IMPLEMENTATION-READY CANNABIS TESTING

Flowers, Extracts, Edibles, and Concentrates

PerkinElmer®
For the Better

ANALYSIS FROM SEED TO FINAL PRODUCT

PARTNER WITH **PERKINELMER**

Analyzing cannabis can be challenging – setting up a laboratory, developing methods to ensure maximum throughput of samples, generating client reports, and preserving data integrity. More importantly, as state and country rules and regulations evolve, cannabis labs need instrumentation and support that can meet new and stricter demands. Difficult matrices like these require the highest sensitivity and greatest performance than ever before. And from pesticides and mycotoxins to residual solvents and terpenes to potency and heavy metals, our instruments will help you analyze quickly and accurately.

Whether your lab is well established or just starting up, having a single-source partner who can offer turnkey solutions that meet the current regulations is essential to a successful business. For years, we've worked with government and contract cannabis laboratories to develop industry-leading methods, technology, and exceptional return on investment. We help drive analytical standards and commit to ensuring your laboratory has maximum uptime.

Learn about our various testing methods and applications for cannabis analyses. Let us work with you to build an efficient workflow, so you can focus on growing your business and brand.

Meet the newest, most elite member of the QSight family

Compared to its predecessors, the QSight 400 LC/MS/MS instrument has superior sensitivity, which can detect analytes present at parts per trillion concentrations. Plus, it has the same unique features you've always loved about the QSight instrument, such as StayClean™ and dual-source technologies.

CANNABIS TESTING AT A GLANCE

PESTICIDES, MYCOTOXINS

Instrument Family:
QSight® Triple Quad
Three models to choose from, depending on your sensitivity requirements

Technology:
UHPLC LC/MS/MS

Benefits: High-selectivity and high-sensitivity tests for compounds in different sample matrices

RESIDUAL SOLVENTS, TERPENES

Instruments:
Clarus® SQ 8 and TurboMatrix™

Technology:
GC/MS with headspace (GC/MS-HS)

Benefits: Works together to analyze accurately and save time

POTENCY CANNABINOIDS

Instrument: Flexar™ HPLC

Technology: HPLC

Benefits: Chromatographic separation and quantitative monitoring of primary cannabinoids

Instrument: Spectrum Two N™

Technology: FT-NIR Spectrometer

Benefits: Enables simple and reliable NIR analysis

HEAVY METALS AND MINERALS

Instruments:
NexION® 2000 and Titan MPS™

Technology: ICP/MS and microwave digestion sample prep

Benefits: Works together to effectively analyze cannabis for nutritional and toxic elements

PESTICIDES

ANALYZING WITH LC/MS/MS
FOR SUPERIOR SELECTIVITY, SENSITIVITY, RESILIENCE, AND EASY SAMPLE PREP

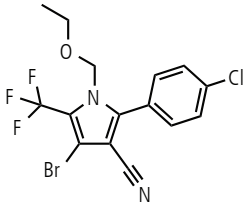
High-performance liquid chromatography tandem mass spectrometry (LC/MS/MS) has emerged as the method of choice for pesticide and mycotoxin analysis in cannabis. Traditionally, pesticides are screened using two analytical instruments: GC-MS/MS and LC/MS/MS. However, most of the studies for the two-system technology approach either do not achieve state action limits or require multiple time-consuming sample preparation methods and instrument consumables.

Our QSight triple quad LC/MS/MS uses a single instrument and single prep method for rapid, reliable results – suitable for labs wanting to comply with stringent regulations. This method allows identification and quantification of all pesticides and mycotoxins at levels well below action limits (0.005 to 0.25 µg/g). The ability to screen and quantitate the hydrophobic and chlorinated compounds normally analyzed on a GC/MS, as well as all the mycotoxins, makes it the ideal analytical technique for the cannabis industry.

