U.S. FOOD & DRUG ADMINISTRATION

VIRTUAL EVENT

PQRI Product Quality Research Institute

FDA/PQRI Workshop on the Regulatory Framework for the Utilization of Artificial Intelligence in Pharmaceutical Manufacturing

An Opportunity for Stakeholder Engagement

Tuesday - Wednesday, September 26-27, 2023

Day 1 – Tuesday, September 26, 2023
10:00 AM – 3:00 PM US ET

9:45 – 10:00 AM US	Pre-Workshop Attendees Check Connections
10:00 - 10:15 AM	***Welcome and Introductory Remarks*** **Glenn Wright**, Chair - PQRI Board of Directors; President and CEO, Parenteral Drug Association (PDA)
SESSION 1: FDA Introduction to State of Artificial Intelligence Regulatory Framework Session 1 will discuss the state of AI in the pharmaceutical manufacturing space and explore the area of consideration for a potential framework to regulate AI technologies. An overview will be provided of how AI can be utilized to support other advanced manufacturing technologies. This session will also provide updates regarding feedback received on the discussion paper.	
10:15 – 10:25 AM	***A Regulatory Perspective on Innovations in Pharmaceutical Manufacturing*** **Patrizia Cavazzoni**, M.D., Director, Center for Drug Evaluation and Research (CDER), US Food and Drug Administration (FDA)
10:25 – 10:40 AM	***An Introduction to Artificial Intelligence*** **Adam C. Fisher**, Ph.D., Director, Science Staff, Office of Pharmaceutical Quality (OPQ)/CDER/FDA
10:40 – 11:00 AM	***Artificial Intelligence in Drug Manufacturing Discussion Paper*** **Thomas O'Connor**, Ph.D., Deputy Director, Office of Testing and Research, OPQ/CDER/FDA
SESSION 2: Use of Artificial Intelligence in Process Development, Process Monitoring, and Commercial Batch Trend Monitoring Session 2 will focus on the application of AI in process development and monitoring commercial processes in pharmaceutical manufacturing. Presentations will cover topics such as digital twin technology for real-time monitoring and optimization of manufacturing processes, the use of AI in setting and optimizing specifications during development and commercial manufacturing, and the generation of structured data for application and submissions. This session aims to provide insights into how AI can enhance efficiency, quality, and regulatory processes in pharmaceutical manufacturing.	
***Moderator: Doug Kiehl**, Senior Director, Eli Lilly and Company*	
11:00 – 11:25 AM	***Digital Twins and Process Modeling/Control/Monitoring*** **Richard D. Braatz,** Edwin R. Gilliland Professor of Chemical Engineering, Massachusetts Institute of Technology Process modeling is being increasingly used in pharmaceutical manufacturing. Multiple model types are summarized, including mechanistic, machine learning, hybrid, and digital twins. The types of applications in which each model type is most suitable are described, including for process design, control, and monitoring. The key points are illustrated by applications to a wide variety of pharmaceutical manufacturing processes, including for small-molecule drugs, recombinant proteins, vaccines, and gene therapies.

11:25 – 11:50 AM	***Automated Visual Inspection Deep Learning Case Study*** **Romain Veillon**, PharmD, Director, Vision Technology MSAT, GSK Deep Learning applied to visual inspection could significantly improve trust and performance of this critical process. We believe that defect detection can be enhanced while false reject can be minimized. Also, Deep Learning will enable faster improvement loop with digital defect image libraries. The deployment of such technologies is a big step change for manufacturers and regulators. This presentation will explain basics of Deep Learning and will cover some associated risks. It will then focus on GMP tech infrastructure required to support massive image storage, labelling and retention. Validation approaches will be proposed. Finally, we will touch challenges associated with new competencies development, new roles to create and up skilling of teams.
11:50 AM – 12:15 PM	***Digital Twins: Leveraging Virtual Worlds to Improve the Real World*** **Kim Wilson,** Business Consultant Executive, Dassault Systèmes Virtual Twin technology helps business reimagine what is possible throughout every stage of the product lifecycle by transforming how products are developed, produced, and commercialized. Companies can switch to digital vs paper driven systems, to data vs document based processes, and to virtual vs physical testing and experimenting. Products can be developed and brought to market faster and more cost effectively, testing can be more efficient and save time, facility layout, resources and safety activities can be optimized, and sustainability goals can be accelerated.
12:15 – 12:45 PM	**Break**
12:45 – 1:15 PM	***Panel Discussion and Q&A*** Moderator: Doug Kiehl Panelists: • Richard Braatz, Ph.D. • Romain Veillon, Pharm.D. • Kim Wilson • Sharmista Chatterjee, Ph.D., Division Director, Division of Pharmaceutical Manufacturing II, Office of Pharmaceutical Manufacturing Assessment (OPMA)/OPQ/CDER/FDA • Ben Stevens, Ph.D., MPH, Director CMC Policy and Advocacy, GSK • Leticia Martinez-Peyrat, Ph.D., Pharm.D., Senior Quality Assessor, ANSM (French National Agency for Medicines and Health Products Safety), European Medicines Agency (EMA)
1:15 – 1:25 PM	**Break and Breakout Room Prep**
1:25 – 3:00 PM	***Breakouts (to address Session 2 topics)*** *Registrants will breakout into several concurrent breakout sessions to facilitate small group discussions*
3:00 PM	***Wrap up and End of Day 1***

