



La science pour la santé
From science to health

Déploiement du cahier de laboratoire électronique à l'INSERM et nouvelles perspectives

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Pourquoi le cahier de labo électronique?

Version papier



Journal de bord:

- Preuve juridique,
- Traçabilité, qualité,
- Gestion de la connaissance.

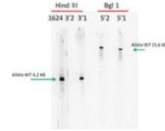
Version numérique (ELN)

Taq DNA Polymerase

The Polymerase Chain Reaction (PCR) is a powerful and sensitive technique for DNA amplification. Taq DNA Polymerase is an enzyme widely used in PCR. The following guidelines are provided to ensure successful PCR using NEB's Taq DNA Polymerase. These guidelines cover routine PCR. Amplification of templates with high GC content, high secondary structure, low template concentrations, or amplicons greater than 5 kb may require further optimization.

Step	Temperature	Time
1. Initial Denaturation at 95°C	95°C	30 sec
2. 30 cycles of: Denaturation at 95°C	95°C	30 sec
3. 30 cycles of: Annealing at 55°C	55°C	30 sec
4. 30 cycles of: Extension at 72°C	72°C	30 sec

PCR Purification



- Horodatage, versioning, signature électronique,
- Gestion des inventaires et instruments,
- Indexation, moteur de recherche,
- Intégration des données numériques,

- + *Travail collaboratif et accès distant,*
- + *Management des équipes et des projets.*

Comment s'est fait le choix entre les différentes solutions?

Pré-étude de 9 solutions

- Labguru, Biodata;
- Hivebench, Elsevier;
- LabCollector, AgileBio;



- Plateforme d'expérimentation



Objectifs

- Expérimenter une solution d'ELN et évaluer son impact.
- Choisir une solution dédiée à la biologie, collaborative, centrée sur le laboratoire et hébergeable en interne.

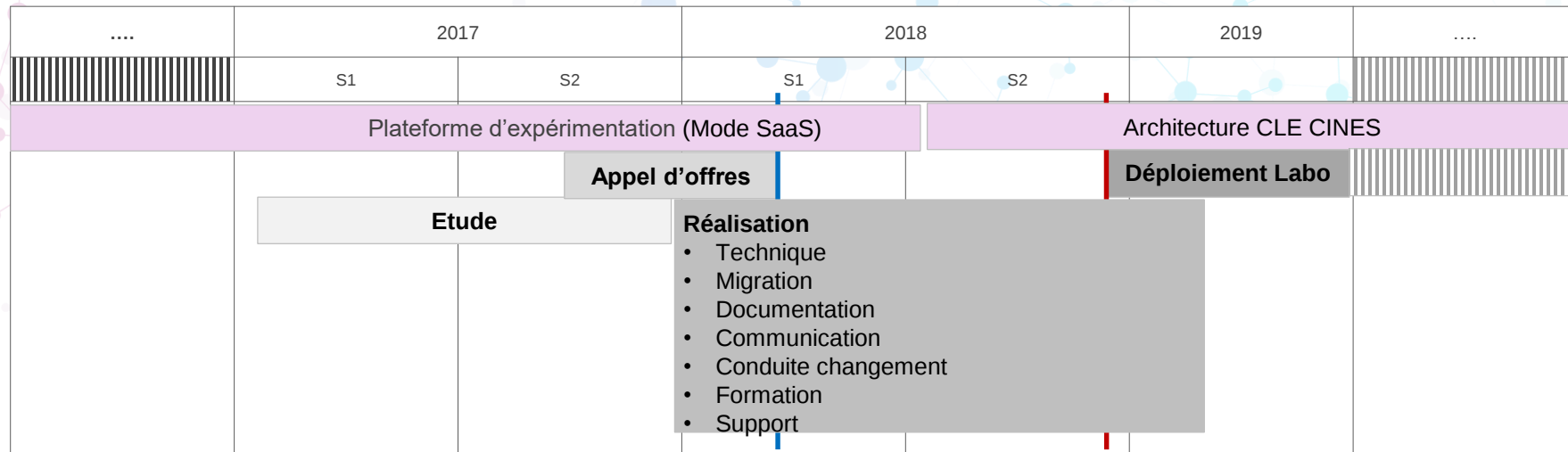
Périmètre

- 250 utilisateurs pendant 2 ans.

