.D., Professor, Department of Immunology, University of Pittsburgh Cancer Institute

8:30 KEYNOTE PRESENTATION

Immunotoxins with Low Immunogenicity for Cancer Treatment

Ira H. Pastan, M.D., Chief, Molecular Biology, National Cancer institute, NIH

Recombinant immunotoxins are hybrid proteins containing an Fv that reacts with a cancer cell and a bacterial or plant toxin that can induce antibody responses and limit the number of treatment cycles. We have developed approaches to identify human B cell and T cell epitopes and have produced active immunotoxins in which both types of epitopes have been removed. We expect these proteins will have low immunogenicity in humans.

9:00 Chimeric Antigen Receptors: Turning an Antibody into a T Cell Receptor

Richard A. Morgan, Ph.D., Staff Scientist, Surgery Branch, National Cancer Institute, NIH

A chimeric antigen receptor (CAR) is a hybrid protein, composed of the antigen recognition domain from a monoclonal antibody (an scFv) fused to an intracellular T-cell activation domain(s). Several clinical trials using CAR-transduced T cells have been reported, and efforts targeting CD19 have led to the effective elimination of lymphoma in patients. An update on these approaches will be presented.

9:30 Target-Molecular Specific Near Infrared Cancer Photoimmunotherapy: A New Highly Specific Antibody-Based Cancer Therapy

Hisataka Kobayashi, M.D., Chief Scientist, Molecular Imaging Program, NCI/NIH

In this presentation, we describe an antibody conjugate with a photosensitive near infrared (NIR) phthalocyanine dye, IR700, which can be used as an optical imaging agent at low doses of light but becomes a photoimmunotherapeutic (PIT) at higher doses of light. PIT using MAb-IR700 is a promising theranostics for highly selective treatment of cancers.

10:00 Coffee Break in the Exhibit Hall with Poster Viewing

PRE-CLINICAL AND CLINICAL DATA

10:45 Antibodies Targeting DLL4 Signaling

Timothy Hoey, Ph.D., Senior Vice President, Cancer Biology, OncoMed

11:15 Path to Clinical Development and Completion of a Phase I Clinical Trial for a New Class of Therapeutic Protein – Anticalins

Laurent Audoly, Ph.D., CSO, Head, Research & Development, Pieris Ag

The pharmacological and biophysical properties of Anticalins are opening the door to new target space and improved therapeutic index. This presentation will focus on those attributes including, but not limited to, safety and efficacy of Anticalins in humans, identification and characterization of a highly specific and purely antagonistic cMet targeting Anticalin, straightforward manufacturing and drug-like properties of bispecific Anticalins.

11:45 Human Anti-CCR4 mAb Immunotherapy for the Treatment of Cutaneous T-Cell Lymphoma

Wayne A. Marasco, M.D., Ph.D., Department of Cancer Immunology & AIDS, Dana-Farber Cancer Institute, Harvard Medical School

Cutaneous T-cell lymphoma (CTCL) is a heterogeneous group of neoplastic disorders characterized by clonally derived and skin-homing malignant T cells expressing high level of chemokine receptor CCR4 that is associated with their skin-homing capacity. Although several therapeutic options have become available for patients with CTCL, no therapy has been curative. Data will be presented on a humanized anti-CCR4 mAb in which in vivo studies in a mouse CTCL tumor model demonstrated potent anti-tumor effects and in vitro studies were used to elucidate the mechanism(s) of tumor cell killing.

Sponsored by Cell Signaling Technology

12:15 pm NG-XMT™, a Novel Proteomics Patform for Rapid Identification and Cloning of Monoclonal Antibodies from Circulating Polyclonal Serum

Roberto D. Polakiewicz, Ph.D., Chief Scientific Officer, Cell Signaling Technology, Inc.

