How to Automate QA/QC Workflows in Cannabis Testing

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Introduction

- Labs need to generate accurate test results to guarantee consumer safety and product potency.

- QA/QC is the key to assure accurate, reliable, and reproducible test results.

Agenda

- By 2028, the global demand for cannabis testing market will surpass $2,669.45 million at 12.72% CAGR growth.
- Quality assurance is pivotal for the sustenance of the continuously evolving cannabis industry.

Source: Vantage Market Research

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What is QA/QC?

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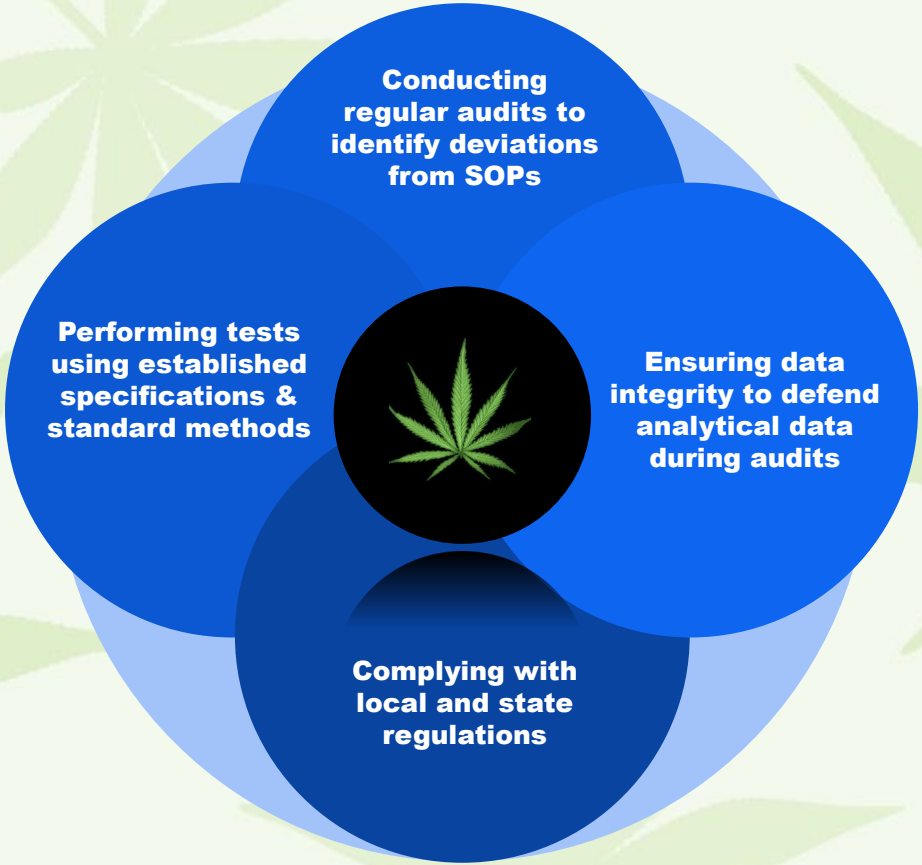
What is Quality Assurance (QA) in Cannabis Testing?



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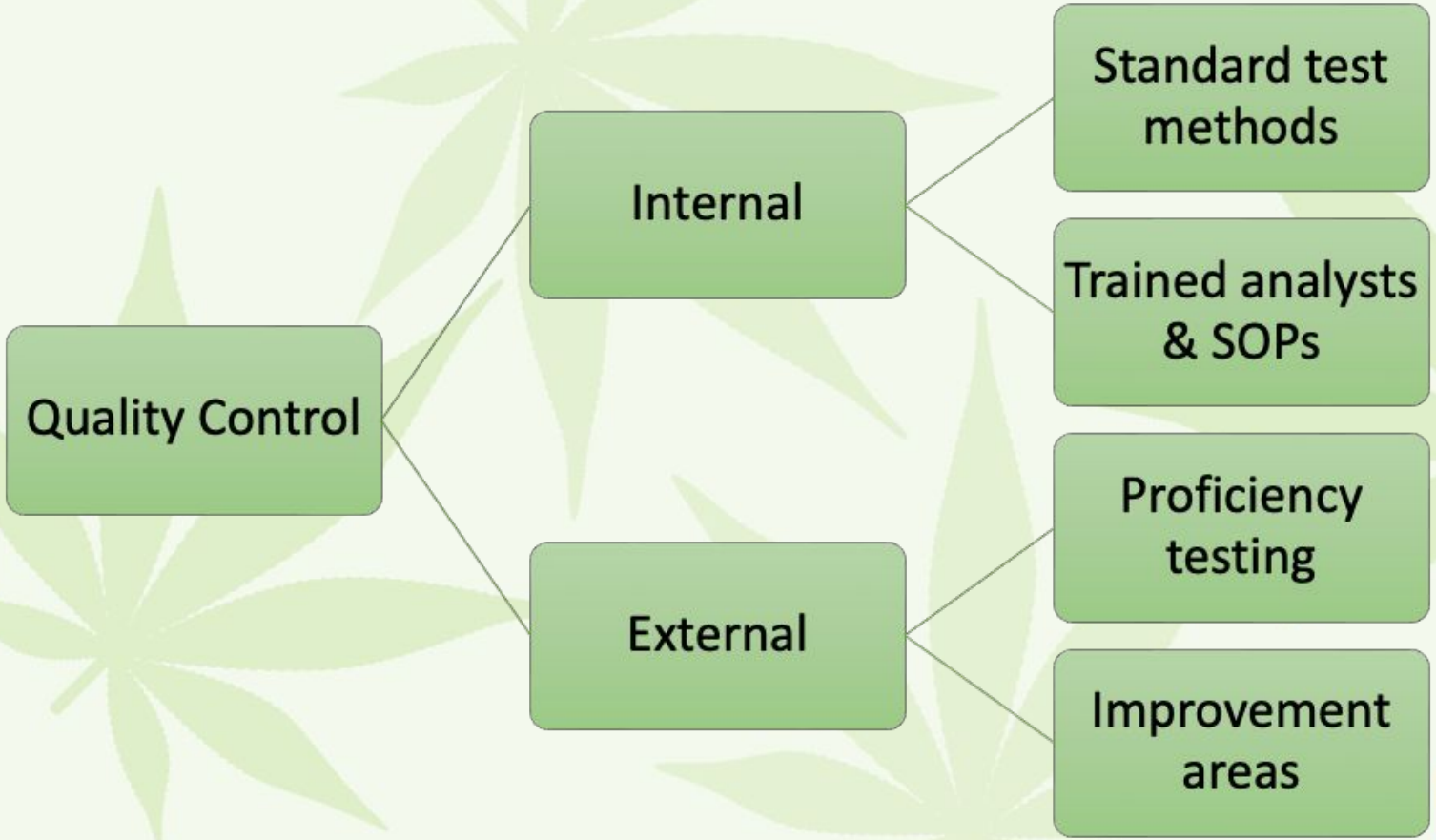
Quality Control (QC): Internal & External



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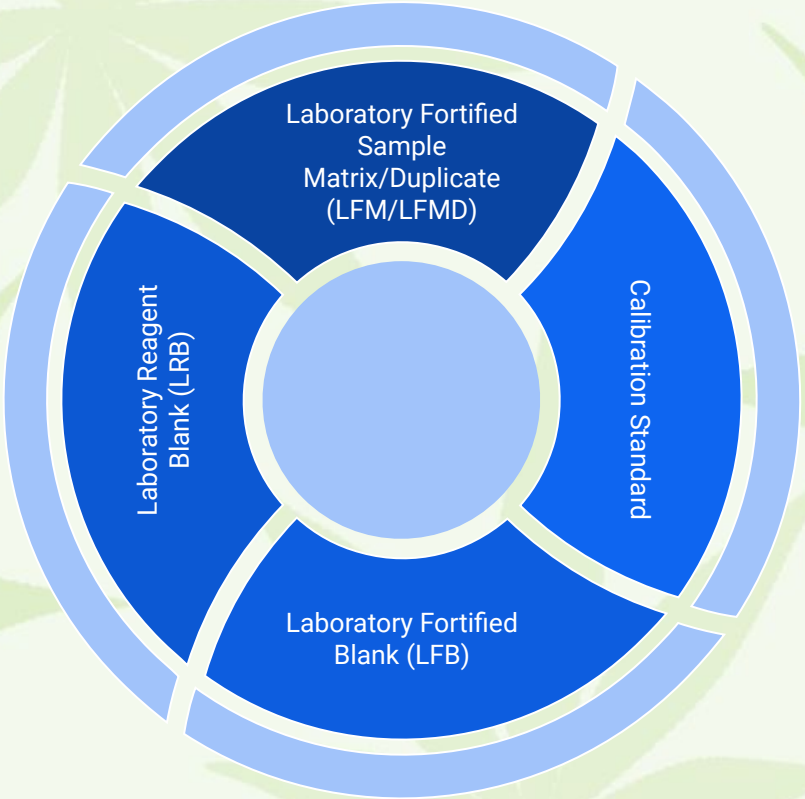
Common QC Samples



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Wondering why QA/QC is so important?

