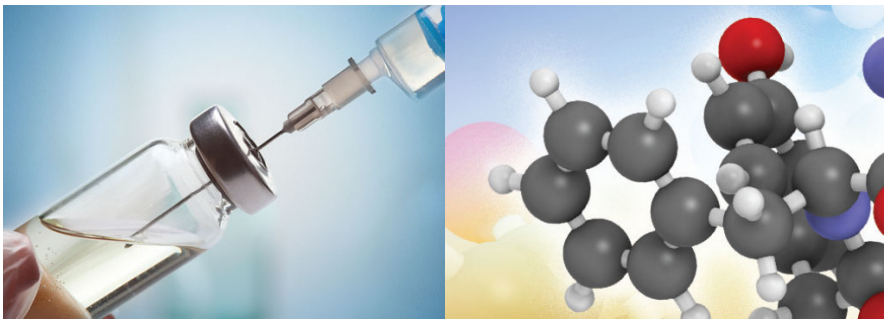
3rd USP Workshop on Synthetic Therapeutic Peptides- Regulations, Standards and Quality



Speaker Biographies & Abstracts (listed alphabetically)

Wilifred Arz, Ph.D.
USP Affiliation:
Member, USP BIO1 – Peptides and Insulins Expert Committee

Sanofi-Aventis Deutschland GmbH
R&D PDP/ Analytical Sciences
Frankfurt, Germany

Wilfried holds a degree in pharmacy of the Johannes Gutenberg University, Mainz (Germany) and a PhD in pharmaceutical chemistry of the Heinrich Heine University, Düsseldorf (Germany)

He started his career in 1984 at Hoechst AG, Frankfurt (Germany) a predecessor company of Sanofi-Aventis Germany and held various positions in the field of Quality Control and Quality Assurance. After 15 years as head of Quality Assurance/Quality Control of the site Frankfurt Biotechnology an API production site for insulins and synthetic peptides he moved in 2013 to R&D and took over the position “Head of Analytical Sciences Frankfurt”. In this position he is responsible for the development of analytical methods for new peptides and insulins.

Wilfried is member of the USP Expert Committees Biologics Monographs 1 - Peptides and JS3-Biologics, the Insulin Expert Panel and of the European Pharmacopoeia expert groups 6 (Biologics) and 10C (Synthetics).

Session III Chair: Impurities
Monday, November 14, 2016, 1:00 p.m. – 2:30 p.m.

Dirk Bachle, Ph.D.
Director Quality Control II
Bachem AG
Bubendorf, Switzerland

Professional Experience
Since 01/2013 Bachem AG, Bubendorf (Switzerland)
Director Quality Control II
- Release of raw and starting materials
- Incoming goods
- In-process control of non-GMP materials
- Mass spectrometry
- Co-administrator CDS Chromeleon
- Project manager paperless lab (SampleManager LIMS)

05/2005 – 12/2012 Bachem AG, Bubendorf (Switzerland)
Team Leader Quality Control II
- In-process control and release of non-GMP R&D products (new building blocks, amino acid derivatives, peptides)
- Implementation of mass spectrometry

Education
2000 - 2004 Ph.D. Studies at the Institute for Organic Chemistry
University of Bielefeld, Germany

2000 Degree as Diploma Chemist at the Institute for Organic Chemistry
University of Bielefeld, Germany

Presentation (Session I)
High Quality Starting Materials: One Important Key to Success
Monday, November 14, 2016, 8:50 a.m. – 9:15 a.m.

In recent years the focus on starting materials for solid phase peptide synthesis increased significantly. A holistic approach for high starting material quality to ensure high API process reliability will be presented.

The methodology comprises tailor-made validated analytical methods based on the individual manufacturing processes of amino acid building blocks. This concept is the backbone of the control strategy including appropriate specifications. Furthermore, a deep inside knowledge of starting material impurity profiles obtained by state of the art analytical technology (UHPLC, UHR-MS/MS) is important to understand the origin of API impurities. In addition, reliable supply chains with defined change control processes will guarantee that the established control strategy remains effective.

