

Supporting Information

Using a lipidomics approach for nutritional phenotyping in response to a test meal containing gamma-linolenic acid

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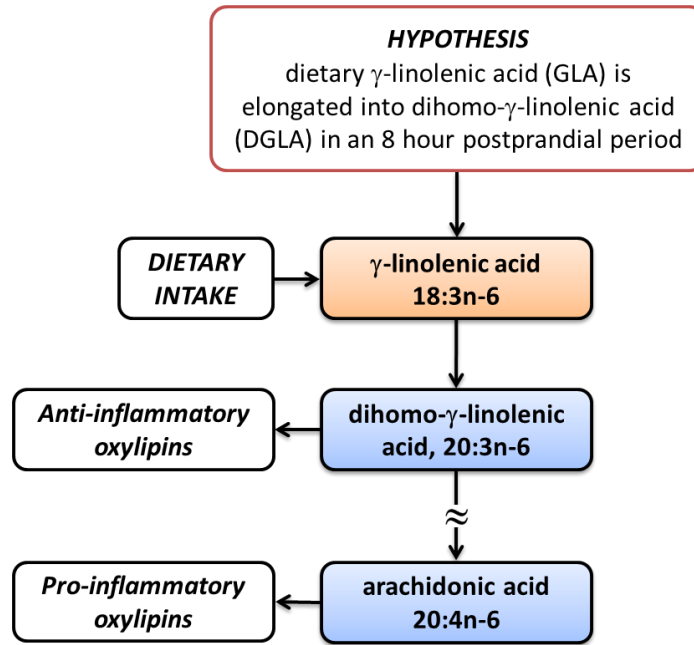


Fig. S1 Illustration of the hypothesis that GLA would be elongated into DGLA in an 8 hour postprandial period in healthy participants using a crossover design

