

Post-Alcohol Recovery Support from a Multi-Component Botanical-Amino Acid Formulation: Formulation-Specific Human Findings and Clinical Evidence Context

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ABSTRACT

Objective: Alcohol hangover is a mixed post-intoxication state rather than a single symptom. We evaluated an NVTIA® post-alcohol nutritional formulation containing standardized *Hovenia dulcis* and *Pueraria lobata* extracts, embedded L-cysteine granules, and curcumin-corn oligopeptide composite granules. **Method:** Thirty healthy adults aged 25–45 years were randomly allocated to the formulation or placebo group. Two capsules (1,400 mg total contents) were taken within 30 min after drinking. Published human studies were then examined for *H. dulcis*, *H. dulcis*-*P. lobata* combinations, L-cysteine, and puerarin/kudzu preparations. **Results:** Approximately 10–12 h later, dry-mouth, fatigue, heavy-headed feeling, and stomach-discomfort scores were 1.2, 1.5, 1.1, and 0.9 in the formulation group and 2.8, 3.1, 2.6, and 2.3 in the placebo group. The descriptive reductions were 51.6–60.9% across the four symptom domains. *H. dulcis* trials reported selected symptom changes, inflammatory responses, and early alcohol-kinetic differences. L-cysteine studies produced different results across formulations and endpoints. Kudzu and puerarin trials consistently altered drinking behavior under controlled conditions. **Novelty:** The formulation-level symptom pattern and the external human evidence identify a practical set of variables for a larger prospective study: validated hangover scales, early alcohol/acetalddehyde kinetics, gastrointestinal and fatigue domains, and selected redox or inflammatory biomarkers.

INTRODUCTION

Hangover symptoms usually become most noticeable as blood alcohol concentration approaches zero. Dry mouth, fatigue, headache, dizziness, nausea, gastrointestinal discomfort, cognitive slowing, sleep disturbance, and mood-related complaints do not occur with the same intensity in every person. Alcohol metabolism, acetaldehyde exposure, inflammatory activation, oxidative stress, sleep disruption, and individual susceptibility all contribute to this variable phenotype [1].

That heterogeneity is relevant to a multi-component nutritional system. *H. dulcis* has controlled human post-alcohol data. *P. lobata* contains puerarin and other isoflavones that have been studied in human drinking paradigms. L-cysteine supplies a reactive thiol relevant to glutathione metabolism, and curcuminoids add a polyphenolic redox component. The formulation therefore brings together ingredient classes that act at different points in the post-drinking period.

The oral solid was also engineered as a structured dosage form. *H. dulcis* and *P. lobata* extracts are combined with a double-layer embedded L-cysteine granule and a curcumin-corn oligopeptide composite granule. The granule design addresses sulfur

odor, curcumin dispersion, powder flow, and storage stability. We examined the next-morning symptom profile of the complete formulation and then used human evidence to decide which ingredient-related endpoints are most informative for subsequent formulation-specific work.

RESEARCH METHOD

Formulation composition and dosage form

Each hard capsule contained 700 mg total contents. For a 1,000-capsule batch, the blend included 140 g *H. dulcis* extract, 84 g *P. lobata* extract, 168 g embedded L-cysteine granules, 280 g curcumin–corn oligopeptide composite granules, 18 g microcrystalline cellulose, 5 g silicon dioxide, and 5 g magnesium stearate. *H. dulcis* contained 15–35% total flavonoids and 2–10% dihydromyricetin; *P. lobata* root extract contained 20–60% puerarin. The L-cysteine granules contained 68% L-cysteine hydrochloride monohydrate, and the curcumin–corn oligopeptide granules contained 10% curcuminoids and 75% corn oligopeptide. On the 700-mg capsule basis, those granules supplied approximately 114.2 mg L-cysteine hydrochloride monohydrate, 28 mg curcuminoids, and 210 mg corn oligopeptide.

Table 1. Composition of the 700-mg hard-capsule configuration.

Component	Nominal amount	Standardization/ granule feature	Scientific role in the formulation
Hovenia dulcis extract	140 mg/capsule	Total flavonoids 15–35%; dihydromyricetin 2–10%	Botanical component with human hangover evidence context
Pueraria lobata root extract	84 mg/capsule	Puerarin 20–60%	Isoflavone-rich botanical component; human alcohol-behavior evidence context
Embedded L-cysteine granules	168 mg/capsule	Specific granule formula contains 68% L-cysteine HCl monohydrate	Double-layer embedding limits sulfur odor and supports storage stability
Curcumin–corn oligopeptide composite granules	280 mg/capsule	Specific granule formula: 10% curcuminoids, 75% corn oligopeptide	Hydrophobic curcuminoids dispersed in a hydrophilic peptide matrix

Component	Nominal amount	Standardization / granule feature	Scientific role in the formulation
Oral solid excipients	28 mg/capsule	Microcrystalline cellulose, silicon dioxide, magnesium stearate	Flow, filling and dosage-form performance

Post-drinking application evaluation

Thirty healthy adults aged 25–45 years with a history of alcohol consumption and recurrent post-drinking discomfort entered the two-group application evaluation. Random allocation produced a formulation group (n=15) and a placebo group (n=15). The formulation group took two capsules, corresponding to 1,400 mg total contents, within 30 min after drinking. The control group received the same amount of placebo capsules containing microcrystalline cellulose at the same time point.