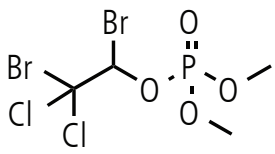
Highlights of the Turnkey Method for Pesticide and Mycotoxin Analysis

- Ability to analyze all North America-regulated pesticides and mycotoxins on a single LC/MS/MS
- Eliminates the need for GC/MS by using APCI source (APCI used for pesticides such as PCNB and Chlordane)
- StayClean™ technology addresses matrix-induced maintenance issues in the MS instrument and improves throughput
- Provides a reliable and reproducible method and SOP with LOQs below state of California action limits
- Features simple and fast sample preparation procedure with acceptable recoveries for all analytes
- Complete application solution includes analysis of mycotoxins and pesticides with one instrument (sample preparation, chromatography, and mass spectrometry)

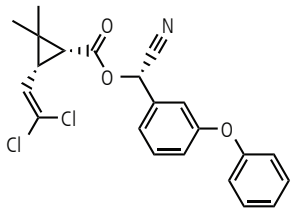
The QSight system's unique dual source technology allows you to run all California state-regulated pesticides on *one* instrument. It eliminates the need for GC/MS analysis by using the APCI source to detect chlordane and pentachloronitrobenzene. Additionally, it captures trace amounts of tricky pesticides such as captan, chlorfenapyr, cypermethrine, cyfluthrin, naled, permethrin, and pyrrethrin.



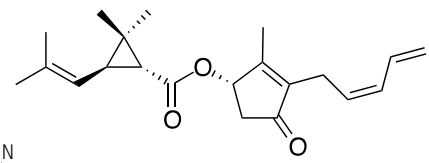
Chlorfenapyr



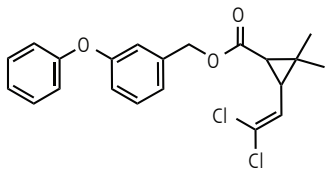
Naled



Cypermethrine



Pyrethrin



Permethrin

PESTICIDES

Dual Source
Two independent probes provide true multiplexing flexibility

StayClean Source
Self-cleaning design delivers maximum sensitivity and exceptional uptime

Mass Filters
High-quality precision rods provide highly stable, precise mass filtering

UniField Detector
Patented technology counts positive and negative ions without high-voltage switching

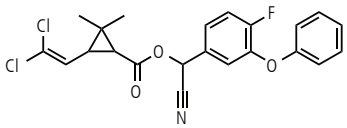
HSID Interface
Provides low background and reliable results and reduces the number of parameters to manage

Laminar Flow Ion Guide
Highly efficient field-free transmission

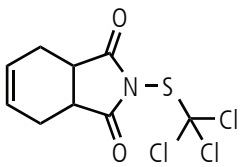
Collision Cell
Fast, efficient fragmentation (fast MRMs) shortens cycle time with zero crosstalk

Modular
Plug-and-play design for ease of service

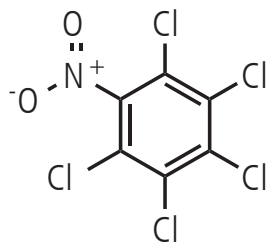
Small Footprint, Vertical Design
Compact 50 cm x 50 cm x 115 cm – no benchtop needed



