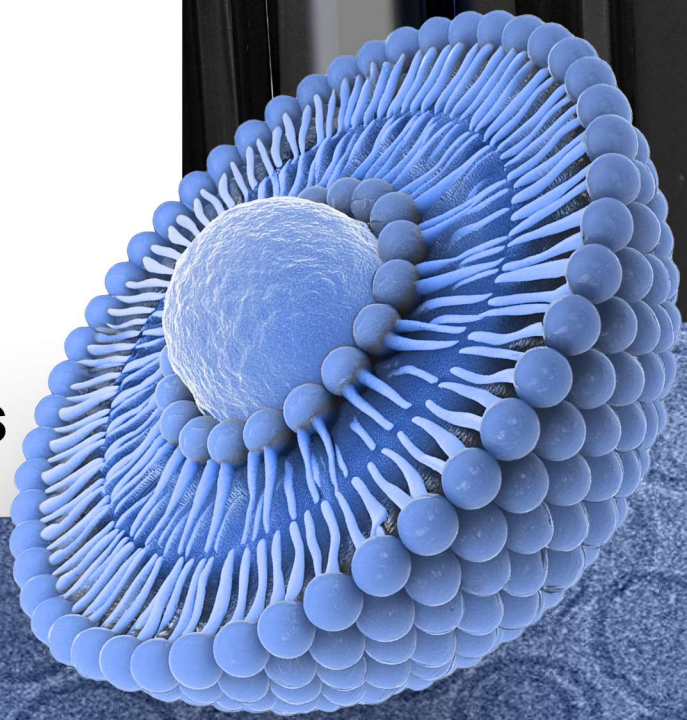
Brain market

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



Summary of the Study[1]

Abstract

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

Overall, **BrainMax Liquid Liposomal Quercetin had the highest bioavailability, up to 11.6 times more,** compared to other non-liposomal Quercetin in tablet supplementation form tested.

KEYWORDS: Quercetin, Liposomes, Bioavailability, Dietary Supplements, Biohacking.

Product Groups

LLQ
Liquid Liposomal Quercetin 250 mg

BrainMax Liquid Liposomal Quercetin

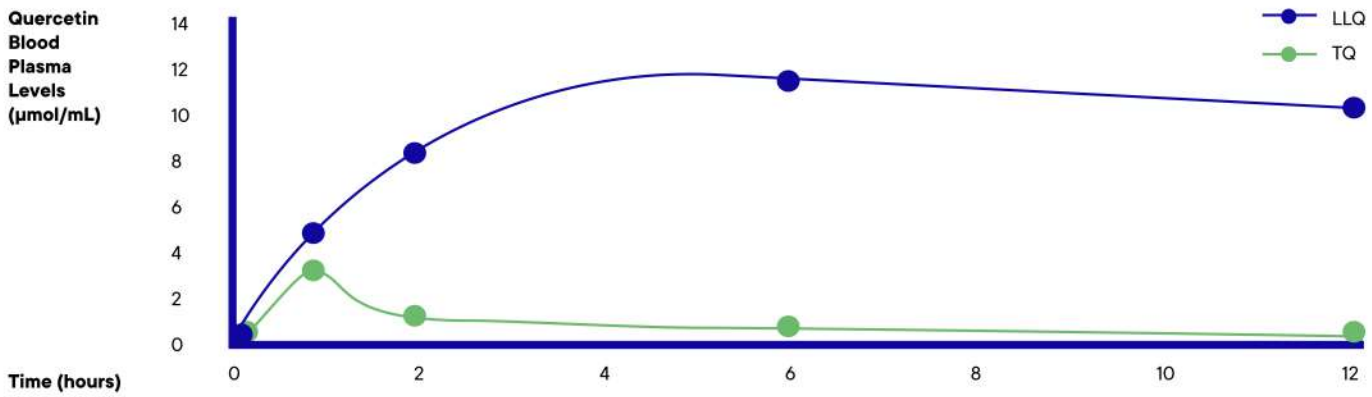
TQ
Non-liposomal tablet Quercetin 250 mg

Manufactured by Competitor in Germany

Results

During the study, blood plasma levels were measured over time after the intake of Quercetin 250 mg in two supplementation forms, namely LLQ and TQ.

