

# Exploring the potential for **AI and automation** in the laboratory

Leveraging technologies  
for efficiencies

In this interview, NewsMedical talks to Cerba Research's **Coen Stalpers** about advances in automation and artificial intelligence in the laboratory setting.



by Coen Stalpers

Senior Laboratory Technician  
at Cerba Research

**Q NM:** Can you describe the role artificial intelligence (AI) currently plays in your laboratory operations?

**A CS:** Typically, we aim to automate processes due to improve inefficiencies and quality. Often, the conceptual nature of these tasks makes it difficult to determine where to start. In such cases, I frequently use AI, specifically ChatGPT, to generate a starting point by prompting questions like, "How would you do this?" or "How would you do that?" This process helps to organize my thoughts into a

tree of ideas, adding branches and leaves that then requires continuous prompting and refining. At the very least, we can clarify objectives and identify appropriate tools through AI.

A concrete example is a machine that outputs data, which we need to integrate into an analysis workflow. If the a method is unclear, AI can provide examples and suggestions. While it is essential to critically evaluate these AI-generated suggestions, it offers a useful shortcut for conceptualizing projects. For instance, AI can guide you through the process if you want

to build a washing machine but lack a mechanical engineering background.

This approach enables us to develop proposals that, while not perfect, are at an acceptable level to present to decision-makers. Once a basic concept is established, it can be refined and professionalized, making it more streamlined and appealing.



**Q NM:** How did you identify which laboratory processes would benefit most from AI integration?

**A CS:** At this time we use AI to explore potential applications within our processes. For instance, I consider various questions to determine how to achieve a specific goal.

However, a potential benefit of AI in the future is in our image analysis area, where we create many images and analyze them by scoring spots on each picture. This process involves distinguishing between background and foreground and can be automated using AI instead of relying on human input. While the exact method is undefined at this stage, AI can guide me on how to approach it.

**Q NM:** What were the biggest challenges you faced during the implementation of AI technologies?

**A CS:** The biggest challenge is distinguishing useful information from bogus content. ChatGPT, being a language model, scans the web and makes educated guesses based on the input.

“Standardizing processes with AI **ensures consistency** enhancing both productivity and quality.”

However, there is a lot of nonsense online. Therefore, it is crucial to recognize that the initial answer is likely to be direction rather than completely accurate.

The need to reformulate the question several times, identify elements that seem inaccurate, and ask for further explanations. This is an iterative process that helps us to stay on track and refine the information received despite the inherent challenges.

**Q NM:** In what ways has AI improved the efficiency of laboratory processes?

**A CS:** By using AI to guide and achieve these improvements, individual and team efficiency can increase dramatically. Standardizing processes with AI ensures consistency, enhancing both productivity and quality.

This leads to reliable, high-quality outputs, reflecting the benefits of integrating AI into daily operations.

AI is primarily supportive with repetitive tasks. Instead of performing the same task multiple times an hour, AI can suggest ways to reduce the frequency. In laboratory settings, where fixed procedures are common, AI can identify which parts of these processes can be automated.

“By leveraging AI to build **automated workflows**, we can reduce hours to minutes or days to hours.”

**Q NM:** How has AI impacted the turnaround time for projects or experiments?

**A CS:** The main impact is turnover time, from starting wet work in the lab to reporting. Currently, this process can take up to four weeks.

By leveraging AI to build automated workflows, we can reduce hours to minutes or days to hours. This shift mirrors the transition from traditional Googling, where everything is done manually, to using AI, which quickly provides broader, contextualized information. For example, as a lab technician handling wet work three years ago, after an experiment, it was standard process to fit raw data into an analysis template, which involved three to four hours of daily for each analysis.

This task was a significant bottleneck and extremely tedious. I reduced this process to two minutes and three clicks, automating it to reduce time with manual review at the end. The system processes the data, funneling it into the following workflow, and displays a progress bar reducing timelines from hours to minutes. The time savings are substantial with each technician performing four to six analyses daily and considering a team of 10 technicians. This automation was enabled by AI, which provided the necessary guidance to streamline the process.

**Q NM:** How does AI assist in data collection and analysis in your laboratory?

**A CS:** Specifically, AI might not be fully utilized yet, but its future potential is significant.

For example, conducting comprehensive meta-analyses on data collected over a year could reveal trends not humanely possible in a busy laboratory. Humans might miss. While we have trend systems, identifying the root cause of subtle or significant trends in assay data can be challenging.

Although our current data organization might not facilitate this easily, AI can act as a thousand data analysts in one. It can process and interpret vast amounts of information, identifying patterns and correlations that are not immediately obvious.







**Q NM:** How do you ensure that AI systems comply with industry regulations and standards?

**A CS:** Automating a process helps by necessitating the standardization and precise definition of quality criteria and specifications. This identifies and addresses discrepancies in how different individuals perform tasks, ensuring that all processes adhere to consistent quality standards. It is important to reduce unwanted variability in assays that can lead to quality issue. At Cerba we implement validation strategies to address this and ensure the automated process produces the expected results. This includes testing with extreme data to confirm the system's robustness.

When building and validating automated systems, the goal is to ensure that the system produces reliable results under normal, intended use. We also consider

potential issues, ensuring anomalies are filtered out or flagged. Continuous monitoring and root cause analysis of unexpected results enable us to make necessary adjustments.

Our validation department plays a crucial role in this process, contributing valuable insights to ensure the system's reliability and consistency.

**Q NM:** Can AI help predict and prevent potential compliance issues? If so, how?

**A CS:** By automating and standardizing processes and defining clear specifications for the system's operation, we can ensure that any deviation from these specifications is immediately flagged.