Day 2 – Wednesday, September 27, 2023
10:00 AM – 3:00 PM US ET

9:45 – 10:00 AM US	Pre-Workshop Attendees Check Connections
10:00 – 10:15 AM	***Welcome to Day 2 and Recap of Day 1*** **FDA/PQRI Workshop Organizing Committee Member**

SESSION 3: Use of Artificial Intelligence within the Pharmaceutical Quality System

Session 3 will focus on opportunities to leverage artificial intelligence within pharmaceutical quality systems. Presentations will cover topics such as the use of Natural Language Processing (NLP) in evaluating Corrective and Preventive Action (CAPA) effectiveness, digital data quality and integrity, management of "big data," and overall understanding of AI recommendations. This session aims to provide insight into regulatory considerations when utilizing AI systems within the pharmaceutical quality system.

Moderator: Diane Paskiet, *MS, Director of Scientific Affairs, West Pharmaceutical Services*

10:15 – 10:40 AM	***Digital Data Quality & Integrity*** **Trent Stone,** President, Varya Virtual
10:40 – 11:05 AM	***Enabling Regulatory Review of Modeling and Simulation through Verification, Validation, and Uncertainty Quantification*** **Marc Horner**, Ph.D., Distinguished Engineer, Ansys Pharmaceutical manufacturers rely on mechanistic, data-driven, and hybrid modeling to understand process performance and improve efficiencies. Therefore, establishing the credibility of these computational models is critical when making decisions regarding process scale-up and automation. This presentation will review current efforts by the American Society of Mechanical Engineers, US FDA and other stakeholders to enable the development and regulatory review of credible knowledge- and data-based models.
11:05 – 11:30 AM	***AI Model Interpretability and Explainability - Methods Considering Various Risk Levels*** **Nandini Rakala,** Ph.D., Visiting Associate, Data Scientist, CDER, FDA
11:30 – 11:55 AM	***Panel Discussion and Q&A*** Moderator: Diane Paskiet Panelists: • Trent Stone • Marc Horner, Ph.D. • Nandini Rakala, Ph.D. • Saumyendu Ghosh, Ph.D., Director, Office of Information Systems Management (OISM), Office of Regulatory Affairs (ORA), FDA • Christina Meissner, Ph.D., AGES Austrian Agency for Health & Food Safety, Institute Surveillance, EMA
11:55 – 12:20 PM	**BREAK**

SESSION 4: Lifecycle Approaches to Management of Artificial Intelligence

Session 4 will focus on different lifecycle approaches to managing AI in pharmaceutical manufacturing. Presentations will cover topics such as the benefits and challenges when developing recommendations for AI model validation. Potential strategies for validating custom versus proprietary AI models and defining reportable changes for self-learning models will also be covered. This session aims to provide insight into regulatory considerations for lifecycle management of AI models.

***Moderator: Cat Vicente**, Associate Director, Enterprise Regulatory Outreach, Johnson& Johnson*

12:20 – 12:45 PM	***Validation of Custom vs Proprietary AI Models and Machine Learning*** **Gaurav Chopra,** Ph.D., Associate Professor**,** Purdue University
12:45 – 1:10 PM	***Validation, Documentation vs Registration and Life Cycle Management of AI and ML Models*** **Gert Thurau,** Ph.D., Head of Manufacturing Innovation in Roche Policy, F. Hoffman-La Roche The approaches to validation and quality system documentation vs. registration needs for AI and Machine Learning (ML) applications will vary along a spectrum of risk or potential impact to the product/patient. Some regulatory and compliance aspects will be reflecting the ongoing discussion around the use of models for manufacturing applications, which itself is an area of limited regulatory guidance. However some unique scientific aspects to AI and ML models (such as for self- or autonomously learning models) will trigger additional considerations to balance the documentation/GMP needs vs. the possibility to harness the unique power of these applications.
1:10 – 1:35 PM	***Panel Discussion and Q&A*** Moderator: Cat Vicente Panelists: • Gaurav Chopra, Ph.D. • Gert Thurau, Ph.D. • Thomas O'Connor, Ph.D. • Shawn Forrest, Digital Health Specialist, Digital Health Center for Excellence (DHCoE)/FDA • Marcel Hoefnagel, Ph.D., Senior Assessor Biopharmaceuticals, Medicines Evaluation Board, The Netherlands and EMA
1:35 – 1:45 PM	**Break and Breakout Room Prep**
1:45 – 2:55 PM	***Breakouts (to address Session 3 and Session 4 topics)*** *Registrants will breakout into several concurrent breakout sessions to facilitate small group discussions*
2:55 - 3:00 PM	***Wrap up and End of Workshop***

Workshop Organizing Committee

Joanne Chia, FDA CDER
Nathan Davis, FDA CDER
Dede Godstrey, PQRI Secretariat
Doug Kiehl, Eli Lilly and Company
Jennifer Maguire, FDA CDER
Manuel Osorio, FDA CBER
Pahala Simamora, FDA CDER
Diane Paskiet, West Pharmaceutical Services
Jean Poulos, Akorn
Anna Scarbro, FDA CDER
David Schoneker, Black Diamond Regulatory Consulting, LLC, IPEC Americas
Cinque Soto, FDA CBER
Cat Vicente, Johnson & Johnson
Maotang Zhou, FDA CDER