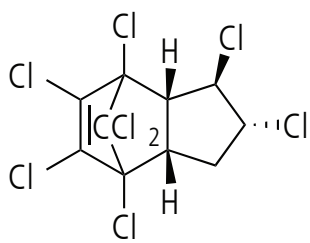
Cyfluthrin



Captan



Pentachloronitrobenzene



Chlordane

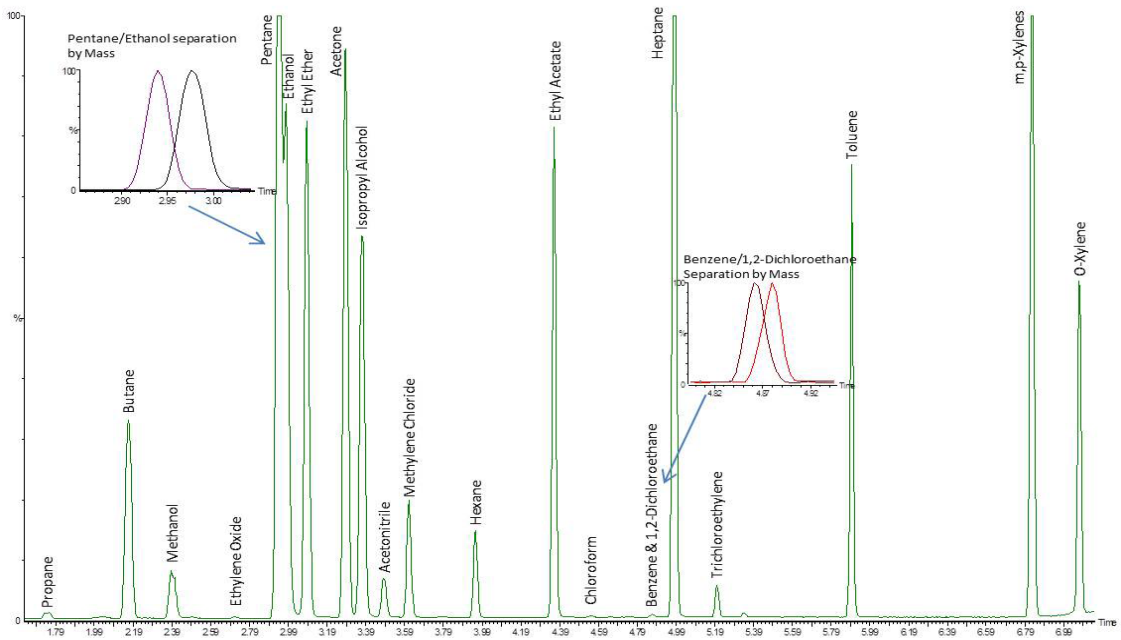
RESIDUAL SOLVENTS

PREVENT END-PRODUCT CONTAMINATION

Most cannabis concentrates are extracted using a solvent such as supercritical CO2, butane, hydrocarbon (hexane), propane, water (ethanol) or alcohol. These solvents are used to extract out the cannabinoids and terpenes from the plant material. In some cases, impurities from the solvent remain in the final cannabis product. These are called residual solvents and understanding their concentration is a critical element of cannabis testing.

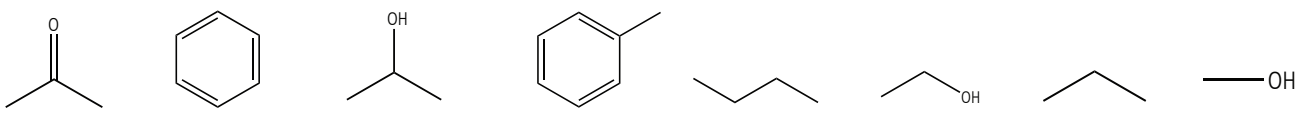
The method of choice for quantifying residual solvents is headspace gas chromatography, a simple technique that allows only the volatile component of the cannabis sample to be measured.

Our preinstalled method for GC/MS-HS technology leverages the identical instrumentation required for terpene analysis, allowing the streamlined lab to run both tests simultaneously.



Residual solvent analysis by GC/MS-HS, in compliance with guidelines for the California market.

Some of the most common residual solvents tested by GC/MS-HS are: butane, propane, ethanol, isopropanol, methanol, acetone, benzene, toluene, and naptha.

