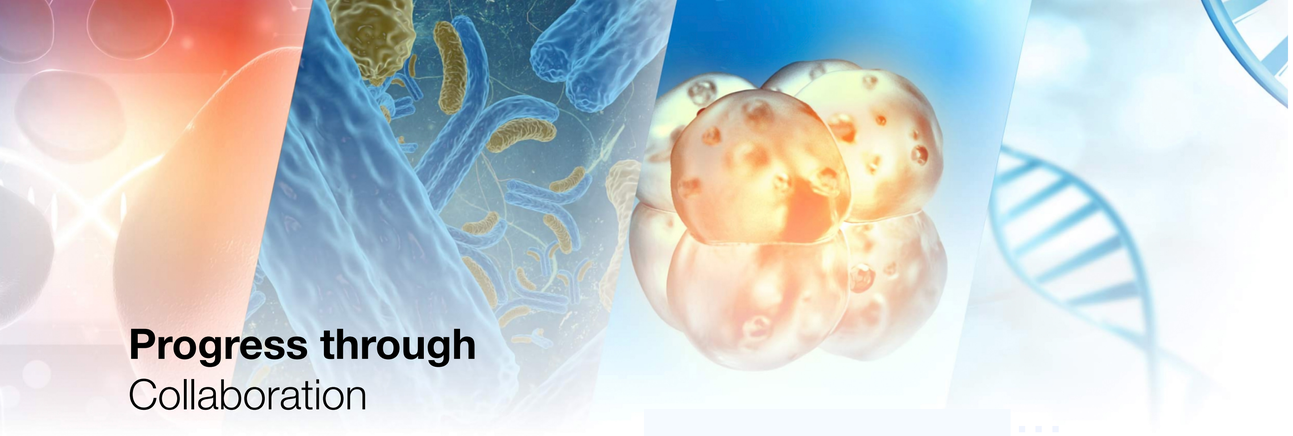
LEVITRONIX®

BIOPROCESSING CONFERENCE 2024

June, 20

Hotel Royal Sonesta Boston
Cambridge, MA : USA

CONFERENCE BOOKLET

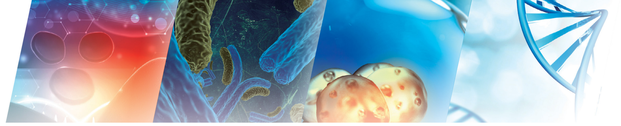


Progress through Collaboration

Rapid progress in biotechnology is poised to change the world in the years to come. However, the ever-increasing complexity of medicine confronts bioprocessing with significant challenges. Novel manufacturing technologies such as Single-Use or Continuous Manufacturing are still in an early stage of implementation.

We at Levitronix® believe that to build on the progress that the industry has made, end-users, system- and component suppliers must come together to reinforce what it takes to foster the trust and tight collaboration that are vital to the future success of bioprocessing.

The Levitronix® Bioprocessing Conference brings industry professionals together to make a change.



CONFERENCE AGENDA

Last update: June 10

8 AM REGISTRATION AND BREAKFAST PROVIDED BY LEVITRONIX

KEYNOTE

9 AM New Products and Processes to Adress Patient Needs
Prof. Charles L. Cooney MIT

9:30 AM Fouling Phenomena in Alternating Tangential Flow Filtration during CHO Cell Processing
Prof. Andrew Zydney The Pennsylvania State University

10 AM Co-current Filtrate Flow in TFF Perfusion Processes: Decoupling Transmembrane Pressure from Crossflow to Improve Product Sieving
Dr. Patrick Romann Levitronix GmbH

10:30 AM COFFEE BREAK PROVIDED BY LEVITRONIX

11 AM Optimizing Cell Retention and Oxygenation for a High-Performance Perfusion Bioreactor Platform
Allyson Caron MilliporeSigma

11:30 AM Scaling Tangential Flow Filtration for Perfusion Harvest from the Bench to Large Scale
Ana Di Lillo AstraZeneca

12 PM Magnetic Levitation Technology for Stirred Bioreactors – Integration and Evaluation
Cedric Schirmer ZHAW

12:30 PM LUNCH BREAK PROVIDED BY LEVITRONIX

1:30 PM Better, Faster, Cheaper: Technology Innovation to Overcome Gene Therapy Manufacturing Challenges
Keen Chung Repligen

