APPLICATION NOTE

Enhancing Technology Transfer with Data Management Technology

ACD/LABS [ADVANCED CHEMISTRY DEVELOPMENT, INC.]
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Introduction

When pharmaceutical companies identify early development candidates that exhibit promising clinical results, the project is transferred from the early development team to a centralized late-stage project team. This could be an internal group or an external contract development manufacturer organization (CDMO).

An essential aspect of the handover process is sharing information in a record called a technology transfer package. These contain an enormous amount of data to equip the late-stage development team. This information is stored in multiple silos: document management systems, LIMS, ELN, CDS, EBR, and SDMS.

This presents a challenge to the early-stage development team, the core facility team, and the department teams. They must assemble the information from multiple data sources—each with its own user interfaces and/or bespoke integrations.

This application note explains how Luminata® supports the transfer of information from early-stage to late-stage project teams.

Chemical Information

Pharmaceutical development teams need to identify all compounds (i.e., by-products, impurities, degradants, etc.) associated with a project. Chemical information that is included as part of a technology transfer package typically includes:

- Reaction schemes

- Degradation schemes
- Molecular structures
- Chemical properties
- Analytical reference data
- Data about intermediates:
    - Safety information
    - Solubility data
    - Solid form data (known hydrates/solvates) and their respective XRD patterns

Without Luminata, this data is stored in several locations where different groups would require specific instruments or software to access the information. Transferring this knowledge between facilities is challenging, requiring team members to gather the relevant data, convert it to an accessible file format, and then share the data with other teams.

Luminata allows users to store all their data together. Users can view where a molecule appears in a process or a batch using the analytical data that has been collected, as seen in Figure 1.

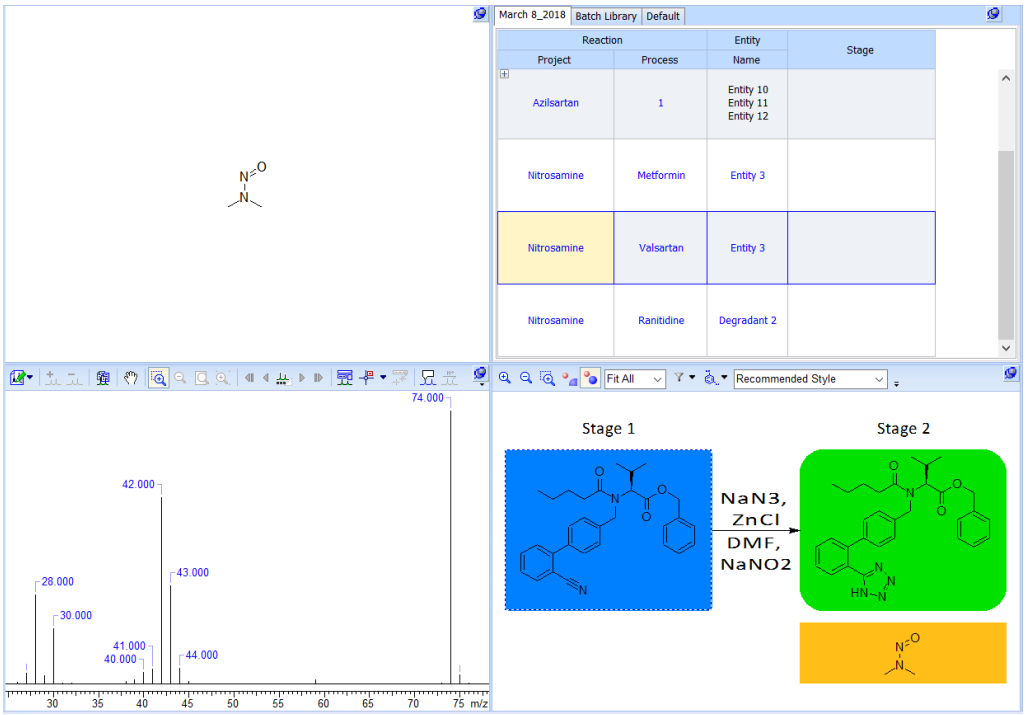


Figure 1. Composition centric view of analytical data, with a table displaying where genotoxic impurity is observed within a project.

This layout helps identify where impurities have been observed within a process. In addition to analyzing the batches or lots where a specific impurity is observed, the software allows users to track which batches have come into contact with this impurity.

Scientists can also view in-silico ADME/Tox results from other software (e.g., Lhasa, ACD/Labs) within the Luminata interface. This provides an overall assessment of the compound (see Figure 2).

