

Roundtable Session 1 – Table 5 – Brainstorming on Applications of AI for Bioassays

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Abstract:

Artificial intelligence (AI) is emerging as a transformative enabler with strong potential to improve the design, optimization, and lifecycle management of bioassays. AI can support more efficient, data-driven method development by helping generate experimental designs, identify critical parameters, assist with troubleshooting, and accelerate data analysis. It may also reduce effort in historically manual, high-volume work such as data review and verification. However, to realize these benefits responsibly, AI outputs must be validated through appropriate human oversight and implemented within a framework that balances innovation with control.

Discussion Questions:

Q: How are you using AI in your laboratory for bioassay development?

Q: Have you explored use of AI to assist with method development activities such as probing different optimization strategies?

Q: Have you used AI to assist in providing a more comprehensive view during troubleshooting an unusual assay result or trend?

Q: How are you leveraging AI for data analysis, visualization, or interpretation of bioassay results?

Q: What challenges or limitations have you encountered when integrating AI into your workflows?

Q: How do you ensure appropriate validation and governance when using AI-generated outputs in regulated environments?

Notes:

1. Introduction

This roundtable discussion focused on the current use and practical applications of artificial intelligence (AI) in scientific and analytical workflows. Participants shared experiences primarily with tools such as Microsoft Copilot, ChatGPT, and Claude, noting

that some organizations are already providing strong infrastructure and training support to enable effective AI adoption.

2. Current Applications of AI

AI is being actively integrated into multiple aspects of daily work, particularly as a knowledge support and productivity tool. Participants highlighted its value in accelerating learning, for example by helping users understand complex topics such as CMC lifecycle and method qualification.

In addition, AI is increasingly used to review documents and support data integrity checks, including applications like identifying risks in data verification processes and improving visualization (e.g., color-coded risk indicators).

Another appreciated use case is real-time troubleshooting, where AI provides immediate support during assay execution or experimental work, helping users quickly diagnose and resolve issues.

More advanced applications include the development of custom AI agents, which can be tailored through prompt engineering to meet specific needs. However, these solutions require ongoing maintenance and careful design.

AI is also being explored in data analysis and statistical support, such as interpreting DOE data generated from tools like JMP and identifying potential risk factors. While helpful, participants emphasized that AI should serve as a supplementary tool rather than a replacement for statistical expertise.

Finally, AI demonstrates strong capability in handling large, well-structured datasets (e.g., LIMS or PLA data) for trending and analysis. However, its effectiveness is reduced when working with less structured development data, which remains a challenge.

3. Data Considerations and Limitations

The discussion highlighted the importance of data quality and structure in determining AI performance. While AI works best with clean, organized datasets, some participants suggested that exposing AI to both structured and unstructured data may improve its robustness and reduce bias.

Machine learning as a broader topic was mentioned but not explored in depth during this session.

4. Key Insights and Considerations

A central theme of the discussion was the importance of effective prompt design, as the quality of user input directly impacts the usefulness of AI-generated outputs.

Participants also emphasized that AI tools are not currently GMP-regulated, reinforcing the need for human oversight. AI should therefore be viewed as an assistive technology, with humans maintaining responsibility for interpretation, decision-making, and compliance.

5. Conclusion

Overall, AI is becoming an integral part of modern workflows, offering significant benefits in learning, efficiency, data analysis, and problem-solving. However, its successful implementation depends on thoughtful use, high-quality data, and continued human supervision. At this stage, AI is best positioned as a powerful support tool rather than a standalone solution.