Michael DeFelippis, Ph.D.
USP Affiliation:
Chair, USP BIO1 – Peptides and Insulins Expert Committee

Senior Research Fellow
Eli Lilly and Company
Indianapolis, IN

Michael R. DeFelippis, PhD joined the Lilly Research Laboratories of Eli Lilly and Company in 1990 after completing his doctorate in biochemistry. He is currently a Senior Research Fellow working in the Bioproduct Research and Development division. His work is focused on development of protein and peptide biopharmaceutical products with particular emphasis on characterizing physicochemical properties, defining delivery options, developing control strategies, executing technology transfers and preparing data packages to support worldwide regulatory submissions and post-launch registrations. Dr. DeFelippis has published manuscripts, review articles and book chapters on the subjects of protein and peptide structural characterization and formulation design/delivery strategies. He has given numerous presentations on these topics and is a named inventor on several patents related to these areas.

Presentations
Workshop Overview
Monday, November 14, 2016, 8:40 a.m. – 8:50 a.m.

Workshop Wrap-up
Tuesday, November 15, 2016, 12:30 p.m. – 1:00 p.m.

Session IV Chair: Drug Substance and Drug Product Specifications
Monday, November 14, 2016, 2:20 p.m. – 4:00 p.m.

Gary Erickson, Ph.D.
CEO
CBL Biopharma, LLC
Boulder, CO

Gary Erickson has served in various R&D and management positions at Syntex Pharmaceuticals, Roche and currently at CBL. These positions include Head of Chemical Development for Roche in Basel, Switzerland and Director of Roche's Technology Center in Boulder, Colorado. In 2008, he established CBL Biopharma as the US subsidiary of CBL Patras.

Dr. Erickson's interests and responsibilities focus on the commercialization of new pharmaceuticals. He has been involved in the leadership of groups engaged in the synthetic development, manufacturing and commercialization of over 60 clinical drug candidates. An example of one of these programs is the successful commercialization of the peptide and HIV inhibitor, enfuvirtide (Fuzeon) which is a complex, 36 amino acid compound that required synthesis at the ton scale. The successful solutions to numerous manufacturing and regulatory challenges presented by Fuzeon has had significant impact in expanding the possibilities for complex peptide commercialization.

Dr. Erickson has also has experience in the regulatory area of drug development/commercialization. Most recently he was an active participant and co-chair of PhRMA's Drug Substance Committee.

Session II Chair: Interactive Session: Implementation of Appropriate cGMPs for Preclinical Through Phase III Drug Substance
Monday, November 14, 2016, 10:40 a.m. – 12:00 p.m.

Cory Evans, Ph.D.
USP Affiliation:
Government Liaison, USP BIO1 – Peptides and Insulins Expert Committee

Chemist, Office of New Animal Drug Evaluation
U.S. Food and Drug Administration; Center for Veterinary Medicine (CVM)
Rockville, MD

Dr. Cory Evans is a Chemistry Reviewer in the Office of New Animal Drug Evaluation (ONADE) in FDA's Center for Veterinary Medicine (CVM) focusing on parenteral veterinary drug products, including peptide, beta-lactam, and anesthetic products, and product classification of veterinary devices and drugs. Dr. Evans has served as an FDA liaison to USP's Peptides & Insulins Expert Committee (BIO1) since 2015. Prior to joining FDA in 2007, Dr. Evans received his Ph.D. from the University of Pennsylvania focusing on natural product synthesis of heterodetic cyclic peptides.

Session VI Chair: Regulatory Considerations
Tuesday, November 15, 2016, 10:00 a.m. – 12:30 p.m.

Joseph Glajach, Ph.D.
Director of Analytical Development
Momenta Pharmaceuticals
Cambridge, MA

Joseph L. Glajch is Director of Analytical Development at Momenta Pharmaceuticals in Cambridge, MA. He received his AB in Chemistry at Cornell University and PhD in Analytical Chemistry at the University of Georgia under L.B. (Buck) Rogers. He has held technical and R&D management positions at DuPont, Bristol-Myers Squibb, Certus, and Momenta with emphasis on HPLC column and method development and pharmaceutical development and analysis. He has served President and Program Chairman of the Analytical Division of the American Chemical Society and the Chromatography Forum of the Delaware Valley and Program Chairman of the Gordon Conference on Analytical Chemistry. He has served on the editorial advisory boards of Analytical Chemistry, the Journal of Chromatography, and LC/GC. He is a member of the USP Expert Committee on General Chemical Analysis as well as three other USP Expert Panels. He has over 40 publications, co-author of three books, and six patents on HPLC column materials and medical imaging agents.

Presentation (Session V)
Advanced Analytical Techniques for the Evaluation of Peptide Therapeutics
Tuesday, November 15, 2016, 8:55 a.m. – 9:20 a.m.