2:00 AM Intensified Production of a Fusogenic Oncolytic Virus by Tangential Flow Depth Filtration
Sven Goebel Max Plank Institute for Dynamics of Complex Technical Systems

2:30 PM Implementation and Automation of Downstream UF/DF of AAV Using Flatsheet Membrane
James Hilton Takeda Pharmaceutical Company Limited

3 PM Pump Performance Design and Performance Considerations for AAV and LVV Manufacturing Operations
Mark McElligott bioX

3:30 PM COFFEE BREAK PROVIDED BY LEVITRONIX

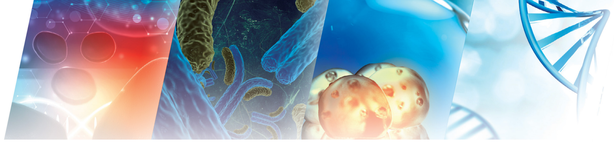
4 PM Enabling a Fully Closed Harvest Technology for Gene Therapy Application
Johanna Wiesner Roche Diagnostics GmbH

4:30 PM Pioneering a Versatile LNP Production Process for mRNA Vaccines, Therapeutics, and Gene Editing – Unveiling the Proof of Concept
Dr. Andreas Wagner Polymun Scientific

5 PM Inline Protein Concentration Measurement Solution for UF/DF Process Control
Zsofia Bencze Ferring Pharmaceuticals

5:45 PM EVENING RECEPTION AT RIVERSIDE TERRACE PROVIDED BY LEVITRONIX

CONFIRMED SPEAKER



Prof. Dr. Charles Cooney

Professor Emeritus
Massachusetts Institute of Technology

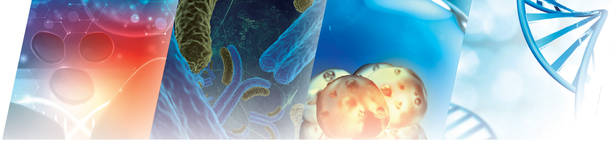
Charles L. Cooney is the Robert T. Haslam (1911) Professor of Chemical and Biochemical Engineering, Emeritus in the Department of Chemical Engineering at MIT and founding Faculty Director, Emeritus of the Deshpande Center for Technological Innovation. His academic career has focused on biotech and pharma process design, operation, economics and control; continuous processing has been a reoccurring theme throughout his research. He has been involved as founder, advisor or board member of over 25 companies and currently sits on the Boards of Directors of Codiak Bioscience, Innovent Biologics (1801.HK), Elektrofi, Iterative Scopes, Levitronix Technologies, LayerBio, Boyd Technologies and is chairman of GreenLight Bioscience. He was a member of the FDA Pharmaceutical Sciences Advisory Committee 2003-2006 and chair from 2005-2006.

Prof. Cooney's research and teaching interests span a range of topics in biochemical engineering, pharmaceutical manufacturing and technological innovation. He has published over 250 research papers, over 25 patents and co-authored or edited 5 books including Development of Sustainable Bioprocesses: Modeling and Assessment, Wiley Press 2006. His teaching has focused on bioprocess development and manufacturing and technological innovation and is interested in the process of stimulating technological innovation and its translation from the university into new company creation.

New Products and Processes to Address Patient Needs

Recognizing that successful manufacturing lies on the critical path to successful delivery of therapeutics to the patient, we continually look for ways to improve process robustness and performance. Innovative process tool and technologies provide the opportunity to improve current processes through process intensification and design of new processes enabling advanced therapeutic products like genomic medicines. Using a framework of Quality, Speed, Cost and Flexibility we can design an innovation strategy for application of advanced tools and methods to meet demands of greater patient access and lower cost for both current and future manufacturing processes.

