Institute of Cannabis Research
COLORADO STATE UNIVERSITY PUEBLO
Advancing Cannabis Science

COLORADO CANNABIS RESEARCH ROUNDTABLE

HOSTED BY THE INSTITUTE OF CANNABIS RESEARCH

November 2025

Prepared By
fountainworks

TABLE OF CONTENTS

1. ORGANIZATION, GOALS, AND METHODOLOGY

On November 14, 2025, the Institute of Cannabis Research (ICR) at Colorado State University Pueblo hosted the Colorado Cannabis Research Roundtable, a multi-stakeholder summit bringing together researchers, industry leaders, policymakers, and regulators to identify and prioritize cannabis research needs at the intersection of science, policy, regulation, and industry practice. Approximately 60 participants representing diverse perspectives across Colorado's cannabis ecosystem gathered at the Colorado State University SPUR Campus to collaboratively develop a research agenda grounded in the real-world needs of the state's cannabis community.

Through structured discussion, collaborative prioritization, and full-group voting, over 60 expert participants from the legislative, academic, and industry sectors collaborated in forming a consensus which identified the highest priority cannabis research needs for serving the citizens of Colorado.

The half-day roundtable featured three expert panels—Regulators and Policymakers, Industry Representatives, and Academic Researchers—followed by thematic breakout sessions where participants identified research priorities across five key areas: Health, Safety & Consumer Protection; Therapeutic Applications & Medical Research; Production, Quality & Regulatory Standards; Education & Prevention; and Industry Development.

1.1 TOP RESEARCH PRIORITIES WERE IDENTIFIED BY THEMATIC AREA

The ICR organized potential research areas into five thematic categories. These categories were developed prior to the meeting to encompass the breadth of cannabis research needs while creating manageable discussion groups and provided an organizing framework for both the morning panel discussions and the afternoon breakout-prioritization sessions. The five themes were:

I. HEALTH, SAFETY & CONSUMER PROTECTION

This category focused on protecting public health and ensuring consumer safety: From understanding what's in cannabis products and their potential health effects, to detecting impairment and preventing harm in settings like roads and workplaces. The theme encompassed product safety, contaminants, adverse health effects, long-term health impacts, impairment detection, driving safety, workplace safety, health surveillance, consumption patterns.

II. THERAPEUTIC APPLICATIONS & MEDICAL RESEARCH

This category encompassed medical and clinical research on cannabis: Studying its therapeutic potential, determining appropriate dosing, understanding patient outcomes, and advancing our knowledge of how cannabis can be used as medicine. The theme encompassed efficacy studies, dosing, patient outcomes, clinical applications, medical cannabis research.

III. PRODUCTION, QUALITY & REGULATORY STANDARDS

This category addressed the full production chain and quality assurance: From how cannabis is grown and cultivated, to the testing and regulatory standards that ensure consistent, high-quality and safe products reach consumers. The theme encompassed agricultural practices, genetic research, crop development, regional adaptation, cultivation, testing standards, compliance research, shelf stability, quality assurance.

IV. EDUCATION & PREVENTION

This category focused on how to be more effective in educating the public and preventing harm: Including strategies for youth prevention, teaching safer consumption practices, and providing accurate information to help people make informed decisions. The theme encompassed public education strategies, youth prevention, safer consumption practices.

V. INDUSTRY DEVELOPMENT

This category examined the business and workforce aspects of the cannabis industry: Foci were on understanding challenges for ensuring a safe and viable industry, developing a skilled workforce, and ensuring consumers have access to clear, reliable information about products and the market. The theme encompassed industry research barriers, workforce development, and consumer education practices.

1.2 SESSION GOALS & OUTCOMES

The roundtable was designed to achieve three primary objectives:

1. **Gather perspectives** from researchers, industry leaders, and policymakers on the most important areas of need for cannabis research in Colorado
2. **Categorize research priorities** across stakeholder groups into thematic areas
3. **Prioritize specific research needs** within each thematic category through small group discussion and monitored voting

The overarching goal was to assess cannabis research priorities for Colorado within the current state of scientific knowledge while identifying key gaps in understanding. The targeted outcome was to develop a research agenda grounded in Colorado's specific needs and informed by diverse stakeholder perspectives.

1.3 ROUNDTABLE APPROACH AND METHODOLOGY

The roundtable employed a three-phase approach designed to gather diverse perspectives, facilitate collaborative prioritization, and build consensus around Colorado's most pressing cannabis research needs.

PHASE 1: EXPERT PANEL DISCUSSIONS (MORNING)

The morning session featured three sequential panel discussions, each offering a distinct stakeholder perspective on cannabis research priorities:

- **Regulators and Policymakers Panel**: Five representatives from state and local government agencies, including Pueblo County Marijuana and Liquor Licensing, Colorado Department of Transportation, Colorado Department of Public Health and Environment, the Colorado Marijuana Enforcement Division, and the Colorado State Legislature, discussed their perspectives on the most important areas of need for cannabis research.
- **Industry Panel**: Five leaders from Colorado's cannabis industry, representing genetics, hemp construction, pharmaceutical development, industry advocacy, and edibles manufacturing, shared their perspectives on research priorities from a business and product development standpoint.
- **Research Panel**: Four researchers from Colorado universities and research institutions, including CU Boulder, University of Northern Colorado, CU Anschutz, and Colorado School of Mines, discussed their perspectives on critical research gaps and opportunities.

Audience members actively engaged by asking questions through Mentimeter, a real-time polling and Q&A platform. Participants also individually captured their own ideas for research needs on structured handouts provided at the beginning of the day. These handouts were organized by the five thematic research categories, allowing participants to brainstorm research priorities within each theme as they listened to the panelists' perspectives.

PHASE 2: THEMATIC BREAKOUT SESSIONS (WORKING LUNCH)

Following the panel discussions, participants transitioned into a working lunch featuring small group breakout sessions organized by thematic research category. To ensure diverse perspectives at each table, participants wore color-coded name tags corresponding to their primary role: researchers, industry representatives, or policymakers/regulators. Tables were intentionally composed to include a mix of these stakeholder groups.

The breakout session structure included three rounds:

Round 1: Sharing Research Ideas - Each person at the table shared 1-2 research needs from their handout that they found most compelling, explaining what problem the research would address, why it matters, and what it would enable (e.g., better policy decisions, safer products, improved public health outcomes). Participants wrote their research priorities on sticky notes, including key rationale.

Round 2: Prioritization as a Group - Tables worked together to identify their top 3-4 research priorities within their thematic area. Participants were encouraged (but not required) to use a structured "Prioritization Exercise" framework that assessed each priority on two dimensions:

- **Impact** (rated 1-3): How significant would the outcomes of this research be? Would it address a critical gap, improve safety, enable better decision-making, or create substantial benefits for multiple stakeholders?
- **Feasibility** (rated 1-3): How realistic is it to conduct this research given current resources, data availability, existing infrastructure, and timeframe?

Round 3: Preparation for Share-Out - Each table designated a spokesperson who prepared to present their top 3-4 priorities to the full group and submitted each priority to Mentimeter for live polling, with responses formatted to include the table's theme number in brackets (e.g., Standardized testing for contaminants).