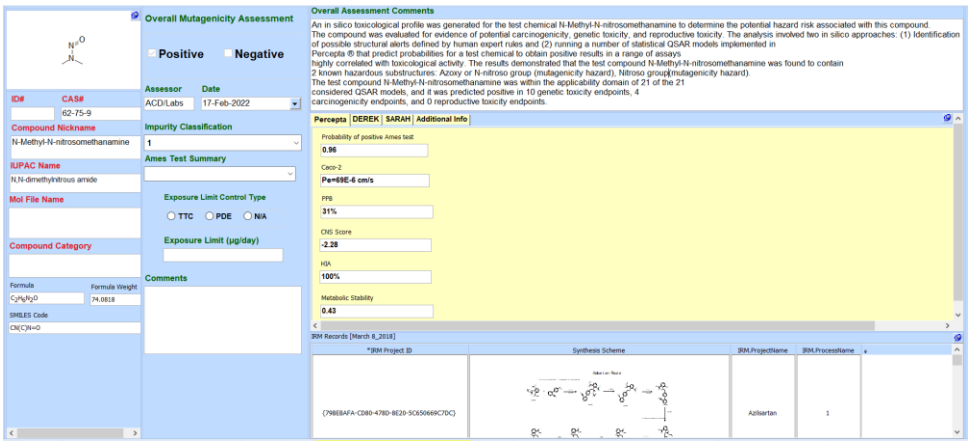


Figure 2. Tox assessment view allows users to review both experimental and in silico toxicological information for a chemical.

Processes Development Data

Process chemists complete many experiments when optimizing a process for a synthetic route. They then use Excel to consolidate results, including reaction workup and wash unit operations metadata, engineering parameters, and analytical results. Scientists will track starting material consumption, the number of impurities, and product yield. Researchers may complete 200–300 experiments per reaction stage to identify the critical quality attributes (CQAs). This process optimization data is required for late-stage development, which is responsible for completing process control justification.

Scientists can store all the data from their process optimization studies for a given project in Luminata (Figure 3). Data that is documented in Excel can be transferred to Luminata. Users can make risk assessments within this interface and view specifications from these optimization experiments.

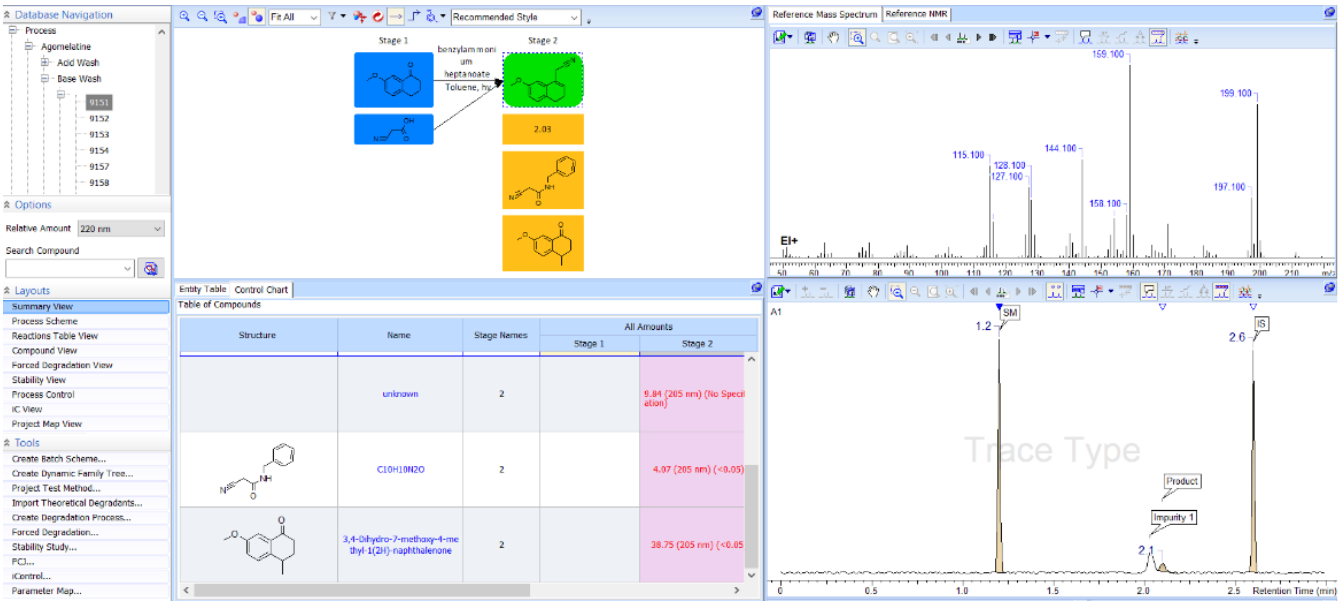


Figure 3. Process centric capabilities.

