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How a biotech organization is transforming vital flow cytometry processes

CASE STUDY

Who should read this study? ***Bench researchers, data scientists & engineers, scientists, IT professionals, lab operations professionals, instrument specialists***

Background

A leading biotech organization performs immunophenotyping with flow cytometry to characterize cell populations from in vivo samples for Investigational New Drug (IND)-enabling Chimeric Antigen Receptor T-Cell (CAR-T) studies. The organization runs more than 40-50 samples per week for in vivo experiments using flow cytometers.

Laboratory Environment

Multiple instruments and informatics applications are a part of their laboratory configuration for flow cytometry.

- Agilent Novocyte (Flow Cytometer)
- Benchling (ELN)
- Egnyte (File Sharing)
- FlowJo (Analysis and Manual Gating)
- GraphPad Prism (Statistical Analysis)
- Microsoft Excel (Data Aggregation)
- Microsoft PowerPoint (Data Visualization)

Challenges

Flow cytometry is a powerful technology for comprehensive analysis of single cells, making it critically important to the future of scientific research. For over 50 years, this technology has evolved from a single-parameter instrument to a complex tool for a simultaneous multiparametric analysis of physical and chemical characteristics of up to thousands of particles per

Key Results

Reduced number of manual data collection and processing steps

Decreased average time to transfer and manipulate experimental data

Faster IND package preparation with improved data integrity

Simpler processes to prepare and publish data for analysis and visualization

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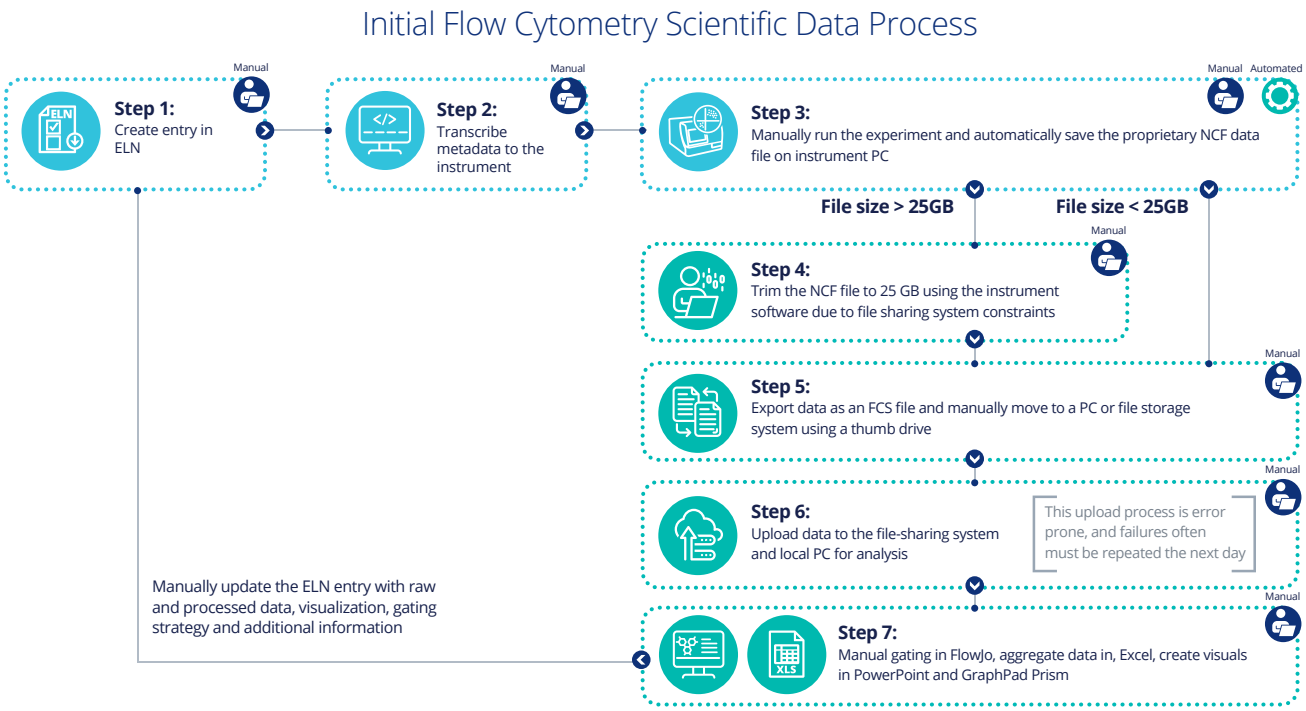


second. Flow cytometry has provided critical learnings about the complexities of certain diseases and conditions and drastically altered medical approaches to treating diseases such as cancer.