PHASE 3: CROSS-REPORTING AND FINAL PRIORITIZATION (AFTERNOON)

The roundtable concluded with each table sharing their top 3-4 research priorities with the full group. Participants shared and viewed priorities in real-time through Mentimeter and voted on the research needs they considered most important across all categories. This voting process allowed the entire group to prioritize areas within each theme and to identify research needs with the broadest support across the entire stakeholder community.

2. SUMMARY OF THE THREE PANEL SESSIONS

The morning session opened with three panels:

1. Regulatory and Policymaking
2. Colorado Cannabis Industry
3. Colorado Cannabis Research

2.1 REGULATORY AND POLICYMAKING PANEL SUMMARY

This panel featured representatives from Colorado's regulatory and policymaking community. Panelists offered diverse perspectives on how cannabis research intersects with public policy, regulatory enforcement, and community safety. The panel was convened to surface regulatory and policy perspectives on research needs for informed decision-making and public protection.

The panelists included:

- **Kyle Aber**
  Deputy Director for Liquor and Marijuana Licensing
  Pueblo County Department of Planning and Development
- **Sam Aspnes**
  Integrated Media Strategist supporting CDOT
  CIG Public Relations
- **José Barrón**
  Retail Cannabis Education Program Manager
  Colorado Department of Public Health and Environment
- **Shannon Bird**
  Colorado State Representative, District 29
- **Brandon Jeffery**
  Director of Marijuana Sciences
  State of Colorado Marijuana Enforcement Division

THE MAIN RESEARCH NEEDS DISCUSSED INCLUDED

- **Legislative information needs:** Research on unintended consequences of regulatory proposals, particularly impacts on black markets and unregulated product access
- **Testing and regulatory standard-setting**: Research on contaminant occurrence, health effects at relevant exposure levels, and development of reliable testing methodologies
- **Public education and behavior change:** Cannabis education research is needed to discover best educational approaches which will affect helpful behavior change
- **Product safety research:** Recall efficacy, health impacts of remediating contaminated products, and untested mycotoxins
- **Occupational safety research:** PPE effectiveness, exposure risks, and long-term health impacts for cannabis industry workers

BALANCING REGULATION WITH UNINTENDED CONSEQUENCES

Well-intentioned policies designed to limit youth access or address public health concerns can push consumers toward unregulated sources where product safety cannot be assured. Several specific examples illustrated this challenge:

- **Youth Access**: Data from Colorado's Healthy Kids Survey shows that youth primarily access cannabis from other youth or trusted adults, not from licensed retailers. Compliance testing demonstrates that regulated dispensaries consistently check identification, suggesting prevention efforts should focus on adult behavior and youth-to-youth transfer rather than solely restricting dispensary operations.

State Representative Bird emphasized a critical tension facing policymakers: how to regulate cannabis in ways that protect public health and honor voter intent for legal access without inadvertently creating black markets.

- **High-Potency Product Limits**: If regulations mandate maximum THC percentages, producers must find ways to dilute high-potency extracts or risk non-compliance. However, the 2019 EVALI crisis demonstrated that some cutting agents pose serious health risks, raising questions about whether potency limits could inadvertently lead to more dangerous products.
- **Emerging Synthetic Cannabinoids**: The regulatory focus on traditional THC limits fails to address synthetic cannabinoids available online under hemp regulations, some of which are significantly more potent than traditional cannabis products.

The fundamental challenge is implementing regulations that genuinely protect public health, particularly for youth and vulnerable populations, without making compliance so economically burdensome that the regulated market collapses and activity moves underground.

LEGISLATIVE INFORMATION NEEDS AND RESEARCH TRANSLATION

State Representative Bird also outlined how researchers can most effectively support policymakers during Colorado's legislative session. With hundreds of bills under consideration, legislators need researchers who are available for direct conversation to answer pragmatic, pointed questions rather than lengthy white papers. Key questions legislators face include: What does this policy look like in practice? Will this regulatory approach achieve its intended outcome? Is a particular claim about product safety accurate?

Research examining unintended consequences of regulatory proposals, particularly impacts on black markets and unregulated product access, would be especially valuable for the legislative process going forward.

In the absence of unbiased, independent research, legislative debates devolve into battles of perspectives influenced by whichever stakeholder voices are loudest. The value of the Institute of Cannabis Research lies in its independence from both industry advocacy and prohibitionist agendas, providing evidence-based guidance on how Colorado can best achieve public health and safety goals while maintaining viable regulated markets.

PRODUCT TESTING AND REGULATORY STANDARD-SETTING

Panelists described the complex, iterative process of establishing appropriate testing requirements and safety limits for cannabis products. Key considerations discussed included:

- **Risk-Based Contaminant Selection**: Determining what to test for requires identifying which contaminants pose legitimate health risks, understanding whether they actually occur in cannabis, and assessing risk based on route of administration (what's dangerous when inhaled may be safe when ingested).
- **Analytical Feasibility**: Regulations must be enforceable with reliable, validated testing methods. Requiring tests for compounds that cannot be reliably detected, or setting limits at analytically impossible levels, creates unworkable frameworks.
- **Limited Cannabis-Specific Research**: With limited established research on cannabis contaminants and safety thresholds, regulators must draw on frameworks from other states, international jurisdictions, and analogous product categories while thoughtfully adapting them to cannabis-specific risks.

This ongoing challenge highlights the need for research on contaminant occurrence, health effects at relevant exposure levels, and development of reliable testing methodologies.

PUBLIC EDUCATION AND BEHAVIOR CHANGE

Panelists emphasized that effective cannabis education research must go beyond simple information dissemination to discovering best educational approaches which will affect actual behavior change. Key challenges identified included:

- **Diverse Audiences**: The cannabis-consuming public is not monolithic, ranging from young males (highest-risk group for impaired driving) to baby boomers consuming in retirement, each requiring tailored messaging.
- **Product Complexity**: The diversity of cannabis products, consumption methods, and individual responses makes it difficult to communicate clear, universal guidance.
- **Persistent Misconceptions**: Research shows that some consumers believe they are better drivers when using cannabis, contradicting evidence that cannabis does impair driving ability.
- **Polysubstance Impairment**: Combining cannabis with alcohol or other substances adds complexity to both detection and messaging.
- **Consumer Education on Safe Storage and Prevention:** The need for strategies to educate consumers on proper product storage to prevent youth access and to prevent youth initiation of cannabis use.

Panelists identified research needs around determining the most effective strategies to educate vulnerable populations, change actual consumer behavior, and address misconceptions about impairment. Effective approaches require being "everywhere, all the time" across multiple media channels while investing in communities to support sustained prevention strategies.

WORKPLACE SAFETY AND PRODUCT RELIABILITY

The panel also touched on several other important research and policy areas related to Colorado's cannabis industry:

- **Workplace Safety**: Concerns about occupational health risks for cannabis industry workers, including respiratory conditions, highlighted gaps between state and federal jurisdiction over workplace safety standards.
- **Mycotoxins and Adverse Health Events**: Questions about mycotoxins as possible contributors to cannabis hyperemesis syndrome illustrated the challenge of developing regulatory responses when primary research on health links and validated testing methods remain limited.

