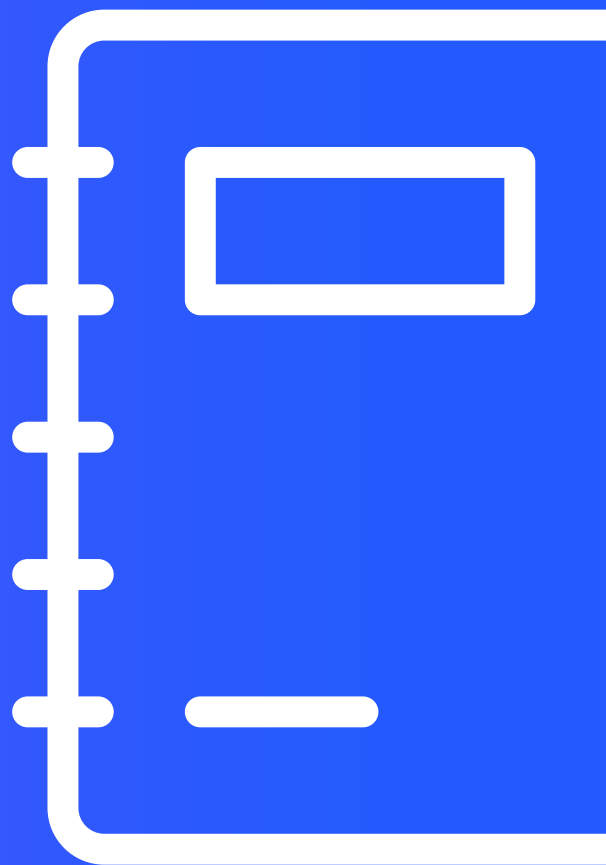




# Taking your lab digital

What to know about  
bringing electronic lab  
notebook technology  
into your R&D lab



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# What is an electronic lab notebook?

Before we talk about integrating an electronic lab notebook (ELN) into your life science R&D lab and ELN best practices, it's important to fully define the capabilities you can get out of an ideal ELN platform; the differences between a paper lab notebook and an electronic lab notebook can provide some benefits you might not expect.

## Like a paper notebook, it's a record of your work

The traditional paper-based lab notebook has been around as long as science has, helping scientists keep track of experiments and observations that are later collected, analyzed, and published. In modern times, the lab notebook also plays a critical legal role in documenting when discoveries happen and who should be credited with the discovery for intellectual property purposes.

At its most basic level, the electronic lab notebook can also provide these same functions. Instead of recording the day's experiment(s) in a lab notebook, signing each page, and having a colleague witness your signature, you type everything into a computer interface and use electronic signature technology.

But when you transition from recording experiments on paper to a digital format, you can gain so much more.

## It's a tool that facilitates searching through studies

One of the first things people think about when they consider moving to an electronic lab notebook is the ability to easily find things like experimental records and data. You get all the benefits of digital search tools to locate specific entries or keywords, and with the best platforms, you also get advanced search tools that can constrain your search and filter results by parameters such as a cell line, plasmid, or other reagent used in the experiment.



## It's a tool that can completely change how your team derives insight from data

One of the most significant benefits of an electronic lab notebook over a paper lab notebook stems from the way it shifts the basic organizational unit for recording studies from the notebook to the individual experiment. The implications of this shift become really exciting when you think about team-based R&D.

With paper-based record keeping, one of the challenges is that the notebook is the basic organizational unit, since you can't remove or add pages (unless you are using a binder, which is not very defensible from an intellectual property point of view). It constrains each scientist to a linear, day-by-day structure which can be difficult to search through and complicated to manage if that scientist is multitasking and running small parts of different studies in a single day.

In contrast, with an electronic lab notebook you are no longer confined to a single, linear, inflexible way of organizing your experiments. You can keep information from multi-day and multi-person studies organized together, making it easier to tie experimental protocols to results and to pull together data for analysis.

The best ELN platforms take this organizational fluidity even further. For example, with Benchling, you can create an entry in Notebook, the application

“As a company at the forefront of cancer immunotherapy, Jounce is making valuable scientific discoveries to develop novel therapeutics. Benchling empowers us to mine our data and answer complex scientific questions across multiple projects and labs.”