Analytical Methods and Reference Data

Analytical method transfer ensures consistent results between early and late-stage development teams. Consistency is critical to ensure results are comparable and to avoid duplicative work. Some of the essential types of analytical data that are shared between these teams include:

Reference data: this information is required for assessing the quality of in-process starting materials, intermediates, and final drug substance lots

Quality assurance data: this is required for regulatory compliance during clinical trials. This includes stability, forced degradation, control method development and validation, fate and purge studies, formulation, and process control data.

Batch/lot data: teams must have access to data for materials used or produced during GMP production of registered starting materials, key intermediates, and drug substance.

Reference and quality assurance data are required during Process Control Justification studies, which take place during late-stage development. Luminata allows users to access this analytical information when reviewing results from lab reactor studies. This significantly reduces the time spent handling data.

For batch/lot information, other software applications that handle batch creation and shipment details cannot access live analytical data. This can cause a disconnect, such as when a process is changed for a GMP batch, causing a controlled impurity to rise above a specific threshold. Luminata manages batch/lot analytical data within

the Batch Library (Figure 4). Users can stack chromatograms across batches, which helps identify performance irregularities resulting from process route changes.

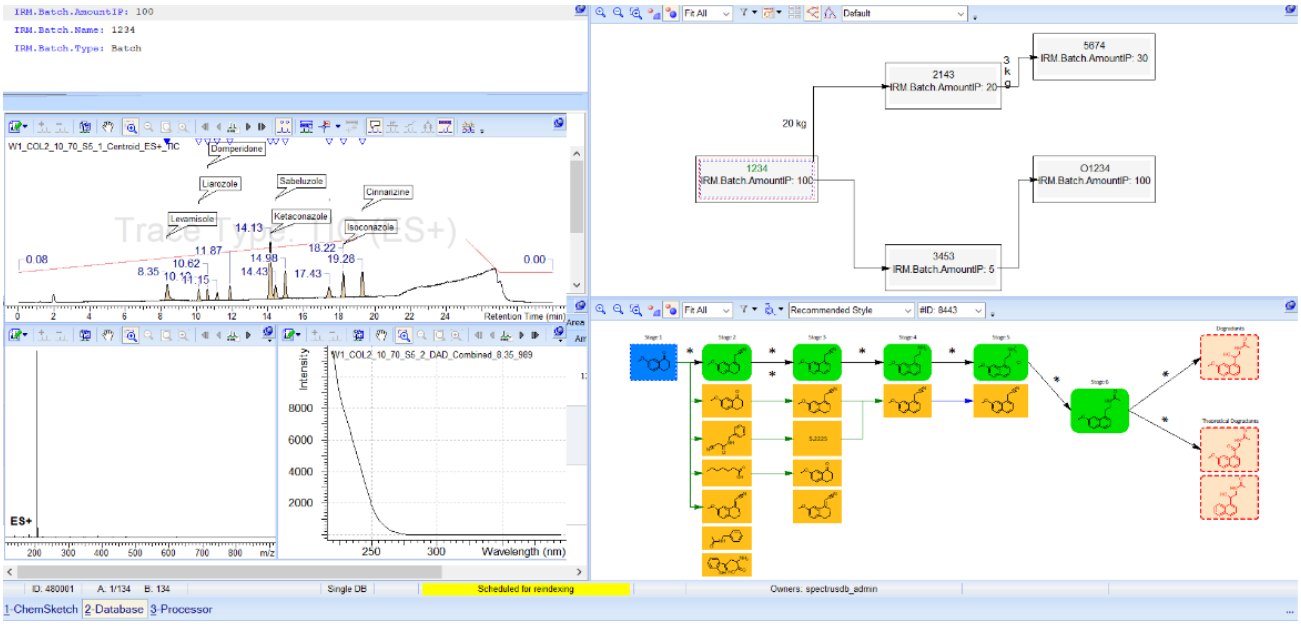


Figure 4. Representation of the Batch Genealogy Family Tree with related analytical and metadata.

Formulation Data

One of the objectives of early-stage development is ensuring the formulation used in Phase I clinical trials can be developed into a manufacturable product by the late-stage team. This requires sharing pH, solubility, polymorphism, and stability data.