- **Enhanced Product Traceability**: Local enforcement officials expressed interest in supporting research needed to develop systems that could track cannabis products from point of sale back to their origin, helping identify bad actors when problematic products are discovered.

2.2. INDUSTRY PANEL SUMMARY

Following the regulatory and policymaker perspectives, the roundtable convened a panel of five industry representatives spanning cultivation, pharmaceutical research, product manufacturing, trade association leadership, and industrial hemp applications. The panel offered insights into research needs from the business and operational side of Colorado's cannabis ecosystem.

The panelists included:

- **Duncan Mackie, PhD**
  Director of Pharmacology & Experimental Therapeutics
  MedPharm Holdings, Bud & Mary's

- **Chuck Smith**
  President and CEO
  Colorado Leads

- **Thomas Swanson**
  Founder, Owner, and Chief Operations Officer
  High Alpine Genetics

- **Mike Hennessy, MS**
  Vice President of Innovation
  Wana Brands

- **Derek Wolf**
  CEO and Co-Founder
  Hemp and Block

KEY DISCUSSION AREAS INCLUDED:

- **Individual cannabinoid compounds and the endocannabinoid system:** Understanding pharmacology, receptor interactions, and therapeutic potential of minor cannabinoids beyond THC and CBD
- **Real-world research on commercially available products:** Observational studies examining consumer experiences, product effectiveness, and usage patterns with dispensary products
- **Routes of administration and delivery mechanisms:** Discovering how cannabinoids behave differently when inhaled versus ingested, including terpene effects and olfactory receptor connections
- **Dosing research versus potency debates:** Focus on actual consumer dosing behavior rather than product potency limits

UNDERSTANDING INDIVIDUAL CANNABINOIDS AND THE ENDOCANNABINOID SYSTEM

The endocannabinoid system is a fundamental part of the human body that is critical for maintaining normal health and metabolism within all body systems, including the cardiovascular, musculoskeletal, digestive, endocrine, immunological, and nervous system. Understanding how cannabinoids interact with this and other body systems shows great promise for medicinal development. Research needs discussed included:

- **Individual compound characterization**: For most minor cannabinoids, researchers have identified chemical structures but lack data on efficacy, receptor affinity, and mechanisms of action
- **Endocannabinoid system research**: Current understanding centers on two receptors (CB1 and CB2), but more research is needed to investigate additional orphan receptors that have emerged and are now know to interact with cannabinoids
- **Human interaction studies**: Understanding how the human body metabolizes, excretes, and responds to minor cannabinoids and their interactions with each other
- **Polypharmacology**: How full-spectrum cannabis products create therapeutic effects through compound interactions rather than isolated molecules

Panelists emphasized significant knowledge gaps around the chemical complexity of cannabis. While THC and CBD are relatively well-studied, cannabis produces over 100 cannabinoids, plus terpenes, flavonoids, steroids, and other medically relevant compounds. The current understanding of individual minor cannabinoids, their pharmacology, receptor interactions, and therapeutic potentials remain limited.

- **Research on the plant's medicinal potential:** Evidence suggests cannabis compounds can be developed as therapeutics for conditions involving inflammation, neurodegeneration (Alzheimer's, Parkinson's), and quality of life improvements, was identified as underexplored due to decades of prohibition.

REAL-WORLD RESEARCH ON COMMERCIALLY AVAILABLE PRODUCTS

Panelists stressed the need for observational research on actual consumer products rather than exclusively lab-based studies. While DEA-licensed laboratory research remains essential, substantial opportunities exist for researchers without DEA licenses to conduct observational studies of commercially available cannabis products.

This emphasis on real-world research represents an opportunity for academic researchers who may have assumed they cannot study THC-containing products without DEA licensure. Observational studies examining consumer experiences, product effectiveness, and usage patterns remain accessible and valuable research pathways.

The gap identified is that consumers are using dispensary products and reporting therapeutic benefits for sleep, pain management, and other conditions, but limited research examines why these products work or how to optimize them. Product developers currently rely on published academic research involving laboratory samples to inform formulations, but real-world product effectiveness and safety data would significantly improve product development for consumer safety and therapeutic outcomes.

ROUTES OF ADMINISTRATION, DELIVERY MECHANISMS, AND CANNABIS AS MEDICINE

Panelists discussed the complexity of different consumption methods, i.e. inhalation versus ingestion being a primary distinction, and how these affect cannabinoid delivery, effectiveness, and safety. Research needs discussed included:

- **Differential effects by route**: Understanding how cannabinoids and other compounds (particularly terpenes) behave differently when inhaled versus ingested, including degradation in the gut
- **Mode of delivery:** Understanding how the mode of delivery affects the medical potential of cannabis products
- **Olfactory receptor connections**: Exploring whether olfactory (smell) receptors located throughout the gut interact with the endocannabinoid system, potentially explaining why aroma plays such an important role in cannabis selection and effects
- **Inflammation-based applications**: Anywhere inflammation is present, cannabinoids may have therapeutic utility, but route of administration matters significantly for efficacy

Panelists were particularly interested in scientific research that could better inform emerging perceptions about how modern cannabis products may work as medicine.

INDUSTRY NORMALIZATION AND FEDERAL FRAMEWORK NEEDS

Panelists discussed the need for research to enable a more functional regulatory and economic framework that could better protect consumer safety by improving the cannabis industry.

- **Federal legalization framework**: Establishing consistent national standards would reduce confusion, simplify compliance for multi-state operators, and create economic stability
- **Economic incentives**: Unlike other agricultural industries that receive federal support, cannabis lacks access to economic incentives and support to address pricing pressures and market challenges
- **Research leadership**: Maintaining Colorado's position as a cannabis research leader through the ICR is critical to the state's economic future and industry competitiveness

From a business perspective, a primary research need was discussed which centers on normalizing cannabis as an industry treated like any other sector. The current state-by-state regulatory patchwork creates significant compliance complexity and competitive disadvantages.

The question underlying this theme is: What research can help demonstrate that cannabis deserves treatment as a legitimate, regulated industry worthy of federal recognition and support?

WASTE BIOMASS UTILIZATION AND CIRCULAR ECONOMY OPPORTUNITIES

Panelists highlighted massive waste streams from cannabis processing that could be repurposed for valuable applications.

Current waste challenges:

- Extraction processors generate tens of thousands of pounds of biomass waste weekly from single facilities
- Fats and waxes from winterization processes are discarded despite having commercial value (lip balms, lotions, soaps)
- Stems, stalks, and post-extraction biomass go to waste
- Because of the current regulatory framework, these materials cannot be repurposed if they originated from THC-containing plants, even when THC has been removed

Research needs include understanding the economic and environmental impacts of current waste disposal requirements for THC-derived materials, and examining regulatory frameworks from other industries (such as corn-based products) that allow differentiated end uses based on final product composition rather than source material.