Kristi Griffiths, Ph.D.
Senior Research Advisor
Eli Lilly & Company
Indianapolis, IN

Kristi Griffiths received a doctorate in statistics from Virginia Polytechnic Institute and State University in 1995 and joined Lilly to support pharmaceutical product development. She provides technical contributions as the lead CMC statistician on numerous product development programs and has been instrumental in the design and implementation of the Lilly Quality by Design strategy. Kristi actively served on the International Pharmaceutical Aerosol Consortium on Regulation and Science (2000-2006) and the USP Statistics Expert Committee (2005-2010). She is currently a Sr. Research Advisor and serves as the statistical advisor for the bioproduct portfolio.

Presentation (Session IV)
Statistical Approaches to Aid the Development of Clinically Relevant Commercial Specification Acceptance Criteria
Monday, November 14, 2016, 3:10 p.m. – 3:35 p.m.

Different sources of information can be brought together to develop and justify proposed commercial specification acceptance criteria. As stated in ICH Q6A, “The justification should refer to relevant development data, pharmacopoeial standards, test data for drug substances and drug products used in toxicology and clinical studies, and results from accelerated and long term stability studies, as appropriate.” However, it may prove quite challenging to develop clinically relevant acceptance criteria, particularly when there are limited data. Applying quantitative and graphical statistical approaches can help to summarize and visualize the quality of material utilized in the preclinical and/or clinical studies that demonstrated safety and efficacy. These approaches can aid in the development of clinically relevant acceptance criteria.

Elena Gubina, Ph.D.
Biologist/Expert Regulator
U.S. Food and Drug Administration; Office of Tissues and Advanced Therapies, CBER
Silver Spring, MD

Elena Gubina joined FDA in 1997, first in the Division of Monoclonal Antibodies, CDER. She has been working as a full time regulator in the Office of Cellular, Tissue and Gene Therapies for the last nine years.

Presentation (Session VI)
Peptide Vaccines Update
Tuesday, November 15, 2016, 10:00 a.m. – 10:30 a.m.

John Kim, MS
Associate Director, Analytical Sciences
Teva Pharmaceuticals
West Chester, PA

CMC Analytical experience over the past 20 years for large molecule therapeutics (vaccines, monoclonal antibodies, fusion proteins) development and licensure. More recently, led the comparability and filing strategy for the first biosimilar antibody to be licensed in developed markets. Seeking to leverage past experience and knowledge for the advancement of synthetic therapeutic peptides.

Presentation (Session IV)
From Critical Quality Attribute Assessment to Specification and Characterization
Monday, November 14, 2016, 2:20 p.m. – 2:45 p.m.

Stephanie J. Leuenroth-Quinn, Ph.D.
Pharmacologist
U.S. Food and Drug Administration, Center for Drug Evaluation and Research (CDER)
Division of Metabolism and Endocrinology Products
Silver Spring, MD

Stephanie Leuenroth-Quinn received a Bachelor of Science from Rochester Institute of Technology (Rochester, NY) in the field of Biotechnology, before beginning her graduate degree work at Brown University (Providence, RI). The focus of her doctoral research was in the field of inflammation, in particular the regulation of human neutrophil apoptosis as it pertained to the wound environment. She published on the topics of neutrophil integrin engagement, hypoxia and cellular signaling pathways before receiving her Ph.D. in Pathobiology. Her postdoctoral work was conducted at Yale University (New Haven, CT), in the field of chemical biology, where she investigated the mechanism of action for an anti-inflammatory and chemotherapeutic natural product. She continued her work at Yale to gain further experience in animal research and preclinical development in the therapeutic field of polycystic kidney disease. Dr. Leuenroth-Quinn joined the FDA in 2009 within the Division of Metabolism and Endocrinology Products (DMEP) as a Pharmacology/ Toxicology new drug reviewer. Currently, she is a senior Pharmacologist and has experience in the review of and regulatory decisions for small molecule, peptide and biologic products. She has also served as a member on multiple committees and working groups such as the Immunotoxicology and Biologics subcommittees.

Presentation (Session III)
Nonclinical Pharmacology Issues for Setting Impurity Limits for Peptides
Monday, November 14, 2016, 1:25 p.m. – 1:50 p.m.

