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A study in healthy participants to assess how the cannabidiol is absorbed into the blood, after inhalation via a new device that heats without burning the hemp

Submission date
10/06/2026

Recruitment status
No longer recruiting

Registration date
23/06/2026

Overall study status
Completed

Last Edited
01/09/2026

Condition category
Other

[_] Prospectively registered
[X] Protocol
[X] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
There is limited data available to date on cannabidiol (CBD) absorption into the human blood following CBD inhalation via a Hemp Heat-not-Burn (HHnB) device, that is a new device that heats the hemp without burning it.
This clinical study evaluated the pharmacokinetics (PK, that is how CBD is absorbed into the blood), safety and tolerability of CBD administered via an HHnB device according to two different regimens, i.e. a standardized (fixed number of puffs) puffing dosing and a non-standardized (ad libitum) administration (as desired by the participant). In addition, subjective effects (through a product effect questionnaire), and human puffing topography (that is the description of the features of the puffs in terms of duration, inspiration etc) were evaluated to provide further insights on product acceptance and use. The study aim was to develop a product that offers a safer and improved option for cannabis users. The sponsor of this study has developed an HnB technology that potentially offers a noncombustion approach by heating cannabis at lower temperatures and potentially producing fewer harmful by-products such as carbon monoxide.

Who can participate?
Male or female healthy volunteers, aged 18-55 years old.

What does the study involve?
All participants received the same investigational product, according to the one arm study design, as follows:
• Day 1: Standardized administration of the study product
• Day 4: Non-standardized administration of the study product
For the standardized administration, the participants inhaled from the stick 10 times (10 puffs), with 30 sec breaks between puffs.

For the non-standardized administration, the participants inhaled from the stick ad libitum, as desired, without restrictions (e.g., no limitation on the duration of the inhalation or pause between puffs) until the device shut down at 6 minutes.

What are the possible benefits and risks of participating?
Cannabidiolo (CBD) has been administered in clinical studies, as a medicine and in consumer products, thus its overall safety profile has been established. CBD has been administered via different routes, with inhalation being common.

Risks not provided at time of registration.

Where is the study run from?
The study was conducted at the CROSS Research S.A. Phase I Unit Clinical Centre, in Arzo (Switzerland)

When is the study starting and how long is it expected to run for?
June 2025 to August 2025

Who is funding the study?
The study Sponsor is Aspeya, Switzerland

Who is the main contact?
The Principal Investigator Dr Milko Radicioni, clinic@croalliance.com

Contact information

Type(s)
Principal investigator, Public, Scientific

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Study information

Scientific Title
A single center, open label study to assess the pharmacokinetics of cannabidiol inhaled via a Hemp heat-not-Burn (HHnB) device in healthy participants

Acronym

HHnB device

Study objectives
To evaluate the pharmacokinetics (PK) of inhaled CBD, administered as standardized regimen (fixed number of puffs) and administered as non-standardized puff regimen (i.e. ad libitum) in healthy adult male and female participants.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 07/04/2025, Ethics Committee of the Canton of Ticino (Comitato Etico del Canton Ticino) (via Orico 5, Bellinzona, 6501, Switzerland; +41.91.814.30.57; michaela.gutacker@ti.ch), ref: 2025-00426; Rif. CE 4795

Primary study design
Interventional

Allocation
N/A: single arm study

Masking
Open (masking not used)

Control
Uncontrolled

Assignment
Single

Purpose
To evaluate the PK of inhaled cannabidiol (CBD)

Study type(s)

Health condition(s) or problem(s) studied
Not applicable, study on healthy participants

Interventions
After signing the informed consent form, at least 40 healthy adult male or female participants underwent screening assessments during an outpatient visit between Day -14 and Day -2. Eligible participants were admitted to the Phase 1 unit the day before the first administration of the study product (Day -1). For the next 5 days (Day 1 to Day 5), participants remained at the site overnight and were discharged on Day 5.

Up to 20 % CBD was present in the HHnB CBD stick, with an average of 13.1% w/w. The average weight of the stick was 88.8 mg, corresponding to 11.63 mg CBD.

All participants received the same study product as follows:
• Standardized administration of HHnB CBD (1 stick): Day 1
and

• Non-standardized administration of HHnB CBD (1 stick): Day 4
One stick of CBD was administered via an HHnB device under standardized conditions and under non-standardized conditions (i.e. ad libitum) on two different study days separated by a washout period (Day 2 and Day 3).

