
Keeping an Electronic Lab Notebook

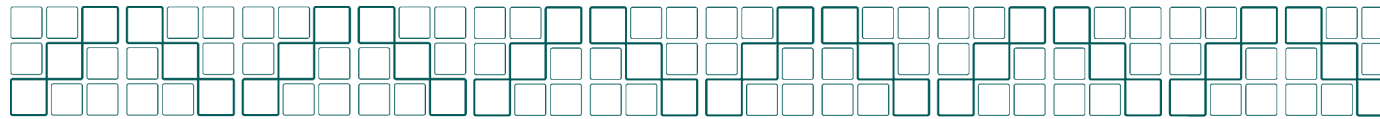
Basic Principles and Best Practices

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Office of Intramural Training and Education



NATIONAL INSTITUTES OF HEALTH

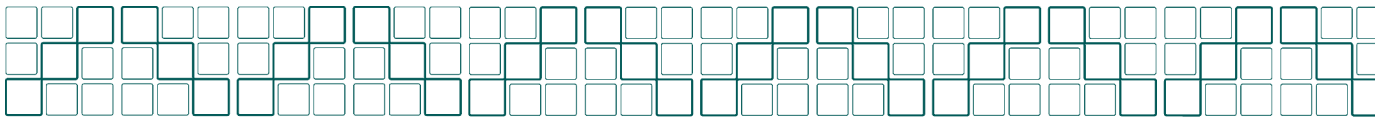


Overview

- Introductory material
 - What is a lab notebook?
 - Electronic lab notebook

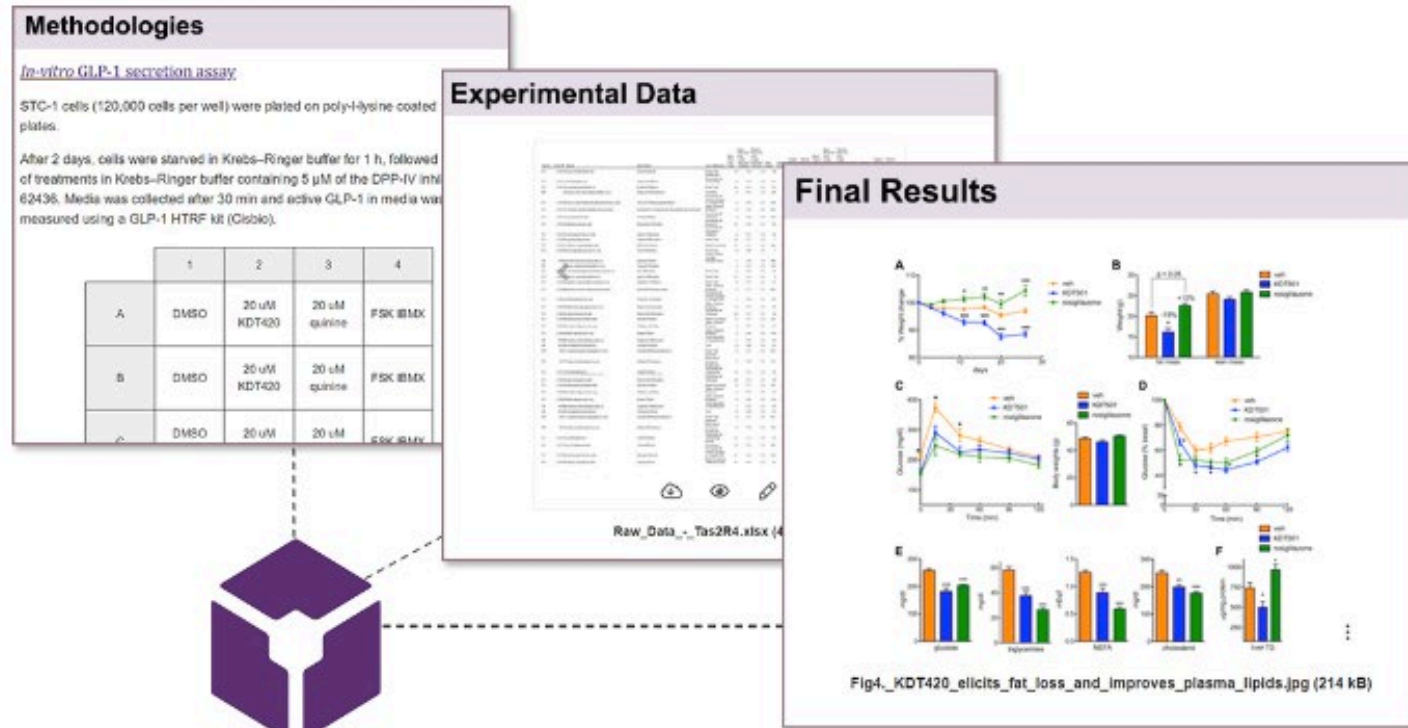
- Lab notebook dos and don'ts
 - Structure and organization
 - Lab notebook ethics