An automated system consistently alerts when it is out of specific, reducing the risk from human distraction or error.

**Q NM:** What future AI advancements are you most excited about for laboratory applications?

**A CS:** I am most excited about the potential to analyze long-term trends in our assay data. We currently track trends in our assays, identifying potential correlations within our data. However uncovering hidden patterns by feeding multiple years, or even a decade's worth of data, into an AI system without manual categorization or cleaning could bring new insights into focus.

The ability to identify such patterns could lead to significant improvements in assay control. For instance, we could predict long-term effects based on specific actions, enabling us to optimize our processes. This analysis is highly feasible with the vast amount of data.

# “Leveraging AI to identify patterns and connections that would otherwise be imperceptible is essential.”

**Q NM:** How do you foresee the role of AI evolving in the industry over the next five to ten years?

**A CS:** In my opinion, AI will impact communication globally. People with limited language proficiency may leverage AI to produce sophisticated text, such as novels or professional emails. This phenomenon is already evident in other domains; for example, programming tools like Copilot predict code based on file and project context, significantly enhancing efficiency.

Such tools foster dependency. Once accustomed to AI assistance, users may find it challenging to operate without it, not only in programming but also in scientific writing, email composition, and even casual conversations. This transformative shift is anticipated soon.

**Q NM:** How do you balance using AI with the need for human expertise and oversight?

**A CS:** Leveraging AI to identify patterns and connections that would otherwise be imperceptible is essential. However, human oversight is crucial as AI-generated outputs can be inaccurate.

When developing new applications with AI, it is necessary to thoroughly understand the AI-derived components.

Domain experts can effectively utilize AI to rapidly generate field-specific content. They can readily assess this output and identify relevant insights. Unsupervised AI can generate dashboards to highlight anomalies. Human intervention is then required to interpret these anomalies, determine their significance, and adjust parameters accordingly. Alternatively, such anomalies may reveal previously unknown patterns. Ultimately, a collaborative human-AI approach is necessary.

**Q NM:** How do you handle client data privacy and security in AI-driven processes?

**A CS:** The sample is assigned a number, and a key correlates the sample to the patient. Consequently, rigorous vigilance is imperative to ensure proper handling of this data and our current procedures are designed to a high standard.







**Q NM:** How do you measure the return on investment (ROI) for AI implementations in the lab?

**A CS:** AI is primarily a tool for automation. We have achieved significant automation with AI. A clear example is piping data from point A to B, where processing time is reduced from hours to minutes. By determining the frequency of this process—four times per working day or 20 times per week—we can calculate substantial time savings. This represents a single assay, and considering all assays, the return on investment becomes even more apparent.

The integration of robots into the laboratory presents a different scenario. While the initial investment in equipment is substantial—on the order of

millions of euros—the long-term benefits are evident. Operator hands-on time is minimized to approximately ten minutes, allowing the robot to perform most of the work. The robot significantly reduces consumable usage, such as plastic fluid. We recently developed a protocol that requires only four boxes of pipette tips compared to the previous 40, representing a tenfold reduction.

**Q NM:** What performance metrics do you use to evaluate the success of AI applications?

**A CS:** The time saved by automating processes is the sole metric by which we can accurately assess performance. While not the primary focus, throughput can also be increased through automation and AI.

From a broader perspective, automation liberates operators to pursue other initiatives. Individuals may be strongly inclined toward maintaining a clean laboratory environment or implementing agile or Six Sigma methodologies.

Automation empowers them to prioritize these areas rather than being consumed by repetitive tasks such as material transfer, titration of 200 samples, and manual data entry.

**Q NM:** Can you share any quantitative or qualitative results that highlight the impact of AI on your laboratory operations?

**A CS:** Algorithms maintain a log of work volume, allowing for quantifiable measurement of data transfer from point A to B. For standardization, by reducing data content transfer it is equated to approximately three to four hours of work by a single individual. By tracking the frequency of this work (approximately four times daily), a time gain of roughly 16 hours is calculated. This equates to time saving without compromising results.

In addition, the robot can perform titrations, a previously labor-intensive task. While industry results are pending, confidence is high in their accuracy. By conducting titrations before the workday or even before the weekend, the team can dedicate the initial hours to experimental work. Parallel processing, involving the initiation of a new titration while analyzing results from the previous batch, doubles throughput. This enables the team to effectively double assay output without increasing personnel.

The value of AI and automation is clear, but the process involves time to explore the concept and resource investment. It is wise to walk before you run into the implementation, taking care to ensure that replacement of human process with automation is yielding the benefits and required outcomes.



### About the speaker

Coen Stalpers is a Senior Laboratory Technician at Cerba Research with a background in medical biotechnology. Holding a master's degree in this field, Coen has gained experience through roles in academia, government, and regulatory quality assurance. Coen enjoys solving problems and finding simple solutions to seemingly complex issues.

Valuing interdepartmental collaboration, Coen has a great interest in computer programming, which is used to automate repetitive tasks and improve efficiency. Within Cerba, he is always on the lookout for ways to improve efficiency by automating processes.

### About Cerba Research

Cerba Research is a leading laboratory services provider across all clinical development phases, to the life science industry (or pharmaceutical, biotechnology, medical device, government, and public health organisations). It combines the deep scientific expertise of specialist services with the capacity and breadth of a global central laboratory network

Cerba Research develops innovative solutions to unique challenges in research and drives operational agility at scale for multiple therapeutic areas, with world recognised expertise in virology and oncology. It is part of the Cerba HealthCare Group with 15,000 employees on five continents, driven to advance health diagnosis.

For more information about Cerba Research, please visit:

[cerbaresearch.com](https://cerbaresearch.com)