CONFIRMED SPEAKER



Prof. Andrew Zydney

Bayard D. Kunkle Chair and Professor of Chemical Engineering
The Pennsylvania State University

Dr. Andrew L. Zydney is the Bayard D. Kunkle Chair and Professor of Chemical Engineering at The Pennsylvania State University. He also serves as Director of the Penn State site in the Membrane Science, Engineering, and Technology (MAST) Center. Dr Zydney was Head of the Chemical Engineering Department from 2004-2014 and was he the founding Director of the Penn State Center of Excellence in Industrial Biotechnology in 2017. Professor Zydney's research is focused on the application of membranes in bioprocessing, including the purification of monoclonal antibodies, vaccines, and gene therapy agents with more than 300 publications in these areas. Dr. Zydney served as Editor-in-Chief of the Journal of Membrane Science from 2010-2019, and he is Past President of the North American Membrane Society (NAMS). He has received the Alan S. Michaels Award for Innovation in Membrane Science and Technology, the American Chemical Society (ACS) Award in Separations Science and Technology, the Gerhold Award for Excellence in Separation Science from AIChE, among others. Professor Zydney has also received multiple teaching awards, including the Warren K. Lewis Award for Chemical Engineering Education from AIChE, the Excellence in Teaching Award from the University of Delaware, and the Distinguished Teacher Award from the American Society for Engineering Education.

Fouling Phenomena in Alternating Tangential Flow Filtration during CHO Cell Processing

Alternating tangential flow filtration (ATF) has become one of the primary methods for cell retention and clarification in perfusion bioreactors. However, product sieving losses due to membrane fouling still limits the performance of these systems. We have obtained new insights into the underlying fouling phenomena using a combination of scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS) to explore the nature and location of foulants, with the specific identity of individual proteins examined by matrix-assisted laser desorption/ionization-mass spectroscopy (MALDI-MS). ATF experiments were performed using 0.2 µm polyethersulfone hollow fiber membranes with Chinese Hamster Ovary (CHO) cell perfusion bioreactors for monoclonal antibody production. Membrane fouling was dominated by proteinaceous material, primarily host cell proteins along with some monoclonal antibody. Fouling occurred primarily on the lumen surface with much less protein trapped within the depth of the fiber. Protein deposition was also most pronounced near the inlet / exit of the hollow fibers, which are the regions with the greatest flux (and transmembrane pressure) during the cyclical operation of the ATF. Individual proteins eluted from the fouled membranes showed multiple species commonly associated with extracellular vesicles, suggesting that deposition of these larger vesicles may be a critical contributor to membrane fouling. These results provide important insights into the underlying phenomena governing the fouling behavior of ATF systems for continuous bioprocessing.

CONFIRMED SPEAKER

Dr. Patrick Romann

Bioprocessing Expert, R&D
Levitronix GmbH

Patrick Romann grew up in Switzerland and did his Bachelor's degree at the University of Zurich before starting a trinational Masters course in Biotechnology at the University of Strasburg (FR), University of Freiburg (DE) and the University of Basel (CH). Afterwards, he worked at Lonza Slough (UK) in the USP development to improve high density cell cultures. Subsequently, he did his PhD in Bioprocess Technology at the Technical University of Vienna, with Merck Serono as industrial partner. During this time, he was evaluating novel technologies to improve Merck's continuous manufacturing platform of biologics. Currently, Patrick is working at Levitronix where he continues to develop innovative solutions to improve bioprocessing.

Co-current Filtrate Flow in TFF Perfusion Processes: Decoupling Transmembrane Pressure from Crossflow to Improve Product Sieving

Hollow fiber-based membrane filtration has emerged as the dominant technology for cell retention in perfusion processes yet significant challenges in alleviating filter fouling remain unsolved. In this work, the benefits of co-current filtrate flow applied to a tangential flow filtration (TFF) module to reduce or even completely remove Starling recirculation caused by the axial pressure drop within the module was studied by pressure characterization experiments and perfusion cell culture runs. Additionally, a novel concept to achieve alternating Starling flow within unidirectional TFF was investigated. Pressure profiles demonstrated that precise flow control can be achieved with both lab-scale and manufacturing scale filters. TFF systems with co-current flow showed up to 40% higher product sieving compared to standard TFF. The decoupling of transmembrane pressure from crossflow velocity and filter characteristics in co-current TFF alleviates common challenges for hollow-fiber based systems such as limited crossflow rates and relatively short filter module lengths, both of which are currently used to avoid extensive pressure drop along the filtration module. Therefore, co-current filtrate flow in unidirectional TFF systems represents an interesting and scalable alternative to standard TFF or alternating TFF operation with additional possibilities to control Starling recirculation flow.