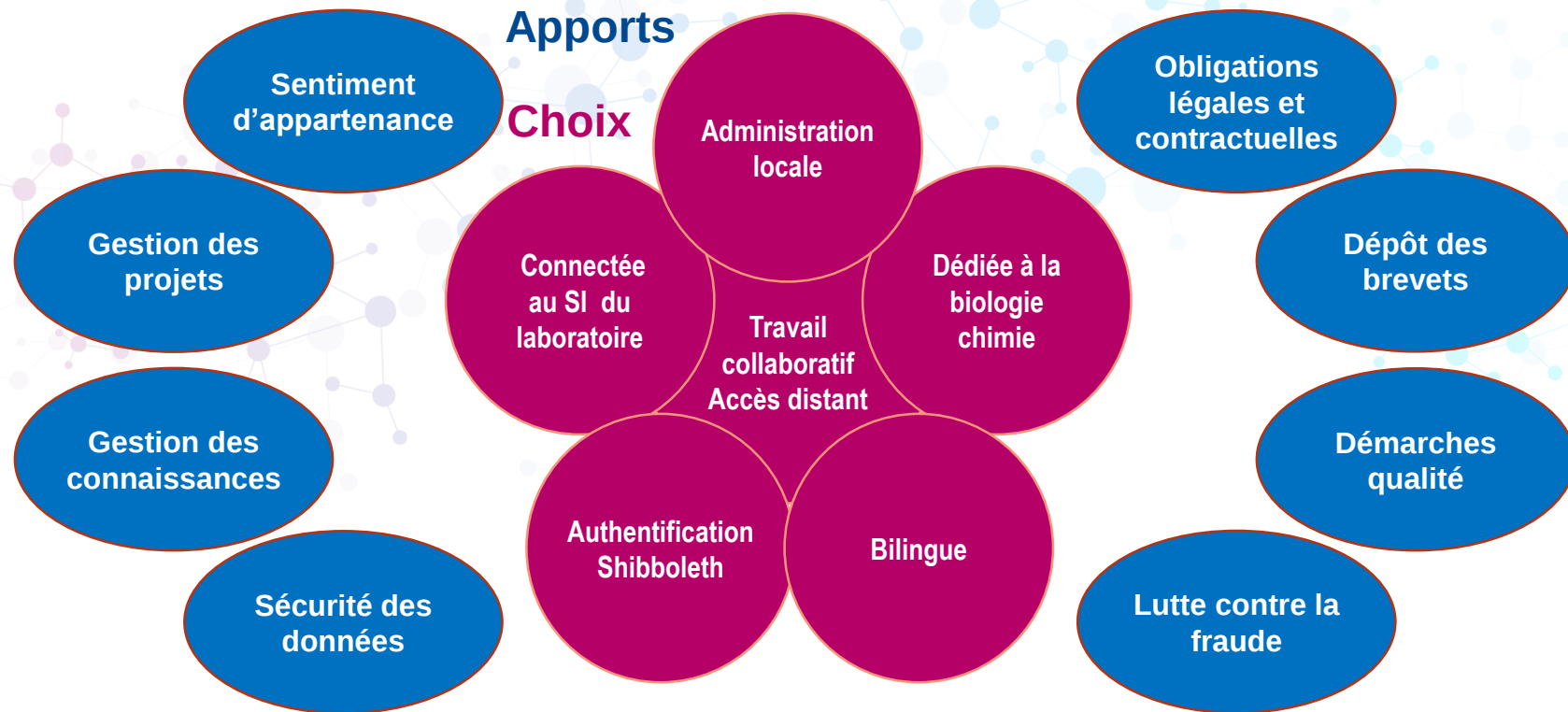
Evaluation

- 2 indicateurs,
- Bilan après 6 mois d'utilisation.

Projet CLÉ (suite à l'expérimentation)



Choix stratégiques et apports de la solution



Ce qui change dans le laboratoire

Le cahier n'est plus personnel, mais partagé

- Travailler en même temps à plusieurs sur une expérience
- Travailler dans plusieurs cahiers
- Centraliser la gestion d'un projet

Le cahier est accessible à distance

CLÉ permet la gestion des projets et de visualiser l'implication de chacun

CLÉ organise la gestion de la connaissance dans le laboratoire

- En cas de départ d'un membre, les données restent dans CLÉ, et ses projets peuvent être réaffectés

CLÉ offre la possibilité de gérer les inventaires et les équipements

Le responsable du laboratoire assure la confidentialité des données

Déployée sous l'autorité des directeurs et organisée autour du responsable du cahier(PI)

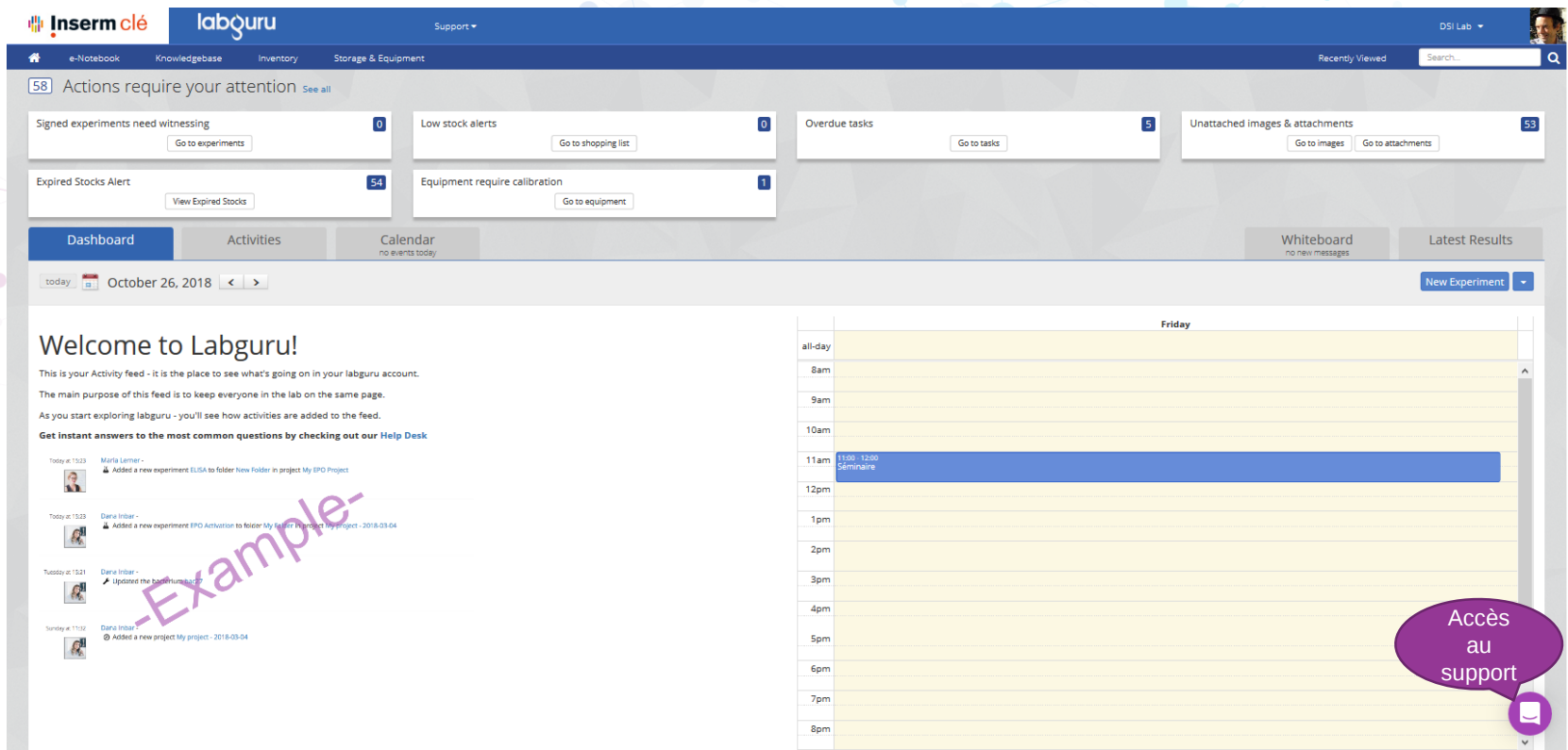
Co-administrée:

