

# Lab-Made Vs. Hemp-Derived: A Debate and Discussion on the Origin of Your Cannabinoids



**Joy Beckerman**

*Principal*

**Hemp Ace International**



**Caitlyn Krebs**

*Co-founder & CEO*

**Nalu Bio**



**David Neundorfer**

*CEO*

**Open Book Extracts**

# Cannabinoids come from **multiple sources**

## Traditional Hemp



Hemp or cannabis  
Pesticides, heavy metals, THC  
High water, high energy, land usage  
Low yield - 20 lbs hemp = 1 kg CBD

## Biosynthesis



Yeast or E. coli fermentation  
Genetic engineering required  
Scaling is challenging  
Low yield - 500L to 1 lb CBD

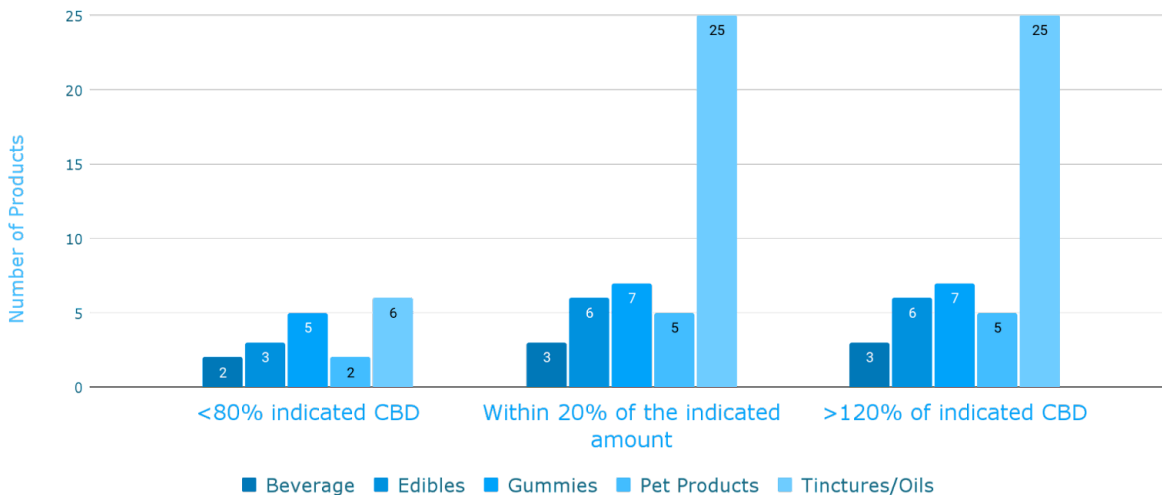
## Chemistry



Off-the-shelf chemicals  
High purity, no heavy metals, no pesticides  
Sustainable, consistent  
High yield - 75%-80%

# CBD products are **not living up to their promise**

Mislabeling of CBD Infused Products in the United States



92%

of CBD products don't meet  
quality + claim standards\*

84%

of CBD products contain  
heavy metals

66%

of CBD products aren't labeled  
accurately

Source: US FDA, 2020

\*Source: LegitScript Oct 2019, "Online CBD Sales: Why It's Still Buyer Beware" Product compliance, 300 distributors

# Benefits of Cannabinoids from Chemistry

- Never touches the hemp plant
- No pesticides, heavy metals, lead and THC which can end up in finished products
- Guaranteed to have 0% THC
- Physically, optically and biologically identical
- Minor cannabinoids can be manufactured at scale - most cost effective option

## Purity

99.9% Pure CBD  
GMP manufactured facility  
No THC  
No pesticides or heavy metals  
No batch variability  
Backed by science + data

## Scalability

CBD made to order in a lab  
Tons of CBD per batch  
Ability to scale with demand  
Not tied to agriculture