CONFIRMED SPEAKER

Allyson Caron

R&D Director, Bioprocessing Applications
MilliporeSigma

Allyson Caron is an R&D Director at MilliporeSigma in Bedford MA, where she leads the Single-Use and Integrated Systems Applications team. Allyson's team enables commercialization of best-in-class technologies by leveraging comprehensive process understanding to collect meaningful data and improve product development decisions. Through her 8 years at Millipore, Allyson has participated in development, launch, and collateral generation for technologies such as the Cellicon® Perfusion Solution, Mobius® iFlex Bioreactors, MAST® Automated Sampling Solution, Mobius® Breez Microbioreactor, and the Procellics™ Raman Analyzer. Allyson holds a B.S. in Chemical Engineering from Tufts University, a MS in Biotechnology from Johns Hopkins, and an MBA from UMass Amherst Isenberg School of Management.

Optimizing Cell Retention and Oxygenation for a High-Performance Perfusion Bioreactor Platform

Manufacturers are implementing perfusion in upstream bioprocessing as a method to achieve higher cell densities and improve efficiency. This approach requires scalable technologies that deliver robust performance while maintaining cell health and productivity. Two common challenges include optimization of cell retention device performance, and achieving scalable power input to meet increased oxygenation demands. In this talk, we will address each of these challenges by highlighting recent advancements designed to optimize performance. In cell retention, we will introduce the Cellicon® Cell Retention Solution as an easy to use and scalable filter platform from bench to production. Fit for cell culture, it enhances filtration performance while offering complete process control including the Levitronix® low-shear single-use pumps and flowmeters. We will explain criteria for selection of the recirculation pumps from lab- to process-scale and provide experimental data to improve understanding of cell shear effects in a perfusion bioreactor. Then, we will highlight the Mobius® iFlex Bioreactor Platform to enable intensified biomanufacturing processes and accommodate a wide range of performance needs. We will describe the selection of motor and impeller designs that allow for up to 100 W/m3 across scales with optimized sparger designs for flexible improved oxygenation capabilities.

Ana Di Lillo

Scientist, Bioprocess Technologies and Engineering
AstraZeneca

Ana Di Lillo is a Scientist at AstraZeneca in Gaithersburg, MD where she evaluates novel technologies for cell retention and clarification in perfusion bioreactors. As a member of the Commercial Scale Up and Implementation team, her current focus is on tangential flow filtration (TFF) scale up.

She received her B.S. and M.S. in Chemical Engineering from Cleveland State University, where she worked in the BioNano Materials Lab studying the purification and interactions of non-covalently functionalized single-walled carbon nanotubes. Post graduation, Ana started at AstraZeneca in Manufacturing Sciences, where she developed her operational, investigational, and technology transfer skills before transitioning into a Scientist role in Bioprocess Technologies and Engineering. Currently, she is optimizing TFF processing for perfusion bioreactors to maximize filter capacity while reducing facility footprint. Additionally, Ana is a member of the volunteer committee of the International Society of Pharmaceutical Engineers (ISPE) Chesapeake Bay Chapter.

Scaling Tangential Flow Filtration for Perfusion Harvest from the Bench to Large Scale

Tangential flow filtration (TFF) has become a desirable choice for cell retention devices due to the ability to handle high cell concentration (>100 million CHO cells/mL) and large-scale bioreactors for an extended continuous bioprocess. The shift to TFF allows for a more scalable process utilizing Levitronix's magnetically levitated centrifugal pump resulting in high sieving performance while maintaining relatively low mechanical stress on cells. However, there are still a myriad of difficulties when scaling TFF from bench to large scale.

Major considerations are hollow fiber membrane fouling, large facility footprint, increasing operational demand, and hollow fiber geometry limitations. In this discussion, we will explore methods for overcoming TFF limitations including: the reduction of Starling flow via high flux to maximize filter capacity, optimizing filter geometry, and modular operational approaches to reduce facility footprint at large scales. These mitigation techniques in combination result in a fraction of the filter area demand while maintaining maximized product yield.

CONFIRMED SPEAKER

Cedric Schirmer

Research Associate
ZHAW - Zurich University of Applied Sciences

Cedric Schirmer is a research associate at the Institute of Chemistry and Biotechnology at the Zurich University of Applied Sciences. He holds a Bachelor's degree in biotechnology and a Master's degree in Bioprocess Engineering.

He works in the field of teaching as well as on various research and development projects in the field of bioprocess and cell culture technology. His focus is on process development and scale-up from mL-scale to pilot scale for cell culture and microbial processes. In this context, he is intensively involved in process engineering characterisation and the development of novel bioreactors, partly with the aid of Computational Fluid Dynamics (CFD).