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QA/QC is Important to Assure Consumer Safety

Heavy Metals
Cannabis plants can absorb heavy metals such as nickel and lead from the soil which are toxic to humans

Microorganisms
Salmonella, E.coli cause serious illness

Mycotoxins
Aflatoxins contribute to bone cancer

Residual Solvents
They can cause damage to the nervous system, allergic reactions, and even death

Foreign Materials
Mold, organic materials, dust or anything that could adversely affect humans

Pesticides
Keeps cannabis free from insects but can cause serious illness in humans

Potency
Assure cannabinoid and terpenoid concentration

Moisture Content
Can be detrimental to the quality & shelf-life of cannabis products

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QA & QC: General Requirements

Manage QC Samples & Their Results

Document Control

Conduct Staff Training

Maintain a Chain of Custody

Instrument Calibration & Maintenance

Validate Test Results

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So, let’s see how to do it!

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How Does a LIMS Help?

Quality Assurance

- Ensuring data integrity
- Following internal quality auditing practices

Quality Control

- Ensuring the quality of the test results
- Ensuring maintenance and calibration of testing equipment used
- Following good documentation and record-keeping practices
- Following Good Laboratory Practices (GLP) to ensure products are consistently produced through controlled processes according to quality standards

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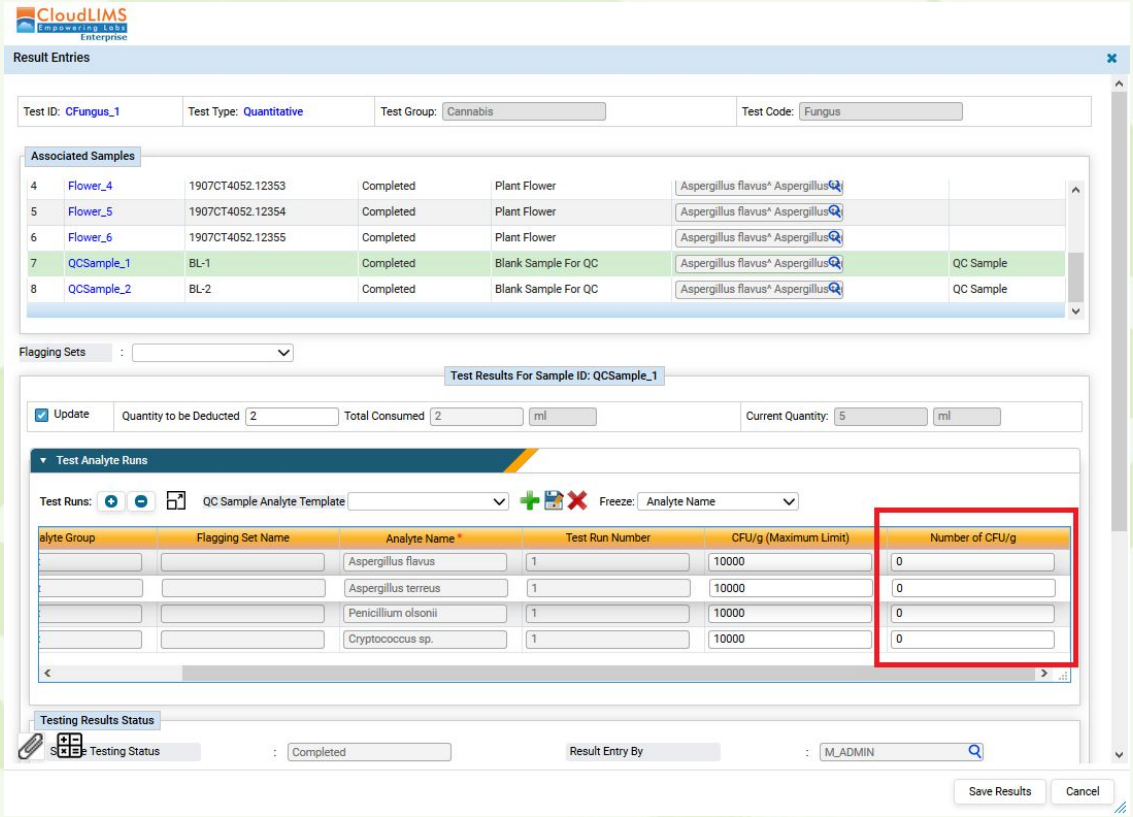
Manage QC Test Results

Manage Quality Control Samples and Their Test Results With Ease



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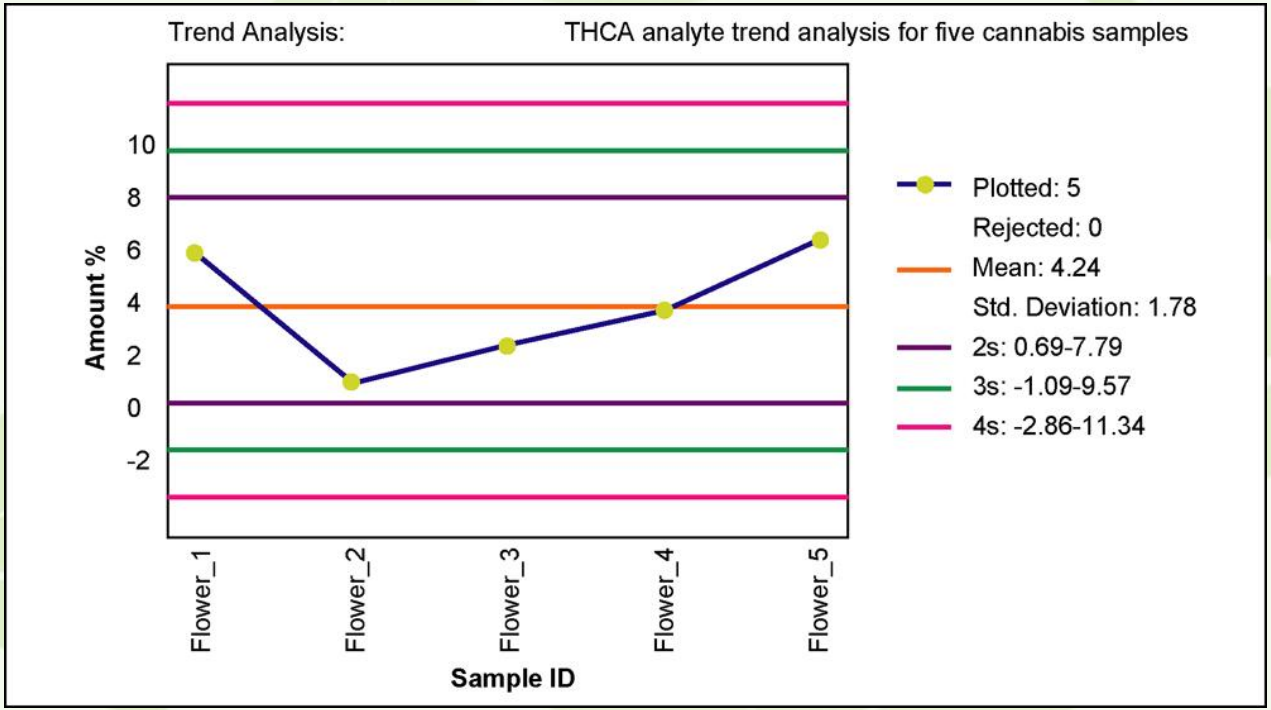
Trend Analysis