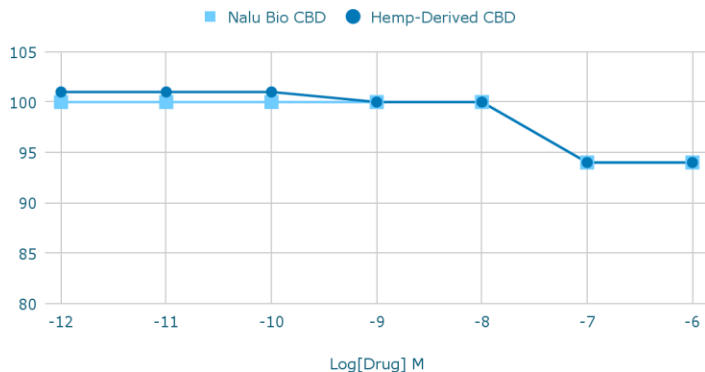
## Sustainability

Less water  
Less land  
Less energy  
Less biomass waste

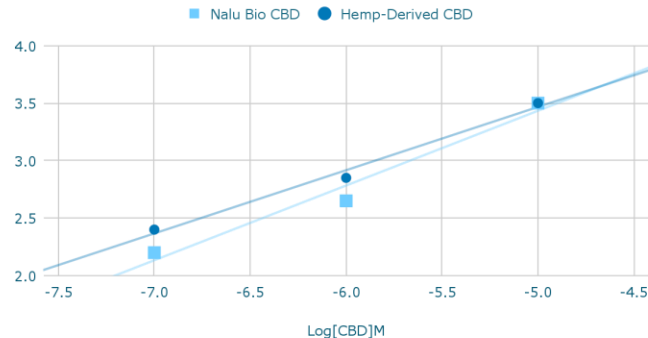
# Chemistry is indistinguishable from hemp

- Scientists at Indiana University tested chemistry-based CBD against hemp-derived CBD
- Studied the impact on CB<sub>1</sub> and GPR5 receptors

**CB<sub>1</sub> - Nalu Bio CBD vs Hemp-Derived CBD**



**GPR55 - Nalu Bio CBD and Hemp-Derived CBD**



- As predicted and expected, chemical and hemp-derived CBD are the same molecule
- Conclusion: Lab-made and hemp-derived CBD acts on endocannabinoid receptors in the same way