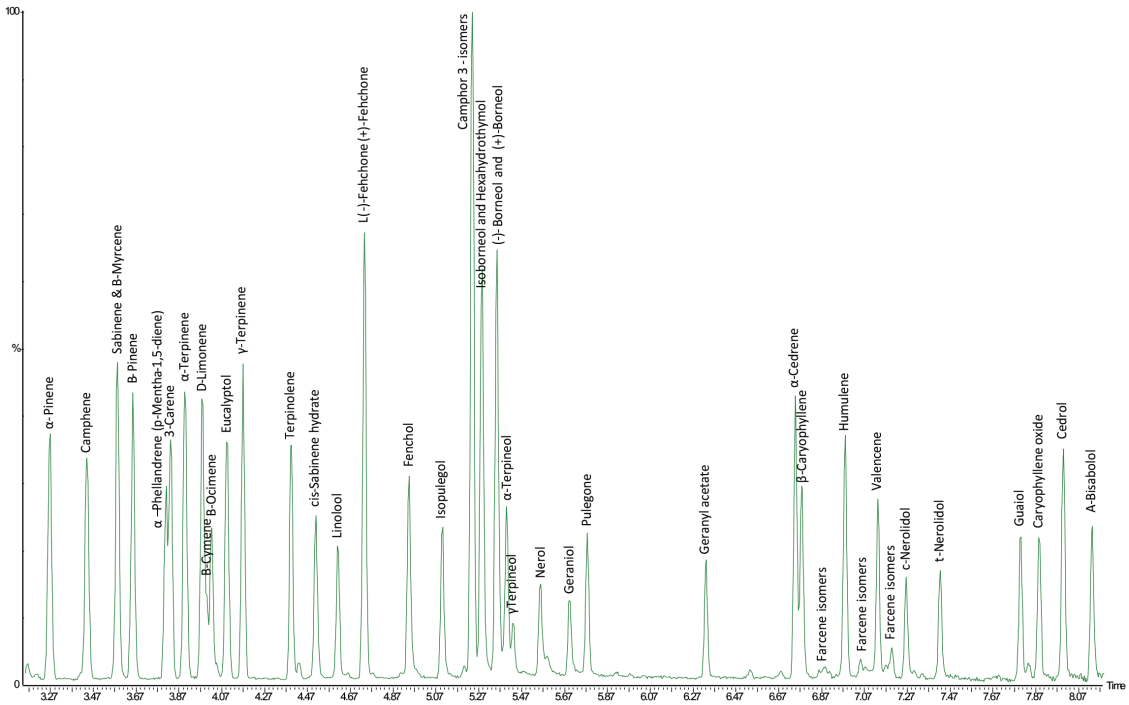


Acetone | Benzene | Isopropyl Alcohol | Toluene | Butane | Ethanol | Propane | Methanol

ISOLATING, IDENTIFYING, AND ANALYZING TERPENES

From oranges to cannabis, terpenes are found in the oils of all botanicals and are often responsible for the distinct flavors and fragrances consumers recognize. By leveraging unique terpenes and key cannabis strains, growers, processors, and producers can differentiate themselves – and their products – in this ever-growing market. Additionally, the potential medical benefits of terpenes are continually explored and new analysis opportunities surge.

Terpene analysis is run on a GC/MS-HS. With easy sample preparation, this laboratory analysis can be used to look at more than 140 terpenes of varying concentrations.



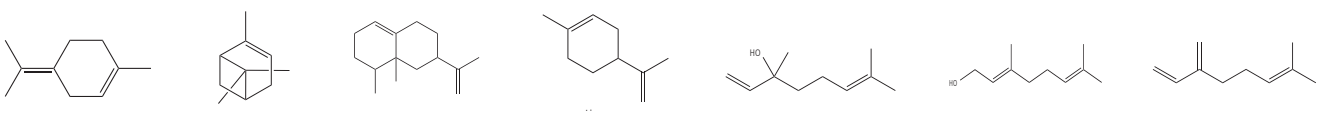
Terpene analysis by GC/MS-HS, showing distinct separation of the terpenes found in the test sample.

From Regulation Requirements to Strain Consistency

Whether you are focused on meeting stringent regulations or on maintaining strain consistency, the Clarus SQ 8 GC/MS is unsurpassed in both sensitivity and stability. Coupled with the TurboMatrix headspace sampler and engineered to deliver unparalleled precision, accuracy, and productivity, the Clarus GC/MS system is the clear choice for laboratories serving the cannabis market.

