

# CBD

Inside  
& Out



Covering cannabis-derived health, wellness and beauty products from seed to shelf

## Formulas *for* Success



**PLUS**  
Packaging that Impresses

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# CBD Formulations That Meet Consumer Demands: Opportunities & Challenges

No matter the application, it's critical to begin with raw materials that have been thoroughly tested and validated for quality.

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A combination of legalization, customer education and demand, and a plethora of new products across a full range of consumables have paved the way for a booming industry where CBD, other cannabinoids, terpenes, and hemp ex-

tracts have gone mainstream.

Hemp-derived CBD products containing less than 0.3% THC (the psychoactive component in hemp) have expanded into markets not envisioned just a few years ago. Consumers today have recognized the benefits and continue to push for CBD and hemp extract ingredients in an ever-increasing range of convenient, diverse, and preferred consumption formats.

CBD can now be found in everything from tinctures, lotions, soaps, shampoos, cosmetics, and candles to CBD-infused food and beverages (for which regulations are continuing to evolve), gummies, breath mints, and new applications for pets and animals.

The largest manufacturers and retailers will be slower adopters of CBD foods and beverages until the U.S. FDA approves the use of CBD in these applications. However, consumers are not waiting for that green light; and smaller manufacturers fueled by an increasing number of direct-to-consumer channels are getting in on the rush.

CBD was initially the most readily available cannabinoid. Now, as more

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data reveals the importance the endocannabinoid system plays in overall health and wellness, research continues to uncover benefits and opportunities for a full range of additional cannabinoids, including CBG, CBC, CBN, CBDV, CBGa, as well as a series of terpenes, all collectively found in hemp extracts. Together, these compounds provide whole plant benefits many have dubbed the “entourage effect.” As scientific evidence continues to come to light, and more clinical studies are conducted on the benefits of cannabinoids and terpenes, more specialized ingredients and products will continue to become available.

Growers, extractors, formulators, and brands are evolving and innovating at warp speed to keep up with consumer demand, while working through regulatory and formulation learning curves and hurdles, and making new discoveries along the way.

## QUALITY FORMULATIONS BEGIN WITH QUALITY RAW INGREDIENTS

Before starting any product development endeavor with CBD, other cannabinoids, and terpenes, it is critical to start only with ingredients and raw materials that have been thoroughly tested and validated to be of the highest purity and quality. There are a number of important considerations when evaluating the quality of CBD and hemp extract ingredients to be used in any product or formulation, including:

- 3rd Party Lab Testing & Documentation—Rigorous certified lab testing is essential in efforts to be sure you are getting what you pay for, to build customer trust, and avoid regulatory and legal complications.
- Botanical Authentication—Is it really hemp? Ask for certification and verification.
- THC Levels—Hemp biomass must contain no more than 0.3% delta-9 THC on a dry weight basis, and so must the final extracted ingredient.
- Contamination—Make sure thorough testing for pesticides, heavy metals, and other contaminants is conducted to prove purity and that your hemp extract/CBD ingredients come with full documentation and COAs (Certificates of Analysis).
- Adulteration—Are the CBD, other cannabinoid, and THC levels accurate, or has the product been adulterated (often for economic advantage) in any way?
- Agricultural Practices—Where is the hemp grown, by whom, under what conditions, and using what cultivars/strains, cultivation, harvesting, and other agricultural methods?
- Extraction Methods—What methods are used to extract the CBD? The most common and acceptable methods are ethanol and CO2 extraction. Also, is the facility cGMP certified with proper quality, batch control, and other processes?
- Acceptable Form—What forms of the ingredient does the

supplier offer, and is it appropriate for the targeted applications?

- USDA Certified Organic—Consumers are increasingly demanding organic ingredients. Make sure that not only your CBD is USDA Certified Organic, but the handling/manufacturing also needs to be USDA Organic certified.

CBD is a lipid-soluble compound and must go through an extraction process. The two main acceptable extraction methods for CBD are carbon dioxide extraction and ethanol extraction. Resulting CBD ingredients are typically available as: full-spectrum hemp oil distillates; broad-spectrum hemp oil distillates; and CBD isolates.