NG-XMT™ is a novel proteomics antibody discovery platform that combines the power of tandem mass spectrometry and next generation DNA sequencing to identify antigen-specific monoclonal antibody sequences directly from circulating polyclonal serum of an animal within days. The applications of NG-XMT™ for therapeutic antibody discovery will be discussed.

12:45 pm Luncheon Presentations *(Sponsorship Opportunities Available)* **or Lunch on Your Own**

EMERGING COMPANIES AND TRENDS IN ONCOLOGY

2:00 Chairperson's Remarks

2:05 A New Paradigm for Immune Activation and Drug Discovery

Cohava Gelber, Ph.D., M.B.A., President & CEO, Caerus Discovery, LLC

Caerus Discovery specializes in identification of subtle or cryptic epitopes (biomarkers) and the development of antibodies that bind these with high affinity using a technology platform, DIAAD. An integral part of the DIAAD technology is the Immune Synapse, a medical device consisting of micro and nanoparticles used to create a microenvironment emulating lymphoid tissue. The Immune Synapse is carefully tailored to match the desired antigen type, ensuring robust and consistent programmed immunization.

2:35 Therapeutic Zybody™ Programs

David M. Hilbert, Ph.D., Vice President and Head, R&D, Zyngenia, Inc.

A novel platform for the generation of multi-specific, multi-valent mAbs, called Zybodies, will be presented. The production, stability, binding attributes and biological function of several lead therapeutic candidates for the treatment of breast cancer will be discussed.

Sponsored by anaphore

3:05 Achieving Multi-Epitopic Multi-Specificity (MEMS) with a Single Highly Conserved Human Therapeutic Protein

Anke Kretz-Rommel, Ph.D., Vice President, R&D, Anaphore, Inc

An Atrimer™ therapeutic is a trivalent human protein that can be engineered to specifically interact through each of its multiple loops with unique target epitopes, readily yielding potent multi-specific multivalent therapeutics expressed by a single gene.

3:35 Refreshment Break in the Exhibit Hall with Poster Viewing

4:15 New Insights into Modulation of c-Met Function in Cancer through a Novel Human Antibody Platform

Hans de Haard, Ph.D., CSO, Research, arGEN-X BV

arGEN-X's SIMPLE Antibody™ platform generates ultra-high potency, fully human antibodies with excellent therapeutic potential. Our approach identifies functionally diverse antibodies against even complex targets, with more comprehensive epitope coverage than antibodies from other technologies. We will present exciting data from our c-Met antibody program, highlighting how functional diversity provides unprecedented insight into modulation of c-Met function for solid tumor immunotherapy.

4:45 Retrocyte Display® – A Unique B Cell Based Antibody Display Technology for the Discovery of "Development-Ready", Fully Human Antibodies

Marc A. van Dijk, Ph.D., CTO, 4-Antibody AG

4-Antibody has developed a powerful and unique *in vitro* fully human antibody discovery platform called Retrocyte Display®. This fast and flexible technology entails the stable expression of full-length human IgG antibodies on the cell surface of B lymphocytes, which guarantees a high-quality antibody output with excellent properties for pre-clinical/clinical development. Examples, showcasing the efficiency of the technology, will be presented.