# Chemistry is more sustainable than hemp-derived

## Chemistry-based CBD uses...



**700X Less Land**

686 vs 1 sq feet



**70X Less Water**

7,086 vs 100 gallons



**14X Less Energy**

9,344 vs 660 Kw h

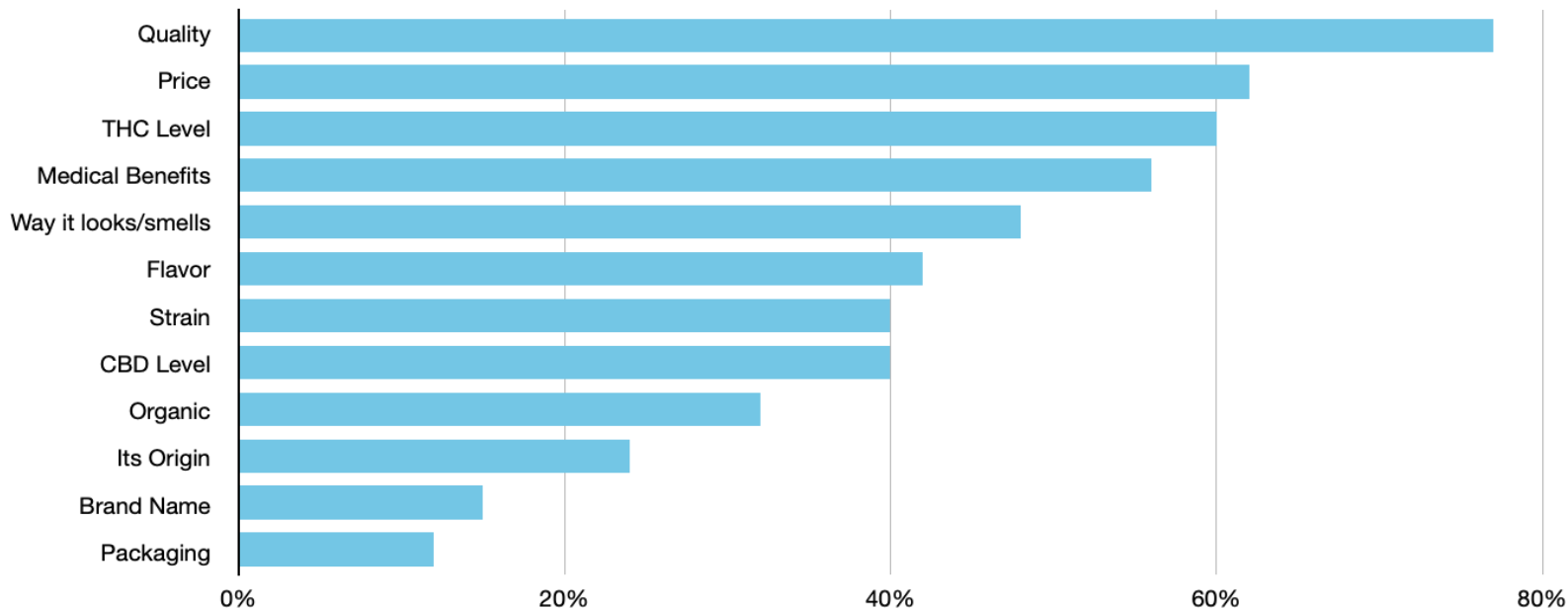
**... than hemp-derived CBD.**

# What is most important to consumers?

## Survey of 1,500 CBD and Cannabis Consumers in 2019

Very important to consumers is Quality #1, Price #2, Medical Benefits #4

“VERY” OR “EXTREMELY” IMPORTANT IN CANNABIS SELECTION



Source: Norcal Cannabis Co., "Five Myths of Today's California Cannabis Consumer"

# Thank you!



**Caitlyn Krebs**  
**Nalu Bio**  
*caitlyn@nalubio.com*



## CBD Ingredients & Blends



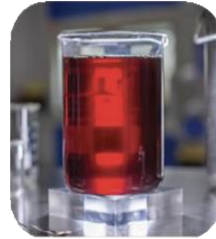
**Full  
Spectrum  
Distillate**



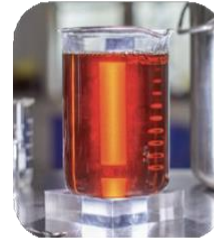
**Broad  
Spectrum  
Distillate**



**CBD Isolate**



**High CBN  
Distillate**



**High CBG  
Distillate**



**Certified  
Organic  
Full  
Spectrum**

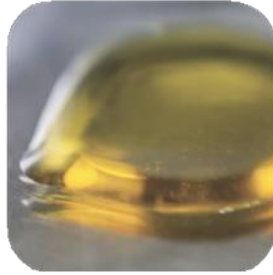


**Certified  
Organic  
Broad  
Spectrum**

# Minor Cannabinoids



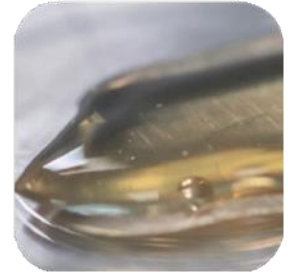
**CBN Isolate**



**CBC Isolate**



**CBG Isolate**



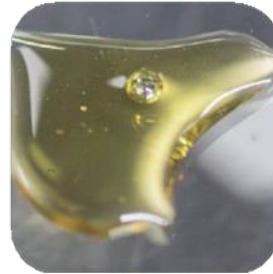
**THCV Isolate**



**CBDV Isolate**



**CBDA Isolate**



**CBT Isolate**



**CBGA Isolate**





**Tinctures**



**Gummies**



**Softgels**



**Aerosols**



**Beverages & Enhancers**



**Oral Dissolving  
Tablets & Mints**



**Topicals**



**Drink Blends**



**Chocolates**



**Fruit Gems**



### 1 Product Selection

- Market sales data
- Consumer trends
- Product strategy

### 2 Cannabinoid(s)

- Specifications
- Volume
- Pricing

### 3 Formulation

- Desired effect
- Ingredient selection
- Testing

### 4 Product Engineering

- Infusion tech
- Delivery systems
- Flavoring

### 5 Manufacturing

- Lead times
- Fulfillment
- Pricing

### 6 Testing & Docs

- Third-party COAs on all ingredients and finished goods

### 7 Packaging & Mkg

- Regulatory compliance
- Private label programs

### 8 Product Distribution

- Drop-shipping
- Distribution partners

# Thank you!



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*dave@openbookextracts.com*

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*dave@openbookextracts.com*