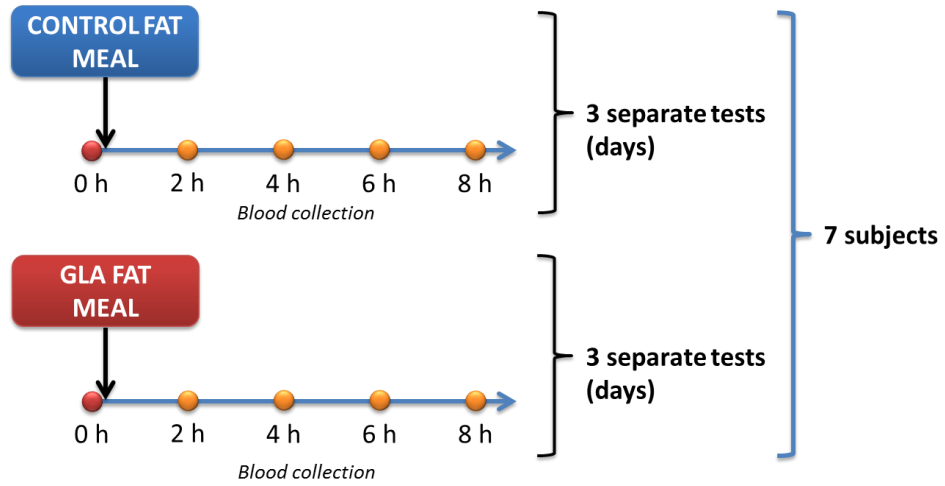


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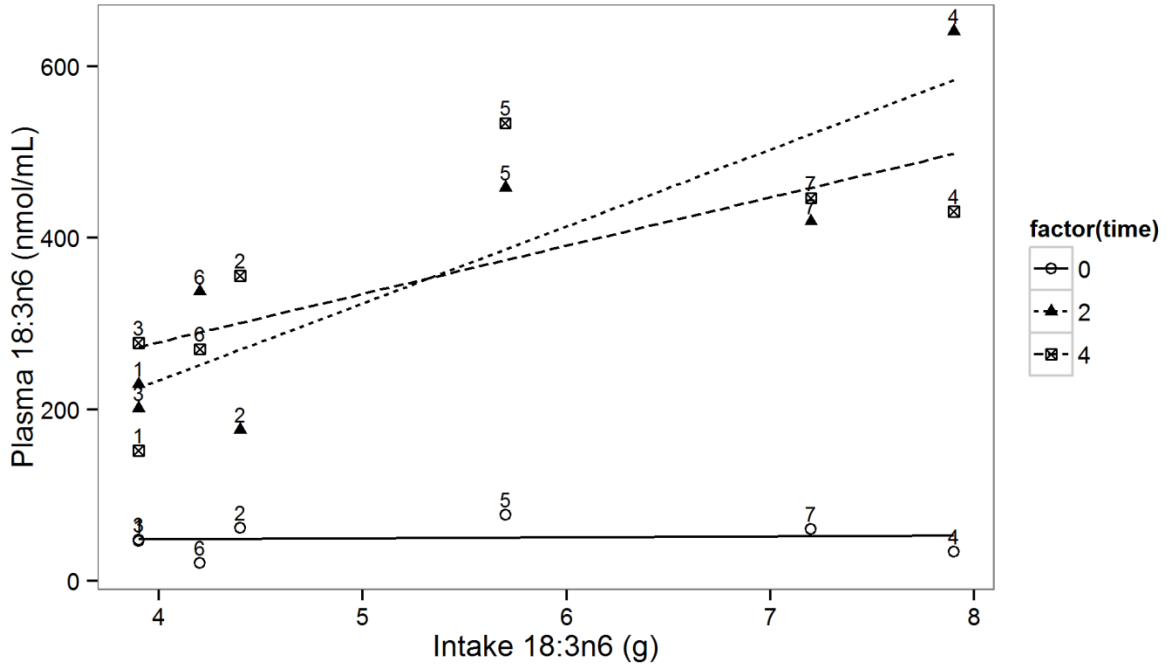
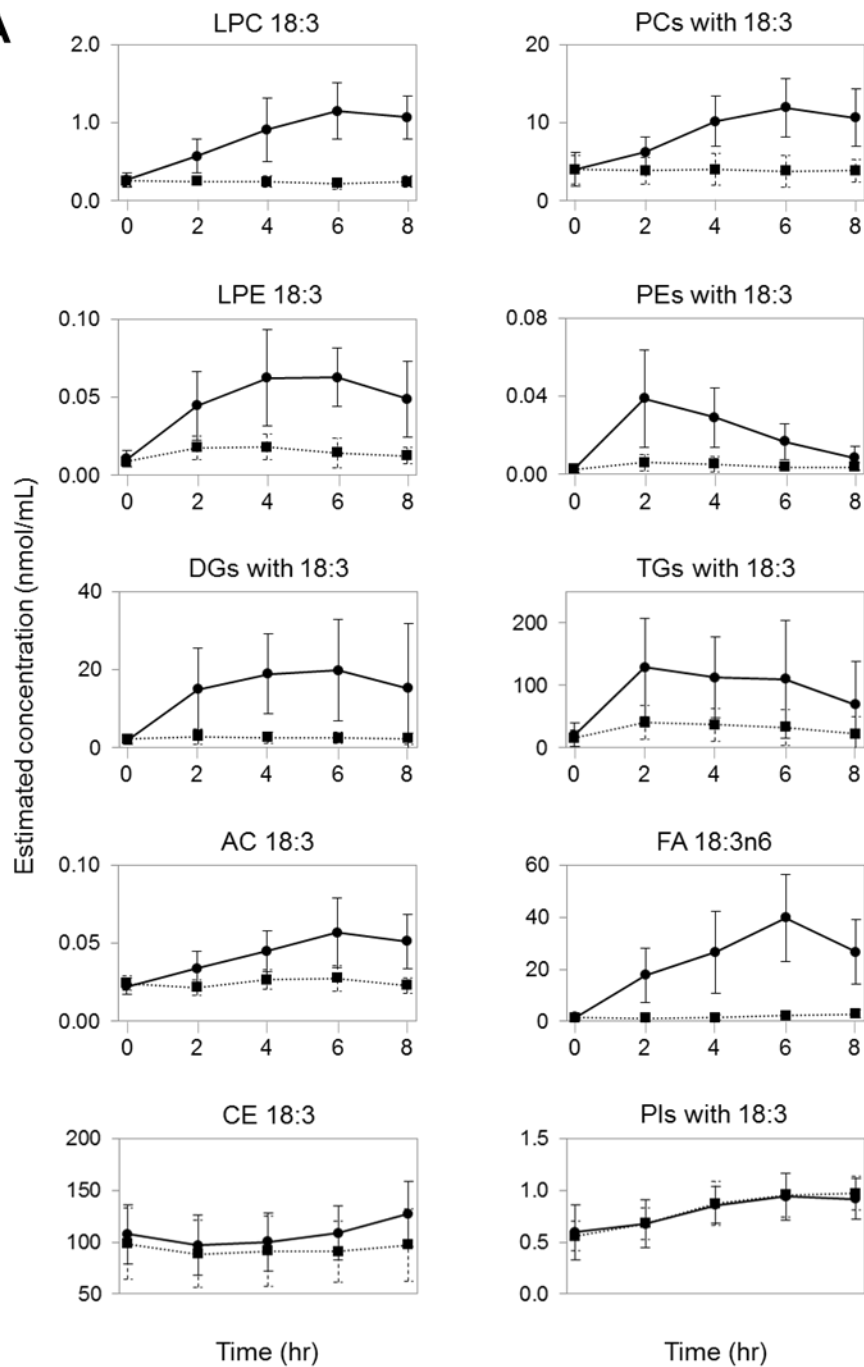