5:15 End of Conference

6:00-9:00 pm Dinner Short Courses*

**Separate registration required; please see page 5 for available courses.*

UPSURGE OF BISPECIFIC ANTIBODIES

Review of Safety Endpoints and Clinical Results

WEDNESDAY, MAY 2

7:00 am Registration and Morning Coffee

OPTIMAL ROUTE TO BISPECIFIC ANTIBODIES

8:30 Chairperson's Opening Remarks

Michael J. Feldhaus, Ph.D., Vice President, Antibody Discovery, Adimab, LLC

8:40 A Simple and Smart Route to Bispecific Antibodies: κλ-bodies

François Rousseau, Ph.D., Head, Protein Engineering, Research, NovImmune SA

κλ-bodies have the characteristics inherent to bispecific antibodies as they can bind multiple targets and have novel modes of action. In contrast to other bispecific formats, κλ-bodies are unmodified fully human IgGs. They depend on the assembly of a kappa and a lambda light chain with a common heavy chain, thus, their stability and in vivo pharmacokinetic properties are indistinguishable to a human IgG. Despite relying on light chain diversity, efficient blockers have been generated. To further expand the versatility of the platform, we generated a new set of κλ-bodies that combine either two lambda or two kappa variable domains with kappa and lambda constant domains. Using this approach, we combine the benefits of a generic purification process with the flexibility of using any light chain type.

9:10 DuoBody™: Efficient Generation of Bispecific IgG1 via Controlled Fab-Arm Exchange

Aran Labrijn, Ph.D., Senior Scientist, Antibody Sciences, Genmab

The DuoBody™ platform generates highly efficiently bispecific antibodies by a controlled Fab-arm exchange process. These bispecific antibodies retain the biochemical structure of regular human IgG1, have Fc-mediated effector functions and regular IgG1 pharmaco kinetics. The technological background and proof-of-concept studies will be discussed.

9:40 TandAbs: A Bispecific Platform that Directs Immune Cells to Kill Cancer Cells and Extends the Half-Life of Immunotherapeutics

Eugene Zhukovsky, Ph.D., CSO, Research, Affimed Therapeutics AG

The TandAb technology comprises CD3 RECRUIT and CD16 RECRUIT modules for the respective activation (recruitment?) of T and NK effector cells that lyse target cells expressing targeted cell-surface antigens. The PROLONG-TandAb platform is under development to optimize the pharmacokinetic properties of our bispecific antibodies by introducing a human serum albumin binding moiety for extended half-life. I will present examples profiling both platforms.

10:10 Coffee Break in the Exhibit Hall with Poster Viewing

PRE-CLINICAL DATA

11:05 Chairperson's Remarks

Patrick Baeuerle, Ph.D., CSO & Senior Vice President, R&D, Micromet

11:10 Two-in-One Antibody: A Platform to Target Two Molecules as IgG or Fab

Germaine Fuh, Ph.D., Senior Scientist, Antibody Engineering, Genentech

Two-in-One antibodies are conventional antibodies in molecular structure generated by evolving the antigen-binding site on each Fab arm of a mono-specific antibody to become dual specific. Variants of HER2 targeting antibody Herceptin that also bind and block VEGF is initial proof-of-concept. In clinical development is an EGFR/HER3 two-in-one antibody that inhibits a broad range of epithelial tumor in mouse models.

11:40 EGFRvIII-Targeted Bispecific T Cell Engagers for Brain Tumor Therapy

Chien-Tsun Kuan, Ph.D., Assistant Professor, Pathology; Member, Preston Robert Tisch Brain Tumor Center, Duke University Medical Center

Bispecific T-cell engagers targeting EGFRvIII were designed to redirect a patient's T-cells to kill cancer cells by targeting to tumor cells expressing GBM-specific EGFRvIII. Our pre-clinical study showing this reagent leading to highly efficient lysis of target cells and significant anti-tumor efficacy in intracranial animal models will be presented.

12:10 pm Luncheon Presentation *(Sponsorship Opportunities Available)* **or Lunch on Your Own**

NOVEL SCAFFOLDS AND FORMATS FOR BISPECIFICS AND MULTICLONALS

1:30 Chairperson's Remarks

Christian Klein, Ph.D., Discovery Oncology oDTA, Pharma Research and Early Development (pRED), Roche Glycart AG

1:35 Computational Modeling to Build a Better Bispecific Scaffold

Surjit Dixit, Ph.D., CTO, Zymeworks, Inc.

Bispecific Azymetric™ antibodies are immunoglobulins engineered using structure guided and computational modelling techniques. They consist of two heterodimeric heavy chains which facilitate the potential to bind two different antigens or drug targets. Pure and stable Azymetric™ antibodies can be expressed in high yields while retaining natural IgG-like effector function and serum half-life.

