Recovery of Biological Products VII

Engineering Foundation

American Chemical Society, Division of Biochemical Technology

Co-chairs

Stephen W. Drew, Merck & Co., Inc., USA
Charles F. Goochee, Chiron Corporation, USA
Dennis M. Lanfear, Amgen, Inc., USA

Le Meridien Hotel, San Diego, California, USA
25-30 September, 1994

Monday, 26 September

Advances in Chromatography I

Session chairs

Shuichi Yamamoto, Yamaguchi University, Japan
Jan-Christer Janson, Uppsala University, Sweden

Design Calculation Procedures for Scaling-up Linear Gradient Elution Chromatography of Proteins
Shuichi Yamamoto, Yamaguchi University, Japan

Expanded Bed Purification of Proteins Using Purpose-designed Adsorbents
Howard Chase, University of Cambridge, UK

Effective Purification of Recombinant Proteins by Use of Cross-Reactive Antibodies
Shigeo Katoh, Kyoto University, Japan

Engineering Aspects of Fluidized Bed Chromatography
Jörg Thömmes, Henrich-Heine University, Germany

Material for Separations

Session chairs

Frances Arnold, California Institute of Technology, USA
Jean Frechet, Cornell University, USA

New Polymeric Separation Media for the Separation of Proteins
Jean M.J. Frechet, Cornell University, USA

Metal Ion Binding and Template Polymerization: New Routes to Materials for Selective Separations
Frances H. Arnold, California Institute of Technology, USA

Phage Surface Display Libraries as a Source of Novle Affinity Ligands: Display of Protein A of Staphylococcus aureus
Richard Willson, University of Houston, USA

Workshop on Regulatory Issues

Kenneth Seamon, Associate Director of Research, US Food and Drug Administration, USA
Susan Vargo, Director, Division of Establishment and Licensing, US Food and Drug Administration, USA

Advances in Primary Isolation Techniques

Session Chairs

Kenneth Taksen, Pfizer, USA
M.-R. Kula, Heinrich-Heine University, Germany

A Comparison of Different Methods of Large Scale Extraction of Bacterial Plasmid DNA for Clinical Applications
K. J. Jem, Apollon, Inc., USA

The Bulk Crystallization of Proteins
Michael R. Johns, The University of Queensland, Australia

Surface-Modified Zirconia Supports for Fluidized-Bed Protein Separations
Michael R. Flickinger, University of Minnesota, USA

Direct Integration of Protein Recovery with Productive Fermentations
Andrew Lyddiatt, University of Birmingham, UK

Tuesday, 27 September

Advances in Membrane Separations

Session chairs

Robert van Reis, Genentech, Inc., USA
Anthony DiLeo, Millipore Corporation, USA

Fractionation of Protein Mixtures Using Selective Membrane Filtration
Andrew L. Zydney, University of Delaware, USA

Protein Purification by High Performance Tangential Flow Filtration
Robert van Reis, Genentech, Inc., USA

Microfiltration of Recombinant Yeast Cells Using a Dynamic Membrane Filter System
Steven S. Lee, Merck & Co., Inc., USA

Microfiltration of Biological and Other Suspensions with Self-Cleaning Spiral Vortices: Possibilities for a New Membrane Module Design
Hanuman Mallubhotla, Rensselaer Polytehnic Institute, USA

Impact of Protein Expression Systems and Post-translational Modifications on Recovery

Session chairs

Mary Sliwkowski, Genentech, Inc., USA
Alfred Gaertner, Genencor International, Inc., USA

Apparent Heterogeneity of Recombinant Proteins as Studied with Soluble Interferon Receptors
Michael Fountoulakis, F. Hoffmann-La Roche Ltd., Switzerland

Comparison of Recombinant Chimeric Immunoglobulin Secreted and Purified from Chinese Hamster Ovary (CHO) and Murine SP2/0 Myeloma Cells
Mitchell E. Reff, IDEC Pharmaceuticals Corporation, USA

Factors Affecting the Structural Integrity of Recombinant Proteins Produced in Mammalian Cell Culture
Mary B. Sliwkowski Genentech, Inc, USA

Wednesday, 28 September

Advances in Chromatography II

Session chairs

Csaba Horvàth, Yale University, USA
Robert Sitrin, Merck & Co., Inc., USA

Column Technology in Protein Chromatography: Advances and New Challenges
Csaba Horvàth, Yale University, USA