- DSI: assure en central l'hébergement, l'exploitation, la maintenance, la sauvegarde et l'archivage
- Responsable du cahier: assure (ou délègue) l'administration des comptes et des droits d'accès

Présentation: Labguru la solution retenue par l'Inserm

- Présentation live
- Evolutions récentes des fonctionnalités

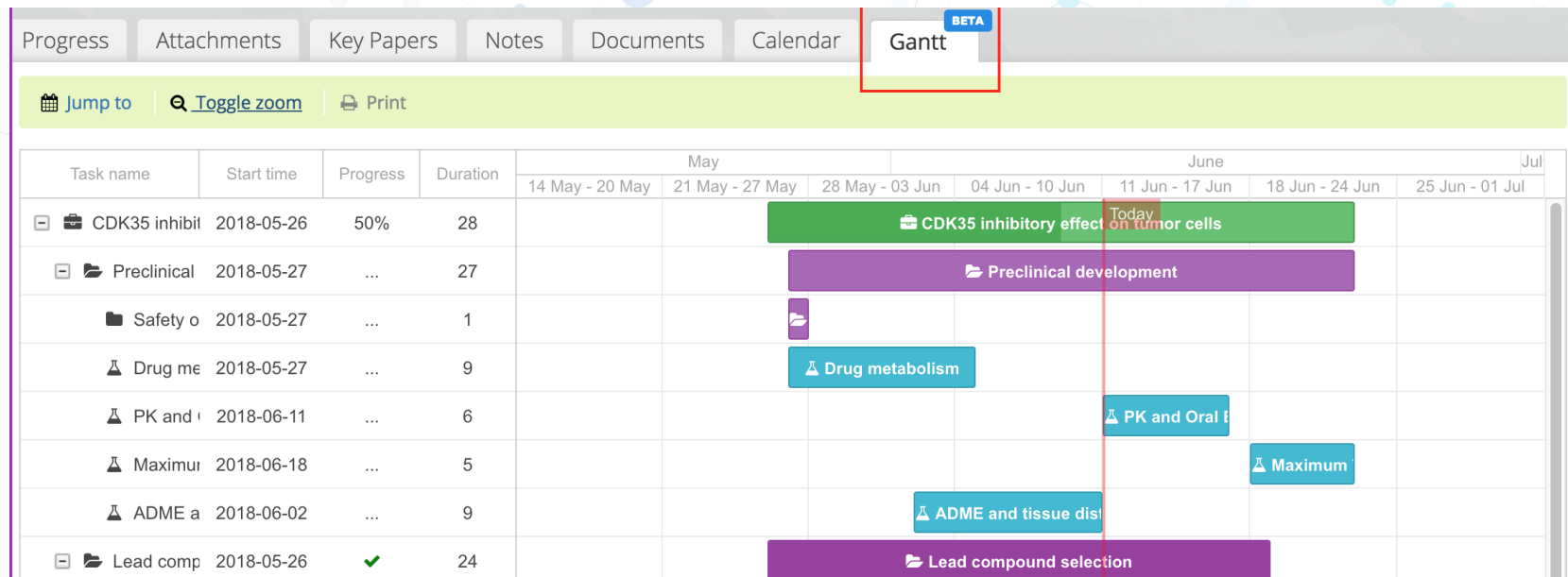
Evolution de la page d'accueil: Tableau de bord collaboratif



The screenshot displays the Labguru dashboard with the following components:

- Header:** Includes the Inserm clé logo, the Labguru brand name, a support dropdown, and a user profile icon labeled "DSI Lab".
- Navigation Bar:** Features tabs for "e-Notebook", "Knowledgebase", "Inventory", and "Storage & Equipment". A "Recently Viewed" section with a search bar is also present.
- Alerts Section:** A row of cards titled "Actions require your attention" (58 total). The cards include:
 - "Signed experiments need witnessing" (0) with a "Go to experiments" button.
 - "Low stock alerts" (0) with a "Go to shopping list" button.
 - "Overdue tasks" (5) with a "Go to tasks" button.
 - "Unattached images & attachments" (53) with "Go to images" and "Go to attachments" buttons.
 - "Expired Stocks Alert" (54) with a "View Expired Stocks" button.
 - "Equipment require calibration" (1) with a "Go to equipment" button.
- Navigation Tabs:** "Dashboard" (active), "Activities", "Calendar", "Whiteboard", and "Latest Results".
- Calendar View:** Shows the date "October 26, 2018". The main content area displays a "Welcome to Labguru!" message and a list of recent activities:
 - Today at 15:23: Maria Lerner - Added a new experiment ELISA to folder New Folder in project My IPO Project.
 - Today at 15:23: Daria Inbar - Added a new experiment IPO Activation to folder My Experiments in project - 2018-03-04.
 - Tuesday at 15:21: Daria Inbar - Updated the bioinformatics.
 - Sunday at 11:02: Daria Inbar - Added a new project My project - 2018-03-04.
- Calendar Widget:** A weekly view for Friday, showing a time slot from 11:00 to 12:00 labeled "Séminaire".
- Annotations:** A purple diagonal watermark "Exemple-" is overlaid on the left side. A purple speech bubble in the bottom right corner says "Accès au support" with a support icon.

Evolution des projets: Piloter la progression et la planification



Evolution des expériences: intégration d'Excel dans l'éditeur



Support ▾
DSI Lab ▾


e-Notebook
Knowledgebase
Inventory
Storage & Equipment
Recently Viewed

Mass spec for media protein
Mass spec for media protein
Mass spec pilot

Pc and L1 30 sample preparation and calibration (duplicate)

🔗 This experiment is a duplicate of Pc and L1 30 sample preparation and calibration

👤 Paul-Guy Dupré
👤 You and 37 more can edit
🚩 Flag Experiment
👤 Sign
More ▾

📅 Start date: Jan 19, 2018
⌚ Duration (days): Enter duration

🏷 tag this item

Description

🔗
💬
More ▾
📄 Copy to report
Save

Instructions are provided in this section to use the NeonTM device with the NeonTM Pipette Station and NeonTM Kits for electroporation of mammalian cells.

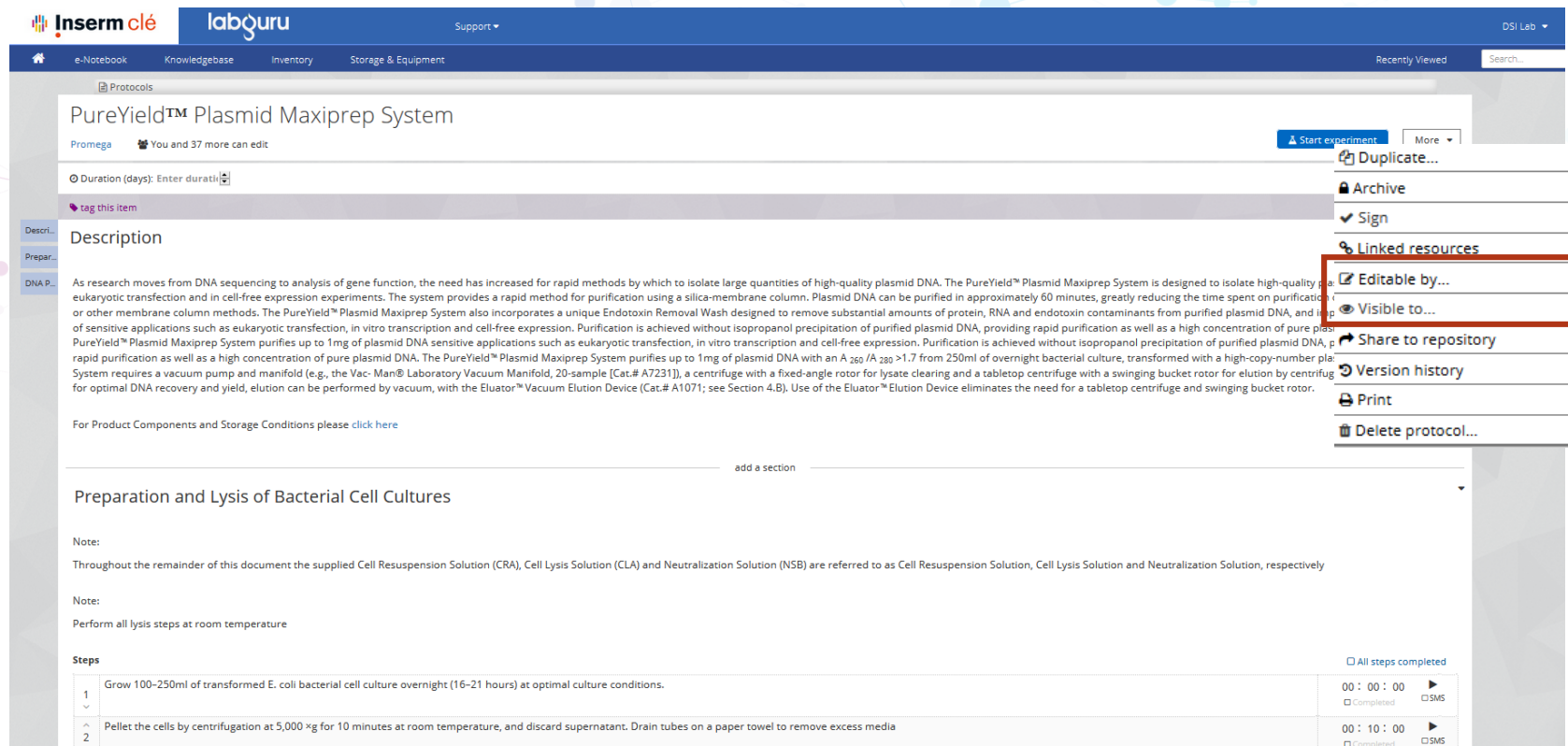
General instructions to prepare cells for use with the NeonTM Transfection System are described below. For primary and stem cell types, use the established methods developed in the laboratory.