Analyze trends across a set of test results, monitor variation in test results & take corrective actions



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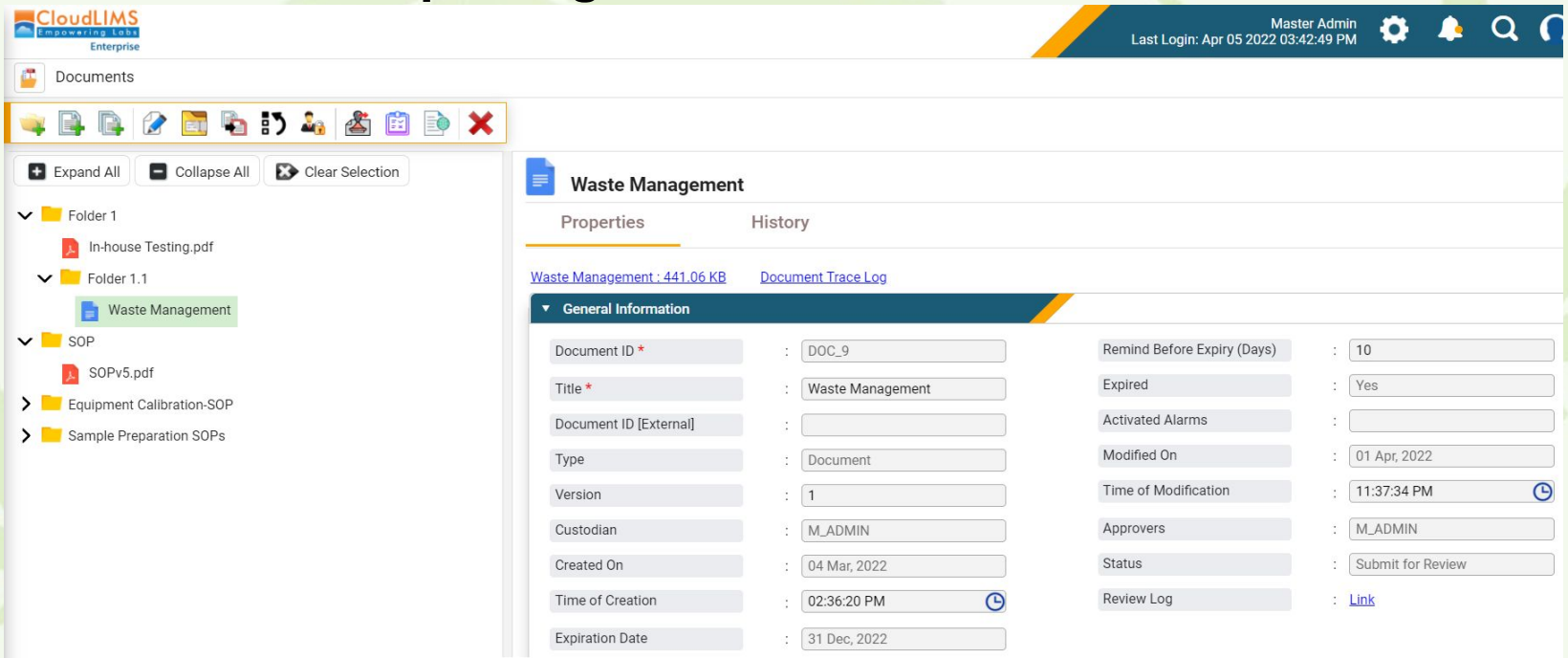
Document Control

Manage documents, track their revision history & assign access privileges to staff based on their roles



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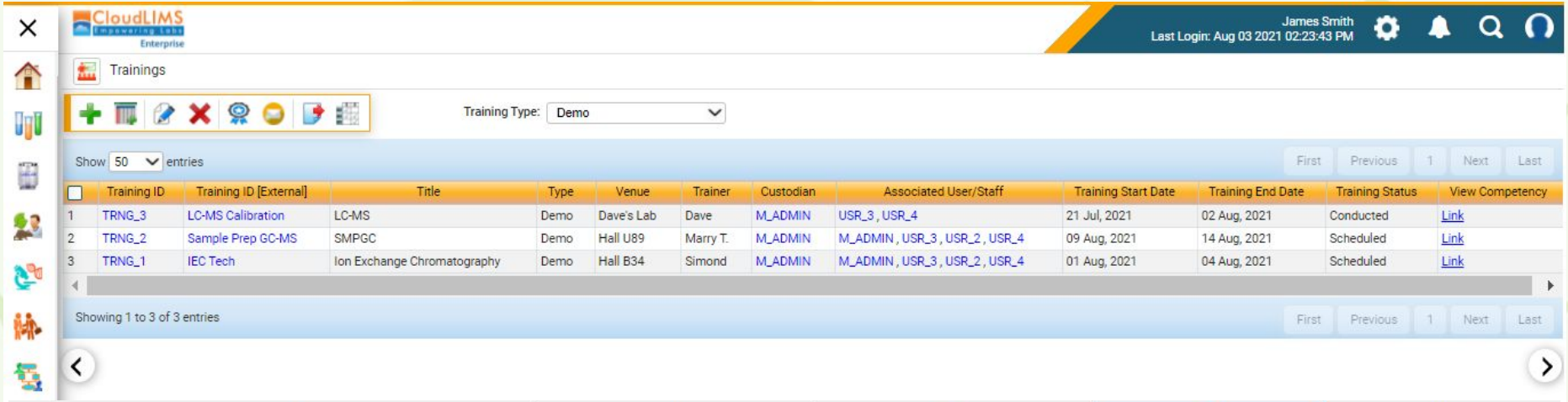
Personnel: Staff Training

Manage staff training & generate training competency matrix



Training ID	Training ID [External]	Title	Type	Venue	Trainer	Custodian	Associated User/Staff	Training Start Date	Training End Date	Training Status	View Competency
1	TRNG_3	LC-MS Calibration	LC-MS	Demo	Dave's Lab	Dave	M_ADMIN	USR_3 , USR_4	21 Jul, 2021	02 Aug, 2021	Conducted	Link
2	TRNG_2	Sample Prep GC-MS	SMPGC	Demo	Hall U89	Marry T.	M_ADMIN	M_ADMIN , USR_3 , USR_2 , USR_4	09 Aug, 2021	14 Aug, 2021	Scheduled	Link
3	TRNG_1	IEC Tech	Ion Exchange Chromatography	Demo	Hall B34	Simond	M_ADMIN	M_ADMIN , USR_3 , USR_2 , USR_4	01 Aug, 2021	04 Aug, 2021	Scheduled	Link

	A	B	C	D	E
1	**Trainings**	**James Smith**	**William Smith**	**Kerry Jones**	**Adam Paul**
2	Ion Exchange Chromatography	4	5	3	5
3	Sample Prep GC-MS	3	4	2	3
4	LC-MS Calibration	2	4	4	2

