

A dynamic splash of clear blue water is the central background element, with droplets and bubbles scattered throughout. In the background, there are several white plastic containers: a tall cylindrical one, a shorter one, and a tilted one in the foreground. A white sachet is also visible in the upper right quadrant.

Caliper Ingredients: A Proven Partner

Food and beverage innovators will find fertile ground in Cannabinoids—but only if they include science-backed and regulation-ready ingredients that can comply with substantiation requirements and earn consumer trust.

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Today's Consumer is Getting Smarter

With a changing regulatory landscape, CBD, once relegated to cannabis dispensaries, has quickly and steadily gained momentum as supplement consumers seek it out for its benefits for sleep, stress, aches and pains, and more. The next frontier? Food and beverage at mass market retail. According to BDS Analytics, a data and market insights firm covering the cannabinoid marketplace, the cannabinoid-infused food and beverage market has the potential to reach \$5.9 billion by 2024, up from \$906 million in 2019.¹ And while this projection does include sales made in dispensaries, BDS points out that opportunities abound for brands that sell their products via online merchants, grocery stores, and even mass retailers like Target and Walmart.

This prospective growth in food and beverage is fueled by unprecedented consumer awareness and interest. According to a 2020 consumer study conducted by the Natural Marketing Institute (NMI), 95% of US consumers are aware of CBD, and one in four (over 60 million consumers) have tried a CBD product.

7 in 10 consumers
believe CBD offers some
type of wellness benefit

Source: NMI

However, the CBD market faces a credibility problem that must be resolved if it is to reach its full potential. According to a recent study from *The CBD Insider*, though consumers were by and large willing to try

CBD, they didn't always find it to be effective.² While about half of consumers turned to CBD products for aches, only one in four found relief; about one-third of consumers sought out CBD products for relaxation, yet only one in three found them to be effective. A similar story was told for consumers seeking better sleep and increased focus. Why? Well, when opportunistic or inexperienced CBD ingredient suppliers are given free rein to push unverified and unproven ingredients into unregulated markets, poor results are to be expected. According to recent FDA research, many (if not most) CBD products don't contain the CBD they claim, and even those that do meet their label claims don't deliver enough of the bioactive ingredient into the bloodstream to produce an effect. Bad, inconsistent products lead to bad, inconsistent consumer experiences. The good news is that, despite these failings, consumers haven't lost faith:



88% of lapsed CBD consumers
still believe CBD is effective and

69% would reconsider using CBD.³

These findings should be a wake-up call for manufacturers and brands: It's time to get serious and let the science (not the PR) lead. It is critical in these formative years of CBD that brands and manufacturers choose a quality CBD ingredient partner with the know-how, accountability, quality control, and science to produce dependable and consistent products that deliver quantitative benefits for consumers. It's equally important to find an ingredient supplier that can deliver on the promises they make. Anyone can say they make a high-quality product, but few have done the work to define quality in a measurable way. Absent

Caliper is a food and supplement ingredient supplier that specializes in cannabinoids, not a cannabis company newly entering the food and ingredients space.



consistently positive product experiences, CBD's reputation—and potential—will take an unrecoverable nosedive, just as opportunity knocks for food and beverage brands to innovate in an area that represents the greatest functional ingredient opportunity in a generation.

Get to Know Caliper Ingredients

Caliper is a functional foods company with proven expertise in the processing, manufacture and commercialization of cannabinoid-infused food, beverage and supplement products. Built on the idea that cannabinoids represent a new category of functional ingredients, Caliper Foods houses three distinct business units spanning cannabis and hemp: Ripple (focusing on cannabis), Caliper Consumer (which produces ready-for-retail finished hemp products) and Caliper Ingredients, which manufactures standardized, shelf-stable formulations of water-soluble hemp-based cannabinoid ingredients for food, beverage, supplement and cosmetic manufacturers.

Caliper's ingredients are powered by proprietary emulsification technology that yields uniform cannabinoid dispersion and verifiable physical, potency, and flavor stability, delivering end-product consistency and verified shelf life. All these offerings come with tight specifications and full documentation that's regulation-ready when federal oversight hits the books.

Centered on Science

In order to truly capitalize on the market potential of CBD, brands must offer products that build trust and bring consumers back again and again. To deliver on this promise, products must not only be safe, but they must also be absorbed quickly so they can deliver sought-after effects. For this reason, Caliper Ingredients invests heavily in pharmacokinetic research to substantiate its absorption claims, with published results based on humans—not lab animals. Anyone can say their product is fast-acting, but only Caliper can provide scientific substantiation to back that claim up.