Development of an Industrial HPLC Process
S.N. Behrns, Merck & Co., Inc., USA

Product Formulation and Stability

Session chairs

Eli Schefter, Cytel Corporation, USA
Ronald Borchardt, University of Kansas, USA

Predicting Chemical Instability of Proteins in Solution and in Lyophilized Formulations
Ronald T. Borchardt, University of Kansas, USA

Approaches for Increasing the Solution Stability of Proteins
Mark C. Manning, University of Colorado Health Sciences Center, USA

Mechanisms of Nonionic Surfactant Stabilization of Proteins
J. L. Cleland, Genentech, Inc., USA

Production Characterization

Session chairs

Helmut Sassenfeld, Immunex, USA
Alan Herman, Amgen, Inc., USA

Analysis of the Solution Structure of Protein Pharmaceuticals by Laser Light Scattering Photometry
Alan C. Herman, Amgen, Inc., USA

Stationary Phases: The Heel of Achilles in Today's Analytical HPLC?
Benny S. Welinder, Novo Nordisk, Denmark

Characterization of the Glycosylation Pattern of Human Granulocyte Macrophage Colony Stimulating Factor Expressed in Yeast
Alain Balland, Immunex Corporation, USA

Elucidating the Thermal Stability of Globular Protein in a Hydrophobic Environment Using 1HR NMR
Timothy J. Hancock, Lehigh University, USA

Thursday, 29 September

Case Studies of Industrial Separations

Session chairs

Stuart Builder, Genentech, Inc., USA
Thomas Boone, Amgen, Inc., USA

Development and Scale-up of a Downstream process for a Highly Purified Inactivated Hepatitis A Vaccine
C. J. Orella, R. Aboud, M. Armstrong, P. A. DePhillips, A. Hagen, J. Hennessey, S. Isabell, F. Leu, J. A. Lewis, C. B. Oswald, C. N. Oliver, D. Seifert and R. D. Sitrin, Merck Co., Inc., USA

Troubleshooting of a Recombinant DNA Therpeutic Protein Purification Process: A Case Study
Andreas Kyriacou, Darren DeWalt, Sushil Madhogarhia, Michael Mills, Sean Campbell, Tom Boone, Naili Liu, Shirley Steavenson and Yu-Heng Ma, Amgen, Inc., USA

Fermentation-Derived Chymosin: Process Development & Product Characterization - A Retrospective Review
Kenneth G. Taksen, Pfizer, Inc., USA

Evolution of a Process for IGF-I
Charles Olson, Roger Hart, Phil Lester, Beth Goodrich, Rober van Reis, Jim Kaspari, Fernando Aspiras, Maria Rodrigues, Jim Swartz, Dorothea Reilly, Nancy McFarland, Susan Leung, Judy Chang, Daniel Yansura, Laura Simmons, Tina Etcheverry, David Reifsnyder and John Ogez, Genentech, Inc., USA

Regulatory Issues in Pharmaceutical Manufacturing

Session chairs

Wolfgang Berthold, Dr. Karl Thomae GmbH, Germany
John Poulos, Amgen, Inc., USA

Managing Change in the Manufacture and testing of Biological Products
Tobias Massa, Schering Plough Research Institute, USA

Validation - Does it Do What it Purports to do?
James Akers, Akers, Kennedy & Associates, USA, Terry Gerrard, Biology, Center for Biologics Evaluation and Research, US Food and Drug Administration, USA

"Variations", Process Changes and Their Regulation in the EU
Annette Baeckman, Bundes Gesundheits Amt (BGA), Germany

Workshop: Regulatory Issues

Session chair

Kenneth Seamon, Center for Biologics Evaluation and Research, US Food and Drug Administration, USA

Friday, 30 September

Protein Refolding

Session chairs

Rainer Rudolph, Boehringer Mannheim GmbH, Germany
David Brems, Eli Lilly & Co., USA

New Methods for Successful in vitro Folding of Inclusion Body Proteins
Rainer Rudolph, Boehringer Mannheim GmbH, Germany

The Role of Partially-folded Intermediates in Protein Aggregation and Inclusion Body Formation
Anthony L. Fink, University of California, USA

Detergent and Liposome Assisted Refolding of Proteins
Paul M. Horowitz, University of Texas Health Science Center, USA

Monitoring and Control of Separations

Session chairs

Michael Hoare, University College London, UK
S. E. Shumate, Merck Manufacturing Division, USA

The Use of Modern Process Monitoring Tools to Facilitate Development and Validation of Manufacturing Processes for Vaccines and Recombinant Proteins
Robert D. Sitrin, Merck Research Laboratories, USA

The Use of RP HPLC for Measuring Activation and Degradation of Coagulation Factor VII during Purification
Inger Mollerup, Novo Nordisk A/S, Denmark

