Clinical Evaluation of Orobuccal Non-Liposomal Nano-Sized Glutathione

Human crossover investigation of acute changes in circulating glutathione markers following a precision-formulated liquid dose

ABSTRACT

This clinical investigation examined changes in blood glutathione parameters following a single orobuccal administration of a non-liposomal, nano-sized glutathione preparation. Fifteen healthy adults participated in a randomized, single-blind, placebo-controlled crossover protocol. Compared with placebo, the active formulation produced statistically significant differences in several reduced and oxidized glutathione measures. The findings offer preliminary human evidence of a measurable physiological response following administration of the investigated liquid formulation.

SCIENTIFIC BACKGROUND

Glutathione is a tripeptide composed of glutamate, cysteine, and glycine and participates in antioxidant defense, thiol regulation, and cellular redox balance. Oral delivery of intact glutathione presents formulation challenges related to gastrointestinal processing and compound stability. A liquid preparation administered across the oral mucosa offers a route worth investigating for its effect on circulating glutathione measures.

CLINICAL METHODS

The study enrolled 15 healthy adults in a randomized crossover comparison of active and placebo formulations. Each participant attended two dosing visits separated by a washout of at least seven days. The active dose consisted of 1 mL of liquid containing 200 mg of reduced L-glutathione; the matched control contained the non-glutathione formulation constituents. Participants held the preparation in the mouth for 90 seconds and then swallowed it. Blood was collected at baseline and 5, 10, 30, 60, and 120 minutes after administration.

FORMULATION CHARACTERISTICS

The investigated non-liposomal preparation contained reduced L-glutathione in a liquid system incorporating almond oil, silica gel, stevia, and orange oil. Reported particle-size measurements included a median diameter (D50) of 449 nm and a D80 of 777 nm. These characteristics describe the specific preparation evaluated in the clinical protocol.

DISCUSSION

The trial documented measurable short-term differences in circulating glutathione parameters after administration of the investigated nano-sized liquid. Its crossover design allowed within-participant comparison with a matched placebo, while the modest sample size and brief observation window limit conclusions about longer-term outcomes. The measured blood changes should not be equated with a directly measured percentage of absolute absorption; the trial did not include a direct comparison against intravenous administration or conventional capsule formulations.

RESULTS

Several glutathione-related blood parameters differed significantly between active treatment and placebo. Selected reported statistical findings are summarized below.

Measured blood parameter	Reported p-value
Erythrocyte reduced glutathione (GSH)	0.001
Total reduced glutathione (GSH)	0.015
Total blood glutathione (GSH + GSSG)	0.006
Total oxidized glutathione (GSSG)	0.004

Across nine concentration measures, the median time of observed maximal change was 30 minutes. Responses varied among participants, and the analysis did not establish a significant treatment-by-time interaction at any one sampling point.

APPLICATION TO +SYRONA

The investigated approach is relevant to +SYRONA’s precision-formulated liquid glutathione portfolio and its focus on advanced ingredient processing and delivery. The company identifies the studied formulation as part of the formulation lineage now marketed within its +SYRONA ecosystem. The clinical data provide a research foundation for explaining the investigated administration format and its observed blood-marker response.

CONCLUSION

A single 200 mg orobuccal dose of the evaluated non-liposomal, nano-sized glutathione liquid was associated with statistically significant changes in multiple blood glutathione measures compared with placebo. These results support further investigation of this formulation approach, including studies with larger cohorts, longer follow-up, and direct pharmacokinetic assessment.

