Brain market

Human Clinical Study on the Comparative Bioavailability of Various Glutathione Supplementation Forms

Summary of the Study[1]

Abstract

The purpose of this study was to compare the bioavailability of Glutathione in liquid liposomal supplementation form BrainMax Liquid Liposomal Glutathione with other non-liposomal tablet form provided by competitor. Twenty metabolically healthy volunteers were enrolled in the study.

Overall,the BrainMax Liquid Liposomal Glutathione **supplement had the highest bioavailability, up to 63.62 times more,** compared to other non-liposomal Glutathione in tablet supplementation form tested.

KEYWORDS: Glutathione, Liposomes, Bioavailability, Dietary Supplements, Antioxidant, Biohacking.

Product Groups

LLG
Liquid Liposomal Glutathione 500 mg

Manufactured for Brainmarket

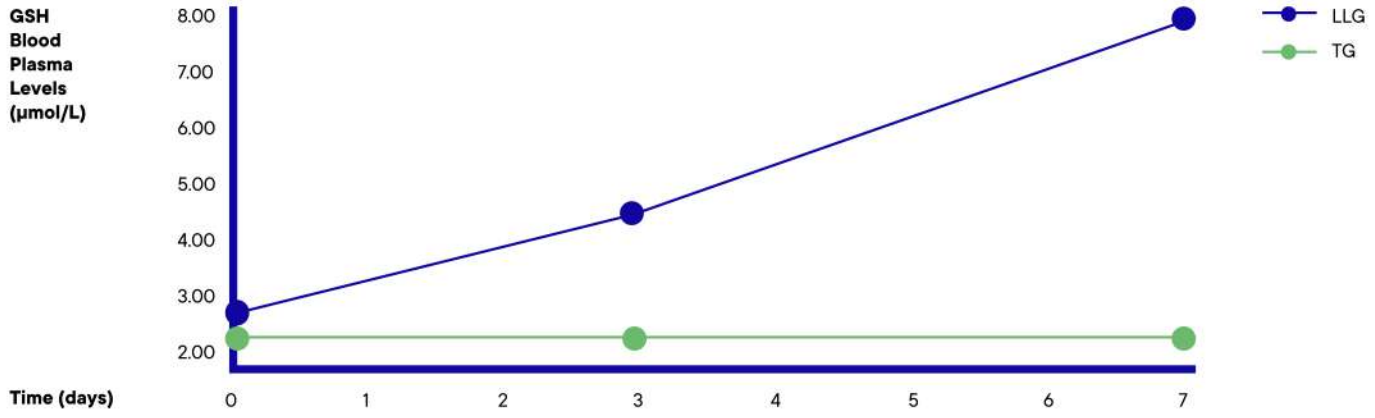
TG
Non-liposomal tablet Glutathione 500 mg

Manufactured by Competitor in the USA

Results

During the study, blood plasma levels were measured over time after the intake of Glutathione (GSH) 500 mg in two supplementation forms, namely LLG and TG.

The results show that the BrainMax Liquid Liposomal Glutathione (LLG) demonstrates **63.62 times** higher bioavailability compared to the competitor's non-liposomal Glutathione (TG). Liposomal Glutathione also **maintained elevated plasma levels throughout the entire study period**, proving sustained highest concentrations during daily supplementation.



[1]See the full study from page 2.

Introduction

Current GSH delivery techniques, besides the invasive intravenous, include tablet, pill or other oral forms with low efficiency of delivery due to the relatively poor bioavailability of Glutathione.[2] This has led researchers to investigate the liposome encapsulation of GSH as a valuable alternative to enhance the bioavailability of this powerful supplement.[3] The current study confirmed that the unique advanced liposomal technology LipoSone™, used in BrainMax, effectively enhances Glutathione bioavailability. The liposomal encapsulation significantly outperforms other supplementation forms, such as traditional tablets.

Method

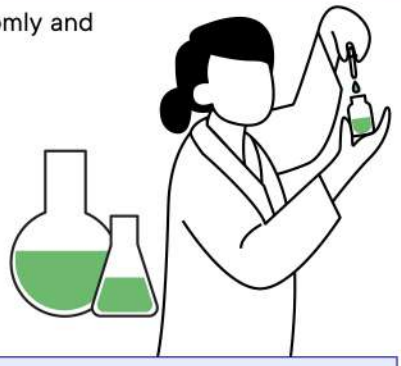
The current study was a randomized, controlled, two-group trial investigating the effect of Glutathione 500 mg in two different formulations: BrainMax Liquid Liposomal Glutathione (LLG) and non-liposomal GSH in tablet form provided by competitor (TG).

Participants

Twenty (20) metabolically healthy volunteers were enrolled in the study. They were randomly and evenly assigned to one of the two supplementation groups.

Exclusion criteria for participants were:

- ✖ <20 and >50 years of age
- ✖ Any diagnosis of chronic condition(s)
- ✖ BMI outside of the normal category range (18.5–24.9kg/m2)
- ✖ Presence of acute illness
- ✖ Use of drugs or dietary supplements on a frequent and/ or mandatory basis



Measurements	LLG*	TG*
Age (years)	27 ± 6	28 ± 7
Females (%)	40	30
BMI (kg/m2)	21 ± 2	21 ± 2
Systolic BP (mmHg)	122 ± 15	121 ± 9
Diastolic BP (mmHg)	72 ± 9	77 ± 6

Table 1. Participant Anthropometric Data

** Mean standard deviation n=10*

Active Substances & Supplementation Groups

a. Liquid liposomal Glutathione (LLG): BrainMax Liquid Liposomal Glutathione

b. Non-liposomal tablet Glutathione (TG): Competitor's GSH 500 mg in tablet form, manufactured in Leonia, New Jersey, USA.