The biotech organization was struggling with flow cytometry workflows that included inefficient, manual processes that were time consuming, high effort, and error prone. They faced four primary pain points:

1: **Time-consuming and error-prone manual data manipulation**

2: **High utilization of instruments and slow upload latency to file sharing systems**

3: **Slow and risky manual IND package preparation processes**

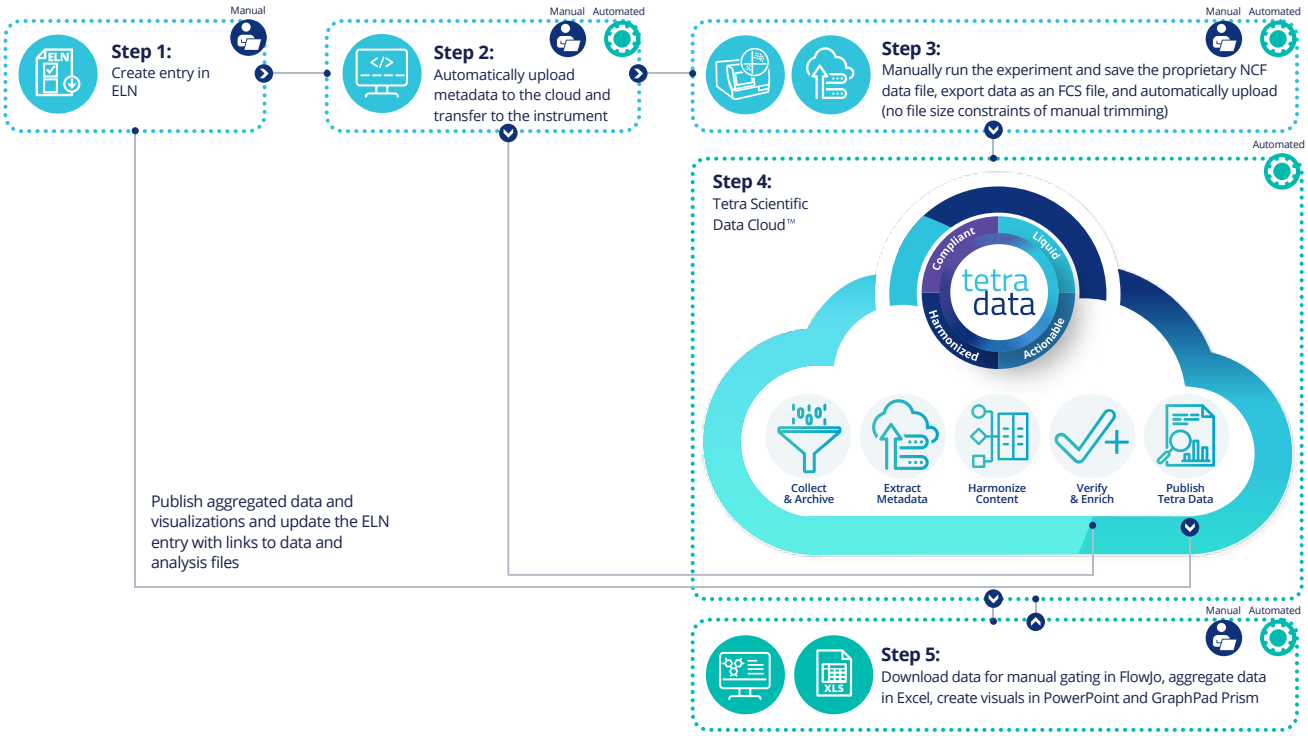
4: **Complex, multi-step scientific data preparation processes for analysis**

Solution

The biotech organization approached TetraScience with the goal of overcoming these challenges and were looking to streamline the processing and management of their scientific data as part of their flow cytometry workflows. They decided to implement the **Tetra Scientific Data Cloud™** to automate the collection and storage of experimental data to the cloud and improve process efficiency and data integrity.

The Tetra Scientific Data Cloud provides centralized access to scientific data across the organization in the cloud, allowing team members across departments to collaborate on the same data without the need to access highly constrained instruments and systems. Their solution also automates previously manual processes that include

Flow Cytometry Scientific Data Process Using the Tetra Scientific Data Cloud



publishing visualizations and analyses to ELN entries, enriching data with metadata context, and storing flow cytometry data in the cloud.