FIGURES & TABLES

Table 1. Participant characteristics

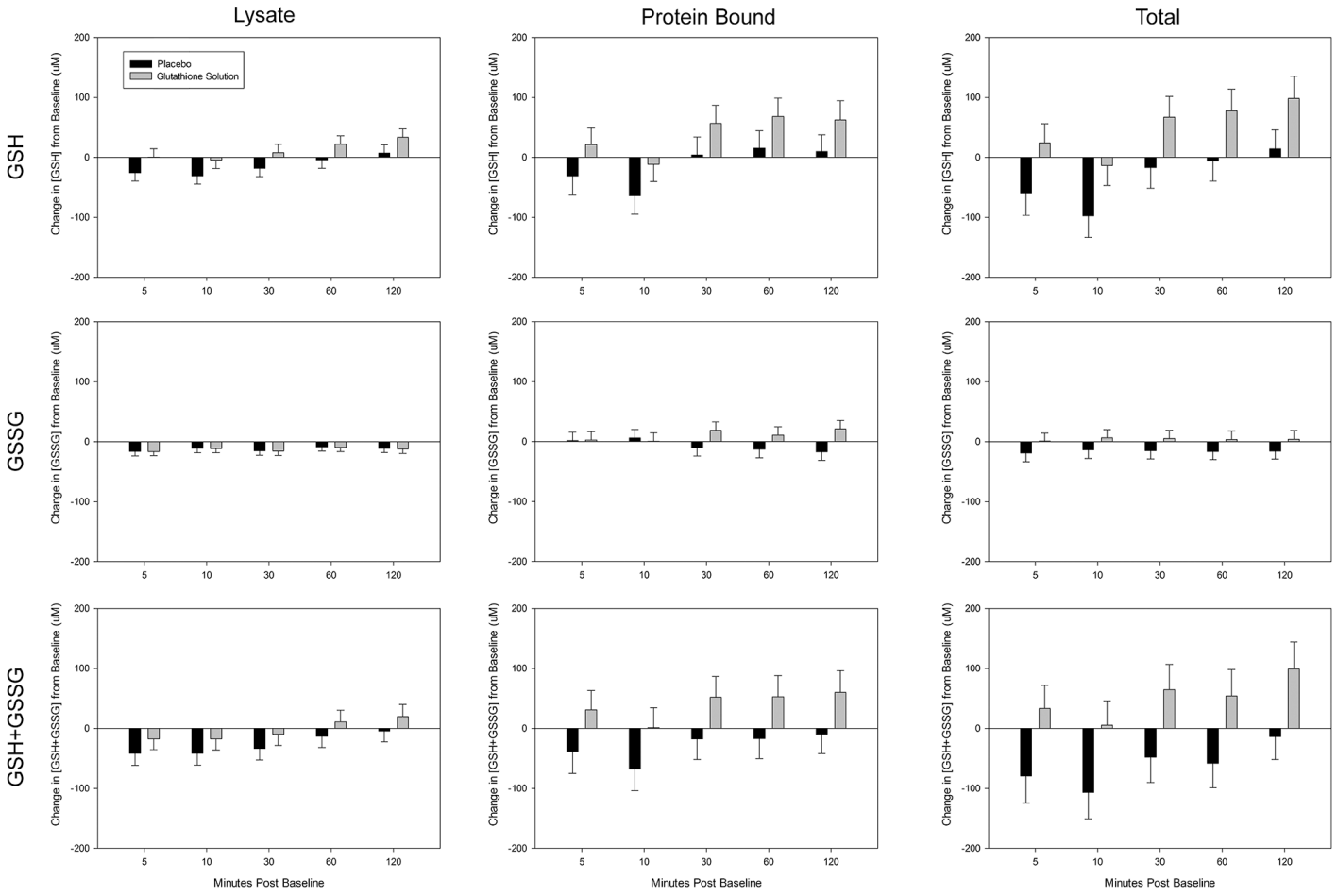
Participants	*N*	Age (years)	Height (cm)	Mass (kg)	BMI (kg/m^2)
Male	8	28 ± 6	179 ± 7	87.6±13.5	27.2±3.6
Female	7	22 ± 1	165 ± 4	67.0±4.6	24.6±1.8
Combined	15	25±5	173±9.3	78.0±14.6	26.0±3.1

Table 2. Baseline glutathione measurements

		Placebo (µM)	NLNG (µM)	p-value
GSH	**Erythrocyte Lysate**	188.1 (20.8)	183.5 (20.8)	0.791
		[144.5, 231.7]	[139.9, 227.1]	
	Protein-Bound	535.2 (73.7)	411.2 (73.7)	0.134
		[382.4, 688.0]	[258.3, 564.0]	
	Total	723.3 (87.3)	594.7 (87.3)	0.170
		[541.8, 904.8]	[413.2, 776.2]	
GSSG	**Erythrocyte Lysate**	61.0 (16.4)	54.4 (16.4)	0.528
		[26.3, 95.8]	[19.7, 89.2]	
	Protein-Bound	178.2 (62.3)	142.1 (62.3)	0.133
		[43.3, 313.0]	[7.2, 277.0]	
	Total	240.4 (77.4)	196.7 (77.4)	0.095
		[72.7, 408.2]	[29.0, 364.5]	
GSH+GSSG	**Erythrocyte Lysate**	243.7 (26.0)	232.5 (35.9)	0.603
		[187.6, 299.9]	[154.4, 310.7]	
	Protein-Bound	724.4 (124.7)	555.5 (124.7)	0.074
		[459.0, 989.8]	[290.1, 820.9]	
	Total	969.3 (151.2)	782.2 (151.2)	0.078
		[646.6, 1292.0]	[459.5, 1104.9]	
GSH/GSSG	**Erythrocyte Lysate**	6.8 (2.1)	5.4 (0.8)	0.268
		[2.2, 11.5]	[3.6, 7.2]	
	Protein-Bound	6.6 (2.1)	4.6 (0.7)	0.290
		[2.1, 11.0]	[3.2, 6.0]	
	Total	6.4 (1.8)	4.2 (0.5)	0.259
		[2.6, 10.2]	[3.1, 5.3]	

FIGURES & TABLES

Figure 1. Glutathione changes across sampling intervals



FIGURES & TABLES

Table 3. Maximum change in glutathione measurements

		Placebo (µM)	NLNG (µM)	p-value
GSH	**Erythrocyte Lysate**	21.6 (7.3)	59.5 (7.3)	<0.001
		[7.2, 36.1]	[45.1, 73.9]	
	Protein-Bound	73.8 (34.7)	142.2 (34.7)	0.175
		[2.7, 144.9]	[71.1, 213.3]	
	Total	50.6 (39.8)	184.5 (39.8)	0.025
		[-31.0, 132.2]	[102.9, 266.1]	
GSSG	**Erythrocyte Lysate**	14.5 (6.8)	10.2 (11.2)	0.708
		[0.0, 29.1]	[-13.8, 34.3]	
	Protein-Bound	28.6 (16.3)	66.8 (16.3)	0.110
		[-4.9, 62.2]	[33.2, 100.3]	
	Total	21.2 (16.6)	67.7 (21.8)	0.102
		[-14.6, 57.0]	[20.7, 114.7]	
GSH+GSSG	**Erythrocyte Lysate**	26.4 (21.5)	61.3 (21.5)	0.260
		[-17.6, 70.4]	[17.3, 105.3]	
	Protein-Bound	63.2 (39.8)	164.5 (39.7)	0.153
		[-19.1, 145.6]	[82.1, 246.9]	
	Total	25.4 (44.1)	205.6 (44.1)	0.035
		[-66.3, 117.1]	[113.9, 297.3]	

FIGURES & TABLES

Figure 2. Individual participant responses