Todd Rowe  
Associate Director Research  
Informatics, Jounce Therapeutics



for recording experiments, and link that entry to specific samples, plasmids, cell lines, and other reagents that are tracked in the Registry application. This capability simplifies the process of assembling critical information for analysis by ensuring that all the information you need — the protocols, the data, and the plasmids, strains, and other reagents — is readily available and up-to-date.

Note that while Benchling has ELN capabilities with the Notebook application, it's actually a unified lab productivity platform that moves beyond the typical definition of an electronic lab notebook.

For example, with Benchling's Insights application, which works seamlessly with Notebook, Registry, and all of Benchling's other applications, you can gain scientific, operational, and administrative insights that paper-based systems can't deliver. Through easily configurable dashboards and reports, scientists can quickly share, group, and analyze data to make connections that could otherwise have been missed. Lab managers can stay on top of lab operations, ensuring that scientists have everything they need to stay productive. And administrators and executives can get information to optimize program management, resource use, and more.

## **It's a tool that can increase efficiency and make the task of recording experiments easier**

One worry that people often have when thinking about switching to an electronic lab notebook is that entering information may be harder and take more time. Instead of quickly jotting down tables, drawing chemical compounds, and pasting or taping in gels, plasmid maps, and other information, you have to learn the ELN's interface, which may be challenging. There are definitely electronic lab notebooks that have clunky user interfaces and that don't integrate well with other programs, making it difficult to import images, tables, and data.

The best ELN platforms go beyond simply replicating the paper lab notebook experience and capitalize on the advantages of the digital environment. For example, with Benchling Notebook, you can actually make the chore of recording the day's experiments easier and faster through the use of templates that can include checkboxes and pull-down menus. Benchling Molecular Biology makes it easy to create entities like plasmid maps and link them to all relevant Notebook entries. And you can integrate data collection instruments such as liquid handlers into the Benchling platform, saving time and reducing errors from manual data entry.



In all, the average Benchling user saves 9 hours per week through efficiency improvements from these and other Benchling features.

### **It's a tool that can simplify standardization and compliance**

A good electronic lab notebook not only supports insight generation and regulatory compliance, it can make these two activities faster and easier.

The same template capabilities that make it easy to use Benchling for recording experiments can also make comparison and analysis easier by enforcing standardized record keeping. This includes tables within Benchling Notebook entries, as tables can be configured with predefined fields for templated data entry.

Benchling also provides customizable witnessing and review processes, with electronic signatures, audit trails, and automatic versioning so you never lose critical information.

“Benchling has improved our efficiency and provided the team with transparency on high quality data.”

Diana Eng  
Fermentation Process Development  
Scientist, Bolt Threads

What Is an Electronic Lab Notebook? It's a small part of what Benchling can offer. Join over 300,000 scientists using Benchling to power life science R&D.

[Request a Demo](#)



## ELN Integration

### Understanding the ways an electronic lab notebook platform connects your R&D lab and how Benchling makes ELN integration easy

If you're considering bringing electronic lab notebook (ELN) technology into your life science R&D lab, you may be wondering what software platforms and instruments you will be able to connect it to and how easy that connection will be to make and maintain. While the answer to those questions will definitely vary by platform, the questions themselves highlight one of the challenges you'll find with many ELNs; because most electronic lab notebooks only enable a small fraction of a life science R&D lab's digital workflows, you need to integrate them with other software and instruments to get the full benefits of searchability, organization, and insight generation that come from going digital (read more about these benefits in Chapter 1 of this eBook, *What is an electronic lab notebook?*).

For many ELNs, integration requires custom coding, especially if you're connecting to a lab information management system (LIMS). And, depending on the respective platforms, that connection can be clunky and will require updates as software and hardware platforms update.

### Benchling sidesteps the need for several common types of ELN integrations

Benchling simplifies ELN integration by virtue of being more than an electronic lab notebook. Most of the functionality commonly accomplished by ELN integrations — such as inventory management, process management, and registration — are already supported by features natively built into Benchling's unified, cloud-based platform. This gives you a seamless digital experience out of the box, across applications that would normally be distinct systems.