2:05 Next-Generation Tri-Epitopic Anti-EGFR Antibodies: Overcoming Resistance by Enhanced Clustering and Downregulation

Jamie Spangler, Ph.D., Postdoctoral Research Associate, Departments of Molecular & Cellular Physiology and Structural Biology, K. Christopher Garcia Lab, Stanford University

Current EGFR-targeted therapeutics are hampered by resistance resulting from mutations in signal effectors downstream of the receptor. We present the design antibody-based fusion constructs that simultaneously target multiple epitopes of EGFR to induce receptor clustering and downregulation and demonstrate that our constructs ablate EGFR signaling and potently inhibit tumor growth in models of BRAF- and KRAS-mutant cancers.

2:35 High Affinity CD3 RECRUIT TandAbs for T Cell-Mediated Lysis of Malignant CD19+ B Cells

Uwe Reusch, Ph.D., Head, Cell Culture, Affimed Therapeutics AG

AFM11 is a CD19/CD3 bispecific tetravalent antibody that recruits T cells to CD19+ target cells resulting in their lysis. Functional assays including biosensor analysis on cells demonstrate that AFM11 is a highly efficacious novel drug candidate for the treatment of B cell malignancies with an advantageous safety profile.

3:05 Refreshment Break in the Exhibit Hall with Poster Viewing

3:50 Problem Solving Breakout Discussions

4:50-6:00 Networking Reception in the Exhibit Hall with Poster Viewing

THURSDAY, MAY 3

DESIGNING THE IDEAL BISPECIFIC ANTIBODY DRUG

8:30 am Chairperson's Remarks

Tariq Ghayur, Ph.D., Senior Research Fellow, Abbott Bioresearch Center

8:35 A Molecular Engineering Approach to Generate of Bispecific Antibodies with Enhanced Effector Functions

Wei Yan, Ph.D., Director, Protein Science, Amgen

We have modified the CH3 domain interface of the antibody Fc region with selected mutations so that the engineered Fc proteins preferentially form heterodimers. This new strategy allows the production of asymmetrical fusions base on Fc heterodimer where each chain is individually engineered to maximize functionality and selectivity of the fusion protein. An example will be given on the generation of a heterodimeric IgG.

9:05 Ang2-VEGF CrossMAb: Development and Characterization of a Novel Bispecific Human IgG1 Antibody to Treat Solid Tumors

Kay-Gunnar Stubenrauch, Ph.D., Large Molecules Research, Pharma Research

and Early Development (pRED), Roche Diagnostics GmbH
The talk describes the successful expression of a new format for a 1+1-bi-specific antibody called CrossMab. The combination of the knob-into-hole technology and the crossover of the CH1 and CL domain on one side of the bispecific antibody allows the generation of cell lines producing the CrossMab with high titer and excellent quality. Development of the production process and analytical characterization of the CrossMab will be presented.

9:35 Transfer'rin Antibodies into the Brain
Mark S. Dennis, Ph.D., Senior Scientist, Department, Antibody Engineering, Genentech, Inc.
Antibodies have a vast therapeutic potential for treatment of CNS diseases, but their passage into the brain is restricted by the blood-brain barrier (BBB). Here we describe an approach to enhance receptor-mediated transcytosis pathways in brain endothelial cells to deliver therapeutically relevant dose levels of antibody across the BBB.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

SAFETY CHALLENGES WITH BISPECIFIC ANTIBODIES

11:00 Chairperson's Remarks
Nazzareno Dimasi, Ph.D., Senior Scientist, Antibody Discovery & Protein Engineering, MedImmune

» 11:05 KEYNOTE PRESENTATION

New Generation of Bispecific Biologics: Challenges and Opportunities in Biotherapeutic Development
Rakesh Dixit, Ph.D., DABT, Vice President, Research & Development, Global Head, Biologics Safety Assessment, Pathology & LAR, MedImmune