Magnetic Levitation Technology for Stirred Bioreactors - Integration and Evaluation

Stirred bioreactors are the most commonly used bioreactors in biopharmaceutical production. Traditionally, the stirrer is driven by a shaft, which always bears a certain risk of contamination. The newly developed stirred bioreactor, which is magnetically driven by the Levitronix® PuraLev® i30 drive, offers an alternative here. This enables a non-contact and magnetically driven stirrer reducing the risk of contamination and offering a wide speed range.
Typically, the bioreactor design differs in its field of application for cell cultures and microbial organisms to fulfill the different requirements. With the help of the newly developed system, it is possible to achieve comparable to better cultivation results compared to commercially available bioreactors for both of the aforementioned areas of application.
CFD simulations for process characterization were carried out as a first step. With this resource-saving method, various setups could be examined and suitable designs pre-selected. Selected designs were then further characterized with prototypes in the laboratory using conventional process engineering characterization methods (mixing time, power input, oxygen transfer, etc.). Finally, the resulting system was biologically evaluated and compared with commercially available bioreactors. Both CHO cell lines and an Escherichia coli strain were used.

CONFIRMED SPEAKER

Keen Chung

Associate Director, Viral Vector Production and Analytics
Repligen

Keen Chung is the Associate Director R&D, Viral Vector Culture and Analytics, Advanced Bioprocess Applications at Repligen. Keen holds a PhD in Molecular Toxicology from Penn State University and received posdoc trainings from UT Southwestern Medical Center and Sandford Research Institute. He started his career in the biotechnology industry as a senior scientist leading analytic team in PD team to support Upstream and Downstream viral vector analytics at Pall Life Sciences. Later, in addition to his analytics leading role, he started to lead the PD Upstream projects as a Principal Scientist to optimize and scale up several viral vector manufacturing processes. In his current role at Repligen, he leads the development of technologies focusing on TFDF based perfusion applications and viral vector analytics for cell and gene therapy manufacturing processes.

Better, Faster, Cheaper: Technology Innovation to Overcome Gene Therapy Manufacturing Challenges

In an era of extraordinary medical advancements driven by the development of paradigm shifting gene therapies, technology innovation is instrumental to address the specific challenges of manufacturing these novel therapies at the required scale and cost.

This presentation will describe the development of targeted upstream technology solution focusing on KrosFlo® TFDF® (tangential flow depth filtration) cell retention technology-based perfusion applications to enhance yield and productivity while keeping the process simple, thus ensuring a cost-effective and scalable process. TFDF-based perfusion culture enabled a 3X higher cell density before transfection compared to batch control. Further, continuous perfusion post-transfection led to ~10X AAV8, ~3X AAV9, and ~80X LV total virus production respectively. These results provide novel insights for developing integrated and continuous viral vector production to meet the global demand and realize the full potential of gene therapy. Present innovations are essential to make gene therapies more affordable and accessible, ultimately benefitting patients worldwide.

CONFIRMED SPEAKER

Sven Goebel

PHD Student
Max Planck Institute for Dynamics of Complex Technical Systems

Sven is an early-stage career scientist, with a Master's degree in Technical Biology, currently working at the Max Planck Institute in Magdeburg, Germany, in the Bioprocess Engineering department as a PhD student. With expertise in up- and downstream processing, process automation, and different cultivation systems, he combines comprehensive knowledge and practical skills to optimize bioprocessing workflows and enhance production efficiency. His main focus is on process characterization, optimization, and intensification of processes to produce viral vectors, vaccines, and oncolytic viruses in bioreactors, in cooperation with several industrial partners. He is co-/author of 7 peer-reviewed publications.

In his free time, he enjoys hiking, skiing and active participation in triathlons.

Intensified Production of a Fusogenic Oncolytic Virus by Tangential Flow Depth Filtration

Oncolytic viruses, as a therapeutic vaccine, offer an elegant approach to cancer therapy. They offer a dual mode of action, as they cause direct tumor cell lysis, and can stimulate immune responses combating the tumor. To address the unprecedented demand and the requirement for high dose inputs of infectious virus, batch-based manufacturing strategies need to be intensified. For high-cell concentration cultivations, membrane-based systems utilizing hollow-fiber modules are widely employed. However, these systems are prone to filter fouling and retention of virus particles, which leads to unwanted accumulation of virus inside the bioreactor within the cell environment until full harvest of the bioreactor broth is possible.