Nonclinical drug development of all new therapeutics including synthetic peptides must include pharmacologic and toxicologic evaluation of all components of the product (e.g., active pharmaceutical ingredients and impurities). Safety must be assessed from early stages of clinical development such as first-in-human trials through approval and post-marketing. Synthetic peptides are defined as those made entirely by chemical synthesis and less than 100 amino acids in size. Impurities in a synthetic peptide drug product may be peptide related such as degradation products or by-product peptides, or may include organic or inorganic impurities remaining from chemical synthesis. As all impurities are considered a toxicologic risk without therapeutic benefit, their levels should be assessed for safety and adequately controlled. Although many nonclinical guidance documents do not specifically pertain to synthetic peptide products, they may be useful to inform the regulation of peptide impurities and their genotoxic potential. Synthetic peptide impurities (peptide and non-peptide related) should be qualified in relevant nonclinical toxicology studies to support clinical safety. Additionally, as synthetic peptide products may contain residual reagents from the chemical synthesis process, genotoxic qualification is also necessary. The nonclinical regulatory expectations for synthetic peptide impurities will be discussed.

Tina Morris, Ph.D.
Senior Vice President, Science—Global Biologics
U.S. Pharmacopeia
Rockville, MD

Tina Morris, Ph.D., is Senior Vice President, Science—Global Biologics at USP. She coordinates USP's standard-setting activities for biologics and biotechnology products. Her department is responsible for the USP Expert Committees charged with developing and revising documentary standards (monographs and chapters) to be included in the USP-NF compendia that are relevant to all biological product classes. The department also develops and maintains USP's portfolio of biological reference materials and has laboratory resources at USP-U.S., USP-India, and USP-China.

Prior to joining USP, Dr. Morris held positions at a number of biotechnology companies in the areas of analytical development--particularly mass spectrometry and recombinant protein characterization. Dr. Morris holds several U.S. patents in the areas of virology and mass spectrometry assay development.

Dr. Morris completed her postdoctoral fellowship at the National Institutes of Health and earned a Ph.D. in Molecular Virology from the University of Lübeck, Germany. She is the author of many publications in peer-reviewed journals and a frequent speaker at national and international scientific conferences.

Presentation
USP Welcome
Monday, November 14, 2016, 8:30 a.m. – 8:40 a.m.

Barry O'Connor, Ph.D.
Business Development Manager
Jitsubo Co. Ltd.
Tokyo, Japan

Barry O'Connor has over 10 years' experience in synthetic chemistry and has been working in the peptide industry in Japan for the last 5 years.

He carried out his degree in organic chemistry in his hometown of Dublin, Ireland at Trinity College, and then was awarded a PhD in synthetic organic chemistry at the University of Manchester in the UK under the supervision of Dr. Roger Whitehead.

Barry then moved back to Ireland to work as a medicinal chemist postdoctoral researcher at University College Dublin with Prof. Pat Guiry. Upon completion, he moved to Japan in 2012 to join Sekisui Medical and worked on the development of peptide-based API's.

In June 2015 he joined Jitsubo, who specialize in the development of peptide therapeutics, and is currently employed there as a manager in Research and Business Development, playing a key role in helping Jitsubo establish a presence and market their pipeline in the United States and Europe. In addition, he is actively involved in helping Jitsubo plan and prepare for their first drug submission to the FDA.

Presentation (Session I)
Molecular Hiving Technology: Novel and Innovative Synthesis Technology for the Drug Substances of Peptide Therapeutics
Monday, November 14, 2016, 9:40 a.m. – 10:05 a.m.

At Jitsubo we are developing a pipeline of generic peptide therapeutics using our proprietary drug substance synthesis technology, Molecular Hiving™.
Molecular Hiving™ technology combines the key advantages of liquid phase peptide synthesis (LPPS) and solid phase peptide synthesis (SPPS), resulting in the production of high quality peptides at low manufacturing costs.

This presentation will include a case study of one of our generic drugs that is currently in development at Jitsubo and is scheduled for ANDA submission in 2017. The case study will include direct comparisons of quality between our generic (manufactured by Molecular Hiving™) and the RLD (manufactured by SPPS), with particular focus on the reduced impurity profile in our API. In-process control advantages over SPPS and how it leads to rapid process optimization will also be shown.

Daniel Samson, Ph.D.
Senior Director API Manufacturing
Bachem AG
Basel, Switzerland

After obtaining his PhD in organic chemistry, Daniel joined Bachem's peptide manufacturing headquarters in Switzerland in 2007. As a team leader he has been responsible for the synthesis of peptides and small proteins. From 2009 to 2011 he held a lab head position focusing on process optimization, technology transfer and scale-up of synthetic peptide manufacturing procedures. In 2010 Daniel joined Bachem in the United Kingdom temporarily focusing on non-GMP custom syntheses of peptides. From the beginning of 2012 he has been leading Bachem's cGMP API manufacturing groups back in Switzerland applying large scale SPPS and preparative HPLC. Science 2015 he is a Senior Director and has responsibility for all peptide API manufacturing aspects within Bachem AG.