Table 1

PDF
Export to CSV
+

Sheet	Font family	Font size	B	I	U	O	B	🔗	📄	📊	🔍	Format	Conditional formatting	📈 Add graph						
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Format	Cell Type	DNA (μg)	siRNA (nM/NeonTM TVol.	platin	Cell no.	Buffer R o													
2	96-well	Adherent	0.25-0.5	10-200	10 μL	100 μL	1-2 × 10 ⁴ 10 μL/wel													
3	96-well	Suspensio	0.5-1	10-200	10 μL	100 μL	2-5 × 10 ⁴ 10 μL/wel													
4	48-well	Adherent	0.25-1	10-200	10 μL	250 μL	2.5-5 × 10 ⁴ 10 μL/wel													
5	48-well	Suspensio	0.5-2	10-200	10 μL	250 μL	5-12.5 × 10 ⁴ 10 μL/wel													
6	24-well	Adherent	0.5-2	10-200	10 μL	500 μL	0.5-1 × 10 ⁴ 10 μL/wel													
7	24-well	Suspensio	0.5-3	10-200	10 μL	500 μL	1-2.5 × 10 ⁴ 10 μL/wel													
8	12-well	Adherent	0.5-3	10-200	10 μL	1 mL	1-2 × 10 ⁴ 10 μL/wel													
9	12-well	Suspensio	0.5-3	10-200	10 μL	1 mL	2-5 × 10 ⁴ 10 μL/wel													
10	6-well	Adherent	0.5-3 (10	10-200	10 μL/1002 mL		2-4 × 10 ⁴ 10 μL or 1													
11	6-well	Suspensio	0.5-3 (10	10-200	10 μL/1002 mL		0.4-1 × 10 ⁴ 10 μL or 1													
12	60 mm	Adherent	5-30	10-200	100 μL	5 mL	0.5-1 × 10 ⁴ 10 μL/wel													
13	60 mm	Suspensio	5-30	10-200	100 μL	5 mL	1-2.5 × 10 ⁴ 10 μL/wel													
14	10 cm	Adherent	5-30	10-200	100 μL	10 mL	1-2 × 10 ⁴ 10 μL/wel													
15	10 cm	Suspensio	5-30	10-200	100 μL	10 mL	2-5 × 10 ⁴ 10 μL/wel													
16																				
17																				
18																				

Evolution des protocoles: définir des droits d'accès



Inserm clé labguru Support ▾ DSI Lab ▾

e-Notebook Knowledgebase Inventory Storage & Equipment Recently Viewed Search...

Protocols

PureYield™ Plasmid Maxiprep System

Promega You and 37 more can edit

⌚ Duration (days): Enter duration

🏷 tag this item

Description

As research moves from DNA sequencing to analysis of gene function, the need has increased for rapid methods by which to isolate large quantities of high-quality plasmid DNA. The PureYield™ Plasmid Maxiprep System is designed to isolate high-quality plasmid DNA from eukaryotic and prokaryotic cells. The system provides a rapid method for purification using a silica-membrane column. Plasmid DNA can be purified in approximately 60 minutes, greatly reducing the time spent on purification compared to other membrane column methods. The PureYield™ Plasmid Maxiprep System also incorporates a unique Endotoxin Removal Wash designed to remove substantial amounts of protein, RNA and endotoxin contaminants from purified plasmid DNA, and is suitable for sensitive applications such as eukaryotic transfection, in vitro transcription and cell-free expression. Purification is achieved without isopropanol precipitation of purified plasmid DNA, providing rapid purification as well as a high concentration of pure plasmid DNA. The PureYield™ Plasmid Maxiprep System purifies up to 1mg of plasmid DNA sensitive applications such as eukaryotic transfection, in vitro transcription and cell-free expression. Purification is achieved without isopropanol precipitation of purified plasmid DNA, providing rapid purification as well as a high concentration of pure plasmid DNA. The PureYield™ Plasmid Maxiprep System purifies up to 1mg of plasmid DNA with an $A_{260}/A_{280} > 1.7$ from 250ml of overnight bacterial culture, transformed with a high-copy-number plasmid. The system requires a vacuum pump and manifold (e.g., the Vac-Man® Laboratory Vacuum Manifold, 20-sample [Cat.# A7231]), a centrifuge with a fixed-angle rotor for lysate clearing and a tabletop centrifuge with a swinging bucket rotor for elution by centrifugation for optimal DNA recovery and yield, elution can be performed by vacuum, with the Eluator™ Vacuum Elution Device (Cat.# A1071; see Section 4.B). Use of the Eluator™ Elution Device eliminates the need for a tabletop centrifuge and swinging bucket rotor.