Potential applications identified:

- **Building materials**: Hemp and cannabis biomass can be processed into insulation products, hempcrete building blocks, and construction materials with performance and health benefits
- **Mineral extraction**: Biomass can be ashed to extract valuable minerals like silica for construction applications
- **Biochar**: Agricultural product with uses in soil amendment and building materials
- **Energy generation**: Agricultural feedstock can power electricity generation
- **Heating products and fuel pellets**: Cellulose-based materials can be processed for energy applications

The fundamental barrier is regulatory: Materials derived from THC-containing plants face disposal requirements even when they no longer contain meaningful THC levels. The solution proposed was regulating the THC molecule itself rather than the entire plant, similar to how corn can be used for food, biofuel, or other purposes without different regulatory treatment based on end use.

DOSING RESEARCH VS. POTENCY DEBATES

Panelists challenged the legislative focus on potency limits, arguing that adverse events and beneficial effects depend entirely on dose consumed, not product potency. The comparison drawn was to alcohol: both moonshine and beer can intoxicate depending on how much someone drinks.

Recent literature reviews on high-potency cannabis concluded that insufficient information exists about how much people actually consume, suggesting a clear research roadmap guidance around dosing patterns, consumer behavior, and relationship between potency, dose, and outcomes.

Research examining actual consumer dosing behavior is needed ~ rather than continued debate about high-potency products.

ADDITIONAL POINTS OF DISCUSSION

The panel also addressed several other research and policy areas:

- **Product quality and organic cultivation**: Testing organic versus non-organic cannabis for medicinal benefits and residual contaminants; understanding how cultivation practices affect therapeutic outcomes
- **American fiber hemp varieties**: Developing regionally adapted hemp genetics for industrial fiber production; ensuring farmers can grow non-intoxicating hemp without risk of "hot" crops (exceeding 0.3% THC); addressing reliance on imported seed stock from other countries

- **Testing standardization**: Researching and creating reference laboratory protocols so all testing facilities evaluate products consistently; addressing gaps in understanding contaminants like Aspergillus (which exists ubiquitously but only certain varieties cause illness)
- **Industry education on proper messaging**: Expanding research on effectiveness of consumer education beyond product components to include safe consumption practices, storage to prevent youth access, and normalizing responsible adult use

Panelist also noted a significant challenge in securing funding to systematically investigate these questions across different product types, consumption methods, and medical applications.

- **Budtender and industry workforce training**: Researching and developing evidence-based educational resources for cannabis retail staff who serve as frontline educators for consumers

2.3. RESEARCH PANEL SUMMARY

The final morning panel brought together four academic researchers from Colorado universities representing diverse methodological approaches and therapeutic focus areas. This panel explored the practical challenges of conducting cannabis research, methodological best practices, and priority research directions from the perspective of those actively engaged in the work.

- **Laura Stewart, PhD.**
  Professor and Director of the Complementary Health and Integrative Physiology Center
  University of Northern Colorado
- **Cinnamon Bidwell, PhD.**
  Associate Professor
  Co-Director, CU Change, Translational Research, Cannabis, Substance Use, and Psychiatry
  University of Colorado Boulder
- **Emily Lindley, PhD.**
  Associate Professor, Department of Orthopedics
  University of Colorado Anschutz Medical Campus
- **Anuj Chauhan, PhD.**
  Professor, Department of Chemical and Biological Engineering
  Colorado School of Mines

KEY DISCUSSION AREAS INCLUDED:

- **Using real-world products in rigorous research frameworks:** Partnerships enabling DEA-licensed research on commercially available products to generate findings relevant to consumer safety and effectiveness
- **Special populations and drug interactions:** Research involving older adults, cancer survivors, and individuals on multiple medications
- **Cannabis use disorder research:**
    - Understanding how legalization, greater access, and higher potency products may intersect with disorder risk
    - Developing therapeutic interventions for cannabis use disorder (currently no frontline medications exist)
    - Assessing cannabis use disorder development risk in therapeutic cannabis trials
- **Dosing complexity across multiple variables:** Research examining cannabinoid ratios, minor cannabinoids, dose levels, routes of administration, and patient populations simultaneously

REAL-WORLD PRODUCTS IN RIGOROUS RESEARCH FRAMEWORKS

Panelists emphasized that the strongest cannabis research involves frameworks that incorporate products people actually use rather than solely laboratory-based studies of isolated compounds. Industry partners who have obtained DEA licenses and completed regulatory requirements to allow their commercial products to be studied in controlled research settings have enabled critical collaborations.

Examples include partnerships with companies like MedPharm (Dr. Duncan Mackie from the industry panel) whose DEA licensure allows products similar or identical to those sold on the Colorado market to be tested under rigorous clinical trial standards. Similarly, partnerships with hemp companies have enabled CBD therapeutic trials using products consumers can actually access.

This approach creates data that would otherwise be unavailable and represents significant effort from industry partners willing to submit their products to unbiased research testing.

Panelists said that the value of this work cannot be overstated; it allows researchers to generate findings that can actually move the needle on improving consumer safety and understanding product effectiveness.

SPECIAL POPULATIONS AND DRUG INTERACTIONS

Research involving populations like cancer survivors and older adults on multiple medications faces IRB challenges due to limited interaction data, creating a circular problem where lack of research makes it difficult to conduct the research needed.

CANNABIS USE DISORDER: PREVALENCE AND PREVENTION

Historically, approximately 10% of individuals exposed to cannabis develop symptoms consistent with substance use disorder: using at levels higher than intended, experiencing interference with important life functions, and difficulty cutting down despite wanting to do so.

Panelists addressed the need for greater research to understand cannabis use disorder, an often-misunderstood risk area.

Public misconceptions remain widespread, with many people unaware that cannabis can be addictive or that cannabis use disorder exists. Establishing the physiological tolerance and withdrawal symptoms associated with cannabis took considerable time, but these phenomena are now well-documented. Withdrawal can include irritability and sleep disruption lasting three to four weeks, with sleep disturbance often cited as the primary reason individuals return to cannabis use when attempting to quit.

Research priorities include:

- Understanding how legalization, greater access, higher potency products, and increased exposure may intersect with disorder risk
- Developing therapeutic interventions (currently no frontline medications exist for cannabis use disorder)
- Exploring whether high-dose CBD might help mitigate withdrawal symptoms and support cessation efforts
- Assessing cannabis use disorder development risk in therapeutic cannabis trials (currently understudied; most therapeutic trials don't evaluate whether patients develop problematic use patterns when using cannabis medicinally)

DOSING COMPLEXITY ACROSS MULTIPLE VARIABLES

Cannabis research requires examining multiple variables simultaneously, different cannabinoid ratios, minor cannabinoids, dose levels, routes of administration, and patient populations, making comprehensive study designs prohibitively expensive and forcing researchers to make strategic trade-offs