Presentation (Session I)
Characterization of Starting Resins Used for SPPS
Monday, November 14, 2016, 9:15 a.m. – 9:40 a.m.

At the start and the heart of every successful Solid-Phase Peptide Synthesis (SPPS), a top-grade starting resin (i.e. the solid support) is needed. However, in contrast to well established test methods for amino acid derivatives, solvents and reagents, meaningful and discriminating test methods for solid supports are hard to develop because of the insolubility of such resins. This presentation will be focused on the characterization of the solid supports e.g. polystyrene and pre-loaded amino acid resins. Physico-chemical quality attributes e.g. mesh size distribution, extent of polystyrene cross-linking, swelling properties, substitution, their impact on SPPS results and acceptance criteria (if applicable) will be discussed. In addition, spectroscopic (i.e. IR, NMR and UV/Vis) data to characterize starting resins will be presented.

Presentation (Session IV)
Setting Specifications for Therapeutic Peptides in Clinical Development
Monday, November 14, 2016, 2:45 p.m. – 3:10 p.m.

For peptide drug substances in early clinical development there is often a very strong focus on fast drug substance supply. Therefore, development of manufacturing process capabilities and process economy, purity and impurity profile is performed in parallel. According to our experience, additional quality attributes such as salt form / counter ion, water content or small organic impurities are typically outside the scope of an early development program. The peptide counter ion for example might impact the shelf life of the API, causing stability issues in solution and as a solid. Sometimes sub-optimal drug substance quality attributes may only become apparent in subsequent drug product formulations. On the other hand, late-phase changes of quality attributes typically encounter pushbacks from different stakeholders, but still may be advantageous. Hence, a phase appropriate setting of specifications is crucial because both regulatory and practical challenges have to be managed in a time and risk based approach.

The presentation will discuss examples from a contract manufacturer's point of view regarding different aspects of peptide drug substance CMC development.

Dale Schmidt, MS
Science & Standards Liaison-Global Biologics
U.S. Pharmacopeia
Rockville, MD

Mr. Schmidt is a Science and Standards Liaison of Global Biologics with USP. He serves as a secondary liaison for the USP Peptides and Insulins Expert Committee. Mr. Schmidt received his B.S. in Biology with a minor in Chemistry, and M.S. in Applied Molecular Biology from the University of Wisconsin-Parkside. Prior to joining USP, he worked most recently at Prometic Biotherapeutics, where he was Associate Director of Assay Support and Development for products and process intermediates from plasma protein purification. Earlier employment was at the American Red Cross (bioanalytical support for plasma protein purification), BioReliance (CRO - analysis and method validation for peptides, proteins and antibodies), and Abbott Laboratories (Abbott Diagnostics Division – bioanalytical method development and validation for recombinant proteins and antibodies).

Presentation (Session VI)
New USP Standards and Initiatives for Peptides
Tuesday, November 15, 2016, 11:30 a.m. – 12:00 p.m.

This presentation will provide an overview of new peptide related USP documentary and reference standards, and discuss new USP initiatives in the area of peptides.

Ved Srivastava, Ph.D.
USP Affiliation:
Member, USP BIO1 – Peptides and Insulins Expert Committee

Vice President, Peptide Chemistry
Intarcia Therapeutics
Durham, NC

Dr. Ved Srivastava is Vice President of Peptide Chemistry at Intarcia therapeutics. Prior to that he co-founded and was Vice President of Chemistry at Phoundry Pharmaceuticals, a peptide therapeutic discovery company that was acquired by Intarcia. Prior to Phoundry he was the Head of Peptide Chemistry at GlaxoSmithKline. Ved spent several years in leadership role with Amylin Pharmaceuticals where he focused on discovery and development of novel peptide hormones for diabetes, obesity and neuropsychiatric therapies.

He has significantly participated in the development and commercialization of Symlin™, Byetta™ and Bydeureon™, first-in-class medicines for the treatment of diabetes.
Ved has over 25 years of experience with expertise in drug discovery and development in the area of metabolic diseases, CNS, and inflammation with major emphasis in peptide medicinal chemistry, chemistry manufacturing and control (CMC) and peptide drug delivery. He has numerous scientific disclosures to his credit including patents, scientific articles and invited lectures.