This talk will present an overview of next generation of bispecific biologics and the pros and cons of development of bispecific biologics. Bispecific target selection and ways to maximize the target and effector function engagement will also be discussed. Challenges and Mitigation Strategies of the following will be presented: Balancing affinity and potency to minimize safety risks, pharmacokinetics and pharmacodynamics challenges, safety and toxicity challenges and risk mitigation strategies, biopharmaceutical CMC challenges. Finally, clinical challenges to development of bispecific will be addressed.

11:35 Bispecific Anti-IL-4/Anti-IL-13 Bispecific in Phase 1: First Clinical Results
Brian Swanson, Ph.D., Senior Director, Clinical & Exploratory Pharmacology, Sanofi
SAR156597, an engineered bispecific antibody, simultaneously binds both IL-4 and IL-13 with high affinity and may attenuate the pathogenesis of idiopathic pulmonary fibrosis, a severe disease with few therapeutic options and a mean survival time of 3 years. SAR156597 suppresses IL-4/IL-13-mediated effects *in vitro* and allergen-induced airway hyperressponsivenes in sensitized monkeys. The safety, tolerability and PK of single subcutaneous doses of SAR156597 have been established in healthy human subjects.

12:05 pm End of Conference

MAY 3-4 | ANTIBODIES STREAM 2nd ANNUAL

ANTIBODY–DRUG CONJUGATES

Learning from the Clinic in Real Time

THURSDAY, MAY 3

12:00 pm Registration

THE NEXT GENERATION OF ADCs – LEARNING FROM THE CLINIC IN REAL TIME

1:30 Chairperson's Opening Remarks
Pamela A. Trail, Ph.D., Vice President, Oncology, Regeneron Pharmaceuticals, Inc.

» 1:40 FEATURED SPEAKER

Lessons Learned from the Clinic – T-DM1 and Beyond
John Lambert, Ph.D., CSO, ImmunoGen, Inc.
Since 1999, a number of antibody-maytansinoid conjugates (AMCs) have entered clinical testing, with the most advanced of these, T-DM1 and SAR3419, attracting attention for their efficacy and tolerability profile. Lessons learned from earlier AMCs helped inform the design of these compounds, and this body of knowledge that can be applied to AMC design continues to expand and will be discussed.

» 2:10 FEATURED SPEAKER

The Development of ADCs at Seattle Genetics
Jonathan Drachman, M.D., Senior Vice President, Research and Translational Medicine, Seattle Genetics
Antibody-drug conjugates (ADCs) represent an important class of new cancer therapeutics under development. The deceptively simple concept of targeted drug delivery has been an elusive goal for decades but has been realized with the approval of brentuximab vedotin (ADCETRIS). The current approach to designing empowered antibodies and testing them both pre-clinically and clinically will be discussed.

2:40 Sponsored Presentations *(Opportunities Available)*

3:10 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00 SAR3419, a DM4-Loaded Antibody-Drug Conjuguate: Phase I Experience in B-Cell Lymphoma
Anne Bousseau, M.D., Head, Early Development Projects, Global Oncology, Sanofi-Aventis
SAR3419 (huB4-DM4)is an antibody–drug conjugate composed of a humanized IgG1 monoclonal antibody, huB4 targeting the CD19 antigen, conjugated through a disulfide linker to a potent tubulin inhibitor, the maytansinoid derivative DM4. This presentation will focus on the translation from pre-clinical to human. Pre-clinical activity as well as preliminary phase I data will be presented, including evidence for the mechanism of action in both tumor-bearing mice and patients.