In addition to drug substance data, Luminata can be used to manage drug product development. Users can compare unit operations (*i.e.*, blending, granulation, mixing, etc.), excipient studies, dissolution studies, and elemental impurities related data. Figure 5 highlights drug product data that can be stored with analytical results.

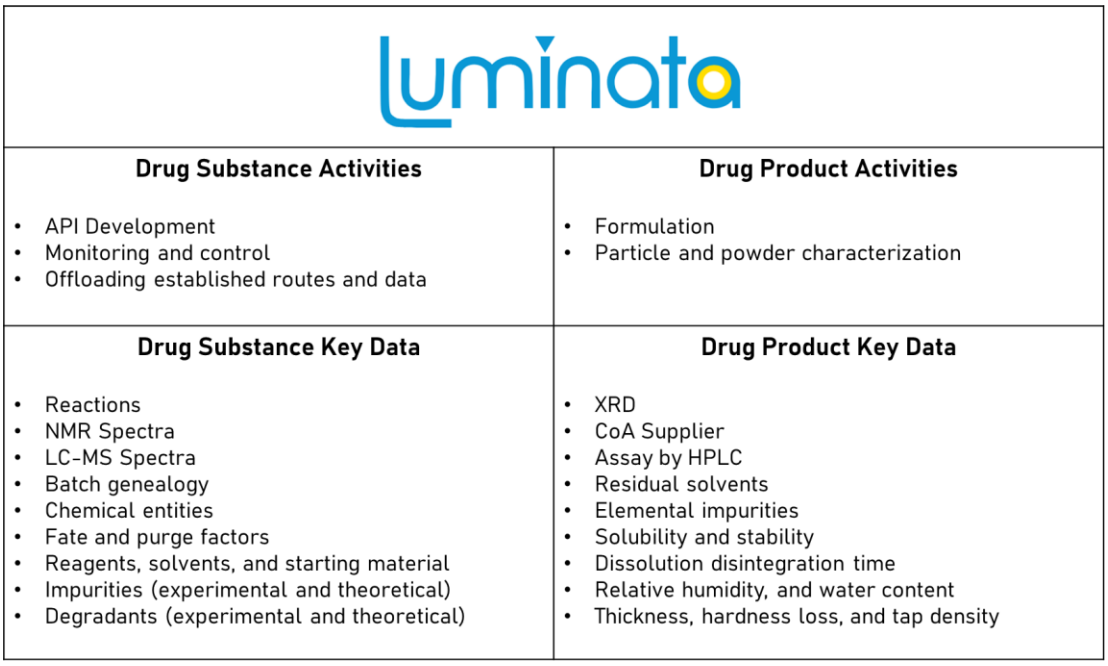


Figure 5. Luminata Usage within DS and DP and how the application can account for all the data of interest within the drug development life cycle.

Extractables & Leachables

Luminata can be used for extractables & leachables (E&L) studies for pharmaceutical packaging materials, medical devices, and drug delivery systems. During E&L studies, analytical data is used to assess the packaging performance under a range of conditions. Conventionally, scientists must transcribe analytical data and metadata to spreadsheets for each project, which becomes difficult to manage and read.

With Luminata, information is organized into an E&L map, which allows users to quickly access, visualize, and compare testing results for bottles, syringes, container-closure systems, and packaging. The project team would then hand off this E&L data for validation or further development to the late-stage team.

Figure 6 shares the results from a test procedure for polyethylene, which formed various impurities depending on the extractable test conditions. Previously, users would need to compile information from several Excel documents to access these results.

Entity Table | Control Chart

Table of Compounds (Records for Stages "Extractables" from Project "EnL DEMO EXAMPLE" and Pr

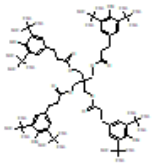
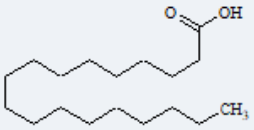
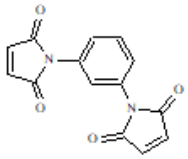
Structure	Name	*8448* Extractables	*8455* Extractables	FW
	Irganox 1010	---		1177.6314
	Stearic Acid	---		284.4772
	phenylenediamaleimide		---	268.2243

Figure 6. Comparing E&L test procedure studies.

Conclusion

Transferring knowledge between project teams or to a CDMO presents several challenges. Knowledge assembly efforts can take significant time because the data is spread across multiple systems. Luminata can deliver value to organizations by accelerating project timelines and simplifying data transfer from the early-stage team to the late-stage team.