Caliper Ingredients' most recent study—the first peer-reviewed investigation of commercially available CBD product pharmacokinetics in humans—shows that its suite of soluble cannabinoid ingredients deliver CBD into the bloodstream significantly faster than typical CBD formulations such as isolates and tinctures⁴, paving the way for products to provide noticeable effects and, in so doing, meet consumers' expectations.



Pharmacokinetics (PK) =

the study of what the body does to bioactive substances, from absorption to excretion, often using blood analysis.

Findings in this area underpin pace claims that drive efficiency messaging like “fast-acting” and “long-lasting.”





The experts: Researchers from Colorado State University conducted an independent bioavailability study using Caliper CBD.

The test: Researchers recruited healthy men and women between the ages of 21 and 62 to take five products over the course of the double-blind crossover study:

- Caliper CBD in three formats:
 - as powder, and as two different liquid concentrates
- An oil-based CBD tincture, and
- An unemulsified CBD isolate powder

All of the preparations were standardized to 30 mg, and orally administered in 8 oz of water.

Researchers then took blood samples throughout a four-hour time period after ingestion to measure how each product was absorbed by the body in each individual.

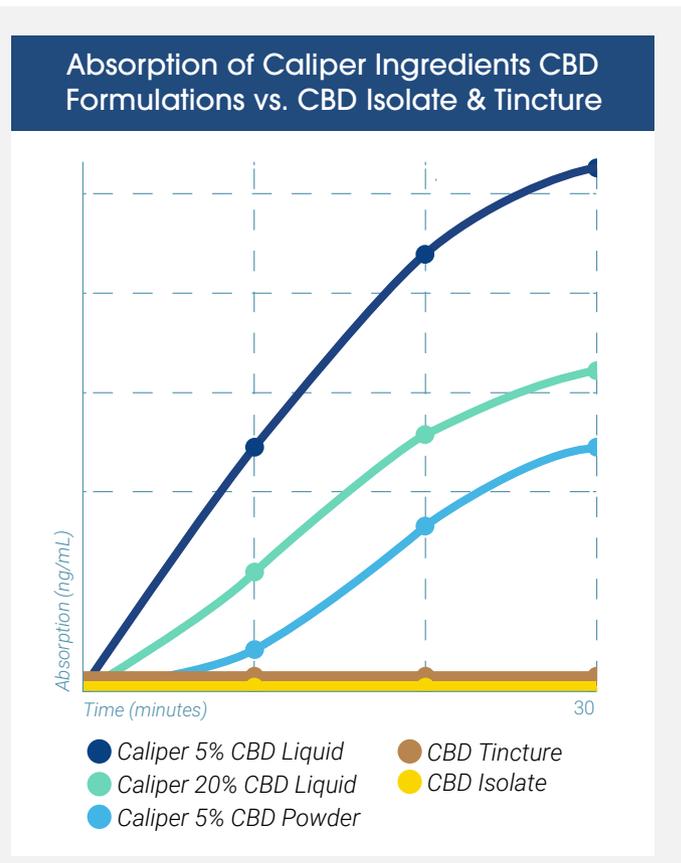
The conclusions:

1. None of the fat-soluble CBD products (neither the oil-based CBD nor the unemulsified CBD isolate) delivered meaningful CBD content into the bloodstream within the first 60 minutes after ingestion. This is a problem, as consumers will not notice any effect in that time period, and potentially attribute any later effects to another stimulus.
2. Smaller particle size did not predict improved bioavailability.
3. Caliper Ingredients absorbed quickly and effectively for fast results.

All of the water-soluble Caliper products were absorbed significantly faster than the fat-soluble controls, with the fastest one (the Caliper liquid in a gum arabic base) detectable in the bloodstream within just 10 minutes. This is an important finding for formulators who want to deliver measurable results fast, so that consumers attribute positive effects to the use of their product.

Based on a comparison of observed circulating blood levels of CBD in the 30 minutes following ingestion:

- **Caliper 5% CBD Liquid Concentrate** (SKU: T-L-A-5) delivered CBD into the bloodstream 424 times faster than isolate and 64 times faster than tincture
- **Caliper 20% CBD Liquid Concentrate** (SKU: T-L-Q-20) delivered CBD into the bloodstream 218 times faster than isolate and 33 times faster than tincture
- **Caliper 5% CBD Powder** (SKU: T-P-S-5) delivered CBD into the bloodstream 142 times faster than isolate and 22 times faster than tincture