The results have shown that the BrainMax Liquid Liposomal Quercetin (LLQ) has **11,6 times** higher bioavailability than the competitor's non-liposomal Quercetin (TQ). Liposomal Quercetin 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

Quercetin has low bioavailability due to its hydrophobic structure, which poses a challenge for the development of effective nutraceutical formulations[2]. **Liposomal encapsulation offer a solution to unlock the power of this supplement.** The current study confirms that the unique advanced liposomal technology LipoSone™, used in BrainMax, maximizes Quercetin bioavailability, outperforming conventional supplementation forms such as tablets.

Method

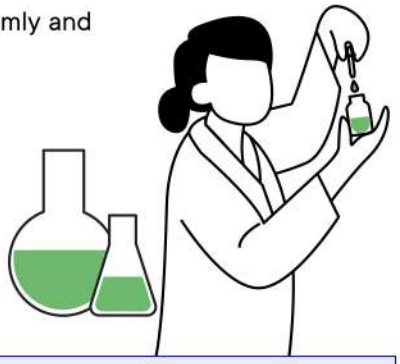
The current study was a randomized, controlled, two-group trial investigating the effect of Quercetin 250 mg in two different formulations: BrainMax Liquid Liposomal Quercetin (LLQ) and non-liposomal Quercetin in tablet form provided by competitor (TQ).

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	LLQ*	TQ*
Age (years)	27 ± 5	28 ± 6
Females (%)	50	50
BMI (kg/m2)	20 ± 1	20 ± 2
Systolic BP (mmHg)	123 ± 9	119 ± 13
Diastolic BP (mmHg)	77 ± 5	79 ± 5

Table 1. Participant Anthropometric Data

** Mean standard deviation n=10*

Active Substances & Supplementation Groups

a. Liquid liposomal Quercetin (LLQ): BrainMax Liquid Liposomal Quercetin

b. Non-liposomal tablet Quercetin (TQ): Competitor's Quercetin 250 mg in tablet form, manufactured in Germany.

Dosage and Blood Collection

Participants in the designated supplement groups, while in a fasted state, received **a 250 mg oral dose of Quercetin.** Blood samples were taken initially before the supplement was consumed (baseline) and then at intervals of 1, 2, 3, 6 and 12 hours following the intake. These samples were centrifuged for six minutes at 15,000 g, cooled to 2°C, and analysed for plasma Quercetin–3–glucoside and Quercetin–4'-glucoside levels by Liquid Chromatography and Mass Spectrometry (LC/MS-MS) techniques.

Data

All participants successfully completed the study. They were predominately in their late twenties, with an equal distribution of males and females. All 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 Quercetin levels over time are graphically represented in **Figure 1**. Pharmacokinetic parameters, such as the peak plasma concentration of Quercetin (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 Quercetin plasma levels reveals that:

After 1 hour, the LLQ group plasma level steadily increases, while the TQ group has already reached the maximum plasma level.

After 2 hours, the LLQ group plasma level increases almost linearly, while the TQ group plasma level decreases by approx. half.

After 6 hours, the LLQ group reaches a maximum level of plasma quercetin, **almost 10 times** higher than the TQ group, that is instead already close to baseline values.

After 12 hours, the LLQ group shows plasma values constant and high, while the TQ group has reached baseline level.

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

The liposomal group has an OBV **11.6 times** greater than the tablet group.