Symptom assessment and descriptive analysis

Approximately 10–12 h after drinking, participants rated dry mouth, fatigue, heavy-headed feeling, and stomach discomfort on a five-level scale from 0 (absent) to 4 (severe). Group means were used for the descriptive comparison. Absolute mean differences and proportional differences relative to the placebo means were calculated from those reported values.

Targeted clinical-evidence appraisal

The clinical-evidence appraisal focused on peer-reviewed human studies of *H. dulcis*, *H. dulcis*-containing combinations, L-cysteine, and *P. lobata*/puerarin in alcohol-related settings. Randomized, blinded, and crossover designs received priority. Published outcomes were kept with their original populations, doses, and interventions so that ingredient-level evidence remained distinct from the complete NVTIA® formulation.

RESULTS AND DISCUSSION

Result

Post-alcohol symptom profile

All four prespecified next-morning scores were lower in the formulation group. Dry mouth was 1.2 versus 2.8, fatigue 1.5 versus 3.1, heavy-headed feeling 1.1 versus 2.6, and stomach discomfort 0.9 versus 2.3. The absolute mean differences were 1.6, 1.6, 1.5, and 1.4 points. Relative to the placebo means, the descriptive reductions were 57.1%, 51.6%, 57.7%, and 60.9%, respectively.

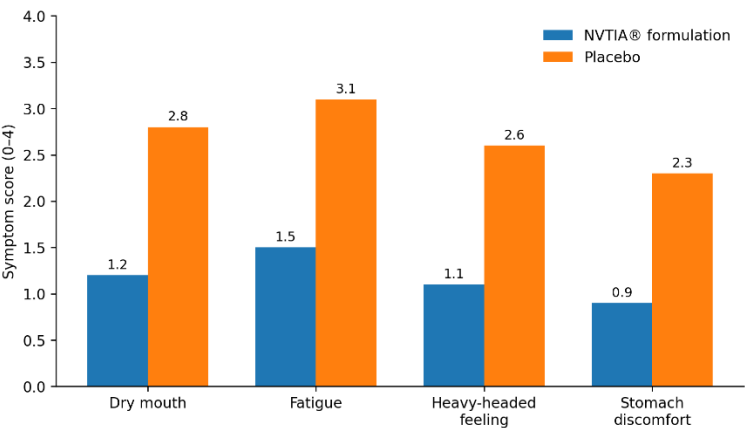


Figure 1. Mean next-morning symptom scores approximately 10–12 h after drinking. Scores range from 0 (no symptom) to 4 (severe). Values are shown as group-mean point estimates, matching the descriptive structure of the assessment.

Alignment with published human evidence

Table 2. Selected human studies relevant to the principal components of the formulation.

Study	Design	Intervention	Alcohol-related finding relevant to this formulation
Kim et al., 2017 [2]	26 healthy men with heterozygous ALDH2; randomized crossover	H. dulcis fruit extract 2,460 mg vs placebo with 50 g alcohol	Selected hangover symptoms improved; inflammatory cytokine patterns and CYP2E1 genotype were explored.
Paik et al., 2024 [3]	30 adults; randomized, double-blind crossover	H. dulcis beverage alone or with P. lobata / glutathione yeast vs placebo	AHS symptom domains and alcohol/acetaldehyde kinetics were evaluated; H. dulcis-based beverages showed favorable symptom signals.

Study	Design	Intervention	Alcohol-related finding relevant to this formulation
Lee et al., 2024 [4]	25 adults; randomized, double-blind crossover	H. dulcis + P. lobata or H. dulcis + glutathione yeast vs placebo	Lower early blood alcohol concentrations in combination groups and reduced gastrointestinal symptom scores were reported.
Eriksson et al., 2020 [5]	19 men; randomized, double-blind, placebo-controlled	L-cysteine-containing vitamin supplement after 1.5 g/kg alcohol	Dose- and symptom-specific signals were reported; interpretation has been debated in later commentary.
Scholey et al., 2020 [6]	20 participants; randomized balanced crossover	Multi-ingredient L-cysteine-containing product vs placebo	Overall hangover severity was similar between treatments, illustrating endpoint and formulation heterogeneity.
Penetar et al., 2012 [7]	10 healthy heavy drinkers; double-blind crossover	Puerarin 1,200 mg/day for 1 week vs placebo	Alcohol consumption pattern was altered, with fewer drinks and smaller sips during the laboratory drinking session.