For Product Components and Storage Conditions please [click here](#)

add a section

Preparation and Lysis of Bacterial Cell Cultures

Note:

Throughout the remainder of this document the supplied Cell Resuspension Solution (CRA), Cell Lysis Solution (CLA) and Neutralization Solution (NSB) are referred to as Cell Resuspension Solution, Cell Lysis Solution and Neutralization Solution, respectively

Note:

Perform all lysis steps at room temperature

Steps

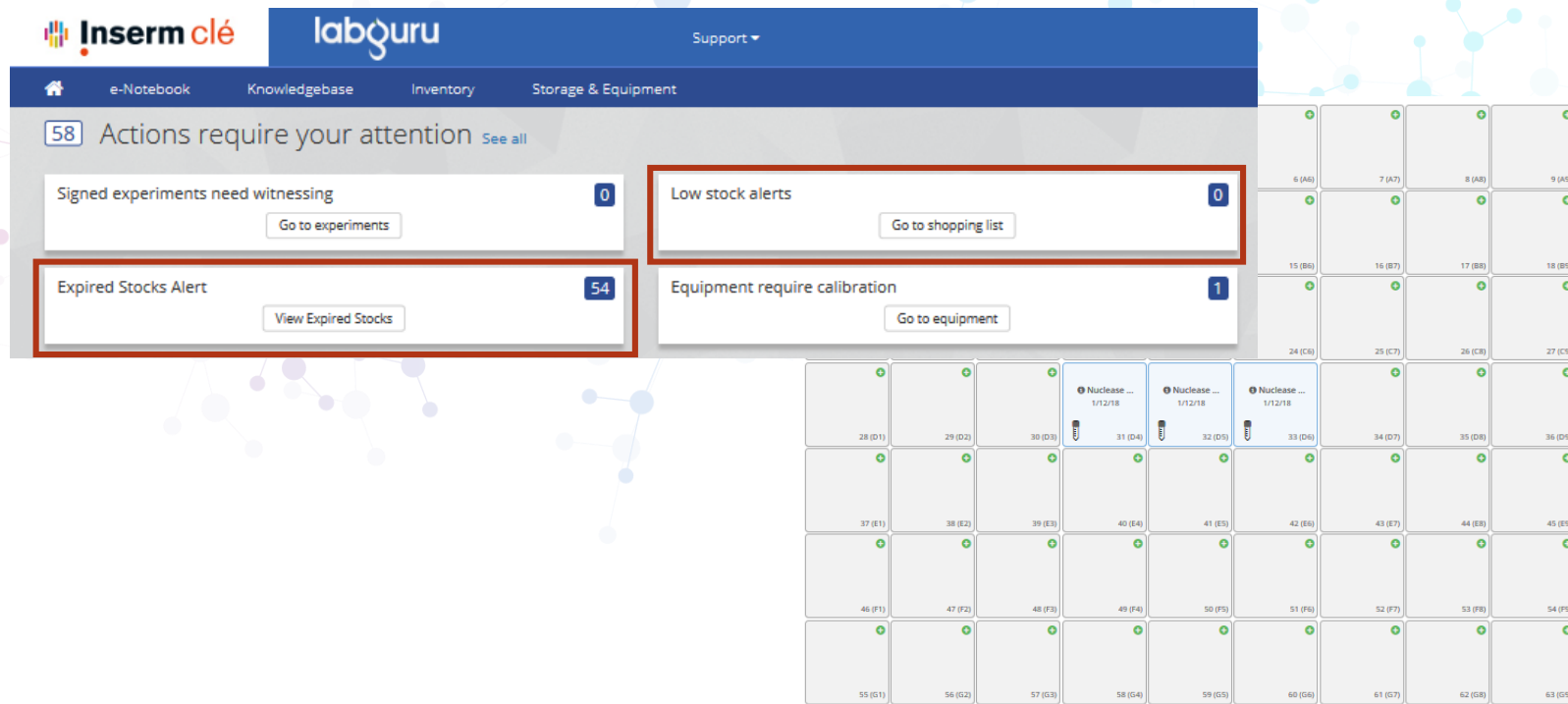
1	Grow 100-250ml of transformed E. coli bacterial cell culture overnight (16-21 hours) at optimal culture conditions.	00 : 00 : 00 Completed SMS
2	Pellet the cells by centrifugation at 5,000 xg for 10 minutes at room temperature, and discard supernatant. Drain tubes on a paper towel to remove excess media	00 : 10 : 00 Completed SMS

☐ All steps completed

Linked resources

- Duplicate...
- Archive
- Sign
- Linked resources
- Editable by...
- Visible to...
- Share to repository
- Version history
- Print
- Delete protocol...