In this study, we evaluated the applicability of a tangential flow depth filtration (TFDF) perfusion system as a novel cell retention device for both perfusion cultivation and continuous harvesting with clarification in a single unit operation at the 3 L scale. Using suspension BHK-21 cells and a fusogenic oncolytic hybrid virus of recombinant vesicular stomatitis virus (rVSV) and Newcastle disease virus (NDV), rVSV-NDV, the integrated TFDF technology allowed to achieve high cell concentrations, continuous virus harvesting, and clarification. Compared to an optimized batch process, 11-fold higher infectious virus titers were obtained in the clarified permeate, resulting in a 460% increase in space-time yield.
Overall, the TFDF module showed very good performance as a perfusion system for the tested fusogenic oncolytic virus. Continuous virus harvesting with subsequent clarification through the TFDF module in one step can simplify process operation and potentially help to develop an integrated, scalable (up to 2000 L), and economical process for future vaccine manufacturing.

CONFIRMED SPEAKER

James Hilton

Staff Engineer, Pilot Plant Operations
Takeda

James works as Staff Engineer, Pilot Plant Operations at Takeda where he focuses on monoclonal antibodies and other biologics at the Lexington downstream pilot group. He has worked at Takeda for three and a half years, commencing his tenure in the Cambridge pilot Gene Therapy group, where he was engaged in transferring downstream pilot-scale production into the new Cambridge pilot lab. Prior to joining Takeda, he accrued two and a half years of experience in GMP manufacturing, specializing in purification and fermentation.

During his tenure at Takeda, he has been actively involved in designing and authoring electronic batch records, assessing new technologies, and implementing continuous chromatography for Protein A operations at PD and Pilot scale in collaboration with global Takeda teams.

Outside of work, he dedicates most of his time to home life, enjoying the company of his wife, three dogs, and their cat.

Implementation and Automation of Downstream UF/DF of AAV Using Flatsheet Membrane

The use of adeno-associated viruses (AAVs) is common in gene therapy technology to deliver the gene of interest in a viral capsid. The upstream process for AAV includes cell expansion, plasmid transfection, and viral vector production. The cell culture material is then harvested and purified to prepare for formulation and fill/finish. After the harvest step, an ultrafiltration/diafiltration step is performed using a flatsheet membrane to concentrate the product 10-20x and exchange the buffer in preparation for further chromatographic separation. As the Takeda Cambridge pilot team transferred gene therapy capabilities into the facility, the group transitioned from stainless-steel equipment to single-use equipment, with a focus on data collection and automation. The initial implementation of the system included controlling retentate flow via the Levitronix® controller with a manual TMP-control clamp which requires adjustments during the run. To further automate the process, the manual TMP-control clamp was replaced with a second Levitronix pump on the retentate line in reverse flow direction, enabling automatic TMP control during operations. The use of the Levitronix® pump resulted in a faster response from the controller, constant control at the set point compared to a manual clamp or an automated valve, and reduced shear on the product during recirculation and processing. Recipes were developed on the controller with support from Levitronix® to perform load and ultrafiltration 1, diafiltration, and ultrafiltration 2 with minimal manual intervention, and the system was integrated with DeltaV for further control capabilities. The process was successfully scaled from 10L to up to 50L bioreactor scale using different sized Levitronix® single-use pumps, and the data capture provided an easy solution for trending and analyzing the performance across the TFF step.

CONFIRMED SPEAKER

Mark McElligott

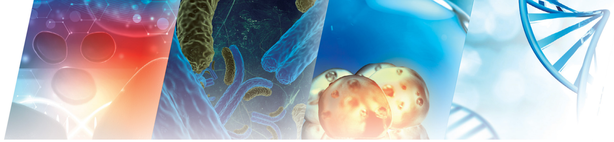
Owner & Principal Process Engineer
bioX

Mark McElligott has over 25 years of diversified Process Engineering experience operating as an industry subject matter expert in Single-Use Systems programming, development, design, and deployment. Mark's experience includes process development and process engineering for facilities and equipment used to support mRNA, Microbiome, mAb, ERT, GCT, HBOC, attenuated vaccine, and MDI/DPI drug manufacturing modalities. Process Development and Manufacturing Science experience inclusive of process design, product development, comparability assessments/testing, process equipment/instrumentation design, as well as relevant analytical methods development.
Mark is the owner of bioX LLC, based in Salem, NH. bioX provides a stage for the industry to conduct caparison, physical/mechanical, biological, and chemical testing across all manufacturing operations. bioX provides pilot scale manufacturing process feasibility testing, along with manufacturing operations expertise.
Mark holds an MS in Engineering from Purdue University where is also currently a Doctoral candidate in Engineering and Technology.