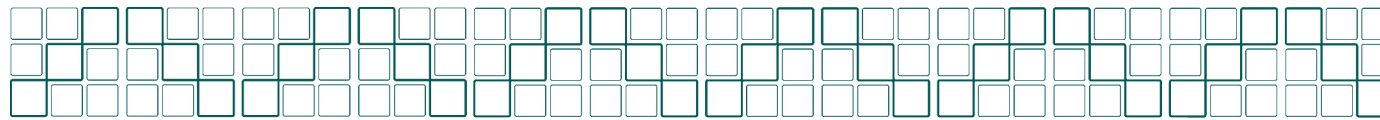
- Examples of good notebooks



A lab notebook

- A lab notebook is a **complete record** of the rationale for your experiments, the methods by which the experiments was performed and the results/interpretation of your data.





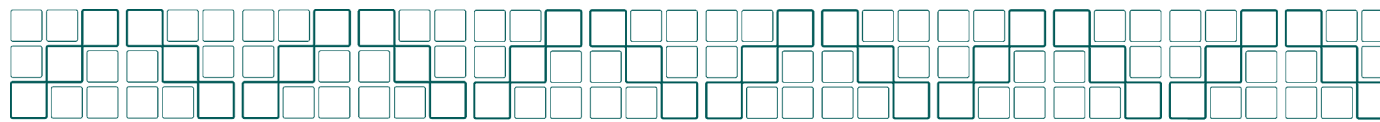
A Lab Notebook Is Not...

- A journal- *a daily record of news and/or events of a personal nature*

- A record of communications- *dictation of conversations with others.*

- A place to compile lab protocols/manuals- *a general book with instruction to perform specific techniques in the lab*

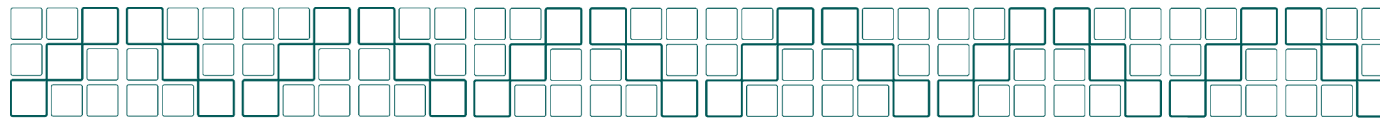
- Yours to take with you when you leave NIH- *the lab notebook is property of NIH/the lab*
 - *A copy can be made if given official permission*



Electronic Lab Notebook (ELN) –

a system used to create, store, retrieve, and share the electronic research records in compliance with NIH records management and security requirements, replacing paper notebooks.

- As of June 30, 2024, the only approved form of NIH lab notebook is the ELN.
 - Lab Archives – discipline-agnostic ELN, documents research across multiple domains.
 - Signals- Chemistry-specific ELN which extensively supports molecular biology.
 - MS Documents with Records Management Module on a MS Platform
 - NIH Server: SharePoint or Microsoft Teams
 - ICs may request other platforms



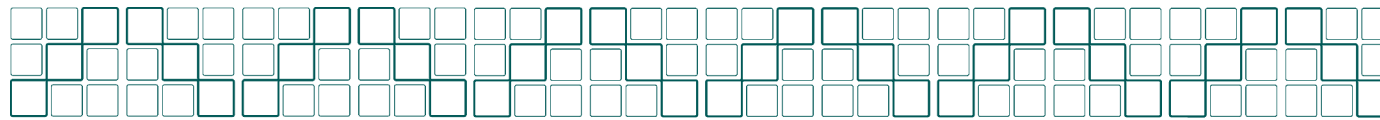
Pros and Cons of Electronic Lab Notebooks