Evolution des inventaires: les alertes

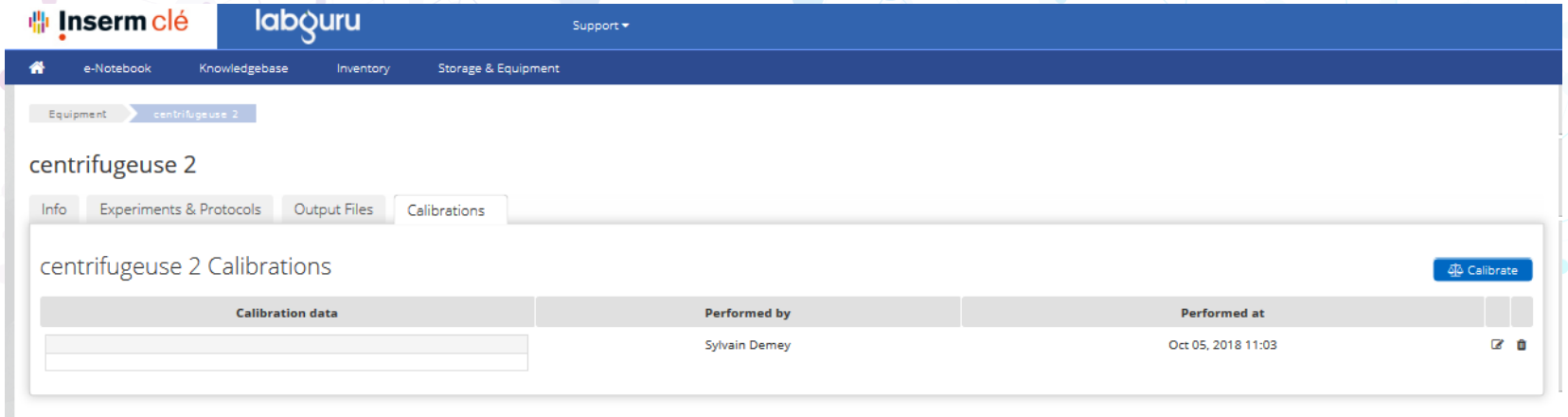


The screenshot displays the 'labguru' inventory management system interface. The top navigation bar includes the 'Inserm clé' logo, the 'labguru' name, and a 'Support' dropdown. Below this, a secondary navigation bar lists 'e-Notebook', 'Knowledgebase', 'Inventory', and 'Storage & Equipment'. The main content area features a header with '58 Actions require your attention' and a 'See all' link. Below the header, there are four alert boxes:

- Signed experiments need witnessing** (0 alerts): Includes a 'Go to experiments' button.
- Expired Stocks Alert** (54 alerts): Includes a 'View Expired Stocks' button.
- Low stock alerts** (0 alerts): Includes a 'Go to shopping list' button.
- Equipment require calibration** (1 alert): Includes a 'Go to equipment' button.

Below the alerts, there is a grid of equipment cards. Each card displays a number in parentheses (e.g., 6 (A6), 7 (A7), etc.) and a green checkmark icon. Three cards in the middle row are highlighted with a blue border and contain the text 'Nuclease ... 1/12/18'.

Evolution des instruments: la calibration



The screenshot displays the 'labguru' web application interface. The top navigation bar includes the 'Inserm clé' logo, the 'labguru' brand name, and a 'Support' dropdown menu. Below this, a secondary navigation bar lists 'e-Notebook', 'Knowledgebase', 'Inventory', and 'Storage & Equipment'. The main content area shows a breadcrumb trail 'Equipment > centrifugeuse 2' and the title 'centrifugeuse 2'. A tabbed interface at the bottom of the main content area includes 'Info', 'Experiments & Protocols', 'Output Files', and 'Calibrations'. The 'Calibrations' tab is active, displaying 'centrifugeuse 2 Calibrations'. On the right side of this tab, there is a blue 'Calibrate' button with a scale icon. Below the title, a table with three columns is visible: 'Calibration data', 'Performed by', and 'Performed at'. The 'Performed by' column contains the name 'Sylvain Demey' and the 'Performed at' column contains the timestamp 'Oct 05, 2018 11:03'. The 'Calibration data' column is currently empty.

Architecture

• Virtualisation

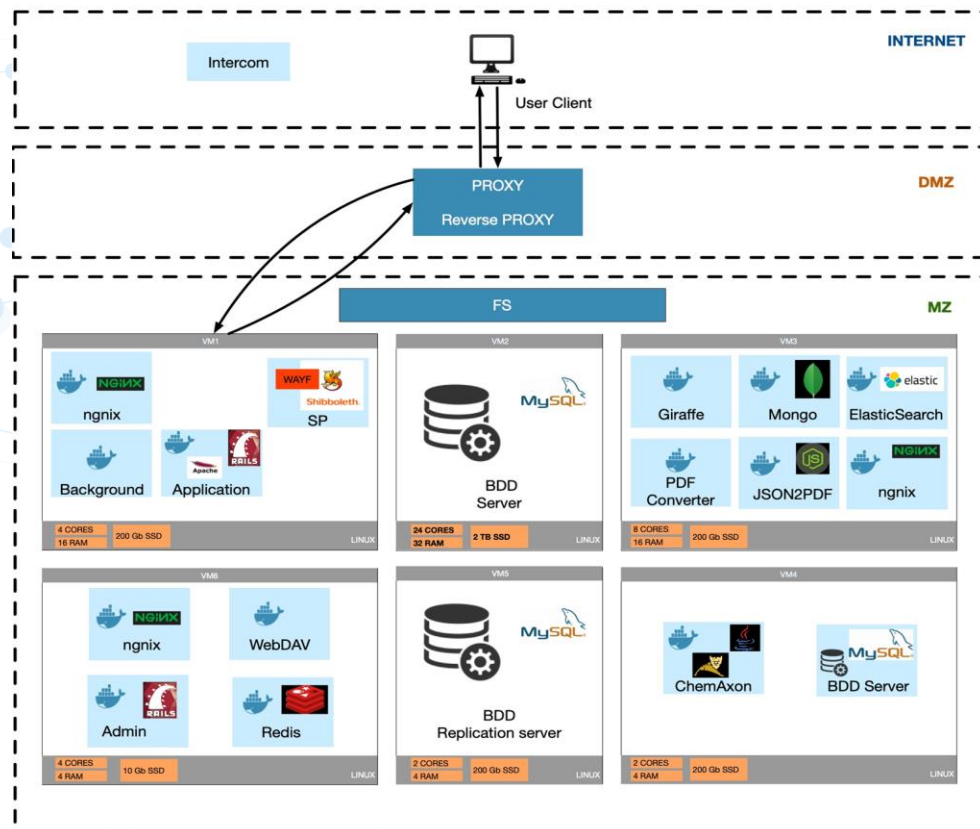
- 6 serveurs VM
- 14 conteneurs applicatifs Docker
- ➕ simplification des mises à jour