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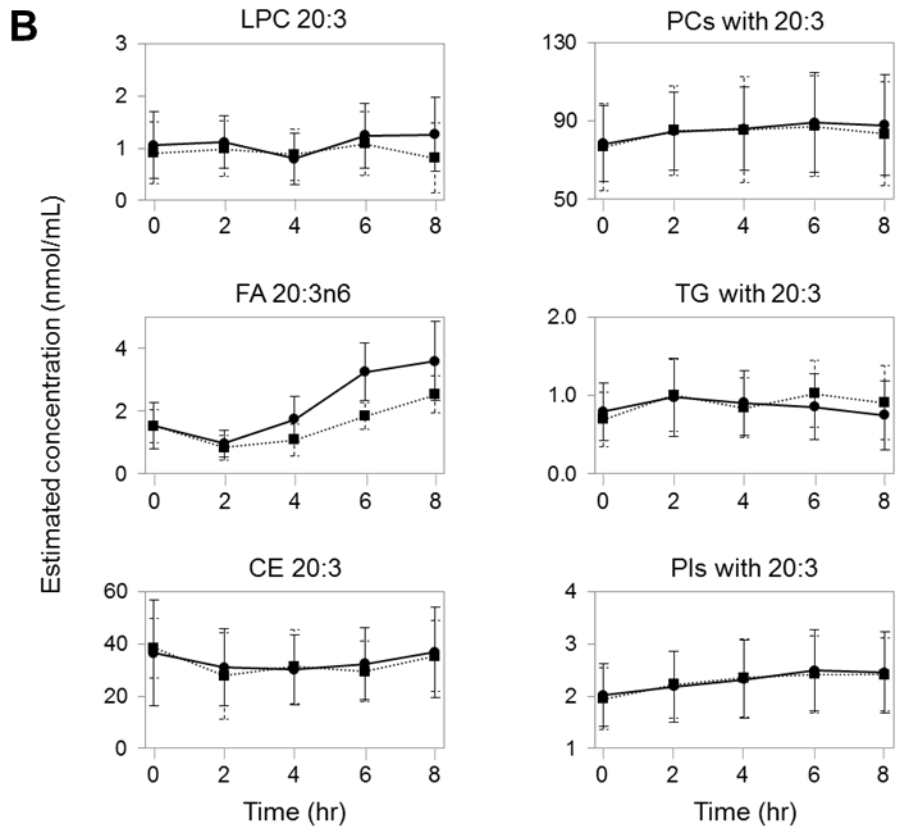


Fig. S4 Mean plasma lipids determined using LC-MS-based lipidomics reflective of the GF and CF fat test meals at 0, 2, 4, 6, 8 h. Mean \pm SD, solid line (GF), dotted line (CF). (A) lipids with 18:3 fatty acid, (B) lipids with 20:3 fatty acid.

Table S1 Characteristics of study participants

Characteristics	CF					GF				
	Mean	±	SD	Min	Max	Mean	±	SD	Min	Max
Sex, <i>n</i>										
Female	3									
Male	4									
Age (y)	31.9	±	11.2	20.0	55.0					
Weight (kg)	74.7	±	8.1	61.6	88.7	74.1	±	8.8	61.3	89.8
BMI	24.9	±	1.8	21.1	26.8	24.7	±	2.0	21.0	26.9
Systolic (mmHg)	115.1	±	9.8	102.0	134.5	116.1	±	14.1	102.0	161.0
Diastolic (mmHg)	67.4	±	7.0	53.0	80.0	68.3	±	8.0	54.0	88.0