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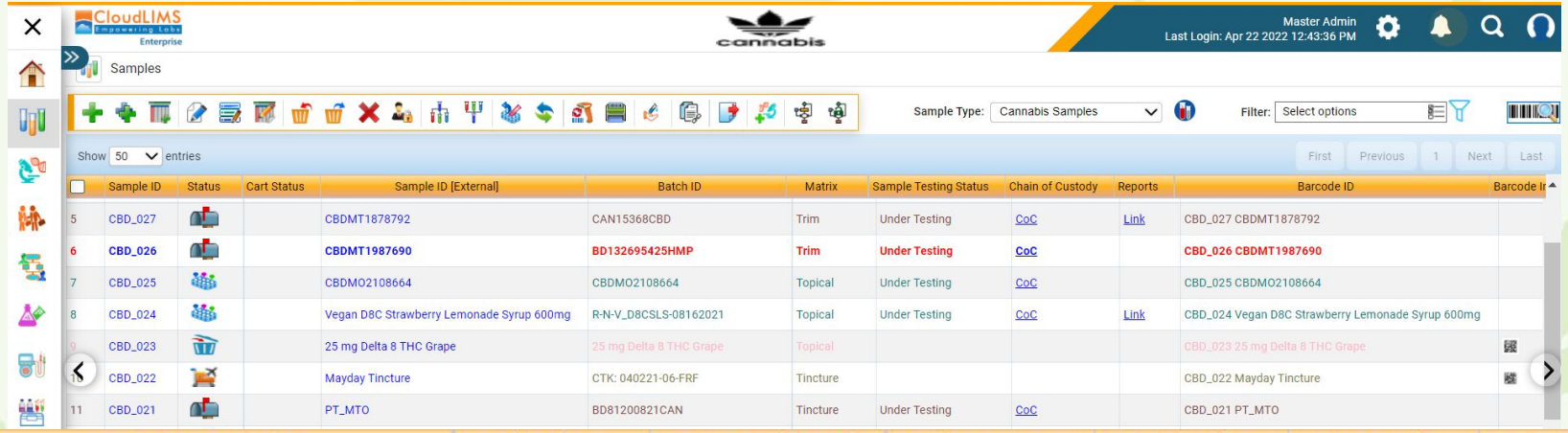
Maintain a Chain of Custody

Track samples from accessioning to disposal



S. No.	Activity Date/Time	Updated By	Action Performed	Attribute Name	Original Value	Current Value	Current Location
1	06 Apr, 2022 [10:05:57 AM GMT+05:30]	Master Admin	Transferred	Custodian	M_ADMIN	USR_4	STG_2~R1C3
2	22 Apr, 2022 [02:30:15 PM GMT+05:30]	Master Admin	Transferred	Custodian	USR_4	USR_1	STG_2~R1C3
3	22 Apr, 2022 [02:30:23 PM GMT+05:30]	Master Admin	Transferred	Custodian	USR_1	USR_2	STG_2~R1C3
4	22 Apr, 2022 [02:30:32 PM GMT+05:30]	Master Admin	Transferred	Custodian	USR_2	USR_4	STG_2~R1C3
5	22 Apr, 2022 [02:30:44 PM GMT+05:30]	Master Admin	Transferred	Custodian	USR_4	M_ADMIN	STG_2~R1C3

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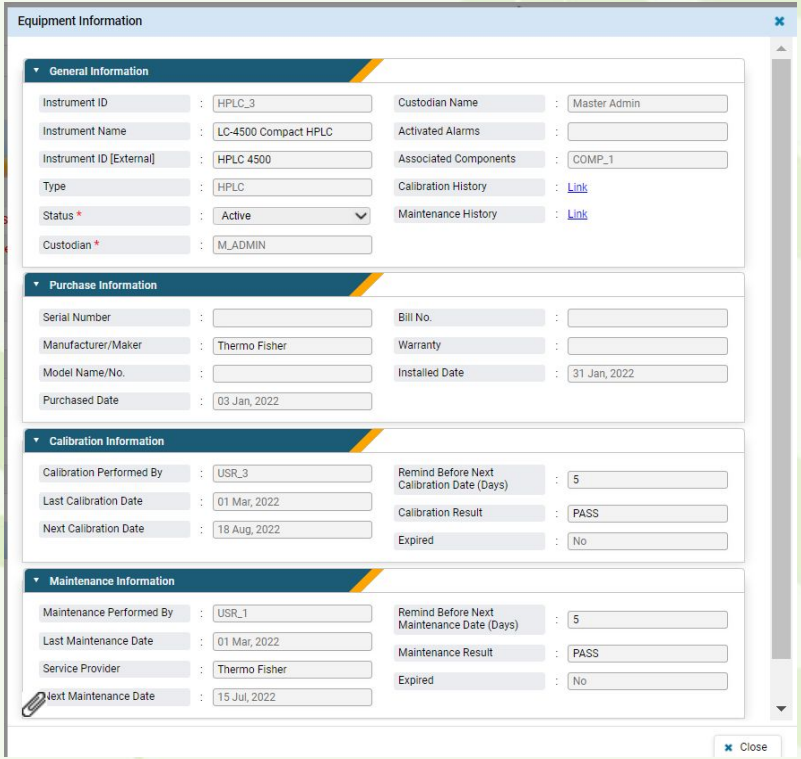
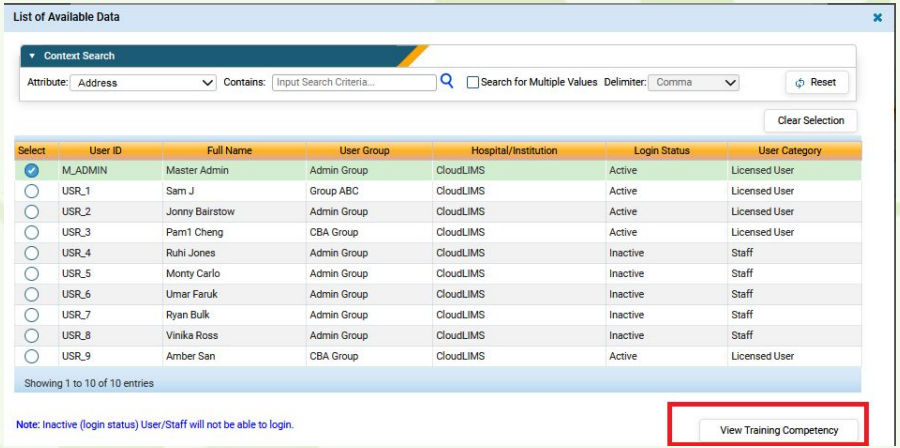
Instrument Calibration and Maintenance

Schedule instrument calibration, manage maintenance data & assign instruments to competent staff





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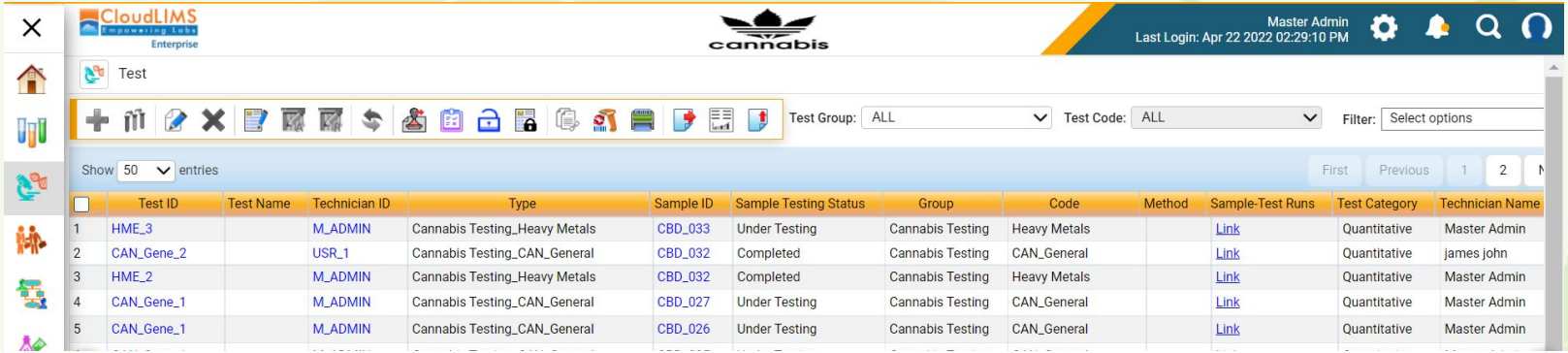
Test and Calibration Methods: Associated Docs

Easily access appropriate instructions for operation, handling of instruments and testing samples to ensure the personnel is using only latest/compliant methods