Clarus GC/MS with TurboMatrix Headspace

Highly valued for revenue or for research, terpenes are strain dependent and can be difficult to analyze due to complicated coleutions. The addition of the headspace to the GC/MS system minimizes analytical challenges and allows for accurate terpene identification.



Terpinolene | a-Pinene | Valencene | Limonene | Linalool | Geraniol | Myrcene

POTENCY

THE NEED FOR CANNABINOID POTENCY TESTING

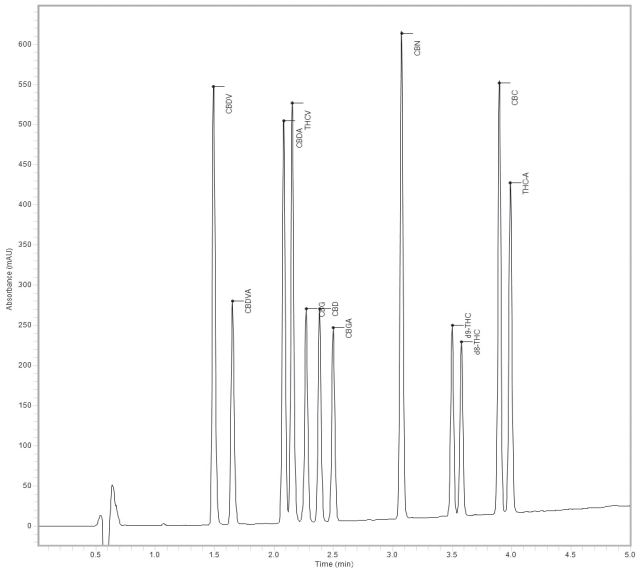
Naturally occurring cannabinoids, the main biologically active components of the cannabis and hemp plant, form a complex group of closely related compounds, of which 70 are known and well described. Of these, the primary focus has been on Δ9-tetrahydrocannabinol (THC) due to its pharmacological and toxicological characteristics, upon which strict legal limits have been enforced. Cultivators and processing labs often focus on Δ9-tetrahydrocannabinolic acid (THC-A), as it is the naturally occurring precursor to THC and is readily decarboxylated to THC via the drying and/or heating of cannabis.

Full Cannabinoid Quantification with HPLC

Our application describes a method for the chromatographic separation and quantitative monitoring of twelve primary cannabinoids, including THC, THC-A, CBD, and CBD-A, in cannabis flower extracts and edibles by HPLC combined with PDA detection. This technique employs our Flexar HPLC system, including a quaternary pump, autosampler with Peltier cooling, column heater and PDA (photodiode array) detector.

Quick and Nondestructive Analysis with FT-NIR

In addition, our Spectrum Two N with near-infrared reflectance module (NIRM) can determine the THCA/CDBA potency ratio in ground cannabis flower. It's a quick and nondestructive method that requires little to no sample preparation, no hazardous chemicals, and allows the sample to be reused in other analyses.

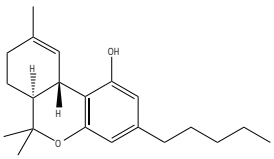


LC chromatogram showing separation of the 12 cannabinoids in the Level-6 standard.

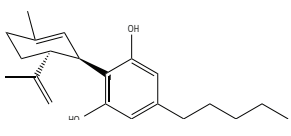
Spectrum Two N FT-NIR Spectrometer

Flexar HPLC

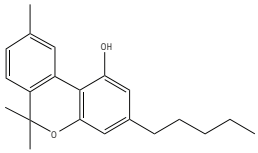
Sample preparation is critical when analyzing potency to achieve accurate quantification of the most commonly desired cannabinoids: THC, CBD, CBN, and CBDV.