Testing for cannabinoids in hemp extracts in oil or wax form is generally pretty straightforward. More challenges are faced in the testing of finished products formulated with other active ingredients, particularly products in powder form. Work only with suppliers that are knowledgeable of the various extraction and testing methods, the variances and subtleties involved, and those who can assist you in properly formulating CBD for your particular product format(s).

## ADDITIONAL CONSIDERATIONS IN SOURCING CBD

- Water-Solubility—This is an important consideration particularly when the CBD will be used in beverages or topical products.
- Carrier Oils—Typical carrier oils include MCT, hempseed, sunflower, avocado, grapeseed, pomegranate seed, and extra virgin olive oils. These can either hinder or aid bioavailability, affect taste, cost, texture, shelf life, and formulation considerations.
- Nanoemulsion—This technology breaks down oily substances (CBD) into tiny particles that are then emulsified into a stable form to improve solubility and absorption in products, and also improve bioavailability within the body.

## ENSURING SHELF-STABLE PRODUCTS

Like all oils, CBD and hemp extract oil is subject to oxidation and rancidity over time. It is important for suppliers and product manufacturers to be proficient in the handling and stabilization of oils. However, powdered forms and water-soluble products can introduce other variables that affect finished product stability. No matter the form, it is best to partner with experts that have strong technical knowledge and experience in the production of shelf-stable products that can provide stability testing results. In many cases, natural botanical extracts with high levels of antioxidants may be incorporated to help support product stability.

## CONSIDERATIONS FOR SPECIFIC MARKET APPLICATIONS

**Dietary Supplements.** Because CBD is lipid soluble, CBD extracts naturally work well in oil-based formulas and soft gel

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capsules. CBD extracts in oil-based formats tend to remain generally stable.

Brands wishing to produce products in tablet form should look for suppliers that understand extraction and powder morphology techniques, and can produce ingredients specifically tailored for tableting. This expertise can also help when multiple ingredients are to be incorporated into the tablet. Some suppliers take additional steps to combine the CBD material with polysaccharides or other ingredients and carriers to make them water-dispersible so they can be used in powders, tablets, and hard-shell capsules. Hemp extracts and CBD oils that have not been distilled often contain minor cannabinoids as well as terpenes. Preserving the terpenes can be desirable as consumers increasingly gain understanding of whole plant benefits (i.e., the “entourage effect”). Terpenes have a more robust, rustic aroma and taste. While some favor these attributes, others do not, and soft gels and tablets are ideal consumption formats; down the hatch they go with no real consideration to taste.

## Beauty and Personal Care.

Women are flocking to CBD for beauty and personal care. When CBD is used for purposes related to skin, it is believed to work by stimulating or impacting the skin’s cannabinoid receptors for overall wellness and pain relief. Because CBD is a potent antioxidant, it also has additional effects on targeting skin inflammation, itching, acne, and other skin issues.

Personal care products take many forms, from relatively free-flowing liquids such as serums and creams to increasingly solid states such as balms. However, most personal care products will be a stabilized system of aqueous and non-aqueous phases.

Cannabinoids and hemp extracts are oil soluble and as such are incorporated in the non-aqueous phase. The procedure involves combining all the water-soluble ingredients in one phase while CBD is added to the non-aqueous phase. Typically, heat sensitive ingredients are added in a third phase while a fourth is used to adjust the final pH.

A nanotechnology emulsified solution is required to include CBD into water-based products.

While there is no set standard for CBD levels in topical products, a common amount of CBD used in skin care products is around 1%. Concentrations can vary widely and studies should be conducted to evaluate the concentration and levels.

**Food and Beverage.** Cannabinoid compounds, including terpenes have a distinct, robust, earthy, natural taste and aroma, which may or may not be desirable in a particular food or beverage product. Flavor is a critical part of formulating any food or beverage, and it is important to achieve just the right balance when incorporating CBD. A variety of natural plant-based extracts may also be utilized to help with taste, including specific flavor modification and bitterness masking. Some ingredients have been developed to be THC-free, while preserving the unique “cannabinoid essence,” and enabling brand managers and formulators to create distinct and desirable taste experiences.

Morphology and flow properties of CBD powders have been designed to more easily incorporate into beverages and powder mixes. Nano-emulsions of CBD improve solubility and absorption in products, and have been shown to improve bioavailability within the body, also simplifying dosage levels and reliability. These forms can be useful in ready-to-drink beverage applications. Advanced and unique oil and powder handling spray tower technology is helping some suppliers address previously unmet market needs for the beverage industry.