Pros

- Facilitates good data management practices
- Easy to search, copy and/or archive
- Easily linkable to other resources (files, PubMed, etc.)
- Data is sharable
- Easily stored on via the cloud

Cons

- Network interruptions – delays downloads, uploads, and/or viewing.
- Risk of security breaches and/or data loss in non-FedRAMP platforms
- Software compatibility



What Goes in the Electronic Lab Notebook

- Notebook name
- Inside the folder
 - General project name
- Body of notebook
 - Experimental entries
 - Background
 - Experimental design
 - Procedures
 - Reagent, sample prep, equipment and biospecimens used
 - Observations/raw data
 - Data analysis
 - Interpretations, conclusion, next steps

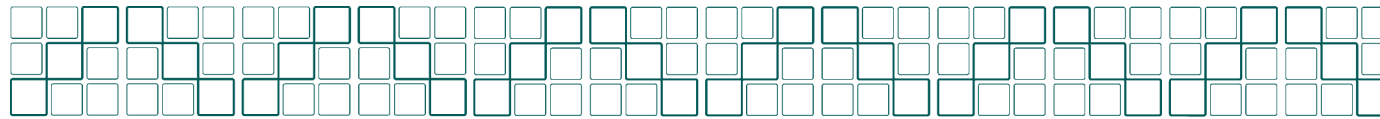
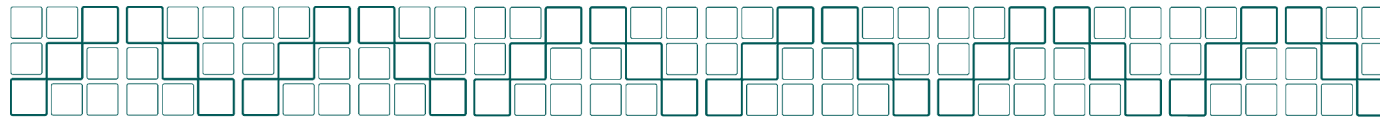


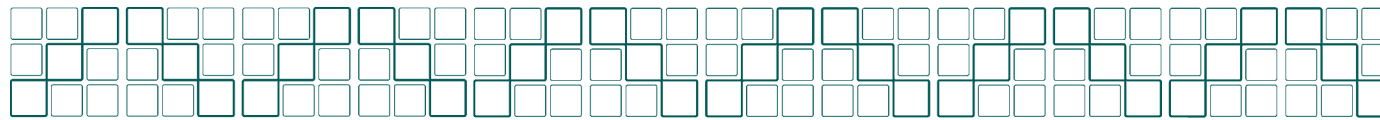
Table of Contents

- Most ELNs automatically generate a table of contents
 - Page number
 - Date/time
 - User's name
- If you are using MS Documents, you will need to add:
 - Your name
 - Date/time
 - Page numbers



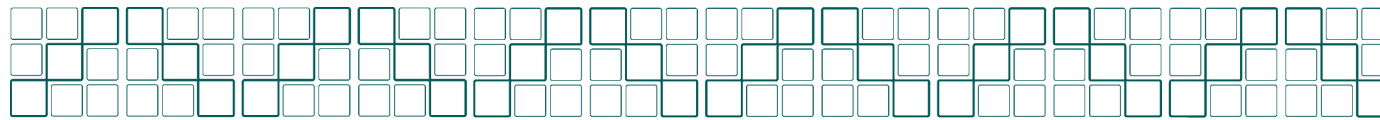
Experimental Entries

- Title
- Hypothesis or Goal: Brief statement of purpose
- Background/rationale
- How: Protocols, calculations, reagents, equipment
- Observations:
 - All that happens (planned or unplanned)
 - Raw experimental data
 - Linked in information or reference to data location
- Data analysis:
 - Processing of raw data, graphs, interpretations, links to source data repositories
- Ideas for future experiments