Discussion

A multi-domain recovery signal

The four symptom domains moved in the same direction, but they do not represent the same physiological process. Dry mouth, generalized fatigue, heavy-headed sensation, and gastric discomfort can arise from different combinations of hydration, sleep, gastrointestinal effects, metabolism, and inflammatory or redox responses. For a

multi-component formulation, that spread across symptom classes is more informative than a single isolated score.

The result is best read at the formulation level. The capsules deliver standardized botanical extracts together with L-cysteine and curcumin–peptide granules, so several active fractions are present at the same time. The observed pattern therefore gives a practical recovery phenotype that can be paired with more specific metabolic and biomarker measurements in a subsequent trial.

Hovenia dulcis as the strongest direct human evidence anchor

H. dulcis has the closest human evidence to the intended use. Kim et al. studied 2,460 mg standardized fruit extract in 26 healthy men with heterozygous ALDH2 and reported improvement in headache, dizziness, nausea, and weakness together with changes in inflammatory-response variables [2]. Alcohol and acetaldehyde were measured in the same crossover experiment, allowing symptoms to be compared directly with metabolite kinetics.

Paik et al. tested H. dulcis beverages alone and in combination with P. lobata or glutathione yeast in 30 adults [3]. Lee et al. used a 25-person double-blind crossover design and reported lower early blood alcohol concentrations in the H. dulcis combination groups, together with lower gastrointestinal symptom scores [4]. These trials are particularly relevant to the lower stomach-discomfort and heavy-headedness scores observed with the complete NVTIA® formulation.

L-cysteine: mechanistic relevance with trial-design sensitivity

L-cysteine contributes a different chemical pathway. Its sulfhydryl group participates in thiol chemistry, and cysteine availability is relevant to glutathione synthesis. Eriksson et al. reported dose- and symptom-specific signals after an L-cysteine-containing vitamin supplement [5]. A separate balanced crossover trial of a multi-ingredient L-cysteine product found similar overall hangover severity between treatments [6]. The contrast between those two studies makes dose, co-ingredients, alcohol challenge, and endpoint choice important design variables.

The NVTIA® dosage form uses β -cyclodextrin/HPMC embedding followed by ethyl-cellulose and shellac coating for the L-cysteine granule. The main purpose is odor and storage control. In a formulation-specific trial, that standardized physical form can be evaluated using the same exposure timing and prespecified symptom domains across all participants. The broader randomized hangover literature remains methodologically heterogeneous [8], and reviews of hangover physiology and alcohol-related inflammation place the symptom state within a wider metabolic and immune context [9], [10].

Pueraria lobata and the behavioral-metabolic context

P. lobata provides a puerarin-rich botanical fraction. Penetar et al. administered puerarin at 1,200 mg/day for 1 week to 10 heavy drinkers and observed fewer drinks and smaller sips during the laboratory session [7]. Standardized kudzu extract reduced drinking in a naturalistic setting [11] and over a 4-week outpatient period [12]. A single-

dose kudzu experiment also reduced alcohol consumption in a binge-drinking paradigm [13]. These studies address drinking behavior rather than next-morning recovery, but they establish controlled human activity for Pueraria-derived isoflavones.

Formulation architecture and translational relevance

The granule architecture is part of the administered composition. Embedding L-cysteine reduces the sulfur-associated sensory problem, while the curcuminoid–corn-oligopeptide/cyclodextrin matrix improves dispersion and powder handling. A separate randomized trial of a 700-mg plant-extract mixture reported changes in alcohol-related biomarkers, ADH/ALDH activity, and several hangover symptoms [14]. The controlled hydrogen crossover study also paired a post-alcohol intervention with symptom outcomes in healthy adults [15]. Those designs are useful examples for integrating subjective and objective endpoints.

For the next formulation-specific study, the main procedural choices can be fixed before recruitment: standardized alcohol exposure, prespecified capsule timing, validated multi-item hangover scales, repeated ethanol and acetaldehyde measurements, and defined gastrointestinal and fatigue outcomes. Redox and inflammatory markers can be added without replacing the symptom endpoints.

Limitations

The current evaluation provides group mean scores for four next-morning symptoms under a defined use scenario. A larger prospective design can retain those domains and add variability estimates, validated multi-item instruments, standardized alcohol dosing, and pharmacokinetic sampling. Prespecified subgroup analysis, including ALDH2 where relevant, would also make inter-individual differences easier to interpret.

CONCLUSION

Fundamental Finding: The NVTIA® multi-component formulation produced lower next-morning scores than placebo for dry mouth, fatigue, heavy-headed feeling, and stomach discomfort in 30 participants. **Implication:** *H. dulcis* trials provide the closest human post-alcohol comparison, including studies with symptom, inflammatory, alcohol, and acetaldehyde measurements. Pueraria-derived preparations supply additional controlled human alcohol-response data. **Limitation:** L-cysteine studies show that formulation and endpoint choice materially affect the observed response. **Future Research:** The same complete formulation can now be examined with validated symptom scales, alcohol-metabolism kinetics, and a prespecified biomarker panel.

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