ADDITIONAL POINTS OF DISCUSSION

- **Mechanistic research**: Understanding biological mechanisms underlying cannabis effects, not just whether products work, but how they work, particularly matters for populations on multiple medications who need to understand interaction risks
- **Occupational safety research**: Researchers appreciated the earlier panel's focus on cannabis industry worker safety, noting that facility tours reveal significant exposure concerns that warrant systematic study
- **Education and behavior change strategies**: Research identifying what types of educational materials and prevention programs actually result in behavior change (rather than just information delivery) remains critically needed
- **Contaminant testing capacity**: Despite MED's limited capacity for contaminant research, academic researchers are conducting work in this space through partnerships enabled by research licenses, including ongoing secret shopper studies examining reported versus actual potency and contaminant presence across flower and concentrate products
- **Cross-disciplinary challenge of indication selection**: For researchers from engineering and formulation backgrounds, determining which therapeutic indications to pursue remains difficult without comprehensive data on individual cannabinoid properties, receptor binding characteristics, and optimal therapeutic applications
- **Transport parameters and physiological modeling**: Need for comprehensive pharmacokinetic data across different cannabinoids and routes of administration to enable system-level modeling and predictive capabilities; expert-authored review papers synthesizing available data would benefit researchers entering the field
- **Collaborative priority-setting**: Rather than regulatory or research silos determining research directions independently, bringing industry, policymakers, researchers, and advocates together early to identify shared concerns and important research questions (as exemplified by this roundtable) can build trust and ensure research addresses community needs effectively

3. BREAKOUT SESSION TO ID RESEARCH NEEDS

Following the panel discussions, participants broke into the five thematic working groups to identify research needs within their assigned category. Each table brainstormed a list of potential research priorities before collaboratively selecting their top 2-3 priorities to share with the full group. More than one table focused on each theme. Each table presented the research needs and identified priorities that are bolded priorities (below) indicating those selected by the group for full-group consideration and voting.

3.1 HEALTH, SAFETY & CONSUMER PROTECTION

MAIN RESEARCH NEEDS IDENTIFIED

- **Understanding use and risk among older adults:** For example, fall risk and drug interactions with other medications
- **Driving-related safety:** Understanding the impacts of recency of use and chronic use for public safety on the roads. Defining and detecting and impairment.
- **Research to identify contaminants:** This included synthetic cannabinoids and other potentially toxic substances

Product Safety: Groups identified significant unknowns around whether product recalls effectively protect consumers, health impacts of untested mycotoxins (including emerging concerns like Fusarium), and remediation of contaminated products.

Occupational Safety: Cannabis industry workers face elevated risks of occupational asthma and allergies. Groups emphasized the need for research on PPE effectiveness, engineering controls (which sit higher in the hierarchy of controls than PPE), and building a safety culture that recognizes all workers are protected under occupational health standards. Understanding long-term health impacts remains critical.

- **Product safety research:** Research to better understand recall efficacy, health impacts of remediation/recovery of contaminated products, untested mycotoxins.
- **Occupational safety research :** To better understand PPE efficacy, risk factors for allergy and asthma, adverse effects in workers, and safety culture.
- **Data integrity, transparency, and access:** There is a need for research involving unavailable or inaccessible state health data, and research to assess product label integrity, and contamination data.
- **Research into how to develop effective educational programs:** The need is to identify how to change consumer behavior through effective education addressing misconceptions and promoting public knowledge and prevention.

Also discussed were:

- Cannabis user identity and consumption patterns.
- Sustainable biomass waste use and downstream waste management.

3.2 THERAPEUTIC APPLICATIONS & MEDICAL RESEARCH

RESEARCH NEEDS IDENTIFIED

- **Research to understand the efficacy of cannabis for pain management**
- **Research into how older populations respond differently to cannabis:** described as "the Wild West" in terms of understanding usage patterns, effectiveness, side effects, and interactions with other medications commonly used by this demographic.
- **Research to advance dose standardization and product profiling:** This emerged as essential but expensive research needs. Groups emphasized the necessity of knowing exactly what's in products and being able to study various dose levels, despite cost constraints limiting comprehensive dose-response studies.

The Therapeutic Applications groups identified pain as a top priority given the substantial observational evidence showing people use cannabis for pain management. Research should examine how consumers use cannabis, in what capacities, and effectiveness.

Research to better understand how routes of administration affect consumers: This matters because consumers have preferences, and clinical trials face challenges when participants resist randomization to particular delivery methods. Understanding how different routes affect experiences and outcomes across cannabinoid profiles is critical.

Methodological priorities included developing placebo controls for THC studies potentially using terpenes or microdosing approaches, and PK/PD modeling which allows researchers to predict drug distribution, metabolism, organ targeting, and effects before conducting expensive clinical trials. Additionally incorporating AI-assisted approaches was discussed.

- **Research that involves placebo controls for THC studies**
- **Pharmacokinetic/pharmacodynamic (PK/PD) modeling**
- **Research about the effects of minor cannabinoids and whole plant versus formulated products:** This is important given increased marketing claims, and that isolated high-dose cannabinoids versus combinations or whole plant extracts likely represent distinctive medical applications.

Also discussed were:

- Research that enables the study of entourage effects
- Research to understand how cannabis affects anxiety disorders like PTSD for veteran populations
- Research on causes and treatments for cannabis hyperemesis syndrome (CHS)
- Underlying mechanisms and effects of cannabis on sleep architecture

3.3 PRODUCTION, QUALITY & REGULATORY STANDARDS

RESEARCH NEEDS IDENTIFIED

The Production, Quality & Regulatory Standards groups emphasized that regulation has outpaced the ability to effectively enforce, audit, or inspect compliance, necessitating research priorities focused on testing infrastructure and standardization.

- **Testing as a Service and Auditing:** Groups advocated for secret shopping licensed testing laboratories, noting that if secret shopping occurs for manufacturers, it should extend to every licensed entity. Feasibility is high because ISO-accredited labs have documented their intended procedures, allowing verification. Identifying problematic practices early prevents them from becoming entrenched habits.
- **Understanding best practices for agriculture and production:** Groups called for determining and standardizing agricultural best practices, then disseminating this knowledge to industry, policymakers, and the public through regulation, social pressure, or economic incentives.
- **Genetic modification studies for plant resistance to disease, mold, ect.**
- **Interdisciplinary research integrating agriculture, economics, and policy/regulation**
- **Potency standards for flower and production methods for minor cannabinoids**

Genetic Research and Development of new plant strains: Rather than focusing solely on potency increases, research should target disease resistance, mold resistance, and plant health improvements. Healthier plants reduce testing burdens by preventing contamination at the source.

Interdisciplinary Approaches: Multiple groups emphasized bringing together "hard sciences" with social sciences, examining how agriculture interacts with economics, economics with policy/regulation, legal frameworks with sociology, ultimately addressing complex issues like impaired driving through sociological pressure rather than solely technical measurement approaches.

3.4 EDUCATION & PREVENTION

RESEARCH NEEDS IDENTIFIED

- **Research to identify standardized dosing profiles:** To educate effectively, research is needed to guide standardized dosing and clear impairment definitions. Groups noted the absence of cannabis equivalents to alcohol's "one shot, one glass of wine, one beer" dosing guidance, suggesting this would be straightforward to develop and highly beneficial.
- **Research to define and detect impairment:** Impaired driving research including modes of consumption, time/duration of impairment, psychology, behavior change, harm reduction, communications.

- **Health behavior and promotion studies of known risks:** The end goal is discovering the best ways to change health behavior and consumer culture to promote safety. This requires health promotion studies, education on known risks, root cause research, and promotion of protective factors. The fundamental question is: how do you change consumer culture to have education resonate into changed behavior? This requires hard facts about risks and benefits across populations.