Powerful Ingredients for Powerful Food and Beverages

Caliper Ingredients' investment in science provides the substantiation needed to make claims like "fast-acting," "long-lasting" and "superior bioavailability." This validation is critical to consumers, who greatly value having a product they can count on. In an external survey of 1000 CBD consumers, conducted for Caliper in February 2021, respondents named "fast-acting" as their top consideration when purchasing a CBD product (47%), even more than price (40%).⁵ Caliper cannabinoid ingredients are designed for rapid go-to-market and scalable manufacturing across a range of food and beverage applications including:

- Powdered drink mixes
- Baking mixes
- Extruded snacks
- Pet foods
- Confections
- Ready-to-drink beverages
- Wet mixes
- Gummies
- Energy gels
- Energy bars
- Dried fruits and vegetables
- Nuts
- Teas



| Product Name | Cannabinoid Concentration | Applications & Benefits |
|--|---------------------------|---|
| LIQUID | | |
| 20% CBD Liquid Concentrate (SKU: T-L-Q-20) | 20% CBD | RTD beverages, shots, gummies, baked goods, confections, topicals. Excellent heat & process stability. |
| 20% Composed Broad Spectrum Liquid Concentrate (SKU: CB-L-Q-20) | 20% CBD 1% CBG | |
| 5% CBD Liquid Concentrate (SKU: T-L-A-5) | 5% CBD | |
| 5% Composed Broad Spectrum Liquid Concentrate (SKU: CB-L-A-5) | 5% CBD 0.25% CBG | |
| POWDER | | |
| 5% CBD Powder (SKU: T-P-S-5) | 5% CBD | Bars, drink mixes, gummies, capsules, tablets. |
| 5% Composed Broad Spectrum Powder (SKU: CB-P-S-5) | 5% CBD 0.25% CBG | |
| 10% CBD Powder (SKU: T-P-S-10) | 10% CBD | Flowable powder, long shelf-life, quick dissolving. |
| 10% Composed Broad Spectrum Powder (SKU: CB-P-S-10) | 10% CBD 0.5% CBG | |



Non-GMO | Kosher | Vegan | All Natural Flavors | Gluten-Free | Sugar-Free | Preservative-Free



A Dynamic Regulatory Landscape

Federal regulation of CBD is sorely lacking. To date, the FDA has focused its enforcement efforts solely on brands making health claims (like those claiming to cure, treat or prevent an illness), but has limited these efforts to sending warning letters to a small number of the worst offenders. Indeed, the agency has not yet imposed an actual penalty (such as fines or mandatory recalls) on any CBD product manufacturer, despite a large number of extremely deserving offenses. The FDA has also chosen not to police traceability, label accuracy, or good manufacturing practices to date, which has created a gaping regulatory hole into which bad actors have freely flowed. In short, the agency has left consumers (and retailers) to fend for themselves.

The FTC, on the other hand, has actively enforced against misleading advertising claims in CBD products, often with substantial monetary penalties. Substantiation matters to the FTC, and brands should recognize that anecdotal evidence does not impress them. While animal studies are better than no studies, human research is still the gold standard. In the FTC's eyes, if human research can be done, then it must be done.

The CBD market is on the cusp of more stringent and defined regulation, as the US Senate recently introduced a bipartisan bill proposing to legalize the use of CBD and other hemp-derived ingredients in conventional foods and beverages. The bill also provides much-needed clarity, as well as a framework, for regulatory and safety actions—including mandating compliance with existing federal regulations and requiring proper labeling.

Many food and beverage brands are waiting to see what the regulatory landscape will look like before they enter the CBD space. With help from Caliper Ingredients, innovators have the opportunity to get in early and offer regulation-ready ingredients and products that will pass muster when laws catch up with trends—and be among the first to earn consumer trust and loyalty.

Understand the basics:

- ✓ Don't make drug claims
- ✓ Follow food safety best practices
- ✓ Label ingredients, including bioactive content, completely and accurately
- ✓ Make promises that matter, and only promise what you can substantiate

References:

1. <https://www.naturalproductsinsider.com/regulatory/cbd-foods-poses-opportunities-and-challenges>
2. The CBD Insider 2019 US CBD Consumer Report. <https://thecbdinsider.com/knowledge-center/the-cbd-insider-2019-us-cbd-consumer-report>
3. Ibid.
4. Bondareva Williams NN et al. "Comparison of Five Oral Cannabidiol Preparations in Adult Humans: Pharmacokinetics, Body Composition, and Heart Rate Variability." *Pharmaceuticals*. 2021;14(1)35 <https://doi.org/10.3390/ph14010035>.
5. Source: Data on file, Caliper Foods