Applications for Advances Process Management System in Downstream Bioprocessing
Steven P. Fraleigh, Gensym Corporation, USA

Poster Session

Session chair

Maria-Regina Kula, Heinrich-Heine University, Germany

Preparation of Peptide Mixture with Nutritionally Definite Characteristics from Protein Hydrolysate by Chromatographic Separation
Shuji Adachi, Yukitaka Kimura, and Ryuichi Matsuno, Kyoto University, Japan

Comparison of Fluidised Bed and Packed Bed for Antibody Purification
Kamran Beyzavi, Bioprocessing Limited, UK

A Novel Hydrophobic Interaction Chromatography Method Allowing High Capacity Protein Binding, at Low or High Ionic Strength, and Facile "Protein Friendly" Elution
Simon Burton and David Harding, Massey University, New Zeeland

Strategies and Method Development for the Direct Extraction of G6PDH Using Affinity Chromatography in Expanded Beds
Y. K. Chang, G. E. McCreath, and H. A. Chase, University of Cambridge, UK

Differences in the Chromatographic Resolution of Several Anion Exchange Resins during the Purification of Plasma Proteins
A. Johnston, J. Bertolini, J. Davies, J. Wu, G. Seneviratne, CSL Limited, Bioplasma Division, Australia

Expanded Bed Affinity Chromatography of Enzymes Using Perfluoropolymer Supports
Graham E. McCreath, Howard A. Chase, and Christopher R. Lowe, University of Cambridge, UK

Development and Modelling of Continuous Affinity Separations using Perfluorocarbon Emulsions
Ryan O. Owen, Graham E. McCreath and Howard A. Chase, University of Cambridge, UK

Modelling of Preparative High Performance Liquid Chromatography of Proteins and Peptides
Arvind P. Sabharwal and Howard A. Chase, University of Cambridge, UK

Large Scale Reversed Phase - High Performance Liquid Chromatography Purification of Insulin
Simone Oliveira and Luciano Vilela, Biobras S/A, Brazil

Separation of Amino Acids by Displacement Chromatography with Unregenerated Resin
Marcus Barwe, and Rolf Wichmann, Universität Dortmund, Germany

A Study of the Relationship Between Adsorption Capacity and Resolution with Two New Polymeric Bioprocessing Resins
P. Cartier, K. Deissler and J. Maikner, Rohm and Haas Company, Y. Kato, T. Kitamura, K. Komiya and T. Matsuda, Tosoh Corporation, Japan, and J. Fisher, TosoHaas, USA

Comparison of Commercial and Custom-Assembled Solid Phases for Protein Adsorption in Liquid Fluidised Beds
Gordon R. Gilchrist, University of Birmingham, UK

Virochromes - a Family of Chromatographic Materials for Biopolymers Recovery and Purification
Levon A. Nakhapetyan, Institute of Biotechnology, Russia

Fermentation and Recovery of Glutamic Acid from Palm Waste Hydrolysate by Ion-Exchange Resin Column
Kumudeswar Das and Anis Mokhtar, University Science Malaysia, Malaysia

A Mathematical Model to Predict the Partitioning of Peptides and Peptide-Modified Proteins in Aqueous Two-Phase Systems
Mark A. Eiteman, University of Georgia, USA, Cynthia Hassinen and Andres Veide, Royal Institute of Technology, Sweden

Direct Processing of Cell Culture and Fermentation Harvests on Packed Bed Columns
Peter Grandics, Susan Szathmary, Warren Chester and Walter Bilash, Sterogene Bioseparations, Inc., USA

Protein Solubilization and Recovery of Activity Yield in the Reversed Micellar Extraction
Sosaku Ichikawa and Shintaro Furusaki, The University of Tokyo, Japan

Solubilizing State of Proteins in AOT Reverse Micelles and Conformation Change relate to Hydrophilic Character of Amino Acid Sequence
Masanao Imai, Katsuhiro Maruyama, Atsuyoshi Ishikawa, and Masaru Shimizu, Tokyo University of Agriculture and Technology, Japan

Isolation of C10 Deacetylase for Production of 10-Deacetylbaccatin-NI from Baccatin-III
Venkata B. Nanduri, Ronald L. Hanson, Thomas LaPorte, Ramesh N. Patel and Laszlo J Szarka, Bristol Myers Squibb, USA

Reverse Micellar Extraction of Lysozyme from Chicken Egg White with Guanidine Hydrochloride Addition
Kazumitsu Naoe, Yukie Shintaku, Yoko Mawatari and Mikio Kawagoe, Nara National College of Technology, Nara, Japan, and Masanao Imai, Tokyo University of Agriculture and Technology, Japan