Dosage and Blood Collection

Participants in the designated supplement groups, while in a fasted state, received **a 500 mg oral dose of Glutathione.** Blood samples were taken initially before the supplement was consumed (baseline) and then on day three (3), and day seven (7). These samples were promptly microcentrifuged, cooled to 2°C, and subjected to plasma Glutathione (GSH) level quantification by Liquid Chromatography and Mass Spectrometry (LC/MS-MS) techniques.

Data

All participants successfully completed the study. They were characterized by healthy Body Mass Index (BMI) and blood pressure levels, detailed by both systolic and diastolic measurements. Participant anthropometric data is provided in **Table 1.**

Each group's average blood plasma reduced GSH levels over time are graphically represented in **Figure 1**. Pharmacokinetic parameters, such as the peak plasma concentration of Glutathione (C_{max}) and the time to reach this peak (T_{max}), are documented in **Table 2**.

The area under the concentration-time curve (AUC_{0-t}) was calculated from dosing to the last measurable concentration using the trapezoidal rule, indicating the total exposure to the active ingredient over time. The incremental area under the curve (iAUC) adjusts the AUC for baseline variations. The Oral Bioavailability Value (OBV) was determined by comparing the liposomal and non-liposomal $iAUC_{0-t}$ values.

Results

A temporal analysis of GSH plasma levels reveals that:

Baseline of the two supplementation groups is considered comparable.

After 3 days, the liposomal group achieved significantly higher plasma GHS levels, compared to the tablet group, that seems to have been undifferentiated from baseline.

After 7 days, the liposomal supplementation **has doubled** the level of plasma GHS while the tablet group showed no sign of improvement.

Considering the **iAUC** values, the outcomes suggest:

The liposomal group has an OBV **63 times** greater than the tablet group.

Measurements	LLG	TG
C_{max} (µmol/L)	7.21	4.28
T_{max} (days)	7	7
AUC_{0-t} (µmol*day/L)*	34.76	18.08
$iAUC_{0-t}$ (µmol*day/L)*	14.32	0.23
OBV	63.62	

Table 2. Pharmacokinetic Parameters Data

C_{max} - Max Plasma Concentration; **T_{max}** - Time C_{max} was reached;

AUC - Area Under The Curve; **iAUC** - Incremental Area Under The Curve.

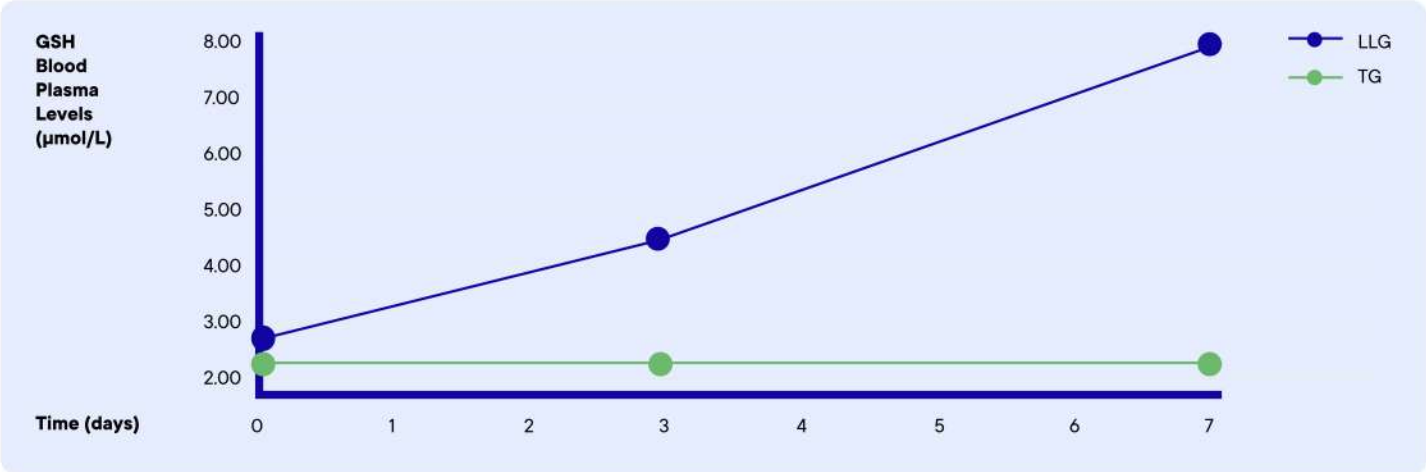


Figure 1. Mean plasma reduced glutathione (GSH) level collected over seven days after daily supplementation in liposomal and tablet form. GSH blood plasma levels measured over time after the intake of glutathione 500 mg in LLG BrainMax Liquid Liposomal Glutathione, and TG tablet product manufactured by competitor.

Discussion and Conclusion

The study demonstrates that BrainMax Liquid Liposomal Glutathione (LLG) exhibits the **highest bioavailability** among the tested groups.

Specifically, LLG has **63.62 times** higher bioavailability than the competitor's tablet form (TG) with the same active ingredient concentration per daily supplementation.

The plasma level of GSH **increased linearly** throughout the **entire 7-day** duration of the study following the daily intake of the liposomal supplement, whereas the non-liposomal tablet group showed no significant increase.

These findings underscore the substantial impact of liquid liposomes on Glutathione bioavailability and highlight the superior performance of BrainMax liposomal formulations.

The advanced liposomal technology LipoSone™, powering BrainMax Liposomal products, is the most effective way to deliver Glutathione to the bloodstream while maintaining the highest blood plasma levels .

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