Pump Performance Design and Performance Considerations for AAV and LVV Manufacturing Operations

Pump selection represents a crucial factor in the manufacturing of advanced therapeutic modalities, including CAR-T cell therapies, gene therapies, autologous cell-based immunotherapies, and regenerative medicine applications. Consequently, data- driven design considerations must be undertaken when evaluating the current landscape of available pump technologies. This study conducted a comprehensive process stream analysis across three distinct pumping technologies, assessing their impact of varying velocities and pressures within individual process streams containing adeno-associated virus (AAV) and lentiviral vectors (LVV). Each process stream was evaluated for its influence on viral vectors, transfection efficiency, and HEK-293 cell viability. The pumps analyzed included the Levitronix® PuraLev® single-use magnetic pump, a quaternary diaphragm pump, and a peristaltic pump. The testing and final analysis was based on the individual impact of each pump on typical upstream manufacturing processes, providing insights into the optimal pump selection for these advanced therapeutic applications.

CONFIRMED SPEAKER



Johanna Wiesner

Senior Associate Gene Therapy
Roche Diagnostics GmbH

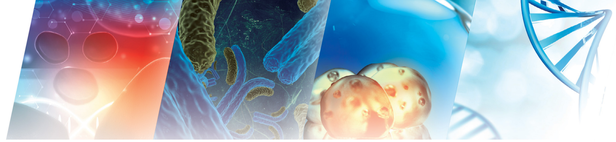
Johanna Wiesner works as Senior Associate Gene Therapy at Roche Diagnostics where she is responsible for cell culture process development and scaling-up harvest processes. With expertise in viral vectors, human cell culture, and single-use technologies, Johanna brings a wealth of experience to her role.

Johanna holds a Master's degree in Life Science Engineering from the Friedrich-Alexander University, Erlangen-Nuremberg. In her free time, she enjoys windsurfing and skiing.

Enabling a Fully Closed Harvest Technology for Gene Therapy Application

A lot of development work usually goes into upstream production and downstream purification, while the chain link connecting the two is often overlooked. The harvest from the bioreactor is said necessary chain link, which is much less represented in the available literature than the rest of the process. However, an optimized clarification is crucial to hand over as many viral vectors from the upstream production to the downstream process, while at the same time reducing cell debris as much as possible to enable efficient purification. Therefore, different clarification technologies were tested to determine their suitability for viral vector harvest.

CONFIRMED SPEAKER



Dr. Andreas Wagner

Head of Liposome / LNP Technology
Polymun Scientific

Dr Andreas Wagner is Head of Liposome Technology at Polymun Scientific GmbH. He has significant expertise formulation of liposomes and LNPs and development of the respective processes for their clinical use. He and the team at Polymun Scientific have significantly contributed to the 1st successful mRNA vaccine Comirnaty by optimizing and up-scaling the LNP process as well as by supporting clinical and early market supply of the successful Covid-19 vaccine.

Dr Andreas Wagner studied Biotechnology at the University of Applied Life Sciences in Vienna, Austria and earned his Master and Ph.D. degrees in the field of biopharmaceutical technology. Dr Wagner is listed as inventor on multiple patents, like the liposome technology and some product patents of liposomal formulations. Furthermore, he has published several peer reviewed articles dealing with liposomes, the technology, products thereof and their application in preclinical and clinical studies.