Measurements	LLQ	TQ
C_{max} (µmol/mL)	10.912	2.544
T_{max} (hours)	6	1
AUC_{0-t} (µmol/mL*h)	107	7.7
$iAUC_{0-t}$ (µmol/mL*h)	61.6	5.32
OBV	11.6	

Table 2. Pharmacokinetic Parameters Data

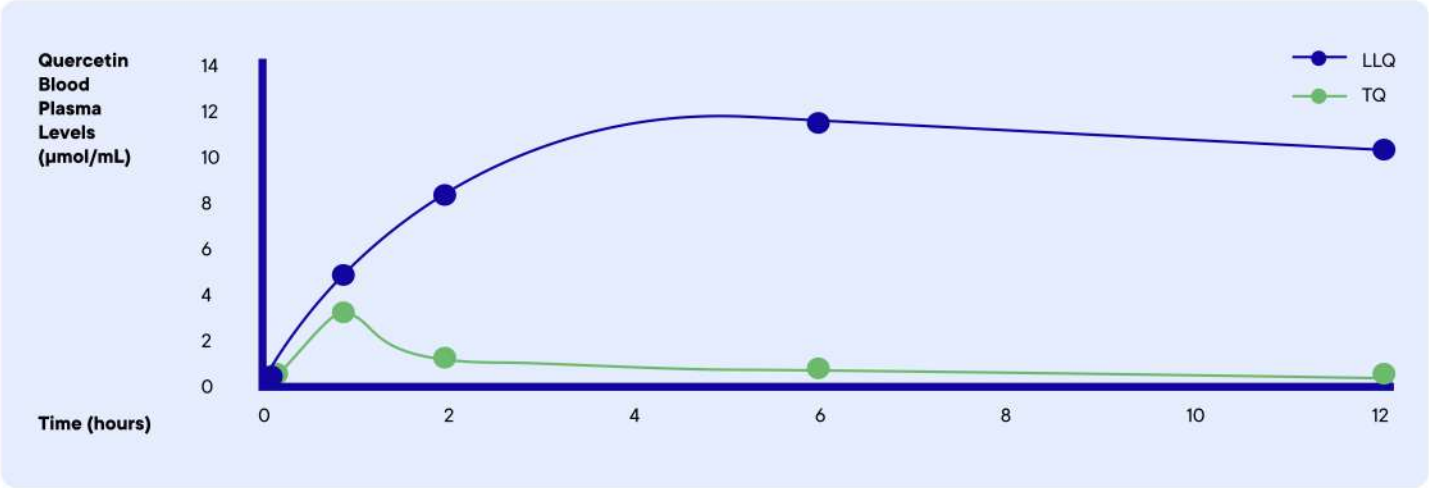


Figure 1. Quercetin blood plasma levels collected over time in two supplementation groups, namely LLG BrainMax Liquid Liposomal Quercetin and TG tablet product manufactured by competitor. Each symbol represents the mean (n=10) and error bars are the standard error.

Discussion and Conclusion

The present study demonstrates **the significant enhancement of Quercetin bioavailability** through BrainMax Liquid Liposomal Quercetin compared to less efficient delivery systems, such as traditional tablet form.

Based on plasma Quercetin levels collected in this study, Quercetin encapsulated in liquid liposomal supplementation is **11.6 times** more bioavailable than non-liposomal Quercetin. At all time points, excluding baseline, the liposomal group's plasma Quercetin levels are **up to 10 times** higher. Liposomal Quercetin also **maintained elevated plasma levels** throughout the **entire 12-hour** duration of the study, meaning daily supplementation results in sustained higher concentrations.

This data demonstrates that liquid liposomal Quercetin offers significantly higher bioavailability than standard supplementation forms at the same dose, highlight the superior performance of BrainMax liposomal formulations.

Overall, the advanced liposomal technology LipoSone™, used in BrainMax supplements, is the most effective way to deliver Quercetin to the bloodstream while maintaining the highest blood plasma levels for up to 12 hours.

1. Zhang M, Swarts SG, Yin L, Liu C, Tian Y, Cao Y, Swarts M, Yang S, Zhang SB, Zhang K, Ju S, Olek DJ Jr, Schwartz L, Keng PC, Howell R, Zhang L, Okunieff P. Antioxidant Properties of Quercetin. Adv Exp Med Biol., 2011, 701: 283–289. doi: 10.1007/978-1-4419-7756-4_38.
2. Kandemir K, Tomas M, McClements DJ, Capanoglu E. Recent advances on the improvement of quercetin bioavailability. Trends Food Sci Technol. 2022, 119 (5): 192–200. doi: 10.1016/j.tifs.2021.11.032.

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