PlantaCORP

INFLUENCE OF LIPOSOMES ON GLUTATHIONE ABSORPTION

ABSTRACT:

Introduction:
Traditional glutathione supplements are broken down into their amino acid constituents in the intestine and are unable to reach the bloodstream intact, making their use ineffective. Repeated doses have been shown to increase plasma glutathione levels, however, these increases are minimal. Liposomes present a solution to this problem by increasing the absorption of active ingredients allowing the molecule to arrive in tact to the bloodstream.

Study Objective:
The objective of the study was to evaluate the absorption of a liposomal glutathione supplement (liposomal) compared to a non-liposomal supplement (standard) after seven days of administration.

Methods:
The study was a randomized, controlled trial. Twenty metabolically healthy individuals enrolled and were assigned to the liposomal or standard group. Each group was administered 500mg of the liposomal or standard glutathione product, respectively, every morning for seven days. Blood was taken at baseline (B0), on day three (T1), and day seven (T2) and plasma glutathione (GSH) levels were measured using liquid chromatography and mass spectrometry. A two-way ANOVA with Tukey's comparisons of means was performed to determine between group differences in plasma GSH levels. A one-way repeated measured ANOVA with Tukey's pairwise comparisons was used to determine within group changes. All statistical analyses were completed with Minitab 19.

Results:
Between-group analysis indicated a statistically significant interaction between the treatment and time of blood draw on plasma GSH levels (F (2,53) =19.01, p=0.000, R^2=73.27%). Simple main effects analysis revealed the liposomal group had significantly higher levels of plasma GSH levels at T1 (p=0.003) and T2 (p=0.000) compared to the standard group. No significant changes were observed between the groups at B0 (p=0.970). Within-group analysis indicated a statistically significant change in plasma GSH over time in the liposomal group (F (2,26) =23.88, p=0.000, R^2=64.75%). Post hoc tests revealed a significant increase from B0-T1 (p=0.045), B0-T2 (p=0.000), and T1-T2 (p=0.001). No statistically significant changes in plasma GSH levels over time in the standard group were observed (F (2,27) =0.02, p= 0.981, R^2 =0.14%).

Conclusion:
Liposomal glutathione significantly raised plasma GSH levels when compared to a standard glutathione supplement and this increase was sustained over one week's time. No changes in plasma GSH levels were observed in the standard group. This study showed that repeated supplementation of liposomal glutathione increased its absorption and thus effectiveness as a dietary supplement.

Funding:
The current study was funded by PlantaCorp GmbH and conducted with the contract research organization Surya Research Clinics in New Delhi, Delhi, India.

OBJECTIVE:

To evaluate the absorption of a liposomal glutathione supplement (liposomal) compared to a non-liposomal glutathione supplement (standard) after seven days of administration.

METHODS:

Study Design
Participants were randomly assigned to two groups and administered reduced glutathione in liposomal or standard form daily for seven days. Blood was taken at baseline (B0), before administration on day three (T1), and after administration on day seven (T2).

Participants
Twenty metabolically healthy adults between 20 and 50 years of age were enrolled in the study.

Plasma Analysis
Samples were assessed for plasma glutathione (GSH) levels using liquid chromatography and mass spectrometry (LC/MS).

Active Substance and Dose
The liposomal group received 12.5mL of PlantaCorp GmbH liposomal GSH product (500mg). The standard group received two tablets of non-liposomal GSH (500mg).

Statistical Analysis
A two-way ANOVA with Tukey's comparison of means was performed to determine the difference between groups in mean GSH levels at each time point. A one-way repeated measures ANOVA with Tukey's pairwise comparisons was used to determine the within group changes in plasma GSH levels. All statistical analyses were completed with Minitab 19.

RESULTS:

Table 1. Between-Group Change in Mean Plasma GSH Levels[a]

Time Point	Standard[bcd]	Liposomal[bcd]	Difference of Means[bcd]	95% Confidence Interval	T-Value	P-Value
B0	2.55 (0.23)	2.93 (0.09)	-0.38 (0.49)	-1.82, 1.06	-0.78	0.970
T1	2.58 (0.23)	4.56 (0.28)	-1.98 (0.50)	-3.46, -0.49	-3.94	0.003*
T2	2.61 (0.19)	7.21 (0.70)	-4.60 (0.49)	-6.04, -3.16	-9.42	0.000*

