CBtru® — an innovative drug delivery solution for lipophilic molecules

Understanding the opportunity

Formulating a highly lipophilic and poorly soluble active pharmaceutical ingredient (API), such as cannabidiol (CBD), can be a complex task. In addition to physical and chemical stability challenges, the **oral bioavailability of CBD** for instance has been shown to be **very low in humans (6%)**, as a result of incomplete absorption in the gut and significant pre-systemic elimination in the liver.[1]

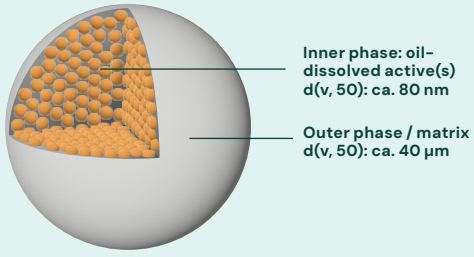
Innovation and formulation capabilities of the dsm-firmenich labs can help address concerns around bioavailability and open new opportunities for drug manufacturers.

Developing patient-centric solutions: How CBtru® can shape the future of modern medicine

Aiming to inspire more patient-centric solutions than those currently on the market, dsm-firmenich has developed CBtru®. This innovative, patent-pending proprietary drug delivery solution presents several opportunities for patients, healthcare professionals, and manufacturers of pharmaceutical products, including:

- The possibility to offer patients oral solid dosage forms, which have wide applicability and increase patient convenience and acceptance in comparison to existing options that are limited to liquid oil-based dosage forms.
- Higher drug loading, meaning that patients can benefit of lower daily dosages than what is currently available with oil-based dosage forms.
- A possibly more reliable and consistent API uptake, less dependent on food intake.
- Optimized bioavailability leading to potentially more effective medicines, decreased probability of drug-drug interactions, and minimized adverse effects.[2]

CBtru® drug delivery technology



Solid dosage form

- Optimized patient compliance vs liquid oil-based dosage form
- Wider applicability in finished drug products
- Good chemical and physical stability

Higher drug loading

- Lower daily dosage of final drug product vs liquid oil-based dosage form
- Lower cost in use (CIU)
- 3x to 4x increase in API loading vs commercially available product

Optimized bioavailability

Demonstrated in human clinical trial:

- Bioavailability as good as liquid oil-based reference product in fed state; higher than reference product in fasted state
- May offer a more reliable and consistent API uptake, less dependent on food intake
- Safe and well tolerated

1. Perucca and Bialer. Critical aspects affecting cannabidiol oral bioavailability and metabolic elimination, and related clinical implications. Cannabinoids in Neurology and Psychiatry, 2020.
2. Millar et al. Towards better delivery of cannabidiol (CBD). Pharmaceuticals (Basel), vol. 13, pg. 219, 2020.

dsm-firmenich

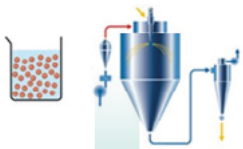
Partner with dsm-firmenich

dsm-firmenich is investing significantly in an advanced R&D process to offer you the right solutions that help meet patient needs. We have completed a full technology screening and validation process of over 200 candidates in the lab.

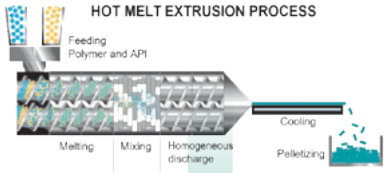
In our research we benchmarked nano-emulsification, liposomal, and lipid nanoparticle (LNP) encapsulation with formation of amorphous dispersions to identify optimal solutions and build a formulation toolbox. Through this process, CBtru® was developed—a spray-dried, nano-emulsified drug product intermediate and innovative drug delivery solution designed to formulate highly lipophilic molecules, such as cannabidiol (CBD).

In-house development

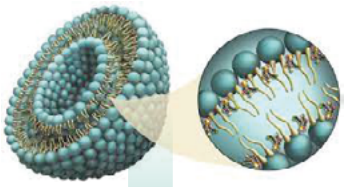
External partnerships



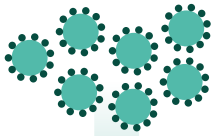
CBD spray dried powder



Amorphous solid dispersions



Liposomes & LNPs



Spray dried amorphous dispersions

In vitro bioaccessibility screening

Caco-2 assay (cell assay) was developed to determine CBD transcellular transport and measure in vitro bioaccessibility. More than 120 lab prototypes, produced using different technologies as mentioned above, were tested using Caco-2 assay. A selection of the best formulations that emerged were tested for in vivo bioaccessibility.

In vivo bioaccessibility screening

- CBtru® demonstrated good physical and chemical stability
- 3x – 4x increase in API loading vs commercial products
- Similar bioavailability vs oil-based CBD formulation Epidiolex®, the first (and to this date only) commercially approved CBD drug product on the market.

Human clinical evidence

dsm-firmenich investigated the absorption and pharmacokinetic profile (bioavailability) of CBtru® vs the market-approved sesame oil-based CBD formulation, Epidiolex®, in a randomized, open-label, 4-way cross-over study (32 individuals, aged 19-55). The study findings confirmed:

- The bioavailability of CBtru® was as good as that of the liquid oil-based reference product in fed state (with a high fat meal)
- In the fasted state, CBtru® demonstrated higher bioavailability than the reference product
- CBtru® was safe and well tolerated.

The clinical study also indicated that CBtru® may offer a more reliable and consistent uptake, less dependent on food intake. By demonstrating that the bioavailability of CBtru® was as good as that of the market-reference oil-based product, Epidiolex®, we've opened new possibilities for promising research and the development of new oral solid dosage forms.

Ready to elevate patient care? Connect with us today

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