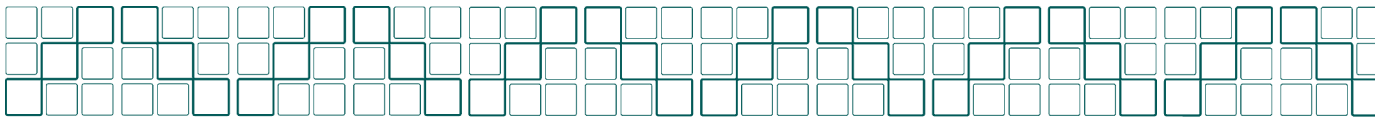
The Details of “How” - Methods

- Reagents
 - Name, source, product number, lot number, expiration date, how and where stored
- Solutions and how they were made and by whom
- Cells used
 - Type, source, passage number, growth medium/supplements, date of last STR and mycoplasma
- Instruments
 - Type, name, location, serial number
- Number and volume of washes
- Centrifuge speeds, temperature and duration of spins
- Heating rates and levels of agitation
- Time between and during steps
- Gel percentages



Ethics

- All data goes into the notebook
 - Even "bad" data points or “outliers”
 - Failed experiments or contradictory experiments
- With LabArchives, you cannot delete your data
 - You can only delete your personal comments
- Using MS Documents
 - Do not delete mistake, strike through them.
- Correct mistakes, do not remove them
 - Cross out mistakes with a single line
 - Type in corrections without covering anything
 - Initial and date all corrections
- Honesty is the best policy



Example



Search Notebook

- ▼ Lab Resources
 - ▶ DMP
 - ▶ LabArchives Onboarding
 - ▶ Workflows
 - ▼ Protocols
 - ▶ Cell Culture
 - ▶ Microbe
 - ▼ Cloning
 - ▶ Snapgene Workflows
 - ▶ Gibson Assembly
 - ▶ NEBuilder HiFi
 - + New...
 - ▶ Proteomics
 - ▶ ABPP
 - ▶ In-Vivo

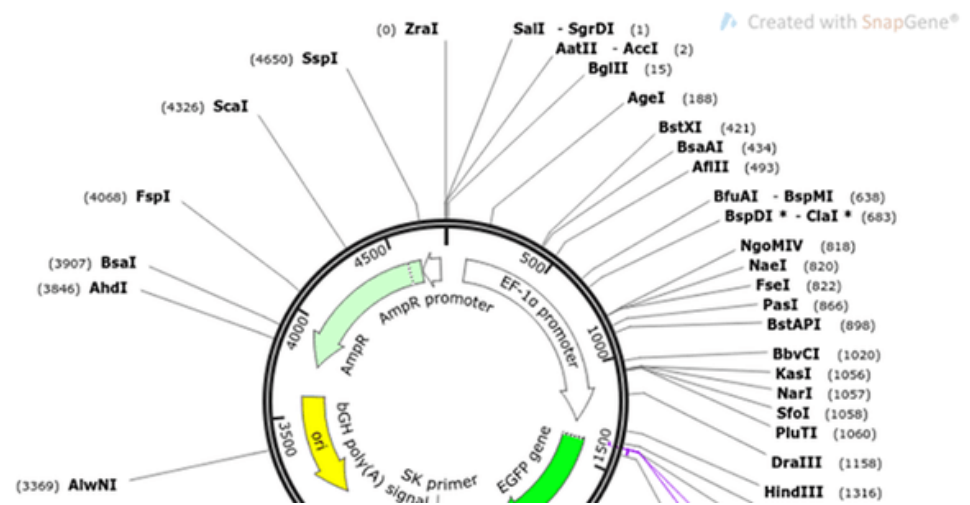
Calculations

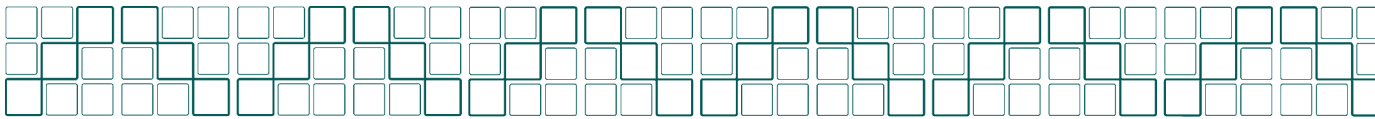
John Doe - Jun 27, 2023, 6:42 PM PDT

Primer	Sequence	Length	Tm (°C)	GC %
Fragment.FOR	GGTCGCCACCatgaaggccactatcatcctcc	32	69	59%
Fragment.REV	TGCTCACCATcttatagtttccgagttgatggcagagc	39	67	46%
Vector.FOR	aaactataagATGGTGAGCAAGGGCGAG	28	62	46%
Vector.REV	tggccttcatGGTGGCGACCGGAAA	25	69	60%