	Test ID	Test Name	Technician ID	Type	Sample ID	Sample Testing Status	Group	Code	Method	Sample-Test Runs	Test Category	Technician Name
1	HME_3		M_ADMIN	Cannabis Testing_Heavy Metals	CBD_033	Under Testing	Cannabis Testing	Heavy Metals		Link	Quantitative	Master Admin
2	CAN_Gene_2		USR_1	Cannabis Testing_CAN_General	CBD_032	Completed	Cannabis Testing	CAN_General		Link	Quantitative	james john
3	HME_2		M_ADMIN	Cannabis Testing_Heavy Metals	CBD_032	Completed	Cannabis Testing	Heavy Metals		Link	Quantitative	Master Admin
4	CAN_Gene_1		M_ADMIN	Cannabis Testing_CAN_General	CBD_027	Under Testing	Cannabis Testing	CAN_General		Link	Quantitative	Master Admin
5	CAN_Gene_1		M_ADMIN	Cannabis Testing_CAN_General	CBD_026	Under Testing	Cannabis Testing	CAN_General		Link	Quantitative	Master Admin

Associated Documents:

Show 10 entries

#	Document ID	Document Name	Type	Status	Preview
1	DOC_1	Final-SOP--Video-Standard-Operating-Procedure-for-the-Measurement-of-CBD-and-THC-in-Hemp.pdf	Document	Published	Preview
2	DOC_2	IDPC_Responsible_Leg_Reg_1.0.pdf	Document	Published	Preview
3	DOC_3	Samples SOP	Document	Published	

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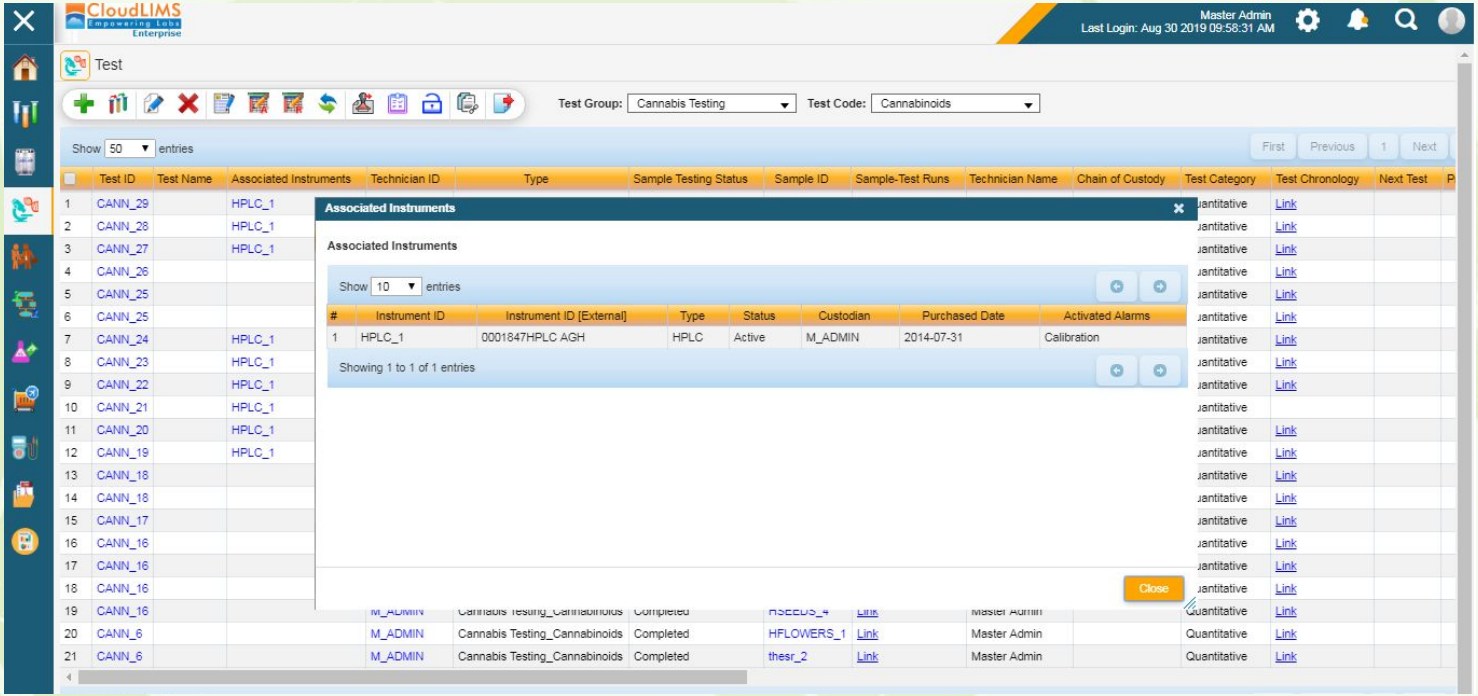
Associated Instruments: Assuring the Quality of Results

While associating an instrument with a test, indicate that the instrument was properly calibrated before the test was conducted



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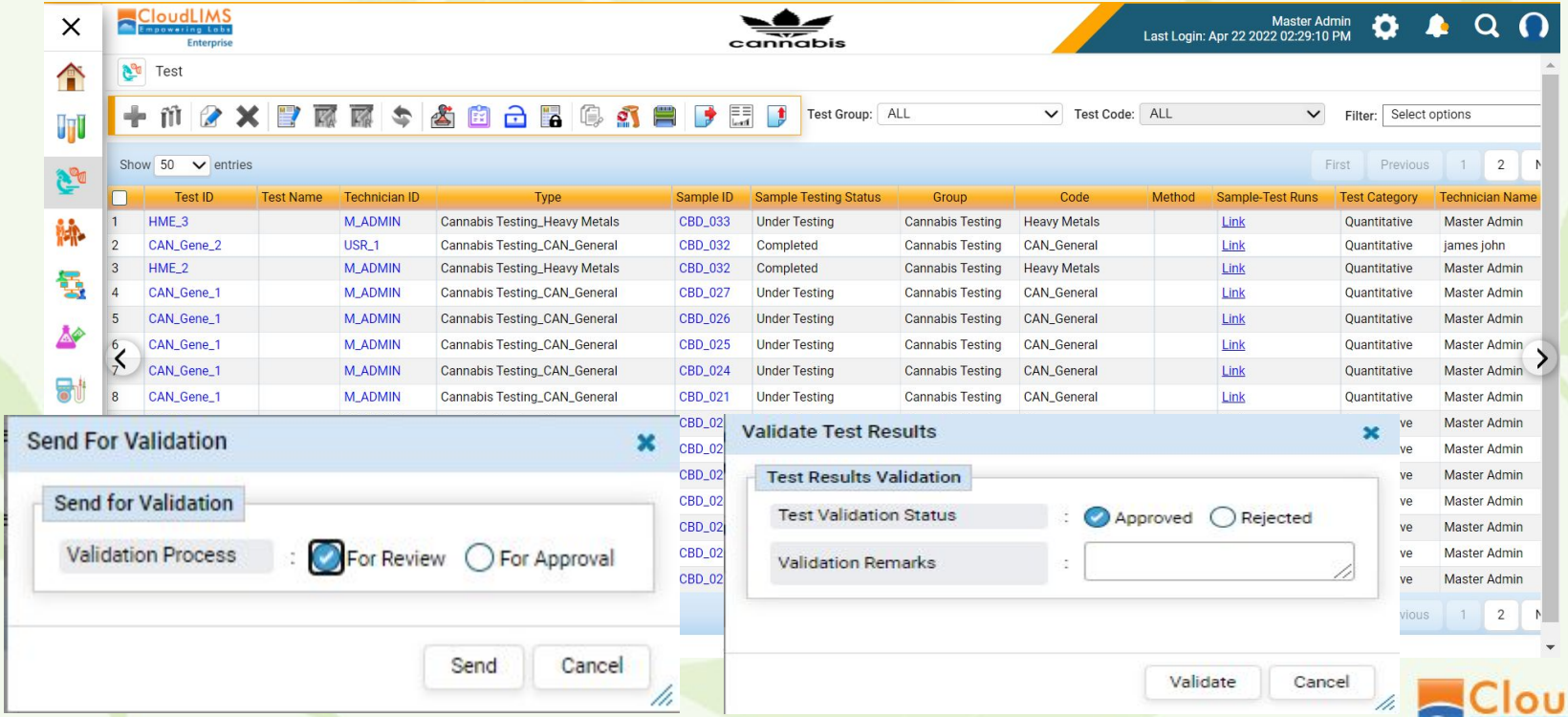
Validate Test Results