Polymun Scientific GmbH is a private Austrian company, located in Klosterneuburg, offering contract development and manufacturing of biopharmaceuticals as well as development and production of liposomal formulations. Its patented liposome technology allows efficient manufacturing of constantly high quality in small and large scale. Polymun is an EMEA-certified manufacturer conducting several own R&D projects. For more information, please visit www.polymun.com

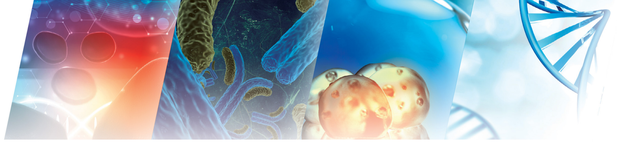
Pioneering a Versatile LNP Production Process for mRNA Vaccines, Therapeutics, and Gene Editing – Unveiling the Proof of Concept

RNA-based therapeutics, which function by either silencing pathological genes through delivery of siRNA or expressing therapeutic proteins through the delivery of exogenous mRNA to cells, hold great potential for the treatment of various diseases, like Covid-19 related diseases. However, mRNA molecules are large, fragile and easily degrade. They do not readily cross plasma membranes to enter target cells and so a delivery solution is required.

Lipid nanoparticles (LNP) are the leading delivery systems for enabling the therapeutic potential of small interfering RNA (siRNA), mRNA for systemic applications or CRISPR. Lipid nanoparticles (LNPs), currently represent the most advanced platform for RNA delivery, which have now advanced into human clinical trials and their mRNA delivery safety profiles have been evaluated in human and non-human primates.

Lipid nanoparticle delivery platforms have been extensively investigated and optimized for the formulation of oligonucleotide drug products and provide a good basis for mRNA based systems. However, mRNA containing LNPs need to be treated differently than oligonucleotide containing LNPs, as particle structure has an impact with respect to stability upon processing conditions. Data will be presented, which describe hurdles and solutions throughout these processes.

CONFIRMED SPEAKER



Zsofia Bencze

DSP Scientist
Ferring Pharmaceuticals

Zsofia Bencze is a downstream process development scientist at Ferring Pharmaceuticals, where she leads activities for monoclonal antibodies (mAbs), multi-specifics, and Adeno-Associated Viruses (AAVs) at the Ferring Biologics Innovation Center. With six years of experience in the biopharmaceutical industry, Zsofia has previously held positions at companies such as Lonza and Celonic. She brings significant expertise in downstream process (DSP) purification, leveraging her knowledge to ensure delivery of safe and effective therapeutics. Zsofia holds a Master of Science from the University of Birmingham in Biochemical Engineering.

Inline Protein Concentration Measurement Solution for UF/DF Process Control

TFF is typically performed to formulate biologic therapeutics to high protein concentrations by ultrafiltration (UF) as well as diafiltration (DF) steps. During the process, protein concentrations are typically measured by at-line analytics to estimate process progression and to initiate the next processing step. High viscosities, at protein concentrations greater than 100 g/L, pose however challenges to the sample measurement process with the risk of inaccurate concentration determination.

A novel single-use inline viscometer, based on magnetic levitation, was integrated into the feed stream of a commercially available TFF device. A reliable calibration protocol was developed to generate a prediction model for protein concentration based on inline temperature and viscosity measurements. Subsequently, real-time monitoring of protein concentration via the viscometer during the TFF operation enabled accurate process control during the UF and DF steps, without the need to sample the process.

This study proves that inline viscometer technology based on magnetic levitation is a viable solution to determine protein concentration without compromising product quality. Real-time viscosity information in combination with a protein concentration prediction model has the potential to increase the control of TFF operations and improve process performance.

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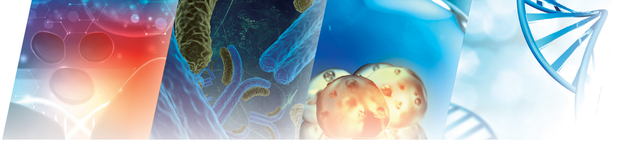

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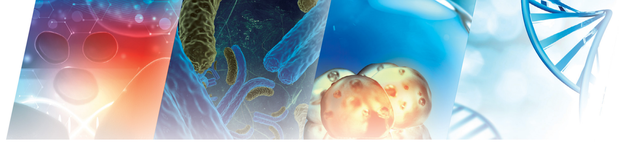

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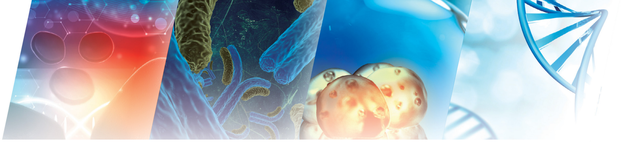

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