Assessments included physical examination, vital signs, urinalysis, blood draws for safety laboratory and PK, ECG, spirometry, and pregnancy tests. Participants were also provided with a questionnaire to assess the effects of the inhaled CBD and, more generally, their CBD consumption habits. Safety and tolerability of the study product were assessed throughout the study.
PK assessments were performed from pre-dose up to 72 h after the start of standardized dosing (Day 1) and from pre-dose up to 6 h after the start of non-standardized dosing (Day 4).

Intervention Type
Supplement

Primary outcome(s)
1. Plasma concentrations of CBD measured using fully validated LC-MS/MS methods at Day 1 from pre-dose up to 72 h after the start of standardized dosing and Day 4 from pre-dose up to 6 h after the start of non-standardized dosing

Key secondary outcome(s)

Completion date
09/08/2025

Eligibility

Key inclusion criteria
1. Male or female non-tobacco smokers or mild tobacco smokers (1-10 cigarettes or nicotine e-cigarette per day) that were willing to comply with the study restrictions related to smoking
2. Age ≥18 and ≤55 years of age
3. BMI ≥ 18.5 and ≤ 30.0 kg/m2
4. Occasional smokers of cannabis (i.e. individuals who smoked cannabis products maximum once a week in the past 3 months) willing to refrain from cannabis products for 2 weeks prior to Day 1
5. Healthy participants, defined as absence of clinically significant illness and surgery within 4 weeks prior to dosing; absence of clinically significant history of neurological, endocrine, cardiovascular, dermatological, hematological, immunological, psychiatric (e.g., history of major depression or C-SSRS score above Type 1 ideation), gastrointestinal, renal, hepatic, and metabolic disease (e.g., diabetes) as well as any other medical history event considered clinically significant in the opinion of the investigator; absence of clinically significant history of respiratory (e.g., significant history of acute or chronic bronchospastic) disease (including asthma and chronic obstructive pulmonary disease treated or not treated); absence of any history of diagnosis of any other pulmonary disease that in the judgment of the investigator was likely to
be exacerbated by inhalation of CBD from the device.
6. Female participants of childbearing potential must have had a negative pregnancy test result before administration of the study product and must have agreed not to donate ova (or egg(s)) for at least 30 days after the last dose of study product administration
7. Female participants of non-childbearing potential had to have/be: a) At least 12 months of

spontaneous amenorrhea; or b) post surgically sterile (documented bilateral oophorectomy with or without hysterectomy) for at least 3 months prior to dosing
8. Female participants of childbearing potential who were sexually active with a non-sterile male partner (sterile male partners were defined as men vasectomized for at least 3 months prior to dosing) must have used two of the acceptable contraceptive methods throughout the study and for 30 days after the last dose:
8.1. Simultaneous use of hormonal contraceptive (e.g., oral, patch, depot injection, implant, vaginal ring, intrauterine device) or non-hormonal intrauterine device used for at least 4 weeks prior to dosing (must agree to use the same contraceptive throughout the study) and condom for the male partner
8.2. Simultaneous use of diaphragm or cervical cap with spermicide and condom for the male partner, started at least 21 days prior to dosing
8.3. True abstinence (i.e., refraining from heterosexual intercourse when this was in line with the preferred and usual lifestyle of the participant). Periodic abstinence (e.g., calendar, ovulation, symptothermal, post-ovulation methods), lactational amenorrhea, and withdrawal were not acceptable)
9. Male participants who were not vasectomized for at least 3 months prior to dosing, and who were sexually active with a female partner of childbearing potential had to be willing to use one of the acceptable contraceptive methods from the first dose and for 90 days after the last dose:
9.1. Simultaneous use of condom and hormonal contraceptive (e.g., oral, patch, depot injection, implant, vaginal ring, intrauterine device) or non-hormonal intrauterine device used for at least 4 weeks prior to sexual intercourse for the female partner
9.2. Simultaneous use of condom and a diaphragm or cervical cap with spermicide for the female partner
10. Male participants (including men who had a vasectomy) with a pregnant partner had to agree to use a condom from the first dose until 90 days after the last dose
11. Male participants had to be willing not to donate sperm from the first dose until 90 days after the last dose
12. Able to understand the study procedures, restrictions and visit schedule and provided signed informed consent to participate in the study