4:30 Antibody-Drug Conjugates: Pre-Clinical Evaluation of a Novel Target
Andrew Simmons, Ph.D., Associate Director, Oncology, Takeda California

5:30-8:30 pm Recommended Dinner Short Course*
SC14 Antibody Conjugate Therapeutics: Potential and Challenges
**Separate registration required, please see page 5 for details.*

FRIDAY, MAY 4

7:45 am Continental Breakfast in the Exhibit Hall with Poster Viewing

THE NEXT GENERATION OF ADCs – LEARNING FROM THE CLINIC IN REAL TIME (CONTINUED)

8:00 Chairperson's Remarks
Peter U. Park, Ph.D., Founder & CEO, Habgen

8:05 Updates from the Clinic: Brentuximab Vedotin (SGN-35)
Michelle A. Fanale, M.D., Assistant Professor, Department of Lymphoma & Myeloma, Division of Cancer Medicine, The University of Texas MD Anderson Cancer Center; Principal Investigator for the ALCL Trial

Patients with relapsed/refractory anaplastic large cell lymphoma (ALCL) and Hodgkin lymphoma (HL) can have dismal outcomes. Both ALCL and HL have high levels of CD30 expression. Brentuximab vedotin is an antibody-drug conjugate that targets CD30 and is linked to the microtubule-disrupting agent monomethyl auristatin E (MMAE). Its accelerated approval in August 2011 represents a crucial turning point in disease treatment.

8:35 General Outline of the ADC Field – Potential Bottlenecks

Marc Damelin, Ph.D., Principal Scientist, Oncology Research Unit, Pfizer Worldwide Research & Development

This presentation will discuss differences in the mechanism of action between calicheamicin and tubulin inhibitor based ADCs, phase II/ III clinical update on CMC-544, an anti-CD22 calicheamicin conjugate developed in NHL, pre-clinical development of a novel ADC targeting the oncofetal antigen 5T4, expressed on tumor initiating cells and current limitations in ADC development and strategies for next generation ADCs.

9:05 Clinical Development of CDX-011, an Antibody-Drug Conjugate Targeting Glycoprotein NMB (GPNMB) for the Treatment of Metastatic Breast Cancer and Other Malignancies

Thomas Davis, M.D., CMO & Senior Vice President, Clinical Development, Celldex Therapeutics

CDX-011 is an ADC comprised of a human IgG2 antibody conjugated to MMAE that targets a novel cell surface protein GPNMB. Initial clinical studies have defined a tolerable phase 2 dose and shown significant disease control with tumor shrinkage in a majority of patients with heavily pretreated breast cancer and melanoma. Objective responses have been seen in GPNMB expressing diseases including triple negative BRCA. A randomized phase 2 study in breast cancer is ongoing.

9:35 Translational Studies of PSMA ADC, a Fully Human Anti-PSMA Monoclonal Antibody Linked to vcMMAE

William C. Olson, Ph.D., Senior Vice President, Research & Development, Progenics Pharmaceuticals, Inc.

Prostate-specific membrane antigen (PSMA) exhibits a unique pattern of expression that is dependent upon the cancer type. Here we describe translational studies of PSMA ADC, including pre-clinical efficacy studies and preliminary tolerability and efficacy findings from an ongoing phase 1 dose-escalation study in advanced prostate cancer.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

CONJUGATION

10:50 Oligobodies: Site Specific Nucleic Acid-Antibody Conjugates for Detection and Therapy

Vaughn Smider, M.D., Ph.D., Assistant Professor of Molecular Biology, The Scripps Research Institute

We use unnatural amino acid chemistry to enable site-specific conjugation to antibody surfaces. Coupling nucleic acids to antibodies allows unique applications including highly sensitive immuno-PCR. Additionally the basepairing properties of nucleic acids confer the ability to create unique multispecific experimental therapeutics.