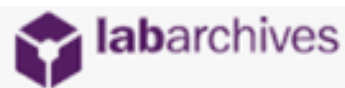
Plasmid Design

John Doe - Jun 26, 2023, 5:23 PM PDT





Example



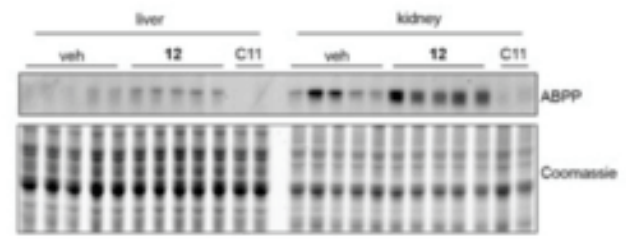
Search Notebook

LYPLAL 1 Activator Compound SAR

+ New Rich Text Attachment Office document

LYPLAL 1

John Doe - May 19, 2023, 5:45 PM PDT



LYPLAL1_part_1.png (86.9 kB)

John Doe Best one yet!!!
May 19, 2023, 5:50 PM PDT

Jane Doe This looks great. I think this is publication ready! @John_Doe_2 what do you think?
May 20, 2023, 9:23 AM PDT

@John_Doe_2 @Jane_Doe_1 Great work! Remember to create another copy in the final results folder

Add Comment



Example

labarchives Search Notebook

Notebooks 25 > **Compound 882-1** + New Attachment Office Document Heading

ABPP Figures - LYPLAL1 OVXP Cell Lysate

John Doe - Jun 16, 2023, 1:53 PM PDT

LYPLAL1 ABPP 1R01AG065456-01A1

Figure 4.

Concentration (M)	% total ABPP (Compound 4)	% total ABPP (Compound 12)
0	~80	~80
10 ⁻⁶	~80	~80
10 ⁻⁵	~75	~70
10 ⁻⁴	~50	~30
10 ⁻³	~30	~25

LYPLAL1_ovxp.png (219 kB)

John Doe - Jun 16, 2023, 1:53 PM PDT

(a) Representative analogues of **4** that display greater potency and efficacy on LYPLAL1 overexpressed in HEK293 cells, as assessed by gel-based ABPP. Western blots of LYPLAL1 and HSP90 (loading control) are shown in the bottom panels.

(b) Endogenous LYPLAL1 is selectively activated in total HepG2 proteomes treated with 10 μ M **12** (or PAL-12) for 1 h and then labeled with FP-alkyne for 20 min prior to attachment of an azide-biotin tag and ABPP-

Example

Search notes

Table of Contents

Tags

Sample tags

Linked files

Link to other pages

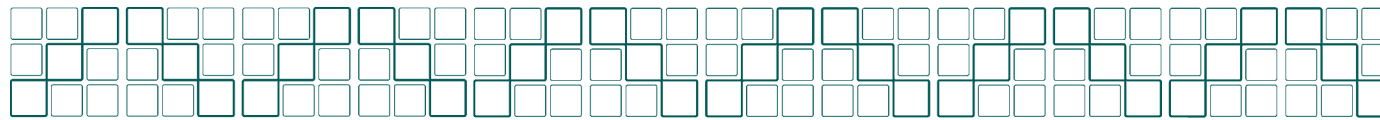
Linked file "Quick Look"

10-Fluorescence Measurements to measure DNA binding - MM-streptavidin

- Compare binding to streptavidin-coated particles
- Procedure:
 - Coupling: 13-07-09 Coupl...in particles.docx 92.0 KB Quick Look
 - Particle concentrations and standards: 13-07-09 Com...vidin particles.xlsx 67.1 KB Quick Look
 - Particles: EB-35
- Experiment: [Page 35 - 1-Subject Notebook 2](#)
- Results:
 - Fluorometer: EB-34 and EB-35.xlsx 18.0 KB Quick Look
- Analysis:
 - EB-35.pzfx 14.1 KB
 - There may be a problem with the data
 - Concentration bound up