Ved is also a member of the BIO1- Peptides & Insulins Expert Committee; and prior to that member of the Therapeutic Peptides Expert Panel of the US Pharmacopeia (USP).
Ved serves in the governance and leadership team of the American Peptide Society (APS) and the American Chemical Society (ACS).

He earned a Ph.D. in organic chemistry from the University of Lucknow, India.

Session V Chair: Advanced Analytical Technologies
Tuesday, November 15, 2016, 8:30 a.m. – 10:00 a.m.

Marie-Pier Thibeault, M.Sc.
Technical Officer-Measurement Science and Standards
National Research Council Canada
Ottawa, Canada

Marie-Pier Thibeault completed a B.Sc. in Chemistry followed by a M.Sc. in Pharmaceutical Sciences from University of Laval. She is currently a Technical Officer within Measurement Science and Standards of the National Research Council Canada. Her work is focused on the development of primary methods and SI-traceable standards for peptides and proteins. She is an expert in amino acid analysis by liquid chromatography - mass spectrometry (LC-MS) following peptide hydrolysis. In addition, she is investigating quantitative nuclear magnetic resonance (qNMR) as an alternative method for peptide quantitation.

Presentation (Session III)
Combining qNMR and LC-MS/MS Amino Acid Analysis Results for Purity Assignment of Peptide Reference Materials
Monday, November 14, 2016, 1:00 p.m. – 1:25 p.m.

Quantitative nuclear magnetic resonance (qNMR) spectroscopy has emerged as an important tool for reference material producers for assigning purity values to small organic molecules. This is due to the unique ability of qNMR to achieve equal response from protons independent of chemical structure. Despite this unique ability qNMR has not experienced widespread use in the development of reference materials for biomolecules such as peptides. This could be due to the susceptibility of qNMR peptide measurements to interference by related peptide impurities that overlap with peptide proton signals. However, this problem is not unique to qNMR as the more commonly employed amino acid analysis following peptide hydrolysis also requires correction for amino acids generated from related peptide impurities. Another complication of qNMR quantitation of peptides is the high complexity of NMR spectra leaving few void regions of the spectrum suitable for the addition of the internal standard. Therefore internal standards typically need to be tailored for each specific peptide, which hinders the development of standardized procedures.

This presentation will highlight strategies to overcome some of the challenges associated with qNMR of peptides. Factors such as choice of internal standard, selection of peptide signals used for quantitation, and signal integration strategies will be discussed. The use of qNMR for accurate quantification of peptide counter-ions will also be demonstrated for mass-balance approach calculations. Finally, a procedure to combine qNMR and LC-MS/MS amino acid analysis results with associated uncertainties will be described.

René Thürmer, Ph.D.
Deputy Head-Unit Pharmaceutical Biotechnology
BfArM - Federal Institute for Drugs and Medical Devices
Bonn, Germany

Dr. René Thürmer received his diploma in chemistry and his Ph.D. in biochemistry from the University of Tübingen. He joined the BfArM (Federal Institute for Drugs and Medical Devices, Bonn, Germany) in 2000. He currently serves as a CMC reviewer and is Deputy Head of the Unit Pharmaceutical Biotechnology.

His experience is in the field of formulation, manufacture and control of medicinal products, in particular in the field of peptides, proteins, liposomes, sustained release polymer drug products, depot formulations, polymer-conjugated drug products, natural and synthetic surfactants, nanomedicine and others.

Presentation (Session VI)
Regulatory Perspectives on Characterization of Quality Attributes of Therapeutic Peptides
Tuesday, November 15, 2016, 10:30 a.m. – 11:00 a.m.

From an analytical and regulatory perspective peptides are interesting since they present a link between products derived from biotechnology and the small molecular chemical compounds. What to control is one of the key questions in connection with regulatory submissions during clinical development and marketing authorization applications and identifying critical quality attributes (CQAs) is vital during pharmaceutical development. The presentation will address the control strategy for synthetic peptides. Requirements for starting materials, manufacturing, characterization, specifications and analytical testing will be discussed.

Renata Varga, Ph.D.
Scientist
Teva Pharmaceuticals Inc.
West Chester, Pennsylvania

Renata Varga graduated as a Chemist working with solid phase peptide synthesis and enzymatic reactions. She obtained a PhD in Hungary in analytical chemistry by analyzing surface water samples for pharmaceutical residues with LC-MS/MS after solid phase extraction. She started to work in Teva Pharmaceuticals as a Researcher Analyst in the Sterile R&D, Godollo, Hungary. She has expertise in the development and NDA/ANDA regulatory filing of sterile infusions, injections, eye-drops, lyophilized powders and therapeutic peptides. She moved to CMC Biologics in West Chester, PA, where she is working as a Characterization Scientist. She provides Critical Quality Attribute Assessments for all peptides, monoclonal antibodies and fusion proteins under development in Teva Pharmaceuticals and also performs characterization studies for product variants, mainly size- and charge variants, but also responsible for higher-order structure studies from the study design to execution and finally authoring the IND/BLA sections.