Groups also emphasized harm reduction approaches alongside prevention. Rather than blanket prohibition, research should explore how to work with existing stigma and facilitate real conversations about safe use versus abstinence-only messaging. This framework extends beyond youth to adults being told "no" by clinicians based on poorly designed studies.

- **Research identifying risks and benefits research across special populations**

Research should focus on safe consumption practices and helping consumers vet products, looking beyond certificates of analysis to include manufacturing process transparency and growing practices. Groups emphasized that guidance information remains insufficient compared to harm-focused messaging, despite widespread consumer use. Establishing vetted, professional, educated guidance sources—not funded solely to communicate harms—represents a need.

- **Research to inform best practices for youth prevention:** Groups challenged current prevention paradigms that emphasize late-onset use prevention and "just say no" messaging. They proposed teaching about the endocannabinoid system (ECS) at the high school biology level, explaining that cannabis is not the only variable affecting the ECS; diet, wellness practices, sleep, and mindfulness all interact with this system. Understanding the ECS could create more open dialogue about cannabis effects.

- **Research to inform harm reduction versus abstinence approaches**
- **Research on how to provide adult education on safe consumption practices and product vetting**

Also discussed were:

- Root cause research for youth prevention
- Research about best ways to promote protective factors and reduction of risk factors
- Research to inform how to affect consumer culture change to promote safe storage

3.5 INDUSTRY DEVELOPMENT

RESEARCH NEEDS IDENTIFIED

- **Plant genetics research for industry sustainability (disease resistance):** With wholesale prices at record lows, industry needs research on reducing cost through plant genetics focused on disease resistance, pest resistance, and overall plant health rather than solely potency increases. Developing stock, particularly true fiber varieties with low THC for industrial applications, represents a significant research opportunity.

The Industry Development groups identified research priorities spanning workplace safety, consumer education, product development, and regulatory standardization.

- **Identifying impaired driving thresholds:** Groups noted the natural inclination to process cannabis impairment through an alcohol lens, but research should take a more appropriate approach in understanding how THC differs, particularly distinguishing patients from recreational consumers.

- **Workforce safety research:** Research must identify and prioritize particular unique hazards cannabis industry environments pose to workers. This includes mandating responsible training for each license type, addressing unhealthy work environments (as health implications can be invisible), and creating mechanisms for employees to report adverse health events.

Effective business development requires market feedback on consumer pain points and product preferences. For hemp applications, particularly fiber varieties, significant opportunities exist as much material is currently imported. Product development research should focus on scaling through established industries like construction, developing specifications and standards for quality (similar to dietary supplement regulations), and research to facilitate providing quality assurance for buildings, schools, and hospitals using hemp materials.

- **Developing standardizing testing protocols for uniform product safety and compliance:** Research should focus on developing uniform testing protocols that inform product safety and compliance, emphasizing data transparency and using existing data effectively rather than spending resources on redundant research.

- **Research on educating budtenders as consumer educators:** Initial research suggests consumers obtain substantial information from budtenders, yet Colorado has minimal requirements for this role compared to other states. Research should examine how budtenders acquire knowledge, what training or certification they receive, whether they follow guidelines, and their effectiveness as the "face" of retail marijuana and disseminators of research findings. This connects to broader questions about the cannabis industry workforce composition and training needs.

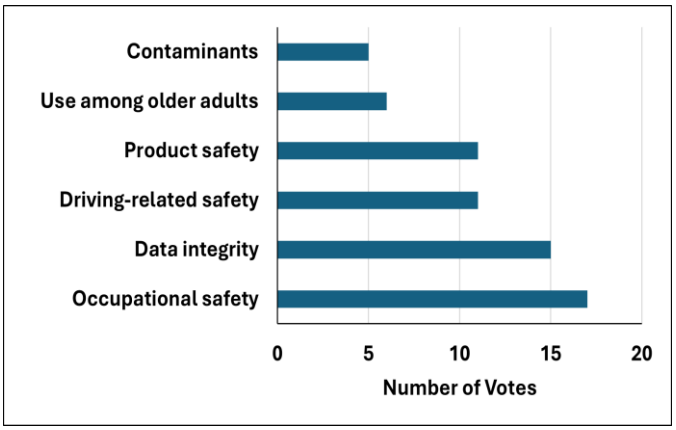
- **Low-barrier construction and building materials product development**

- **Real-World Product Testing**: Beyond tightly controlled clinical trials, research should examine consumer use of commercially marketed products, efficacy regarding expected outcomes, and even potency in real-world settings. While dose-level control in clinical trials provides statistical power, it's not always necessary to derive meaningful results from studying complex products across diverse use cases.

4. FINAL RESEARCH NEED PRIORITIZATION

Following the breakout session discussions and share-outs, all roundtable participants voted on the research priorities identified across the five thematic categories. Each participant could vote for multiple research needs they considered most important. The results below show the research priorities within each thematic area ranked by the number of votes received, reflecting the collective priorities of researchers, policymakers, industry representatives, and other stakeholders present at the roundtable.

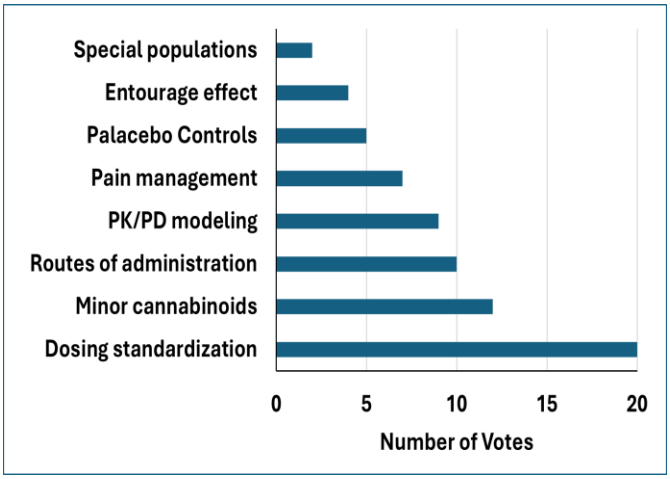
4.1 HEALTH, SAFETY & CONSUMER PROTECTION



1. **Occupational safety:** PPE efficacy, allergy and asthma, adverse effects, and safety culture - 17 votes
2. **Data integrity, transparency, and access:** Unavailable/inaccessible state health data, product label integrity, contamination data - 15 votes
3. **Driving-related safety:** Recency of use, chronic use, and impairment - 11 votes
4. **Product safety:** Recall efficacy, health impacts of remediation/recovery of contaminated products, untested mycotoxins - 11 votes
5. **Use among older adults:** Fall risk and drug interactions with other medications - 6 votes
6. **:** Synthetic cannabinoids and other substances - 5 votes