Challenge #1: Manual data manipulation

Flow cytometry workflows often contain multiple steps requiring data manipulation and moving between instruments, applications, and storage. The biotech organization's sequence was as follows:

1. Create an experimental entry in an electronic lab notebook (ELN) and prepare samples
2. Manually transcribe all metadata from the ELN into the instrument
3. Run the experiment and save the resultant proprietary NCF files to the instrument PC
4. Manually trim data files to below 25 GB (if needed) due to file sharing system file size constraints
5. Export data from the instrument software as flow cytometry standard (FCS) format and upload both the FCS and raw NCF files to the file sharing system
6. Backup raw data from the instrument PC to a file storage system (because of limited flow cytometer storage capacity and data being clear before the next experiment)

Solution: Automating the collection, harmonization, and archival of data

The Tetra Scientific Data Cloud automates many of these manual, time-consuming and error-prone tasks.

- Metadata from the ELN is pushed automatically to the Tetra Scientific Data Cloud.
- Experimental data is automatically archived in the cloud without any file size constraints or the need for manual trimming.
- Raw, proprietary-format files and FCS files are automatically pushed to the cloud where they are harmonized and ready for analysis.

Challenge #2: Instrument and file sharing bottlenecks

Due to instrument utilization, scientists regularly needed to wait until the end of the day to trim data files. Often, they would also need to upload files to the file sharing system (Egnyte) overnight with no way to know until the next day if the upload was successful. These manual steps were time consuming with multiple file uploads taking several hours and prone to failure.

Solution: Automating instrument data transfer

Scientists are able to bypass constrained instruments and file sharing systems by automatically pushing raw data to the Tetra Scientific Data Cloud.

- Uploading data is faster and less prone to failure.
- Automation eliminates manual work for bench scientists, enabling them to focus on higher-value tasks.
- Instruments are no longer the bottleneck for data analysis with data accessible in the cloud without the need to reformat, trim or manipulate.

Challenge #3: IND package preparation

Many of the organization's studies are IND enabling and must preserve raw scientific data. Previously, experimental data over 25 GB in size had no backup system with the only copy being one that was transferred to a PC using a thumb drive. Files that were greater than 25 GB often needed to be trimmed on the instrument software at the end of the day (potentially hours after the experiment) leaving the information insecure and at risk for data loss. Additionally, the slow, error-prone uploads to the file sharing system presented additional risks.

Solution: Adopt a cloud-native platform

The Tetra Scientific Data Cloud allows all scientific experimental data to be housed in a secure and compliant cloud-native environment.

- Task automation protects data integrity and accuracy and minimizes human intervention.
- All teams across the organization have access to centralized experimental data in the cloud, reducing the need for redundant copies.

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Challenge #4. Preparation for data analysis

Flow cytometry data analysis previously followed a multi-step manual process:

1. Perform manual gating in FlowJo on a laptop
2. Aggregate the data in Microsoft Excel, perform statistical analysis in GraphPad Prism, and create visuals of the gating strategy in Microsoft PowerPoint
3. Upload raw and processed data to the ELN entry and the analysis and visualization files

Solution: Automating aggregation and publishing of data

The Tetra Scientific Data Cloud allows scientists to simply download FCS files from the cloud to perform manual gating.

- The Tetra Scientific Data Cloud file log agent automatically detects updates to aggregated data, analysis, and visualization files and uploads them back into the platform—no manual intervention is required.
- Similarly, these aggregation and visualization updates, analysis files, and links to raw and processed data are now automatically published to the ELN entry.

Addressing Critical Pain Points

Replatforming to the Tetra Scientific Data Cloud allows scientists to simplify complex flow cytometry runs, bypassing time-consuming manual data manipulation tasks, reducing workflow times from days to hours, accelerating IND package preparation, while enabling automatic publication for rapid analysis and visualizations.

For this biotech organization, embracing the Tetra Scientific Data Cloud has been a clear winning strategy.

> “Partnering with TetraScience has invigorated our scientific progress and transformed our flow cytometry process, which is vital to our mission. Not only is our data secure and compliant, but it is also easily accessible to our teams and saves us hours of manual manipulation daily. In our pursuit of a blood cancer cure, the Tetra Scientific Data Cloud is proving to be a tremendous asset.”
>
> *- Biotech Company VP*

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TetraScience is the Scientific Data Cloud company with a mission to transform life sciences, accelerate discovery, and improve and extend human life.

To learn more on how to optimize processes and accelerate discovery, visit tetrascience.com

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