BMI, body mass index

Table S2 Individual participant characteristics

Subject	Sex	Age (y)	BMI	Physical activity level	Physical activity description	Mean GLA dose (g)	Mean energy of test meal (kcal)
1	F	34	24.8	1.4	Sedentary/low active	3.9	700
2	M	55	24.5	1.5	Low active	4.4	800
3	F	32	26.8	1.4	Sedentary/low active	3.9	700
4	M	26	25.6	2.5	Very active	7.9	1400
5	M	30	24.9	1.5	Low active	5.7	1000
6	F	26	21.7	1.9	Active	4.2	750
7	M	20	25.9	2.5	Very active	7.2	1300

Table S3 Nutrient composition of the control and GLA test meals

	CF	GF
	Mean ± SD	Mean ± SD
Energy (kcal)*	973.3 ± 295.5	965.3 ± 293.7
Energy (kJ)*	4075 ± 1237	4041 ± 1230
Protein (g)	21.9 ± 6.6	21.8 ± 6.6
Protein (% energy)	9.0 ± 0.0	9.1 ± 0.1
Carbohydrate (g)*	109.1 ± 33.0	108.6 ± 33.0
Carbohydrate (% energy)*	44.8 ± 0.2	45.0 ± 0.1
Fat (g)*	49.9 ± 15.2	49.3 ± 15.0
Fat (% energy)*	46.1 ± 0.2	45.9 ± 0.1
14:0 (% fat)*	2.2 ± 0.0	2.3 ± 0.0
16:0 (% fat)	19.3 ± 0.1	19.2 ± 0.1
18:0 (% fat)*	4.4 ± 0.0	5.6 ± 0.0
16:1n7 (% fat)*	0.33 ± 0.0	0.19 ± 0.0
18:1n7 (% fat)*	0.65 ± 0.0	0.25 ± 0.0
18:1n9 (% fat)*	42.6 ± 0.17	25.8 ± 0.1
20:1n9 (% fat)*	0.11 ± 0.0	2.2 ± 0.0
22:1n9 (% fat)*	0.0 ± 0.0	1.4 ± 0.0
24:1n9 (% fat)*	0.0 ± 0.0	0.81 ± 0.0
18:2n6 (% fat)*	29.1 ± 0.1	29.5 ± 0.10
18:3n6 (% fat)*	0.0 ± 0.0	11.5 ± 0.1
18:3n3 (% fat)*	1.4 ± 0.0	1.1 ± 0.0

*Differences between test meals based on Wilcoxon-signed rank test, $P < 0.05$.

Table S4 Concentrations (nmol/mL) of the internal standards spiked in blood plasma

Internal standard	Concentration (nmol/mL plasma)
LPE 17:1	49.3
LPC 17:0	30.0
PC 12:0/13:0	1.44
PE 17:0/17:0	16.0
<i>d</i> ₇ -Cholesterol	155
SM d18:1/17:0	8.54
Cer d18:1/17:0	13.9
<i>d</i> ₃ -Palmitic acid	443
DG 12:0/12:0/0:0	101
<i>d</i> ₅ -TG 17:0/17:1/17:0	6.74
CE 22:1	771

Table S5 Concentrations (nmol/mL) of baseline fatty acid methyl esters between each test meal

Fatty acid	CF			GF		
	Mean	±	SD	Mean	±	SD
14:0	144	±	102	132	±	70.4
15:0	31.7	±	12.9	32.6	±	12.8
16:0	2110	±	659	2179	±	548
18:0	649	±	139	678	±	124
16:1n7	177	±	84.3	186	±	68.8
18:1n7	129	±	38.7	133	±	33.1
18:1n9	1937	±	580	1994	±	647
24:1n9	31.6	±	8.5	32.9	±	7.2
18:2n6	2725	±	688	2831	±	707
18:3n6	47.8	±	18.6	49.7	±	18.7
20:3n6	145	±	43.4	150	±	44.2
20:4n6	707	±	186	734	±	209
18:3n3	63.3	±	45.3	66.2	±	36.5
20:5n3	47.1	±	21.8	58.3	±	20.8
22:5n3	49.9	±	12.7	53.8	±	7.5
22:6n3	150	±	56.3	163	±	65.5

No significant differences based on related samples Wilcoxon-signed rank test.