Send out multiple test results for validation and approval before releasing the CoAs to your clients



Generate Custom CoAs

California Compliant CoA

ABCL_170 page 1 of 1

ABC LABS

ABC Labs Certificate of Analysis

675 Valley View Ln, Dallas, TX 75234, United States | License: TL5220015

ISO/IEC 17025:2017 Certification L65-20-5 | Accreditation #

Sample 210621_2

Compliance Fail

Sample ID:	BBL_170	**Matrix:**	Tinctures	**Cultivar:**	ABC
Company:	Rps2	**Registration#:**		**Email:**	johan@cannabistech.com
Phone:	9187915521	**Sampler:**	Smith	**Sampled:**	12:30
Receiver:	Smith	**Received:**	21 Jun, 2021	**Reported:**	23 Jul, 2021
Address:	Address	**GPS:**	23:23	**Acreage:**	ARC
Description:	DES	**Lot Crop Permit ID:**		**Analyses Executed:**	NOTHC

Lab Notes:

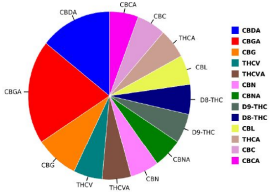
*NOTHC - Cannabinoid Profile Analysis

Analyzed 22 Jul, 2021 | Instrument HPLC-DAD | Method
Measurement Uncertainty at 95% confidence 10.0%

Analyte	LOD	LOQ	Result %	Result mg/g
Cannabidivarinic acid (CBDVa)	0.020	0.050	ND	ND
Cannabidivarin (CBDV)	0.030	0.100	NR	NR
Cannabidiolic acid (CBDa)	0.030	0.080	5	50.0
Cannabigerolic acid (CBGa)	0.030	0.080	7	70.0
Cannabigerol (CBG)	0.050	0.160	3	30.0
Cannabidiol (CBD)	0.060	0.170	>=99%	>=99%
Tetrahydrocannabivarin (THCV)	0.060	0.170	2	20.0
Tetrahydrocannabivarinic acid (THCVa)	0.050	0.150	2	20.0
Cannabinol (CBN)	0.030	0.100	2	20.0
Cannabinolic acid (CBNa)	0.080	0.260	2	20.0
D9-Tetrahydrocannabinol (D9-THC)	0.120	0.360	2	20.0
D8-Tetrahydrocannabinol (D8-THC)	0.150	0.450	2	20.0
Cannabicyclol (CBL)	0.130	0.380	2	20.0
D9-Tetrahydrocannabinolic acid (THCa)	0.090	0.280	2	20.0
Cannabichromene (CBC)	0.060	0.190	2	20.0
Cannabichromenic acid (CBCa)	0.220	0.670	2	20.0
Total THC			3.754	37.54
Total CBD			4.386	43.86
Total CBG			9.139	91.39
Total Cannabinoids			35.0	350.0

*Dry Weight

Sample Photography



ND Not Detected
N/A Not Applicable
NT Not Reported
LOD Limit of Detection
LOQ Limit of Quantification
<LOQ Detected
>ULOL Above upper limit of linearity
CFU/g Colony Forming Units per 1 gram
TNTC Too Numerous to Count

Accreditation #

Authorized Signature

Jack Spencer, PhD
Senior Technician
25 Jul, 2021 02:05:15 PM

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Maryland Compliant CoA

CBD Canna Labs

Office: 802-908-8142 | Fax: 802-908-8142
18 HERCULES DR, COLCHESTER, VT 05446

Certificate of Analysis

Company:	RPS2 213 Interstate Dr, Somersworth, NH 03878	**Sample ID:**	FLD_001	**Report Date:**	2021-09-02
		Lot:	A	**Date Analysed:**	2021-08-26
Customer ID:	C10054	**Matrix:**	Flower Dry	**Analyst:**	Henry Barone
Grower License#:	NA	**Date Sampled:**	2021-08-26	**Report ID:**	
		Date Received:	2021-08-26		

Cannabinoid Summary

Cannabinoid Profile	LOQ (mg/g)	Concentration (mg/g)	Weight (%)	Flag
CBDVA	0.000	<LOQ	<LOQ	
CBDV	0.001	<LOQ	<LOQ	
CBDA	0.001	0.0020	0.0002	
CBGA	0.001	<LOQ	<LOQ	
CBG	0.002	<LOQ	<LOQ	
CBD	0.002	0.0003	0.00003	<LoQ
THCV	0.002	0.0020	0.0002	<LoQ
CBN	0.001	<LOQ	<LOQ	
D9 THC	0.002	0.0003	0.00003	<LoQ
D8 THC	0.002	<LOQ	<LOQ	
THCA	0.003	0.0003	0.00003	<LoQ
CBC	0.002	<LOQ	<LOQ	
Total THC		0.0005631	0.00005631	
Total CBD		0.002054	0.0002054	
Total Cannabinoids		0.0049	0.00049	

0.0005631 Total THC	0.002054 Total CBD	0.00049 Total Cannabinoids	0.0003 D9-THC
0.19% Percent Moisture	3.65 : 1.00 THC : CBD Ratio		

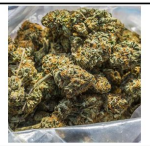
Cannabinoids Methodology: High Performance Liquid Chromatography(HPLC) using PerkinElmer FLEXAR™ with Photo Diode Array Detector (PDA).

Total CBD and total THC are calculated values, to account for assumed decarboxylation from the acid form (THCA or CBDA) to the neutral form, causing weight loss of the acid group.

These values are calculated as follows:

Total THC = (THCA x 0.877) + D9-THC
Ratio of Total CBD: Total THC
Total CBD = (CBDA x 0.877) + CBD
Reagent Blanks <LOQs for all analytes

LOQ = The lowest quantity that this method can reliably detect. Any cannabinoid that was not detected is assumed to be less than the stated LOQ (<LOQ).
All results reflect dry weight of material, based on % moisture of the sample.



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(802) 140-0148 laboratory@cbdcannalabs.com

Colorado Compliant CoA

Quality Testing Labs

1

Certificate Of Analysis

Potency

Client Information

First Name:	Elijah	**Last Name:**	Patch	**Email:**	qtl@gmail.com
Phone No. :	(303) 937-9484	**Address:**	7935 E US Hwy 50		
City:	Boone	**State:**	CO	**Zip**	81025

Sample Information

Sample ID:	CNEX_50	**Sample ID (External):**	CBN Isolate
Type:	Concentrates N Extracts	**RFID/METRC Tag:**	1A4000B000370DD000000168
Entry Date:	2021-08-25	**Incoming Package Notes:**	
Class:	Hemp	**Date Analyzed:**	2021-08-25 - 2021-08-26

Cannabinoid Profile: HPLC-PDA: Potency/ Tier 2 Basic 5

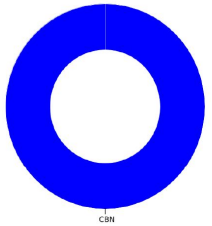
Analyte Name	Result (%)	Result (mg/g)
CBDa	0.000	
CBD	0.000	
CBN	100.000	
d9 THC	0.000	
THCa	0.000	
Other Cannabinoids	0.000	

Total THC	**0.000**	
Total CBD	**0.000**	

LOQ = 0.827

Note:
Formula for calculating Total THC and Total CBD are:
Total THC = (THCa x 0.877) + THC
Total CBD = (CBDa x 0.877) + CBD