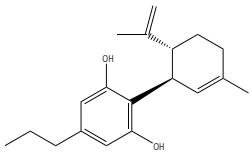
THC



CBD



Cannabinol

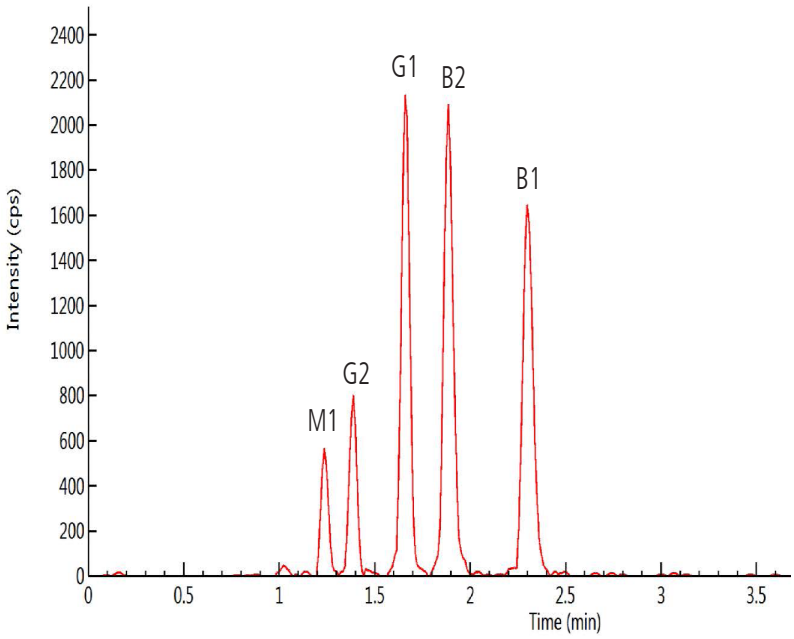


CBDV

PREVENT THE SPREAD OF CONTAMINATION

In addition to pesticides, the growth of various molds and fungi during the growing process can produce carcinogenic mycotoxins including ochratoxin A and aflatoxins. As a result, testing for levels of pesticides and mycotoxins in cannabis is important to ensure consumer safety and quality control, as these molecules can be highly toxic to all animal organisms and have harmful effects even at very low doses. Contamination can occur in the field, but also during the subsequent phases of transportation, storage, or processing, or when environmental conditions of temperature and humidity are precise enough to develop fungal spores naturally present in the environment.

Our mycotoxins method allows laboratories to quantitate at low levels (0.005 to 0.25 µg/g), which is well below the actions limits set by the state of California with good precision. That's what makes this a novel method for screening and measuring pesticides and mycotoxins in cannabis with a single instrument.



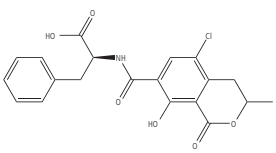
TICs of 1 ppb aflatoxin standard

UHPLC with MS Detector

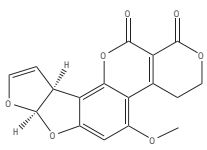
The use of a universal MS detector, which includes the QSight 200 and 400 series, allows the development of a single analytical method without resorting to a system of derivatization. The QSight system identifies molecules, exploiting the ions generated when subjected to a process of ionization. Each toxin is analyzed in the most appropriate ionization method: ESI + or ESI -.

QSight 200 or 400 series – ideal for pesticide analysis

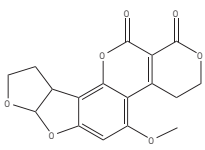
As with potency, the QSight instrument comes with an SOP that outlines a method to test challenging matrices presented by mycotoxins.