Recovery of Insects Cells (SF9) Using Hollow Fiber Microfiltration
Loc Trinh and Joseph Shiloach, National Institutes of Health, USA

Chromatographic Recovery of Industrial Enzymes from Fermentation Broth
Landon Steele, Ben Bulthuis, Todd Becker, Genencor International, Inc., USA, and Simon Burton and David Harding, Massey University, New Zealand

Cost Sensitivity Analysis of Mammalian Cell Clarification Techniques
S.J. Abraham, S. Dennett, M.E. Brown, Celltech Biologics plc, UK

Affinity Ultrafiltration for Enzyme Purification
Hördur Filuppusson and Kristmundur Sigmundsson, University of Iceland, Iceland

Preparation, Capacities, and Dynamics of Affinity Membranes Using Nylon and Polysulfone Hollow Fibers
Elias Klein, Don Yeager, Eva Eichholz, Benita Braun, Raghunandan Seshadri, University of Louisville, USA

Preparative Isoelectric Focusing in Multicompartment Electrolyzers with Immobiline Membranes
P.G. Righetti, E. Wenisch, and M. Daniels, University of Milano, Italy, and Hoeffer Scientific Instruments, USA

Protein Separation Using Centrifugal Membrane Chromatography
Woo-Jin Chang and Yoon-Mo Koo, Inha University, Korea

A New Membrane Ion Exchanger for Rapid Purification of Proteins from Animal Cell Culture Using FPLC-System
Dirk Lütkemeyer and Jürgen Lehmann, University of Bielefeld, Germany

Membrane Adsorbers with High Dynamic Binding Capacity for Rapid Protein Concentration, Purification and Removal of Contaminants based on Adsorption/Desorption
A. R. Weiss, G. Henricksen, Sartorius Corp, USA, and K. Rupp-Rodluwski, W. Demmer, T. Ehlert, H. H. Hoerl, D. Nussbaumer, Sartorius AG, Germany

Purification of Native gp120 from HIV-1 Infected T-cells
Gustav Gilljam, Swedish Institute for Infectious Disease Control, Christina Jagersten, Inger Lagerlund and Marianne Sparrman, Pharmacia Biotech AB, Sweden

Identification and Monitoring of Protease Activity in Recombinant Saccharomyces cerevisiae
Juan A. Gimenez, Don D. Monkovic, and Michael L. Dekleva, Merck & Co., USA

Enhancement of Downstream Processing Using Genetic Engineering
Craig E. Forney, Meng H. Heng, John R. Luther, Maribel Rodríguez Torres, and Charles E. Glatz, Iowa State University, USA

Purification of Recombinant Proteins by Displacement Chromatography
Claayton A. Brooks, and Joe Dunn, Immunex Manufacturing Corp., USA

Selective Adsorptive Separations Using Internal Gradients
Akhil Agrawal, Lisa L. Evans, and Mark A. Burns, USA

Rapid Development and Implementation of High Performance Displacement Chromatography in a Bioprocess Setting
Jana Jacobson, BioWest Research, USA

Multivalent Binding and Heterogeneity in Protein-Surface Interactions: Application to Metal Affinity Chromatography
Robert D. Johnson and Frances H. Arnold, California Institute of Technology, USA

Improving Mass-Transport Efficiency in Adsorptive Bioseparations with Magnetic Resonance Measurements
Keith Roper and Edwin N. Lightfoot, University of Wisconsin-Madison, USA

Economical Scaling-Up of Purification Processes
Sanjeev Saxena, Sepragen Corp., USA

Use of Ion-Exchange Resin for Continuous Separation and Purification of Lactic Acid from an Immobilized-Cell Fermentation in a Biparticle Fluidized-Bed Reactor
E.N. Kaufman, S.P. Cooper, S. Clement, M. Little and T.C. Scott, Oak Ridge National Laboratory, USA

Ligand Distribution and Capacity in the Immunoaffinity Purification of Factor IX
John P. Tharakan and Victoria Ayers, Howard University, USA

Rapid Detection of Antibodies by Liposome Immunoassay
Shigeo Katoh, Kyoto University, Japan

Characterization of a Recombinant Human Interleukin-1 Receptor
J. L. McGourty, S. Srinivasan, S. L. Novick, K. K. Brasher, K. Stremler, S. Waugh, A. Balland, H. M. Sassenfeld, Immunex Corporation, USA