Healthy volunteers allowed
Yes

Age group
Adult

Lower age limit
18 Years

Upper age limit
55 Years

Sex
All

Total final enrolment
40

Key exclusion criteria

1. Any clinically significant abnormal finding at physical examination at screening that could interfere with the objectives of the study
2. Clinically significant abnormal laboratory test results which in the opinion of the investigator could prevent participation in the study, at screening
3. Positive serology test results for HBsAg, HCV antibody, or HIV antigen and antibody at screening
4. Positive pregnancy test (at screening or Day -1) or lactating female participant
5. Positive urine drug (including cannabis related substances) screen and alcohol saliva test at screening or
Day -1
6. Participant with abnormal lung function defined by spirometry testing such as: FEV1 < 80% of predicted normal value OR FEV1/FVC ratio < 0.70 at screening OR with post-bronchodilator FEV1 ≥ 12% increase from pre-bronchodilator values (Reversibility testing)
7. Clinically significant ECG abnormalities at screening
8. Clinically significant vital signs abnormalities (systolic blood pressure lower than 90 or over 140 mmHg, resting diastolic blood pressure lower than 50 or over 90 mmHg, or resting heart rate less than 50 or over 100 bpm) at screening
9. History of cannabis use disorder (i.e. mental health condition in which there was a problematic pattern of cannabis use that causes distress or impairs life) within 1 year prior to screening or of hard products (such as cocaine, phencyclidine [PCP], crack, opioid derivatives including heroin, and amphetamine derivatives) within 3 months prior to screening
10. History of alcohol use disorder (defined as a problematic pattern of alcohol use leading to clinically significant life impairment or distress) within 1 year prior to screening or regular use of alcohol within 6 months prior to screening that exceeded 10 units for women or 15 units for men of alcohol per week (1 unit = 340 mL of beer 5%, 140 mL of wine 12%, or 45 mL of distilled alcohol 40%)
11. Known allergic reaction to CBD, or other related products, or to any excipient in the formulation
12. Any of the following laboratory parameters above 1.5 x upper limit of normal (ULN) at screening or baseline (Day -1): aspartate aminotransferase (AST), alanine aminotransferase (ALT), and total bilirubin. Analyses could be repeated once for confirmation.
13. History of liver disease or hepatic dysfunction (including cirrhosis), hyperbilirubinemia, jaundice, or elevated liver enzymes
14. History of epilepsy, major depression, schizophrenia or any other psychotic disorders
15. Use of medications for the timeframes specified below, except for medications exempted by the investigator on a case-by-case basis because they were judged unlikely to affect the PK profile of the study product or participant’s safety (e.g., topical drug products without significant systemic absorption):
15.1. current use of clobazam or valproate sodium, or use within 4 weeks prior to dosing; no other prescription medication from 14 days and over the counter (OTC) products from 7 days prior to dosing and throughout the study
15.2. Depot injection or implant within 3 months prior to dosing (excluding depot injection for contraception)
15.3. Any product known to induce or inhibit CYP3A4, CYP2C9 or CYP2C19 mediated hepatic drug metabolism, including St. John’s wort and cytochrome p450 (CYP) substrates of CYP1A2 (e. g., theophylline) and CYP2B6 (e.g., bupropion, efavirenz), CYP2C8 (e.g., montelukast), CYP2C9 (e. g. phenytoin), CYP2C19 (e.g., diazepam) and uridine 5' diphospho-glucuronosyltransferase (UGT) substrates of UGT1A9 (e.g., diflunisal, propofol, fenofibrate), and UGT2B7 (e.g., gemfibrozil, lamotrigine, morphine, lorazepam) within 30 days prior to dosing until the last PK blood draw
15.4. Any vaccine, including COVID-19 vaccine, within 14 days prior to dosing
15.5. OTC medications and natural health products (including herbal remedies, homeopathic and traditional medicines, probiotics, food supplements such as vitamins, minerals, amino acids,

essential fatty acids, and protein supplements used in sports) within 7 days prior to dosing, with the exception of occasional use of paracetamol (acetaminophen) (up to 2 g daily)
15.6. any food or beverages containing grapefruit, starfruit, Seville orange, pomegranate, pineapple, or pomelo from 7 days prior to dosing until the last PK blood draw
15.7. any food containing poppy seeds from 24 hours prior to admission until the last PK blood draw
15.8. any alcohol-based products from 24 hours prior to admission until the last PK blood draw
16. Participation in the evaluation of any investigational product for 3 months before this study. The 3-month interval was calculated as the time between the first calendar day of the month that followed the last visit of the previous study and the first day of the present study
17. Blood donations for 3 months before screening
18. Any reason which, in the opinion of the investigator, would have prevented the participant or made him/her inappropriate from participating in the study

Date of first enrolment
11/06/2025

Date of final enrolment
04/08/2025

Locations

Countries of recruitment
Switzerland

Sponsor information

Organisation
Aspeya, Switzerland

Funder(s)

Funder type

Funder Name
Aspeya, Switzerland

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary

Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Basic results		26/08/2026	27/08/2026	No	No
Protocol file	version 2.0	09/05/2025	01/09/2026	No	No
Statistical Analysis Plan	version 1.0	24/09/2025	01/09/2026	No	No