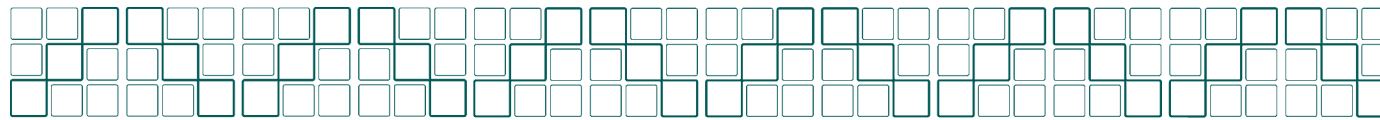
	3	4	5	6	7	8	9
0 A	306	303	284	367	10	9	4
1 B	23	19	19	26	107	122	85
2 C	7085	7103	6354	5445	185	227	164
3 D	9	7	5	7	224	271	211
4 E	6	8	6	5	283	273	235
6 F	10	10	10	6	574	617	413
8 G	11	10	12	9	647	647	474
10 H	11	9	9	8	429	490	531

EB-35 EB-34 Sheet1 **15**



PI Responsibilities Around Recordkeeping

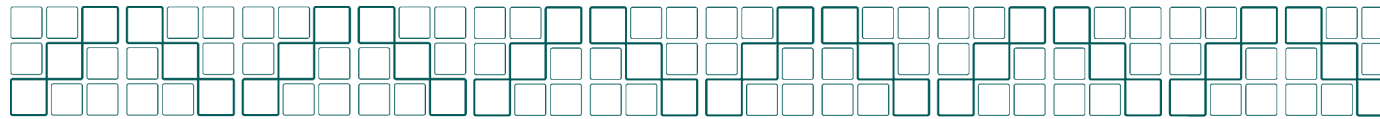
- PI should establish best practices for the ELN in the research group
 - includes practices related to collecting, labeling, annotating, storing, editing, cleaning, auditing, processing, excluding, analyzing, and sharing data
- PI should serve as the Notebook Owner within the ELN system so that they remain under the control of and available to the PI at all times.
- Ensure that all staff receive proper instruction on ELN
- Establish processes for regularly reviewing data (especially primary data)
- Assumes ultimate responsibility for the integrity of the data that is entered into the ELN



The transition to ELNs

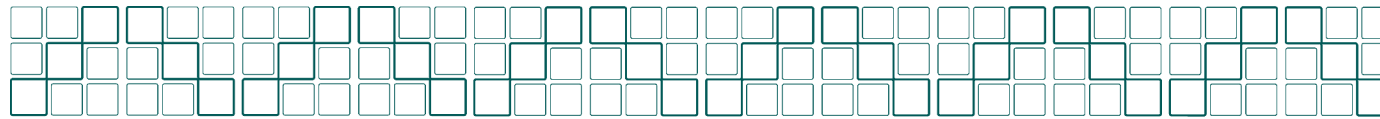
No new paper lab notebooks created by IRP after June 30, 2024

- **New research** started after 6/30/2024 must be documented in an approved ELN.
- Ongoing research must be transitioned to an approved ELN by 6/30/2024.
- Final documentation of research expected to conclude shortly after 6/30/2024 but no later than 12/31/24 may be completed using the existing laboratory notebook, if no new paper notebook will be created.
- Legacy paper laboratory notebooks used for scientific reference do not need to be transferred to ELN but need to be managed in accordance with records management requirements.



References

- Guidelines for Scientific Record Keeping in the Intramural Research Program at the NIH
 - https://oir.nih.gov/system/files/media/file/2023-11/guidelines-conduct_research.pdf
- Writing the Laboratory Notebook, Howard Kanares, ACS 1985
- LabArchives
 - <https://www.labarchives.com/>
- NIH Sourcebook
 - <https://oir.nih.gov/sourcebook/intramural-program-oversight/electronic-lab-notebooks/>



Acknowledgements

- Charu Chaudhry, PhD
 - NICHD

- Garland Crawford, PhD
 - NIAMS

- Nicholas Fritzkee, PhD
 - NIDDK