Relative Cannabinoid Concentration



Other Information

Analysis Comment	Remark

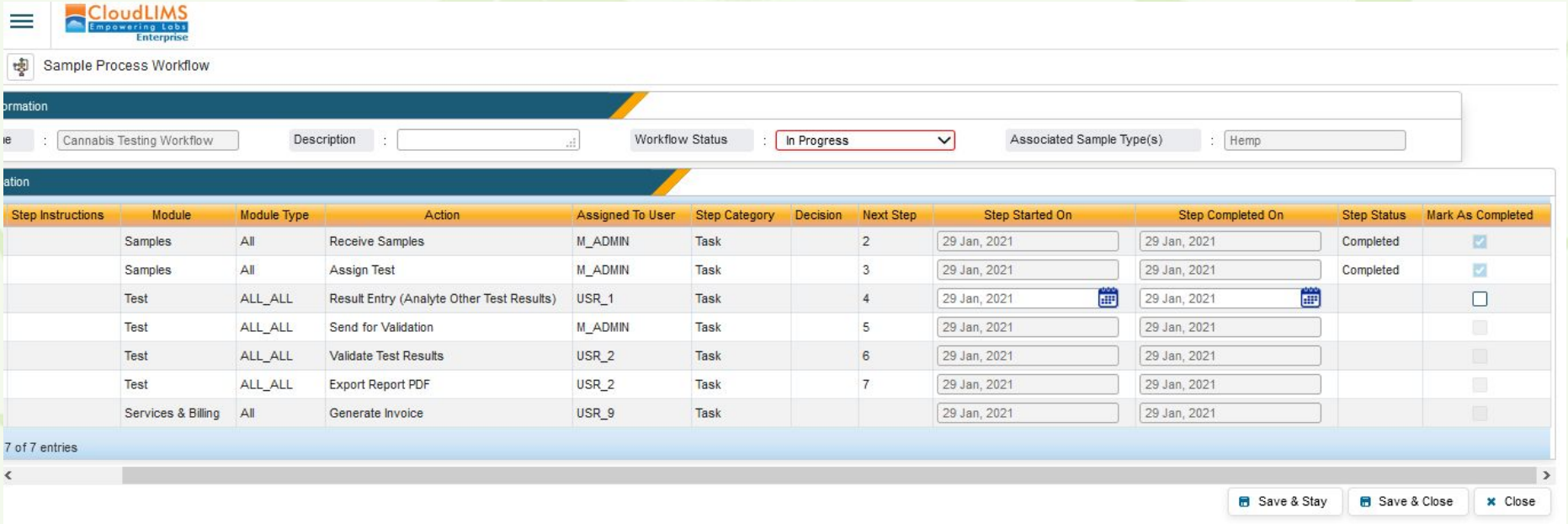
Prepared by: Noah Toman
2021-08-26

Approved by: Oliver Griffin
2021-08-26 17:11:31.0

Report contains results for only those items submitted to the laboratory. Sampling not performed by Quality Testing Labs. Results applied to the samples as received.
This report shall not be reproduced except in full without approval from Quality Testing Labs.

Manage Workflows

Monitor the sample processing status, enforce standard operating procedures (SOPs), and track deviations from the specified SOPs



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Read-only Audit Trail

Maintain an audit trail of each activity along with a date & time stamp

Show 50 entries

First Previous 1 2 3 4 5 Next Last

	Activity ID	Activity Date/Time	Attribute Name	Module Name	ID	Action Performed	Original Value	Current Value	Updated By
1	ACT_1340	22 Apr, 2022 [03:00:32 PM GMT+05:30]	Test ID	Test Management	M_ADMIN	Document Association		DOC_1, DOC_2, DOC_3	M_ADMIN (Master Adr
2	ACT_1316	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Result Upload/Update Timestamp	Test Management	HME_3 (Sample ID : CBD_033)	Updated	21 Apr, 2022 [03:59:03 PM GMT+05:30]	21 Apr, 2022 [05:41:02 PM GMT+05:30]	M_ADMIN (Master Adr
3	ACT_1317	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Concentrations (ppb) From File	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : As 75 Helium KED (ppb))	Updated		-1	M_ADMIN (Master Adr
4	ACT_1317	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Concentrations (ppb)	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : As 75 Helium KED (ppb))	Updated	FZ	DFG	M_ADMIN (Master Adr
5	ACT_1317	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Result ug/g	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : As 75 Helium KED (ppb))	Updated	NR	ADF	M_ADMIN (Master Adr
6	ACT_1318	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Concentrations (ppb) From File	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Cd 111 Helium KED (ppb))	Updated		0.09	M_ADMIN (Master Adr
7	ACT_1318	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Concentrations (ppb)	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Cd 111 Helium KED (ppb))	Updated		0.09	M_ADMIN (Master Adr
8	ACT_1318	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Result ug/g	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Cd 111 Helium KED (ppb))	Updated		0	M_ADMIN (Master Adr
9	ACT_1318	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Flag Calculation based on this column	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Cd 111 Helium KED (ppb))	Updated		0	M_ADMIN (Master Adr
10	ACT_1319	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Concentrations (ppb) From File	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Pb 208 Helium KED (ppb))	Updated	140	345	M_ADMIN (Master Adr
11	ACT_1319	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Concentrations (ppb)	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Pb 208 Helium KED (ppb))	Updated	0.09	345	M_ADMIN (Master Adr
12	ACT_1319	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Result ug/g	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Pb 208 Helium KED (ppb))	Updated	0	0.35	M_ADMIN (Master Adr
13	ACT_1319	21 Apr, 2022 [05:41:02 PM GMT+05:30]	Flag Calculation based on this column	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Pb 208 Helium KED (ppb))	Updated	0	0.35	M_ADMIN (Master Adr
14	ACT_1302	21 Apr, 2022 [03:59:03 PM GMT+05:30]	Result Upload/Update Timestamp	Test Management	HME_3 (Sample ID : CBD_033)	Updated	21 Apr, 2022 [03:47:54 PM GMT+05:30]	21 Apr, 2022 [03:59:03 PM GMT+05:30]	M_ADMIN (Master Adr
15	ACT_1303	21 Apr, 2022 [03:59:03 PM GMT+05:30]	Concentrations (ppb)	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : As 75 Helium KED (ppb))	Updated		FZ	M_ADMIN (Master Adr
16	ACT_1303	21 Apr, 2022 [03:59:03 PM GMT+05:30]	Result ug/g	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : As 75 Helium KED (ppb))	Updated		NR	M_ADMIN (Master Adr
17	ACT_1303	21 Apr, 2022 [03:59:03 PM GMT+05:30]	Flag Calculation based on this column	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : As 75 Helium KED (ppb))	Updated		Error	M_ADMIN (Master Adr
18	ACT_1307	21 Apr, 2022 [03:59:03 PM GMT+05:30]	lod	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Total)	Updated		0	M_ADMIN (Master Adr
19	ACT_1307	21 Apr, 2022 [03:59:03 PM GMT+05:30]	limitrangelow	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Total)	Updated		0	M_ADMIN (Master Adr
20	ACT_1307	21 Apr, 2022 [03:59:03 PM GMT+05:30]	limitrangehigh	Test Management	HME_3 (Sample ID : CBD_033 | Analyte Name : Total)	Updated		0	M_ADMIN (Master Adr
21	ACT_1296	21 Apr, 2022 [03:47:54 PM GMT+05:30]	Result Upload/Update Timestamp	Test Management	HME_3 (Sample ID : CBD_033)	Updated	19 Apr, 2022 [05:08:10 PM GMT+05:30]	21 Apr, 2022 [03:47:54 PM GMT+05:30]	M_ADMIN (Master Adr