4.2 THERAPEUTIC APPLICATIONS & MEDICAL RESEARCH

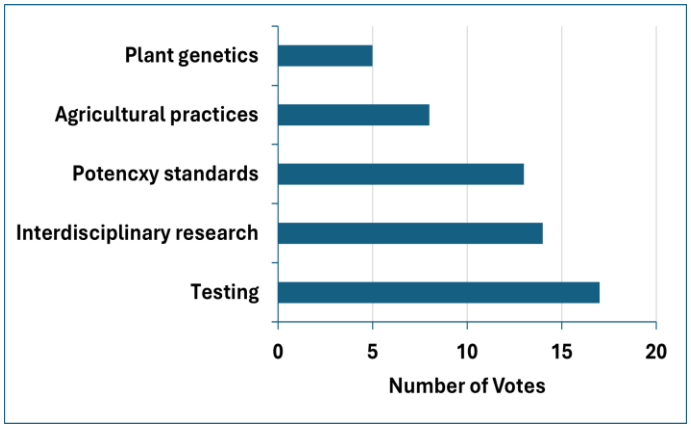
1. **Dosing standardization and product profiling** - 20 votes
2. **Effects of minor cannabinoids and whole plant versus formulated products** - 12 votes
3. **Routes of administration** - 10 votes
4. **Pharmacokinetic/pharmacodynamic (PK/PD) modeling** - 9 votes
5. **Effects of cannabis in pain management** - 7 votes



6. **Placebo controls for THC studies** - 5 votes
7. **How to study entourage effects** - 4 votes
8. **Understanding differential effects for older and other special populations** - 2 votes

4.3 PRODUCTION, QUALITY & REGULATORY STANDARDS

1. **Testing services:** Auditing, secret shopping, and accountability - 17 votes
2. **Interdisciplinary research** integrating agriculture, economics, and policy/regulation - 14 votes
3. **Potency standards** for flower and production methods for minor cannabinoids - 13 votes
4. **Best practices for agriculture and production:** Standardization and education - 8 votes

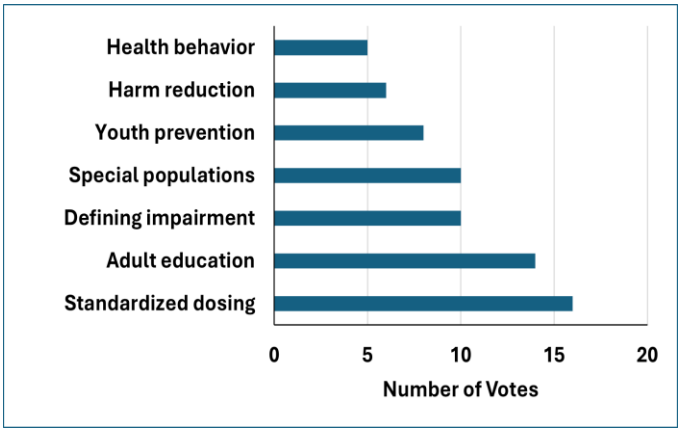


5. **Genetic modification for plant resistance:** to combat disease, mold, etc. - 5 votes

4.4 EDUCATION & PREVENTION

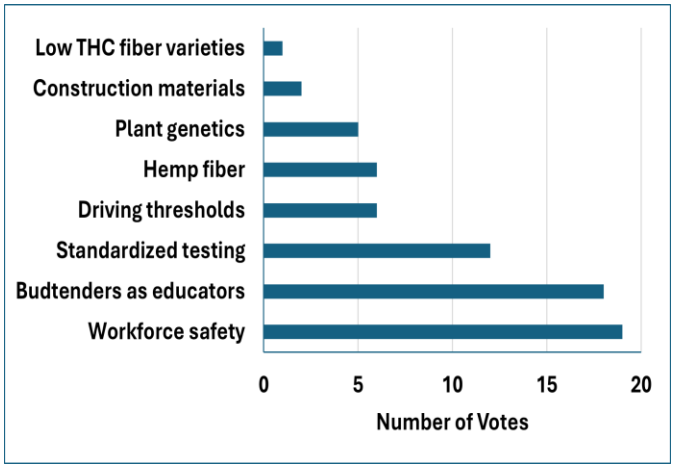
1. **Standardized dosing** - 16 votes
2. **Research to inform best practices for adult education** on safe consumption practices and product vetting - 14 votes

3. **Defining impairment** - 10 votes
4. **Risks and benefits research across special populations** - 10 votes
5. **Youth prevention:** Early intervention and endocannabinoid system (ECS) education - 8 votes
6. **Harm reduction versus abstinence approaches** - 6 votes
7. **Health behavior and promotion studies of known risks** - 5 votes



4.5 INDUSTRY DEVELOPMENT

1. **Workforce safety** - 19 votes
2. **Research on educating budtenders as consumer educators** - 18 votes
3. **Standardizing testing protocols for uniform product safety and compliance** - 12 votes
4. **Impaired driving thresholds** - 6 votes
5. **Hemp fiber specifications and standards** (and testing methods) - 6 votes



6. **Plant genetics for industry sustainability** (disease resistance) - 5 votes
7. **Low-barrier construction and building materials product development** - 2 votes
8. **Seeds for true fiber low THC** - 1 vote

5. CROSS CUTTING PRIORITIES

Examining the top three priorities from each thematic category revealed several research needs that transcend individual thematic focus areas and reflect broad stakeholder consensus:

STANDARDIZATION ACROSS MULTIPLE DOMAINS

Standardization emerged as a critical cross-cutting priority, appearing in multiple forms across categories:

- Dosing standardization (20 votes in Therapeutic Applications; 16 votes in Education & Prevention)
- Standardizing testing protocols (12 votes in Industry Development)
- Production standardization and best practices (17 votes for testing audits in Production/Quality)
- Potency standards (13 votes in Production/Quality)

The consistent emphasis on standardization reflects stakeholder recognition that establishing common definitions, measurement approaches, and quality standards is foundational to advancing both research and regulatory objectives.

WORKFORCE AND OCCUPATIONAL SAFETY

Worker safety concerns garnered substantial support across multiple categories:

This cross-cutting priority to better understand factors that promote worker safety highlights growing awareness of health risks facing cannabis industry workers and the need for research on exposure hazards, protective measures, and long-term health impacts.

- Occupational safety (17 votes in Health, Safety & Consumer Protection)
- Workforce safety (19 votes in Industry Development)

TESTING INFRASTRUCTURE AND DATA INTEGRITY

Multiple high-priority items addressed testing quality and data accessibility:

- Testing as a service and auditing (17 votes in Production/Quality)
- Data integrity, transparency, and access (15 votes in Health, Safety & Consumer Protection)
- Standardizing testing protocols (12 votes in Industry Development)

These priorities reflect the need for research to support testing laboratory reliability, access to quality reference materials, and involved component of the need for centralized, accessible data systems to inform research, regulatory, and clinical decision-making.

IMPAIRED DRIVING RESEARCH

Driving impairment appeared as a priority across three categories:

- Driving-related safety (11 votes in Health, Safety & Consumer Protection)
- Impairment definition (10 votes in Education & Prevention)
- Impaired driving thresholds (6 votes in Industry Development)

This consistent emphasis on driving safety reflects ongoing challenges in measuring cannabis-related impairment, particularly regarding recency of use, chronic user tolerance, and distinctions between medical patients and recreational consumers.