In addition, Benchling enables you to integrate any instrument, software, or database using our fast, reliable, and well-documented REST APIs. We've worked with hundreds of biotech companies to build integrations with everything from custom software, to liquid handlers, to Amazon S3 buckets, resulting in more uniform data capture, more centralized data storage, and more automated and efficient operations.



Here's an overview of capabilities that typically have to be integrated with an ELN – but that are natively built into Benchling:

## Benchling Applications:



**Notebook:** The most user-friendly electronic lab notebook in the industry — reduce time to data entry by 85% with the first cloud-based notebook built for modern life science.



**Molecular Biology:** A comprehensive molecular biology suite of 10+ tools in one collaborative environment — build, share, and record DNA, oligonucleotides, and amino acid sequences in one unified platform.



**Registry:** A convenient and easy-to-use registration system built from the ground up for large molecule R&D — model biological entities and easily enter and extract the data you need.



**Inventory:** Track the locations of vials, wells, batches, and more, and automatically link results to them.



**Requests:** A single system for request submission and fulfillment — track request progress in real-time and optimize resource allocation.



**Workflows:** A digital process management platform for early research through development — organize any scientific workflow into trackable stages and test new variations to optimize your outputs.



**Insights:** Easy-to-configure dashboards and reports provide a full view of R&D — everyone from scientists and managers to executives can have customized dashboards to deliver the answers that *they* need.





## Benchling Platform:



**Lab Automation:** Synchronize informatics and instrumentation to drive efficiency and maximize the potential of your full suite of molecular laboratory tools.



**Validated Cloud:** Unify R&D teams for easier collaboration and data management to accelerate time-to-market while meeting compliance requirements with a modern cloud architecture and enterprise-grade security.



**Codeless Configuration:** Configure and reconfigure workflows without a single line of code so you can quickly adapt and align to your evolving R&D process, resulting in rapid prototyping, full deployment, and fast time to value.



**Developer Platform:** Integrate any instrument, software, and/or database with Benchling to centralize your data and enable automation. It comes equipped with APIs, Events, and Data Warehouse, so you can connect Benchling to existing IT infrastructure with ease.

“Benchling gives transparency across the company. Because everything is in one place, our scientists don’t have to jump from system to system. They can quickly get all the details and all the data associated with any construct or experiment. By keeping a good registry of constructs and the associated assay data, we’re able to extract learnings from it that we otherwise wouldn’t have.”

Vipin Suri  
Vice President of Discovery, Obsidian



## Electronic lab notebook best practices

Just as with paper lab notebooks, there's a set of electronic lab notebook best practices to bear in mind when considering which electronic lab notebook (ELN) to purchase, as well as when implementing an ELN in your lab.

### Set up robust, up-to-date templates

At its heart, the main goal of the ELN is the same as the paper lab notebook: to keep track of experiments and data so you or someone else can review what you've done and reproduce your experiment. Many electronic lab notebooks let you set up templates to speed recordkeeping while helping users capture all critical data in a standardized format. The trick is to create templates that are rigid enough to ensure that users provide the required information while being flexible enough to cover a range of study types.

Depending on the type of lab you are in — whether it leans more towards discovery or to development — you may want to define templates in different ways. Here are a few organizational methods to consider:

- By type of study (i.e. strain generation, protein extraction, assay optimization)
- By scale (i.e. small-scale growth, 10L fermenter growth, production scale growth)
- By team

Regardless of how you design and organize your templates, you should develop a control and maintenance plan. Each template collection should have an identified lead who is responsible for developing that set of templates and is the only person with the ability to edit those templates. The template collection lead can also schedule regular template reviews to obtain their team's input into template structure and to identify which, if any, templates are outdated and in need of retirement.



A few template features specific to Notebook, Benchling's ELN application, are always recommended as electronic lab notebook best practices by our implementation team because they greatly simplify the user experience. These features include the ability to create structured tables and placeholders for specific types of file attachments.