Showing 1 to 50 of 1,146 entries

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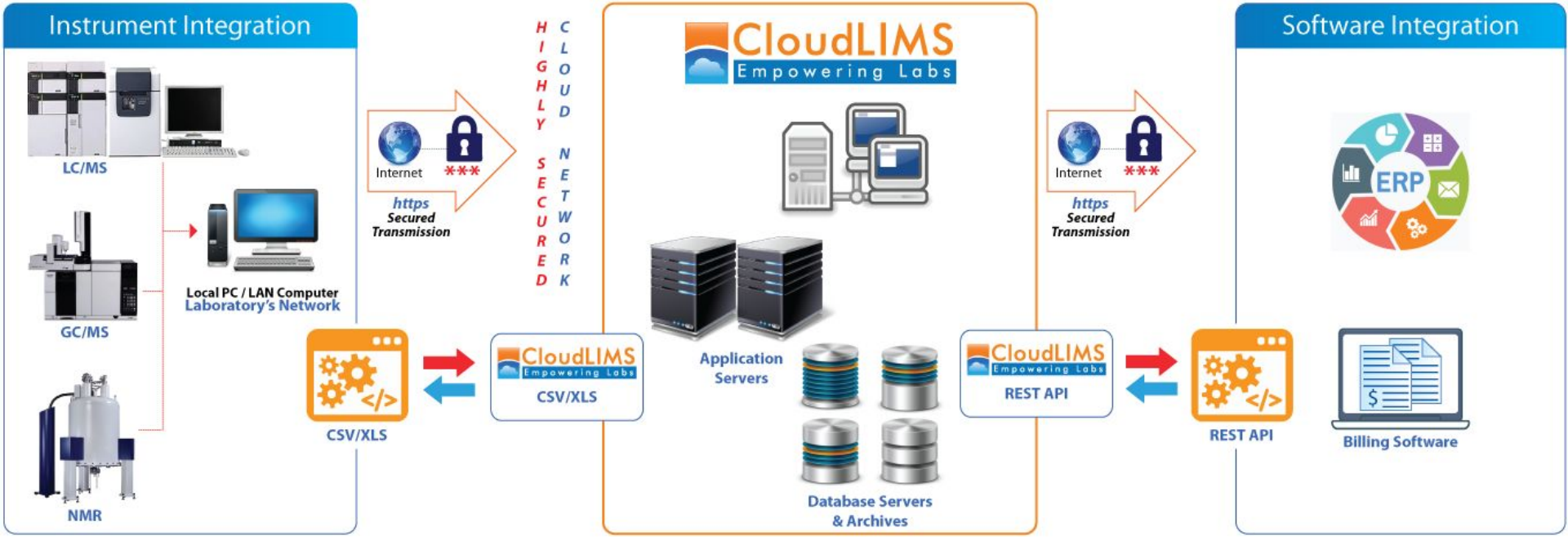
Instrument & Software Integration

Instrument and software integration assures data integrity, minimizes turnaround time, helps post test results directly to seed-to-sale software



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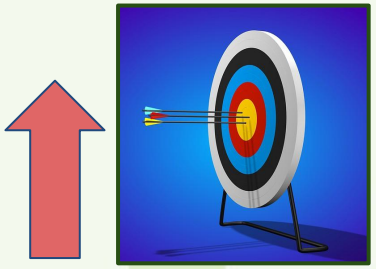
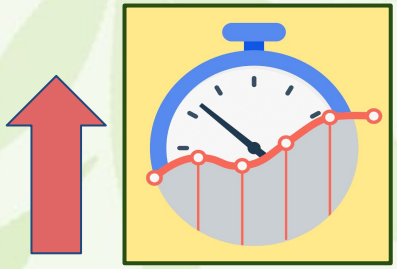
Benefits of Deploying a Cannabis LIMS



TEST RESULT ACCURACY



PRODUCTIVITY

QUALITY

LOWER COSTS

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Benefits of a Cloud-based Cannabis LIMS

- No upfront investment
- Automatic data backups
- Enhanced data security
- Real-time data sharing
- Rapid scalability

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How to Choose the Right LIMS

Checklist of Essential Functionality of a LIMS:

- ✓ Streamline and automate QA/QC processes
- ✓ Maintain a chain of custody of all samples through their lifecycle
- ✓ Manage staff training and their competency
- ✓ Manage documents, SOPs, and track their version history
- ✓ Schedule instrument calibration & manage maintenance data
- ✓ Generate custom Certificates of Analysis (CoA)

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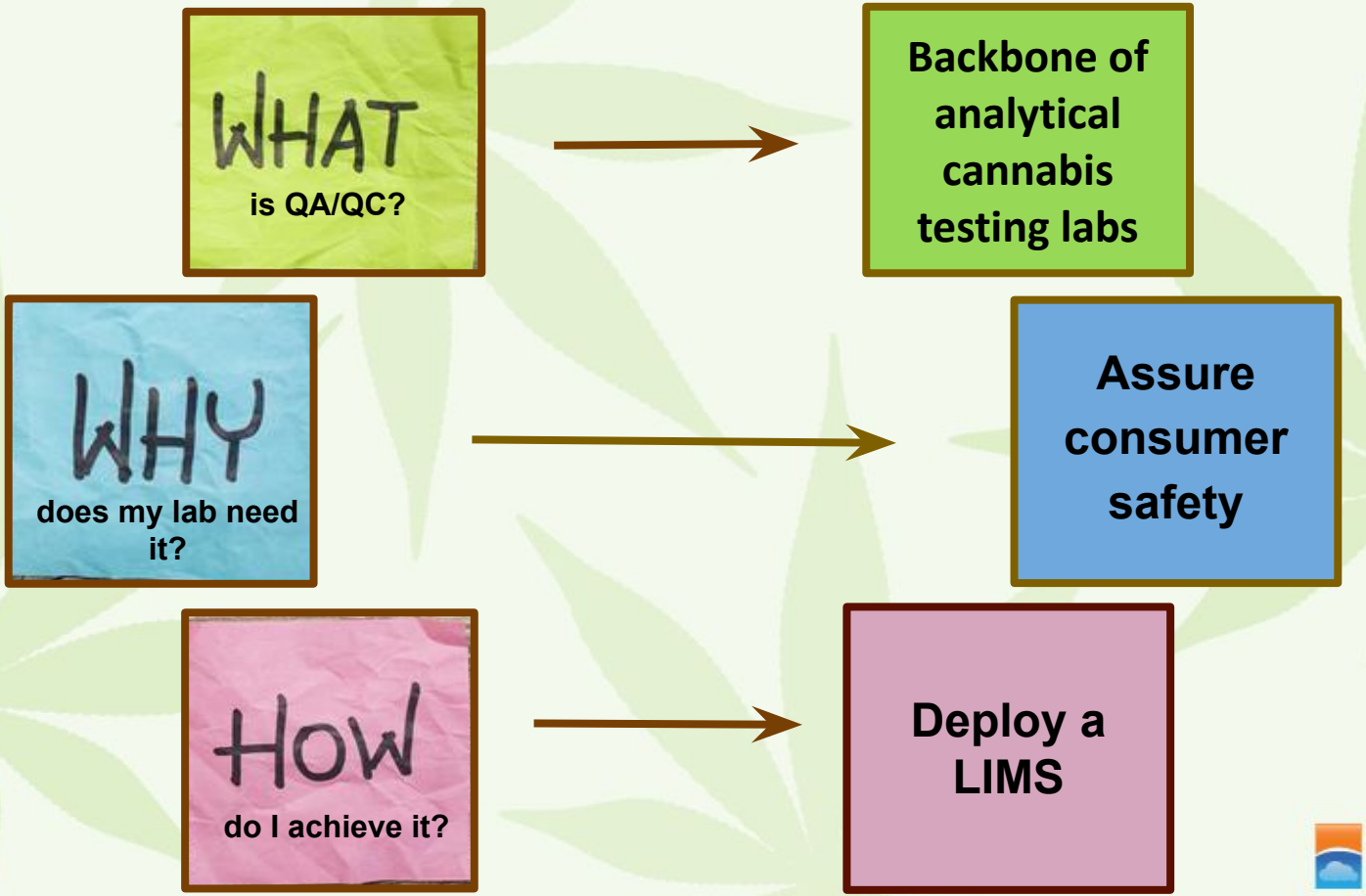
In Conclusion...



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