

Advancing gene therapy development with engineered qPCR data

CUSTOMER STORY

Development scientists at a global biopharmaceutical company evaluate the impact of process changes on gene therapy products. They use quantitative polymerase chain reaction (qPCR) to measure the titer of viral vector carrying the correct genetic payload. The team is currently able to process about 20 plates of samples per week.

The Challenge

The original workflow for the qPCR assay—from setup to analysis—involved many manual steps (Figure 1). After running samples on the qPCR instrument, scientists import the results and relevant metadata—such as sample ID, dilution factors, and replicate number—into Excel. This data entry process can take up to one hour per assay. In Excel, they analyze the data and perform quality control (QC) before uploading the results to their electronic lab notebook (ELN).

The inefficiencies of the workflow limit the group's throughput and make it prohibitively difficult to analyze data across multiple experiments. Moreover, the manual-intensive process is prone to human errors, jeopardizing data integrity.

The Solution

The biopharma's leadership recognized the need for greater efficiency and scalability in chemistry, manufacturing, and controls (CMC). As a result, they partnered with TetraScience to streamline their viral titer assay.

The Tetra Scientific Data and AI Cloud™ automatically collects data from the qPCR system, liquid handler, and ELN (Figure 2). It then contextualizes the data with experimental metadata and converts it into an open, vendor-agnostic format. This data is then consumed by a custom dashboard via REST API, where scientists can select results from specific runs, easily inspect data in tables and plots, and exclude samples that fail QC. Upon completion of the scientist's review, the Scientific Data and AI Cloud automatically sends the results to the ELN.

The Result

The efficiency gains are expected to increase assay throughput by up to 6x, enabling the CMC group to process over 100 plates per week. With a centralized store of contextualized data in the cloud, scientists can rapidly find results using searchable metadata fields. Moreover, automating data processes will enhance data integrity.

AI Readiness

The Scientific Data and AI Cloud transforms the qPCR data into AI-native Tetra Data. The resulting large-scale, compliant, liquid, and purpose-engineered datasets facilitate meta-analyses across experiments, as well as future AI applications. This allows scientists to identify trends, rapidly troubleshoot issues, and gain deeper insights into gene therapy development.

Challenge:

Scientists at a top 10 biopharma use a manual-intensive data workflow to assess gene therapies with qPCR, limiting throughput and data analysis.

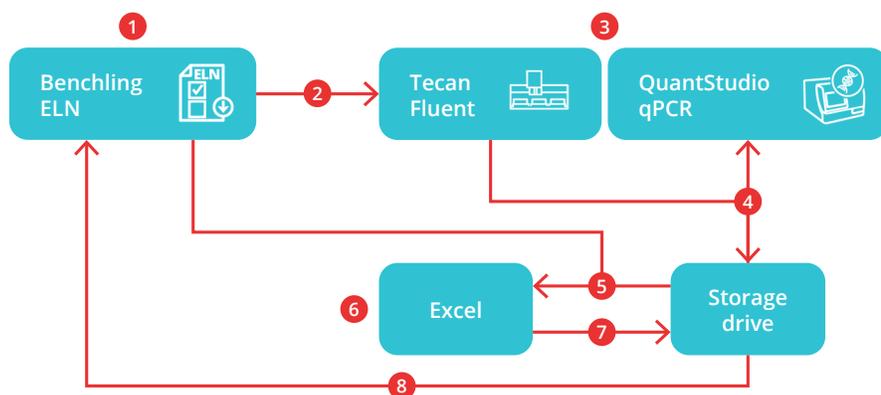
Solution:

The Tetra Scientific Data and AI Cloud automatically replatforms and engineers qPCR results into analytics- and AI-ready data.

Result:

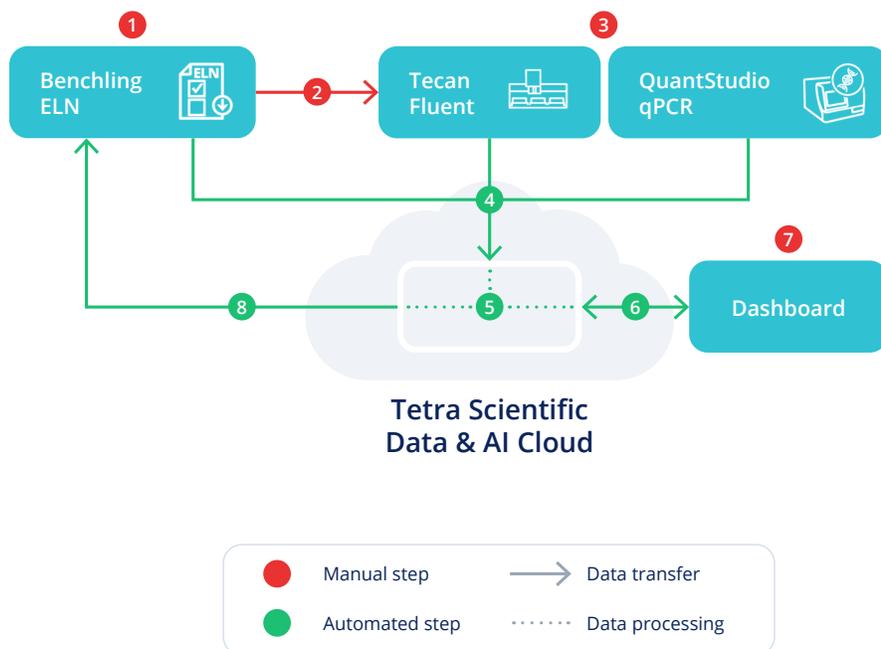
- Increase assay throughput by up to 6x
- Minimize manual steps, saving up to 1 hour per assay
- Enable meta-analyses across multiple experiments

Figure 1. Initial workflow



1. The scientists receive a request for titer analysis and create an experiment in their ELN with the relevant samples.
2. They enter sample information into the instruments.
3. They prepare samples using a Tecan Fluent liquid handler and run them on the QuantStudio qPCR system.
4. They export the liquid handling logs and qPCR results and transfer them to a local storage drive.
5. They import the qPCR data along with experiment information into an Excel workbook.
6. They review and analyze the results.
7. They export the analyzed results to their local drive.
8. They manually attach the results to the experiment within their ELN.

Figure 2. Tetra workflow



1. The scientists receive a request for titer analysis and create an experiment in their ELN with the relevant samples.
2. They enter sample information into the instruments.
3. They prepare samples using a Tecan Fluent liquid handler and run them on the QuantStudio qPCR system.
4. The Tetra Scientific Data and AI Cloud automatically collects instrument and experiment data.
5. The qPCR results are automatically contextualized with experimental metadata and converted into Tetra Data.
6. The dashboard retrieves the data through the REST API.
7. The scientists review and approve the results.
8. The approved results are automatically sent to the ELN via the Scientific Data and AI Cloud.