Adding structured tables to templates in Notebook makes the process of pulling data from other Benchling applications – such as Registry, Results, and Inventory – into the Notebook a seamless and straightforward process. In fact, the user won't even realize that they are accessing a different application. Structured tables also help to ensure that data is being captured in a consistent and repeatable way across the organization, making it easy to search for and mine data.

[Benchling's implementation team is experienced at helping all types of labs set up Benchling and can provide guidance on template structure.](#)

## Set up standardized naming conventions and metadata fields

When setting up an electronic lab notebook system that will enable multiple users to collaborate, using a uniform file naming convention is critical to ensure data is easily findable.

One example of a file naming convention is:

[Project name\\_scientists name\\_date \(YYYYMMDD\)](#)

For certain types of electronic lab notebook entries, you may want to ensure that specific metadata about that entry is captured and associated with its digital record. For instance, you may want to capture which plasmids are mentioned in the entry. Selecting a system that gives you the flexibility to structure and search by your entries' metadata gives you an additional layer of access and insight into your data.

[Benchling's implementation team can help you develop a plan to rename files to a uniform system.](#)



## Set up a robust user permissions hierarchy

While not every ELN can provide different levels of access via permissions, we recommend mapping out the different user needs, capabilities, and electronic signature requirements before you implement your electronic lab notebook platform.

For example, many of Benchling's customers give end users **Read** access to Notebook templates so they can create new Notebook entries using those templates, but only designated administrators get **Write** or **Admin** access. This ensures that scientists don't accidentally edit or, worse, delete critical templates, keeping your processes standardized and your data clean.

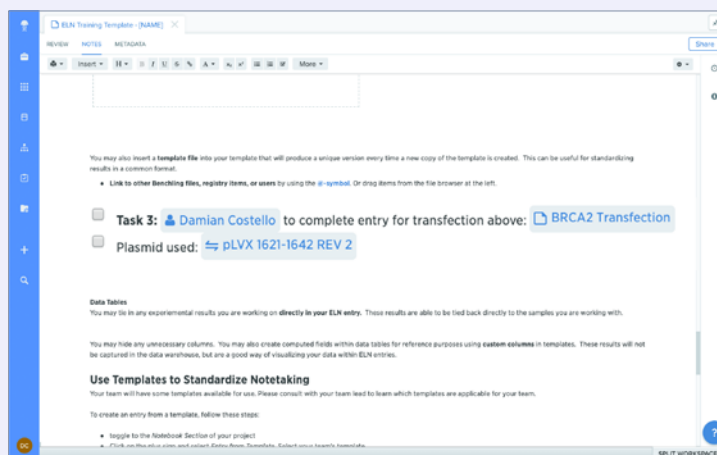
Benchling's codeless configuration capabilities make it easy to change user permissions as needed without writing a line of code.

## Tips specific to Benchling

If you're considering bringing Benchling into your lab, here's a tip from our team. You can [see other Benchling tips and tricks from our team here](#).

**To share results and enable collaboration, @-mention your colleagues in your notebook entries.**

The @-mentioning feature also allows you to tag other members of your organization in your notebook entries. Our team recommends using this feature when you want to share notes or data with your collaborators. The collaborators who are mentioned in the entry will receive an email notification.



# Taking your lab digital

Fully digital recordkeeping — including automated data capture from instruments — is clearly the future of the modern life science R&D lab, and electronic lab notebooks are a powerful and essential part of that future. But ELNs are only a first step. Benchling can help your lab gain all the enhanced data insight and operational efficiencies that a fully integrated life science R&D cloud platform can offer.

Bring life to your life science R&D with Benchling.

Protein Expression & Purification Entry

EXP17001593 In progress

Sample ID	Container	Stage Run
pBIO004-20170928	Search container...	Prot1

SATURDAY, 6/1

- Express plasmid in appropriate cell line
- Grow cells
- Purify protein
- Register new protein
- Record yield

pUC19-CMV-Gene-GFP

Lac Operator Start  
Lac\_Promoter  
Promoter 1  
GFP  
4500  
GFP REV  
500  
FWD  
REV  
4000

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