• Technologies actuelles

- Elasticsearch, MongoDB, NGNIX, Redis, Json, MySQL

• Authentification shibboleth

- ➖ complexité du support multi-établissements



Déploiement

- **Un cahier pour**
 - un groupe de recherche travaillant sur des projets communs, autour d'un responsable
 - un plateau technique
 - un contrat industriel

Étapes du déploiement dans une UMR

Inscription – validation

Réunion préparatoire

Demande – ouverture de cahiers

Réunion de lancement dans le laboratoire

Formation – support des utilisateurs

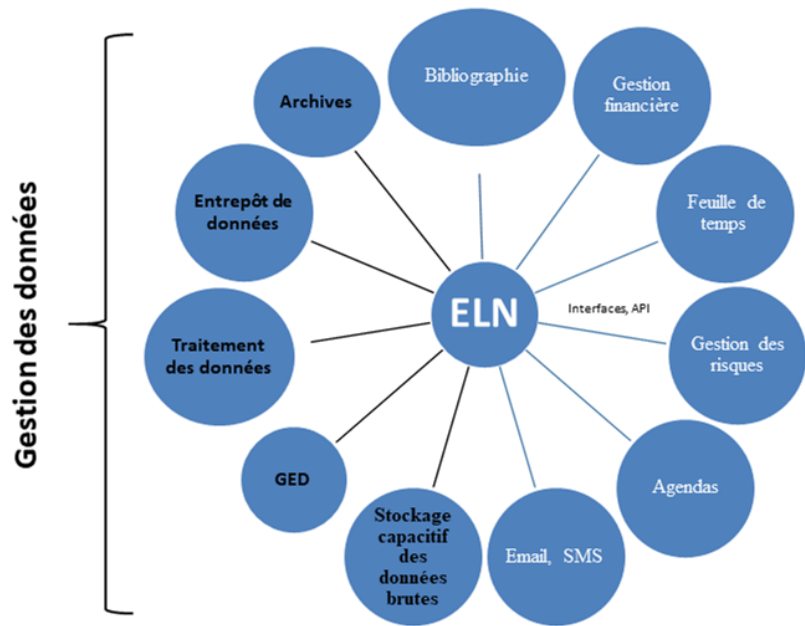
Bilan à 10 mois

Structures en cours de déploiement	44%
Cahiers créés	550
Utilisateurs enregistrés	2500
Utilisateurs formés (e-learning)	250
Administrateurs formés (Webinar)	170

Rôle fédérateur de l'ELN

Le LIMS du laboratoire (Laboratory Information Management System)

- **Besoins locaux**
 - s'interfacer avec des applications métiers et des bases de données
- **Besoins institutionnels**
 - s'interfacer avec le catalogue de services scientifiques et administratifs



API pour échanger les données (application programming interface)

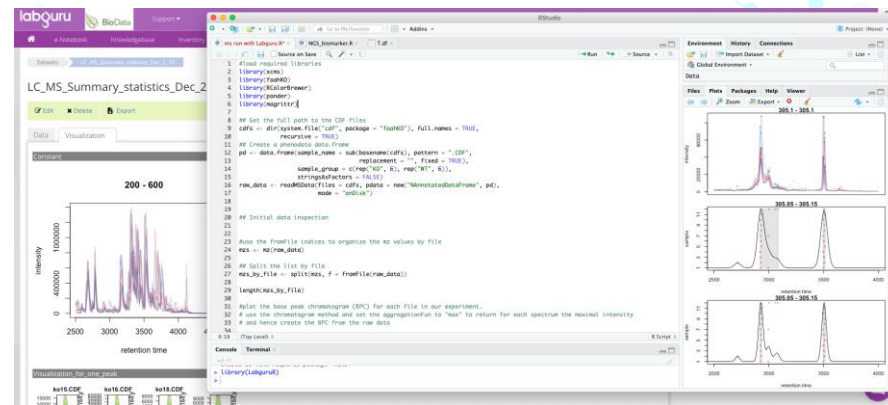
API de Labguru

- basées sur JSON / REST
- publiées sur <https://my.labguru.com/api/docs>,
<https://github.com/BioData/labguru-api-examples>

- pour consulter, créer, modifier
 - projets de recherche
 - équipements
 - expériences
 - documents annexes
 - protocoles
 - DataSet, SOPs...
 - stocks

LabguruR

- script pour travailler depuis R
 - accéder aux DataSet depuis la Rconsole
 - enregistrer les résultats dans Labguru



Nouveaux enjeux : un ELN comme GED de la recherche

Améliorer la gestion de la donnée

- Retrouver et décrire la manière dont seront obtenues, documentées et analysées les données produites au cours d'un projet de recherche
- Garantir dès le début du projet, dans le cadre du DMP, la production de données de recherche FAIR

Améliorer la reproductibilité des expériences

- Garantir que des expériences ont été faites dans les mêmes conditions et que les démarches de mesures sont strictes
- Garantir la traçabilité et conserver le descriptif et l'ensemble des éléments associés à un projet
 - données brutes (besoins capacitifs)
 - résultats
 - moyens mis en œuvre (protocoles, logiciels et versions utilisés...)

Et le stockage?

Actuellement

- Le plus gros cahier utilisé depuis 2015 est de 60 Go
- Peu de données brutes
 - Contraintes réseaux et navigateurs
- Stockage en mode Fichier (NFS) sur des baies NetApp (FAS8020)

Cible

- Augmenter les quotas pour prendre en charge l'essentiel des données (de l'ordre de 100 To)
- Utiliser des agents de synchronisation automatique
- Nouvelle architecture de stockage capacitif et pérenne (Mode objet)