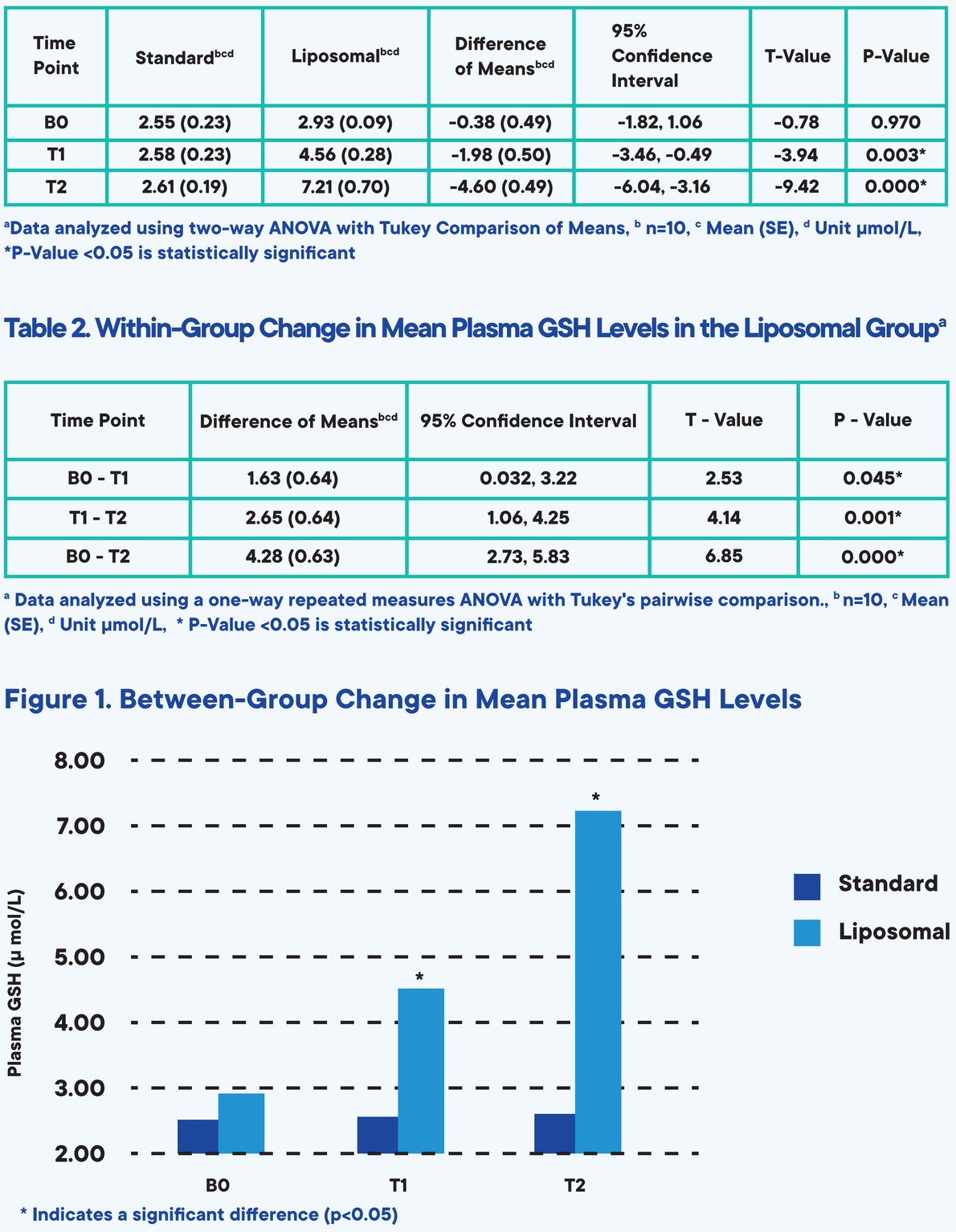
[a]Data analyzed using two-way ANOVA with Tukey Comparison of Means, [b] n=10, [c] Mean (SE), [d] Unit µmol/L, *P-Value <0.05 is statistically significant

Table 2. Within-Group Change in Mean Plasma GSH Levels in the Liposomal Group[a]

Time Point	Difference of Means[bcd]	95% Confidence Interval	T - Value	P - Value
B0 - T1	1.63 (0.64)	0.032, 3.22	2.53	0.045*
T1 - T2	2.65 (0.64)	1.06, 4.25	4.14	0.001*
B0 - T2	4.28 (0.63)	2.73, 5.83	6.85	0.000*

[a] Data analyzed using a one-way repeated measures ANOVA with Tukey's pairwise comparison., [b] n=10, [c] Mean (SE), [d] Unit µmol/L, * P-Value <0.05 is statistically significant

Figure 1. Between-Group Change in Mean Plasma GSH Levels



* Indicates a significant difference (p<0.05)

RESULTS:(Continued)

All enrolled participants completed the study. They were in their late 20s, primarily male (65%) and had a healthy blood pressure (121.50/77.25 mmHg) and BMI (21.25 kg/m^2). There was a statistically significant interaction between the treatment and time of blood draw on plasma GSH levels, F (2,53) =19.01, p=0.000, R^2=73.27%. The liposomal group had significantly higher levels of plasma GSH levels at T1 (p=0.003) and T2 (p=0.000) when compared to the standard group (Table 1). There was a statistically significant effect of time on plasma GSH levels in the liposomal group F (2,26) =23.88, p=0.000, R^2=64.75%. Post hoc tests revealed a significant increase in plasma GSH levels from B0-T1 (p=0.045) and B0-T2 (p=0.000) and from T1-T2 (p=0.001) in the liposomal group (Table 2). No significant increases over time were observed in the standard group, F (2,27)=0.02, p=0.981, R^2=0.14% (not shown).

CONCLUSIONS:

Liposomal glutathione significantly raised plasma GSH levels when compared to a standard glutathione supplement on day three and day seven of administration. Liposomal glutathione also raised plasma GSH levels consistently throughout the week, while no changes in plasma GSH levels were observed in the standard group. This study shows that liposomes are able to effectively deliver glutathione intact to the bloodstream after repeated supplementation, potentially increasing its effectiveness as a dietary supplement.

ACKNOWLEDGEMENTS:

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CONFLICTS OF INTEREST:

In relation to this presentation, we declare the following, real or perceived conflicts of interest: the authors are employees of the company PlantaCorp GmbH, a producer of liposomal dietary supplements.

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