LEAD SELECTION FOR ADCS

11:20 SPECIALIZED CASE STUDY: Decisions, Decisions – Selecting Targets and Leads for ADCs

David A. Tice, Ph.D., Principle Scientist, Oncology Research Department, MedImmune

Recent advances in linker and payload chemistry have opened up new opportunities to develop antibody-drug conjugates. This presentation will focus on lessons learned and best practices for the selection of targets and leads to fill early pipelines across the industry. Examples will be presented for a variety of topics including target expression and internalization, methods for target validation, antibody formats during lead selection, and optimal antibody characteristics for drug conjugates.

11:50 PANEL DISCUSSION:
Target Discovery and Antibody Selection for Optimal ADCs

Pamela A. Trail, Ph.D., Vice President, Oncology, Regeneron Pharmaceuticals, Inc.

Peter Park, Senior Director, Discovery Research, ImmunoGen, Inc.

Mahendra Deonarain, Ph.D., Head, Antibody Technology, Life Sciences, Imperial College

Hans-Peter Gerber, Ph.D., Executive Director, BioConjugate Discovery & Development, Oncology Research Unit, Pfizer Worldwide R&D

David A. Tice, Ph.D., Principle Scientist, Oncology Research Department, MedImmune

Jon Terrett, Chief Scientific Officer, Oxford BioTherapeutics Inc.

12:20 pm Luncheon Presentation *(Sponsorship Opportunity Available)* **or Lunch on Your Own**

SAFETY DATA AND PK/PD MODELING FOR ADCs

1:35 Chairperson's Remarks

David A. Tice, Ph.D., Principle Scientist, Oncology Research Department, MedImmune

1:40 Pre-Clinical Safety and Efficacy Evaluation of the Anti-CD37 Antibody-Maytansinoid Conjugate IMGN529

Jutta Deckert, Ph.D., Principal Scientist, Discovery Research, ImmunoGen, Inc.

IMGN529 is a CD37-directed antibody-maytansinoid conjugate in development for the treatment of B-cell malignancies, including non-Hodgkin's lymphoma (NHL) and chronic lymphocytic leukemia (CLL). Its unique design enables IMGN529 to kill malignant B cells using multiple, targeted mechanisms. The pre-clinical evaluation of IMGN529 will be discussed with a focus on i*n vitro* safety studies.

2:10 Use of PK/PD Modeling as a Tool to Quantitate Efficacy of ADCs in Mouse Tumor Models and for Early Predictions of Clinical Efficacy

Alison Betts, Senior Principal Scientist, Translational Research Group, Pharmacokinetics, Dynamics and Metabolism, Pfizer, Inc.

2:40 Assays for Detection and Characterization of Binding Anti-ADC Antibodies

Marta Starcevic, Ph.D., Clinical Immunology, Amgen, Inc.

Assays for Detection and Characterization of Neutralizing Anti-ADC Antibodies

Arunan Kaliyaperumal, Ph.D., Principal Scientist, Clinical Immunology, Amgen, Inc.

ADC CHEMISTRY – NEWLY EMERGING PAYLOADS

3:20 Drug-Linker Development for ADCs

Edmund Graziani, Ph.D., Associate Research Fellow, Worldwide Medicinal Chemistry, Oncology East, Pfizer Global Research & Development

Antibody drug conjugates (ADCs) are an emerging modality for the treatment of cancer. Presently, three classes of cytotoxic payloads have been successfully employed on these modalities in clinical settings, namely the auristatins, maytansines and calicheamicins. This talk will focus on Pfizer's innovative chemistry strategy to discover and develop new linker-payload classes that will yield more efficacious and potentially better tolerated conjugates to advance this area of research.

3:40 Optimizing the Performance of ADCs with an Expanded Genetic Code

Ho Sung Cho, Ph.D., Chief Technical Officer, Ambrx

Ambrx is using its proprietary Protein Medicinal Chemistry platform to optimize the therapeutic potential of Antibody-Drug Conjugates. By creating homogeneous, novel ADCs with defined drug antibody ratios (DAR), and sites of conjugation rationally selected to preserve antibody structure and function, we are able to perform quantitative experiments to identify the best mAb, DAR, linker design, MOA and site(s) of conjugation for several cancer targets. This presentation will provide a summary of our recent findings.