Presentation (Session V)
Higher-Order Structure Comparability of Peptide Therapeutics
Tuesday, November 15, 2016, 8:30 a.m. – 8:55 a.m.

An increasing number of generic peptide therapeutics are being developed and submitted for marketing application. Unlike small molecules, peptides can exhibit higher-order structural features that can impact both efficacy and safety; therefore, comparability at this level should be assessed during generic peptide development. Spectroscopic methods commonly used for studying higher-order structure of biologics such as CD, FTIR, Raman spectroscopy, intrinsic fluorescence, NMR, and thermal methods such as DSC, are the logical first choice for peptides as well.

This presentation will summarize the design and results of higher-order structure comparability studies for 30+ amino acid peptides. In this study the peptides were analyzed with different spectroscopic techniques in comparison with reference product to demonstrate the comparability of the higher-order structure between the generic and the innovator product.

Michael Verlander, D.PHIL.
USP Affiliation:
Member, USP BIO1 – Peptides and Insulins Expert Committee

President
Proactive Quality Compliance, Inc.
San Diego, California

Dr. Verlander is currently acting as an independent consultant supporting the pharmaceutical industry in the areas of quality and regulatory compliance; he also serves as a member of USP's Biologics Monographs 1 – Peptides Expert Committee and is currently chair of a USP Expert Panel for Glatiramer Acetate. Prior to this, he served as President of PolyPeptide Laboratories San Diego, a part of the PolyPeptide Group, from 2009-2013. He was previously Executive Vice President and co-founder of PolyPeptide Laboratories, Inc., in Torrance, California, a position he held since 1996. During his tenure, he had responsibility for Quality Assurance and Regulatory Affairs, served as Director of Global Quality Assurance and Regulatory Affairs for the PolyPeptide Group from 2003 to 2009, and guided the Group's sites through numerous successful facility inspections by FDA in both the US and Europe. He was also involved in the design, construction and start-up of a new PolyPeptide Group manufacturing facility for peptide APIs in India.

Prior to joining PolyPeptide Laboratories, Inc., Dr. Verlander was Vice President, Technical and Regulatory Affairs at Bachem California, Torrance, California (1986 – 1996); Director, Peptide Research and Peptide Production, Immunetech Pharmaceuticals, San Diego, California (1985 – 1986); and Research Director, BioResearch, Inc., San Diego, California (1978 – 1985). He was previously a member of the research faculty at the University of California, San Diego, Department of Chemistry (1972 – 1978), after completing his postdoctoral training at the Salk Institute for Biological Studies, La Jolla, California, and his graduate and undergraduate training in Chemistry at the University of Oxford.

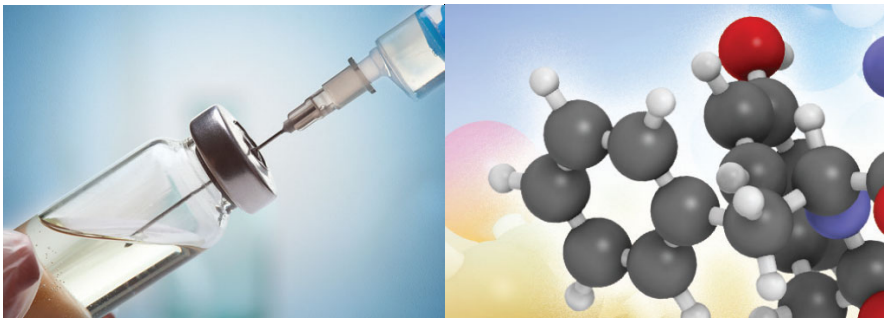
Session I Chair: Raw Materials and Manufacturing
Monday, November 14, 2016, 8:50 a.m. – 10:25 a.m.