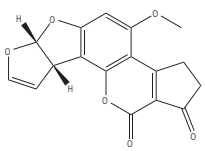
Ochratoxin A



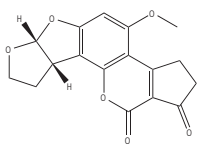
Aflatoxin G1



Aflatoxin G2



Aflatoxin B1



Aflatoxin B2

HEAVY METALS

ENSURE SAFETY FOR END CONSUMERS

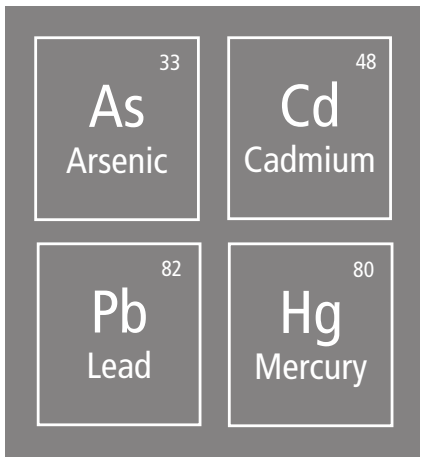
Harmful toxic elements can be absorbed into cannabis plants primarily through uptake from soil, water, and fertilizer. Concentrations are at comparatively trace levels – in the parts per billion or parts per trillion – but can still be harmful to end consumers. As such, it's important to measure the toxic elemental content of plants and plant materials. Cannabis and hemp plants are complex biological entities that require sample preparation, usually consisting of homogenization followed by microwave digestion to completely break down the complex matrix and extract the elements. Despite these steps, it's still possible for matrix-induced spectral interferences to persist, which may cause false readings, especially for the toxic elements. To ensure accuracy and compliance, our NexION ICP-MS includes a detailed SOP that allows heavy metals, such as mercury, lead, arsenic, and cadmium, to be quantified in a cannabis lab.

Microwave Digestion and ICP-MS Makes Sampling Easy and Efficient

The NexION ICP-MS combined with a Titan MPS microwave system can effectively prepare and analyze cannabis for both nutritional and toxic elements. Reproducible sample digestion is achieved through precise reaction control of temperature and/or pressure. Access to the sample area from above, via a hinged lid, offers easy sample access. The system employs 100 mL vessels and allows digestion temperatures up to 260° C and pressures up to 100 bar.

NexION 2000 ICP-MS

Titan MPS Microwave Sample Preparation System



Element	Experimental (mg/kg)	% Recovery	California Method Requirements
Arsenic (As)	*0.03*	*100*	*0.20*
Cadmium (Cd)	*0.02*	*97*	*0.20*
Mercury (Hg)	*0.04*	*97*	*0.10*
Lead (Pb)	*0.05*	*87*	*0.50*

The data reveals the NexION's sensitivity to be 10x lower than the strictest requirement presented to date for metal analysis, ensuring safety and testing compliance.

THE COMPLETE CANNABIS LAB SOLUTION

Consumables, From Analysis to Results

Laboratory consumables, such as vials, columns, and injectors, can ensure the continual optimal performance of your laboratory. We provide cannabis-specific consumables, designed to give you greater confidence in your results throughout the lifetime of your instrument.

Your Path to Lab Efficiency Starts Here

With our dedicated cannabis service team, you're gaining support from the absolute best in the business. That means certified technicians in the field who are familiar with all the techniques and cannabis methods you employ. We have the unique qualifications that can help empower your science and your business: analytic method services, asset procurement and disposition, business intelligence, qualification and validation, lab relocation, instrument service and repair, and a deep-seated knowledge of our customers' business requirements.

Software that Drives Efficiency

We offer a suite of intuitive, straightforward software that works across the various touchpoints in your lab, taking you from sample to results faster and easier.

iLab™ Laboratory Execution System (LES)

Work more efficiently with a system that allows you to abandon manual paper processes and embrace simple, accurate automation, from data collection to calculations to reporting results.

ChemDraw®

Create publication-ready, scientifically intelligent drawings of chemical structures and biological pathways with the complete drawing tool of choice for chemists and biologists.

Simplicity™ 3Q

Achieve a streamlined workflow, from method development to results. It's ideal for acquiring, quantifying, and reporting, and has flexible data viewing options and powerful remote diagnostics.

For more information on our Cannabis Testing Solutions, visit www.perkinelmer.com/cannabis

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