Table S6 Percent change in plasma fatty acid methyl esters in response to the test meals¹

Fatty acid	Time	CF		GF		P value	
		Mean	± SD	Mean	± SD	Treatment	Subject
18:1n9							
	0 h	1937.1	± 580.2	1999.7	± 640.0	NS	0.001
	%Δ 2 h	61.3	± 44.5	38.3	± 33.9	0.024	0.003
	%Δ 4 h	56.1	± 39.5	26.0	± 22.2	0.019	0.027
	%Δ 6 h	31.9	± 30.6	18.2	± 26.7	NS	0.039
	%Δ 8 h	5.6	± 21.5	-0.7	± 25.2	NS	0.001
18:2n6							
	0 h	2725.2	± 688.0	2836.6	± 703.9	NS	0.002
	%Δ 2 h	30.8	± 20.0	30.3	± 25.0	NS	0.002
	%Δ 4 h	27.7	± 14.3	26.6	± 13.1	NS	0.0005
	%Δ 6 h	18.1	± 9.4	24.3	± 15.6	NS	0.0005
	%Δ 8 h	9.2	± 8.7	11.3	± 16.4	NS	0.0005
18:3n6							
	0 h	47.8	± 18.6	49.8	± 18.5	NS	0.007
	%Δ 2 h	10.1	± 17.7	802.7	± 708.5	0.026	NS
	%Δ 4 h	5.5	± 12.7	725.1	± 435.8	0.005	NS
	%Δ 6 h	4.1	± 16.4	645.2	± 215.2	0.0005	NS
	%Δ 8 h	-1.1	± 11.8	442.6	± 240.9	0.003	NS

Table S6 (cont.) Percent change in plasma fatty acid methyl esters in response to the test meals¹

Fatty acid	Time	CF		GF		P value	
		Mean	± SD	Mean	± SD	Treatment	Subject
20:3n6							
	0 h	144.5	± 43.4	150.1	± 43.9	NS	0.01
	%Δ 2 h	10.2	± 12.0	8.3	± 10.2	NS	NS
	%Δ 4 h	8.2	± 7.1	24.6	± 17.7	0.029	NS
	%Δ 6 h	6.3	± 7.1	26.8	± 14.0	0.003	NS
	%Δ 8 h	4.5	± 6.3	24.3	± 17.0	0.006	NS
20:4n6							
	0 h	707.1	± 186.0	736.1	± 206.4	NS	0.003
	%Δ 2 h	8.1	± 9.9	5.6	± 12.1	NS	0.013
	%Δ 4 h	9.7	± 6.0	7.9	± 9.5	NS	0.045
	%Δ 6 h	5.9	± 6.8	8.7	± 7.4	NS	NS
	%Δ 8 h	5.2	± 4.8	8.5	± 9.3	NS	NS

¹ Values as mean ± SD. Baseline values are nmol/mL of plasma and the percent change in circulating fatty acids is calculated by the difference in concentration of each 2-hour time point minus baseline divided by baseline concentrations multiplied by 100. NS stands for not significant.

Table S7 Estimated variance of total plasma fatty acids at 0, 2, 4, 6, 8 h in response to the CF and GF test meals¹

Fatty acid	Between-subject variation (RSD _b), %									
	0 h		2 h		4 h		6 h		8 h	
	CF	GF	CF	GF	CF	GF	CF	GF	CF	GF
18:1n9	38.6	37.6	21.4	28.5	39.2	38.6	46.1	50.4	56.2	50.6
18:2n6	29.7	25.2	19.5	23.1	23.7	26.8	30.6	34.4	32.7	35.7
18:3n6	44.5	41.6	43.3	51.3	51.2	46.9	52.9	65.4	50.3	74.7
20:3n6	37.4	31	34.6	28.5	36.4	27.5	36.1	32.3	37.5	33.2
20:4n6	30.7	29	28.4	26.9	25.2	24	25.5	25.5	23.9	27.1

Fatty acid	Within-subject variation (RSD _w), %									
	0 h		2 h		4 h		6 h		8 h	
	CF	GF	CF	GF	CF	GF	CF	GF	CF	GF
18:1n9	16.4	18.3	13.9	20.2	21.9	20.5	15.6	16.6	15.4	7.5
18:2n6	14.6	9.7	9.6	14.3	9.4	12.2	11.0	10.8	10.6	6.1
18:3n6	26.5	25.4	27.1	26.9	24.4	31.9	15.6	27.6	15.4	18.5
20:3n6	18.8	15.0	13.8	14.2	17.8	15.3	11.2	18.3	14.1	13.6
20:4n6	13.2	12.6	11.3	14.5	7.9	8.9	8.5	8.1	7.8	11.2

¹ Estimated variation expressed as relative standard deviation (%); between-subject variance calculated as: [group SD/group mean×100] for each time point per test meal (RSD_b) and within-subject variance calculated as the mean of the relative standard deviation calculated for each subject across triplicate test days for each time point per each test meal (RSD_w).