4:10 Light-Activated ADCs

Mahendra Deonarain, Ph.D., Head, Antibody Technology, Life Sciences, Imperial College

4:25 Extracellular Antibody/Drug Conjugates: A New Paradigm for MAb/Drug Conjugates

James R. Prudent, President and Chief Executive Officer, Centrose

Centrose discovered the first-ever synergistic drug targeting system called the Extracellular Drug Conjugate System or EDC. EDCs are like Antibody Drug Conjugates (ADCs) but are safer and more effective because they are not pro-drugs and only affect diseased cells. To modulate cell growth and activity, EDCs use mAbs (specific to diseased cells) and attached modulating drugs that work in concert together. Currently, Centrose has 7 EDC lead drug candidates and is continuing to build the pipeline and platform.

4:40 End of Conference

HOTEL & TRAVEL INFORMATION

CONFERENCE HOTEL

The Boston Park Plaza
Hotel & Towers
50 Park Plaza at Arlington Street
Boston, MA 02116
T: 617-426-2000

Discounted Room Rate: $199 s/d

Discounted Room Rate Cut-off Date: March 30, 2012

Please visit our conference website to make your reservations online or call the hotel directly to reserve your sleeping accommodations. You will need to identify yourself as a Cambridge Healthtech Institute conference attendee to receive the discounted room rate with the host hotel. **Reservations made after the cut-off date or after the group room block has been filled (whichever comes first) will be accepted on a space and rate-availability basis. Rooms are limited, so please book early.**

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Group Leader, Institute of Cell Biology & Immunology, University of Stuttgart

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SATURDAY, APRIL 28 - SUNDAY, APRIL 29

Biologics Partnering Forum

Partnering Forum
Non-Attendee Rate.....$1395
Conference Attendee Rate.....$1045

SUNDAY, APRIL 29

Morning Courses

SC1 Phage and Yeast Display Libraries

SC2 Techniques for Antibody Selection & Screening

SC3 Recommendations on Immunogenicity Evaluations-Anti-Drug Antibody and Neutralizing Antibody Assay Development, Validation and Sample Testing

SC4 Engineering Optimized Biotherapeutics

SC5 Translational Strategies for Development of Monoclonal Antibodies Part I: Focus on Early Discovery

Afternoon Courses

SC 6 Alternate Display Technologies

SC 7 Use of HT Sequencing for Antibody Library Generation and Selection

SC8 Engineering of Bispecific Antibodies

SC9 Biosimilars: Development, Regulation & Prospects

SC10 Translational Strategies for Development of Monoclonal Antibodies Part II: Focus on Nonclinical Development to Clinic

SC11 Molecular Imaging on Tissues Using Mass Spec

TUESDAY, MAY 1

Dinner Short Courses

SC12 Asia-U.S. Biotech Alliances: Opening Up New Opportunities for Pre-Clinical Development of Biologics

SC13 Light Scattering – Theory, Do's & Don'ts, and Data Interpretation

THURSDAY, MAY 3

Dinner Short Courses

SC14 Antibody Conjugate Therapeutics Challenges

SC15 Advances in Immunogenicity Assays

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Academic, Gov't, Hospital Affiliated....$345

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Commercial.....$995
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		$1,455	$1,595
STANDARD: (Includes access to either conference options I & II, OR II & III)		$2,375	$2,575
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I. April 30 - May 1	II. May 2 - 3 (am)	III. May 3 - 4 (pm)
• Phage & Yeast Display	• Engineering Antibodies	• Antibody Optimization
• Difficult to Express Proteins	• Optimizing Protein Expression	• Purifying Antibodies
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• Antibodies for Cancer Therapy	• Bispecific Antibodies	• Antibody-Drug Conjugates

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