Another consideration in using CBD in food and beverage products is that different emulsion densities must be adjusted for changing sugar content. Emulsions also interact differently within various pasteurization processes.

Consumers increasingly desire edibles and confections; and because hemp extracts and CBD oil are fat soluble, this makes them desirable and appropriate to use in recipes calling for fats,

including brownies, cakes, breads, cookies, and bars in single packaged servings. Careful monitoring of baking duration, temperature, timing, and storage is critical to ensure the cannabinoid and terpene profiles are not lost or diminished in the process.

**Pet Products.** One size doesn’t fit all in terms of the ingredients and potencies when formulating for pets, particularly when it comes to nutraceuticals. It is mandatory to ensure proper dosages and ingredient levels when developing pet supplements and other functional products. In doing so, it is important to take weight, age, and any underlying conditions into account when designing formulas with functional ingredients intended to support and nurture the health, well-



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ness, and comfort of pets. Also, the potency of nutraceutical ingredients should be commensurate with the amount used in scientific studies to elicit a beneficial response.

When selecting ingredients for a pet formula, first and foremost, there should be evidence of its safe use in animals and the threshold for when it could cause an adverse effect. Brands should look for a supplier that has been certified through the National Animal Supplement Council (NASC). For over 20 years, this respected non-profit industry organization has worked to advance efforts that help ensure the protection, health, and safety of animals and is the authority on compliance and quality.

## WORK WITH KNOWLEDGEABLE SUPPLIERS & PARTNERS

Many companies have recognized the vast potential and opportunities in this burgeoning new space. As the industry evolves, new players want to be a part of it. Unfortunately, many of them are new to the production of foods, beverages, dietary supplements, and beauty products, and may be unfamiliar with existing requirements and best practices. While a supplier may understand how to grow and extract CBD, they may not be proficient nor sufficiently experienced to meet industry standards, follow regulatory and documentation requirements, nor be equipped to meet formulation challenges. Working with a supplier that has demonstrated knowledge and experience across the supply chain and throughout product development can be invaluable.

cGMP-certified manufacturers are held accountable for ensuring the full supply chain complies with applicable standards, and there could be some handholding and a learning curve for suppliers that are new to the space. Additionally, brands require product consistency and reliability in their ingredient supply chain, areas in which the nascent hemp supply is catching up.

The following are factors that growers and consumer packaged goods manufacturers should consider when selecting a reputable supplier/extractor:

- Experience and reputation
- Capacity and scaling

- Vertical integration to farming practices and traceability
- Extraction methodology and yields
- Testing and compliance programs
- Organic status for both biomass, extraction, and carrier oils
- Sustainability

Because of the rush of new players, it is critically important for brands to verify if the supplier can truly guarantee reliability, transparency, and stock to scale with your organization's growth. Many companies say they are vertically integrated, but are they really? Do they have the infrastructure in place to prove they truly have end-to-end control to provide supply chain security?

Brands should seek out established food and dietary supplement ingredient suppliers that have added CBD hemp extract solutions as an extension of their core competencies, instead of partnering with inexperienced or undercapitalized newcomers.

There continue to be significant financial, technical, and operational resources being invested into the CBD supply chain. A number of larger companies with deep roots in botanical extraction and related intellectual property and systems are entering the space to bring scale and efficiency not seen previously in the hemp supply chain.

From a purely technical perspective, hemp cannabinoids are just like any other fat-soluble herbal compound; an experienced formulator will know how to formulate with hemp extracts to achieve the desired finished product and label claims. ■

About the author: Collette Kakuk is vice president of global marketing for Layn Natural Ingredients and its subsidiary, HempRise. She has 30 years of experience in branding, customer experience, qualitative and quantitative market research, predictive modeling, and competitive analysis, including food service, food processing, manufacturing, restaurant, banking and top Fortune 100 business consulting. Her passion for people, animals, and the planet fuels her interest in natural botanical ingredient marketing and innovation. She proudly served in the U.S. military and holds an MBA from the Ross School at the University of Michigan. For more information: [www.hemprise.com](http://www.hemprise.com).