CONSUMER AND PUBLIC EDUCATION

Education priorities spanned multiple categories:

- Research on educating budtenders as consumer educators (18 votes in Industry Development)
- Adult education on safe consumption practices (14 votes in Education & Prevention)
- Data transparency and label integrity (15 votes in Health, Safety & Consumer Protection)

These priorities emphasize the need to understand how consumers receive information, improve educational resources, and ensure product information accuracy.

OLDER ADULT POPULATIONS

While receiving different vote levels, older adult populations appeared as a research priority in both:

- Therapeutic Applications & Medical Research (2 votes)
- Health, Safety & Consumer Protection (6 votes, focused on fall risk and drug interactions)
-

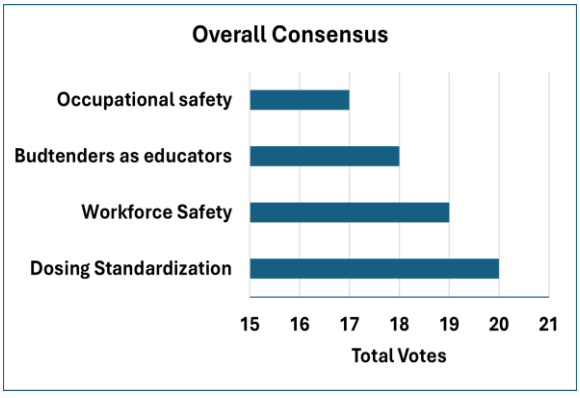
This reflects recognition that older adults represent an important and understudied cannabis-using population with unique safety and therapeutic considerations.

INTERDISCIPLINARY RESEARCH APPROACHES

Interdisciplinary research received substantial support (14 votes in Production/Quality), reflecting stakeholder recognition that cannabis research challenges cannot be addressed through single-discipline approaches alone. This priority resonates with broader themes emerging throughout the roundtable discussions, including calls for whole-body approaches to understanding cannabis effects, integration of social sciences with hard sciences, and consideration of how agricultural practices interact with economics, policy, and sociology. The complexity of cannabis as both a plant, a medicine, a consumer product, and a regulated industry necessitates research frameworks that bridge traditional disciplinary boundaries.

CONCLUSIONS

The voting results demonstrate substantial alignment across stakeholder groups regarding foundational research needs. The highest-priority items—dosing standardization (20 votes), workforce safety (19 votes), research on understanding educating budtenders as educators (18 votes), and occupational safety (17 votes)—represent actionable research directions with clear relevance to policy, regulation, industry practice, and public health. The prevalence of cross-cutting themes suggests that advances in these priority areas would benefit multiple aspects of Colorado's cannabis ecosystem simultaneously, making them particularly strategic targets for research investment.



6. CURRENT RESEARCH BARRIERS IDENTIFIED

Throughout the roundtable discussions, participants identified significant barriers that impede cannabis research progress but fall outside the scope of specific research questions that ICR can directly address through funded studies. These systemic challenges, ranging from federal scheduling status to infrastructure limitations, create constraints on what research can be conducted, how efficiently it can be executed, and how effectively findings reach intended audiences.

6.1 REGULATORY AND JURISDICTIONAL BARRIERS

Federal Schedule I Status and Hemp-Marijuana Regulatory Divide

Cannabis's Schedule I classification creates foundational research barriers, compounded by the regulatory distinction between hemp and marijuana established in the 2018 Farm Bill:

- Researchers studying CBD products (hemp) can access standard clinical infrastructure (research pharmacies, streamlined approvals), while those studying THC products face extensive Schedule I restrictions—even when hemp trials deliver similar amounts of intoxicating cannabinoids
- In Colorado, university research pharmacists cannot handle marijuana products, forcing researchers to recruit pharmacist colleagues to manage dosing, inventory, and quality control, significantly increasing complexity and costs
- "Inversion" (hemp entering marijuana markets) and "diversion" (marijuana marketed as hemp) create regulatory asymmetry where regulated businesses face extensive testing requirements while hemp-derived intoxicating products face minimal oversight
- Companies must complete extensive FDA IND applications (including Chemistry, Manufacturing, and Controls documentation) before researchers can access their products, limiting studies of commercially available products patients report as effective
- Materials from THC-containing plants face disposal requirements even after THC removal, preventing waste repurposing for construction materials, energy generation, or other applications

6.2 RESEARCH INFRASTRUCTURE AND RESOURCE BARRIERS

Key infrastructure gaps limit research quality and feasibility:

- **Certified Reference Materials**: Limited access to high-quality CRMs and RMs with appropriate variance undermines testing validity and quality control across all research priorities

- **Environmental Testing**: Lack of infrastructure for testing air, HVAC systems, and facilities means quality control issues may originate from buildings/ventilation rather than plant material itself (e.g., Pueblo's testing facility sits near a steel mill, raising heavy metal concerns)
- **Energy Efficiency Funding**: Unlike other states and agricultural sectors, Colorado lacks funding for energy-efficient cultivation equipment, creating barriers to sustainability research and implementation
- **Study Funding**: Resource constraints restrict researchers to examining one or two dose levels rather than comprehensive dose-response studies needed to optimize therapeutic applications
- **Data Integrity and Transparency**: Researchers and regulators lack centralized access to critical data including state health metrics, adverse event reports, employee health issues, and product testing/contamination information. Groups highlighted the need to verify product label integrity and establish accessible public health databases that allow stakeholders to identify top adverse events and workplace issues.

6.3 RESEARCH PROCESS AND IMPLEMENTATION BARRIERS

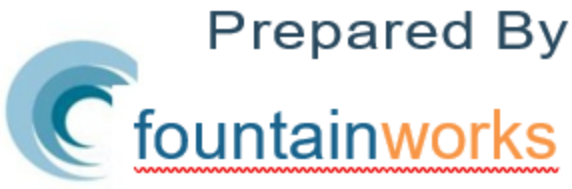
Recruitment and Study Design Challenges:

- Therapeutic trials face narrow participant pools: individuals using high doses must be excluded (compromises trial design), while others avoid participation due to federal illegality, stigma, or privacy concerns
- Cannabis's well-known side effects make blinding difficult—participants often identify active treatment, introducing expectation biases into self-reported outcomes

Timeline and Resource Realities: Rigorous studies require well-characterized products, long intervention periods, large sample sizes, whole-person assessment, and attention to drug interactions. From IRB approval through dissemination, these studies take years to complete—contrary to public expectations for quick findings.

Dissemination Gaps: Research remains confined to academic journals and conferences rather than reaching policymakers, practitioners, clinicians, and consumers. Even high-quality findings fail to influence practice, policy, or public understanding due to poor translation from the "ivory tower" to accessible formats.

These barriers collectively constrain the pace, scope, and impact of cannabis research in Colorado. Addressing these systemic challenges through policy advocacy, infrastructure investment, and institutional change would significantly enhance Colorado's capacity to conduct the research needed to inform evidence-based policy and practice.



This report was prepared by Fountainworks Inc. to summarize the key themes, research priorities, and insights that emerged from the roundtable discussions.

Fountainworks served as the external facilitator for the event, designing and implementing the engagement process to gather input from stakeholders and synthesize their perspectives.

Edited by JPS, 1.6.25