Deyi Zhang, Ph.D.
Staff Fellow
U.S. Food & Drug Administration, Office of Generic Drugs (OGD)
Silver Spring, MD

Dr. Deyi Zhang is a Staff Fellow in the Office of Generic Drugs (OGD) in FDA focusing on projects related to complex drug substances, including developing regulatory policy and product-specific guidance of such products and managing related research activities. Dr. Zhang is a versatile scientist with over 18 years of broad research, development and regulatory experience in academia, pharmaceutical industry, biotech and regulatory agency. Prior to joining FDA in 2015, he was an Executive Director in Crown Bioscience, a biotech company focusing on oncology drug discovery and translational medicine. Dr. Zhang led his team to deliver several development-stage small molecule candidates for various kinase targets. Before joining Crown, he worked at Eli Lilly and Company for 10 years, rising from Research Scientist to Principal Research Scientist. He delivered multiple clinical candidates for projects in neuroscience and oncology areas while gaining rich experiences in disease areas, medicinal chemistry and DMPK. Prior to his career at Eli Lilly, he was a NIH Postdoctoral Fellow working on natural product synthesis and peptidomimetics at University of Pennsylvania. Dr. Zhang received his Ph.D. in Organic Chemistry from University of Notre Dame. He has over 10 issued US patents or patent applications, and over 35 publications and presentations.

Presentation (Session VI)
Scientific Considerations in Submitting Synthetic Peptide Drug Products as ANDAs Referencing Peptide Drug Products of rDNA Origin
Tuesday, November 15, 2016, 11:00 a.m. – 11:30 a.m.

Poster Presenters
(listed alphabetically)



Marc Jacob, Ph.D.
Global Product Manager
Phenomenex
Torrance, CA

Marc Jacob, Ph.D. joined Phenomenex as Global Product Manager for Chiral and Preparative Chromatography in 2011. Previously, he was Director of Process Development at Bachem (Torrance, USA) where he led efforts to develop and produce peptide Active Pharmaceutical Ingredient. Prior to Bachem, he worked for contract manufacturing organizations in the research, development and manufacturing of small molecules such as chiral amino acids and peptide building blocks.

Dr. Jacob earned his Doctorate in Synthetic Organic Chemistry at the University of Montpellier II (France) in 1996 with an emphasis in Asymmetric Synthesis of Amino Acids and subsequently completed Postdoctoral Research at Texas A&M University in 1998 under the supervision of Sir Derek Barton (Nobel Laureate 1969).

Poster Presentations

Development of a Multi-Step Purification Process for the Purification of Exenatide

HPLC Enantioseparation of N-FMOC α-Amino Acids Using Polysaccharide-Based Chiral Stationary Phases Under Reversed Phase Conditions

Edwin Kellenbach, Ph.D.
Principal Scientist-Biochemistry
Aspen Oss
The Netherlands

October 1986: M. Sc. (cum laude) in organic chemistry (Leiden University) and in-vivo NMR (Max Planck Institute Dortmund).

November 1991: Thesis: “DNA-binding by the Glucocorticoid Receptor”, Utrecht University.

November 1991-April 1992: post-doc at the Department of Molecular Physics, Wageningen University.

May 1992-April 1994: NMR specialist within the Structure Analysis section, Solvay-Pharma, Weesp.

May 1994-October 2001: Section Leader of the Structure Analysis section, Organon, Oss, the Netherlands.

November 2000-October 2002: Section Head Analytical Chemistry, Organon, Riom, France.

November 2002-September 2011: Senior Director Analytical Development, MSD, Oss.

September 2011-October 2013: Section Lead GTO Biochemistry (15 persons).

November 2013- April 2016: Program Manager Biochemistry.

May 2016-present: Principal Scientist Biochemistry.

Member of European Directorate for the Quality of Medicine (EDQM) expert group 6 (biologicals).

Member of the USP expert panel on synthetic peptides.

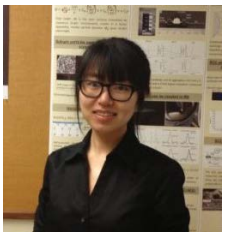
Coauthor of over 30 articles on proteins and protein-DNA interaction, analytical chemistry and physicochemical characterization in peer reviewed journals.

Invited speaker at international scientific meetings on quality, analytical chemistry, process analytical technology and heparin.

Research interests
Spectroscopy, peptides and proteins, heparins and heparinoids, physicochemical and extended characterization of biopharmaceuticals, chirality, polymorphism, structural biology, structure-activity relations.

Poster Presentation

Proton NMR as an Alternative for Amino Acid Analysis for Peptide Identity Testing



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Poster Presentation

Adding Mass Detection for Improved Productivity an Confidence in the Analysis of Synthetic Peptides