Analysis of Isohormone Profile and Glycosylation Pattern of recCG Produced by Recombinant CHO Cells in Perfusion Culture
John W. M. Mulders, Piet Levering, Jan B. L. Damm, and Renato de Leeuw, N. V. Organon, The Netherlands

The Characterization of Three Isoforms of a Humanized Antibody to the CD33 Antigen on Myeloid Leukemia Cells
Barbara H. O'Connor, Gary Taniguchi, and Brent R. Larsen, Protein Design Laboratories, Inc, USA

Flow Injection Thin-layer Cell Immunosensor with Chemiluminescent Detection of Peroxidase Label
Alexander P. Osipov, Evgeniy V. Vlasov, Alexey M. Egorov, M.V. Lomonosov Moscow State University, Russia

Enabling the Rapid Design of Bioprocesses through Integrated Simulation and Verification Studies
M Bulmer and N.J. Tichener-Hooker, University College London, UK

Purification Process Development of Hepatitis B Virus Core Antigen
Yi-Ding Chu, Huey-Yen Tsai and Wei-Kuang Chi, China

Pilot-Scale Pufification of Pyrogen-Free Human Growth Hormone Analog hGHG120R for Animal Testing
Tingyue Gu, Yizhou Zheng, Yesong Gu, Raj Haldankar, Nihar Bhalerao, Darin Ridgeway, Paul E. Wiehl, Wen Y. Chen, and John J. Kopchick, Ohio University, USA

Purification of Plasma Protein C by Aqueous Two-Phase Systems
James T. Hsu and Timothy J. Hancock, Lehigh University, USA

Large-scale Purification and Amplified Expression of Protein-L
Roger J. Hinton, Angus R. Trowern, Garry B. Stevens, Tony Atkinson, Clive J. Duggleby, and Jonathan P. Murphy, Centre for Applied Microbiology & Research and Max Atkinson, AECC, UK

Purification of a Recombinant Fab-fragment, Expressed in Escherichia coli
Christina Jagersten and Kicki Blaho, Pharmacia Biotech AB. Mats A.A. Persson, Karolinska Institute, Jorma Hinkula, Swedish Institute for Infectious Disease Control, Sweden

Process Purification Economic Model
Shirish Joshi, Sepragen Corporation, USA

Large Scale Purification of Myo-Inositol Monophosphatase from Brain
Francis Kwok, Xinghua Wang and Samuel C.L. Lo, Hong Kong Polytechnic, Hong Kong

Optimization of Biopharmaceutical Manufacturing via Process Simulation
Demetri P. Petrides and Vital Aelion, NJ Institute of Technology, John Calandranis, Intelligen, Inc., USA

The Production of Human PTH(1-38) by Recombinant DNA Technology
Paul Ramage, Hermann Gram, Hans Peter Kocher and Klaus Memmert, Sandoz Pharma Ltd., Switzerland

Interferon y Receptor Extracellular Domain Expressed as IgG Fusion Protein in Chinese Hamster Ovary Cells. Purification, Biochemical Characterization and Stoichiometry of Binding
Michael Fountoulakis, Cecilia Mesa, Georg Schmid, Reiner Gentz, Michael Manneberg and Gianni Garotta, F. Hoffmann-La Roche Ltd., Switzerland

Development of an Integrated Cleaning Validation Program in a Multi-Use/Multi-Product Facility
Silvia Lombardo, Somesh Nigam, James Dugger, Anthony Scotton and Randall Rupp, Regeneron Pharmaceuticals Inc., USA

Cleaning and Sanitization Validation Requirements for Chromatography Media and Systems
Gail Sofer, Pharmacia Biotech, USA, and Niklas Adner, Pharmacia Biotech, Sweden

Effect on Impurities on Inclusion Body Protein Refolding
Eliana De Bernardez-Clark and Jhansi Maachupalli, Tufts University, and Brian Kelley and Neil Schauer, Genetics Institute, USA

Refolding Proteins in Reverse Micelles: Choice of System Composition and Transfer of Denatured Protein
Julian B Chaudhuri and Sanjay Mall, University of Bath, UK

The Use of Generic Virus Validation Procedures for Processes to Purify Monoclonal Antibodies
C.R. Hill, Celltech Biologics plc, Slough, UK

Protein Refolding and Inactivation During Bioseparation. Bioprocessing Implications
Ajit Sadana, University of Mississippi, USA

Improved Refolding of a Matrix-Bound Fusion Protein
Günter Stempfer, Rainer Rudolph, Boehringer Mannheim GmbH, USA

A New Apparatus for Scaling-up Free Flow Electrophoresis
Prabha Painuly and Robert Ritacco, E.M. Separations Technology, USA