

Supplemental Online Material

Supplementary Table S1. Potential dairy fat biomarkers in plasma cholesterol esters (CE), triglycerides (TG) and phospholipids (PL) measured in the pilot study of the Lifelines cohort (n = 96)

Fatty Acid	Plasma CE (mol%)	Plasma TG (mol%)	Plasma PL (mol%)
C14:0	0.78 (0.66 – 0.95)	1.62 (1.25 – 2.24)	0.46 (0.40 – 0.56)
C15:0	0.20 (0.17 – 0.23)	0.30 (0.26 – 0.37)	0.29 (0.25 – 0.33)
C17:0	IS	0.49 (0.42 – 0.58)	0.39 (0.35 – 0.42)
T-C16:1(n-7)	0.025 (0.017 – 0.036)	0.026 (0.022 – 0.036)	0.023 (0.017 – 0.027)
T-C18:1(n-7)	BDL	0.10 (0.07 – 0.15)	0.11 (0.08 – 0.13)
CLA	0.052 (0.037 – 0.065)	0.069 (0.042 – 0.091)	0.037 (0.028 – 0.046)

Data are raw data (mol%) presented as Median (25th – 75th percentile).

Abbreviations: CE, cholesterol esters; TG, Triglycerides; PL, Phospholipids, C14:0, Margaric acid; C15:0, Pentadecanoic acid; C17:0, Heptadecanoic acid; T-C16:1(n-7), Trans-Palmitoleic acid; T-C18:1(n-7), Vaccenic acid; CLA, Cis-9, Trans-11 Conjugated linoleic acid; IS, Internal standard; BDL, below detection limit.

Supplementary Table S2A. Univariate regression analyses and multivariate models for the association of circulating potential dairy fat biomarkers and energy-adjusted dairy fat intake (g/d) in the Lifelines cohort study (n = 769)

	Potential Circulating Dairy fat Biomarkers											
	C14:0		C15:0		C17:0		T-C16:1(n-7)		T-C18:1(n-7)		CLA	
	Std β	p-value	Std β	p-value	Std β	p-value	Std β	p-value	Std β	p-value	Std β	p-value
Plasma TG												
Model 1	0.204	<0.001	0.286	<0.001	0.049	0.19	0.233	<0.001	0.292	<0.001	0.215	<0.001
Model 2	0.191	<0.001	0.267	<0.001	0.057	0.12	0.228	<0.001	0.271	<0.001	0.203	<0.001
Model 3	0.191	<0.001	0.268	<0.001	0.052	0.15	0.226	<0.001	0.269	<0.001	0.202	<0.001
Model 4	0.194	<0.001	0.267	<0.001	0.054	0.15	0.225	<0.001	0.270	<0.001	0.201	<0.001
Model 5	0.133	0.001	0.231	<0.001	0.047	0.19	0.185	<0.001	0.240	<0.001	0.160	<0.001
Plasma PL												
Model 1	0.214	<0.001	0.215	<0.001	0.132	<0.001	0.130	<0.001	0.269	<0.001	0.272	<0.001
Model 2	0.199	<0.001	0.197	<0.001	0.111	0.001	0.129	<0.001	0.253	<0.001	0.258	<0.001
Model 3	0.195	<0.001	0.195	<0.001	0.109	0.002	0.126	<0.001	0.250	<0.001	0.255	<0.001
Model 4	0.197	<0.001	0.196	<0.001	0.108	0.002	0.126	<0.001	0.252	<0.001	0.257	<0.001
Model 5	0.186	<0.001	0.189	<0.001	0.099	0.01	0.118	0.001	0.254	<0.001	0.249	<0.001

Model 1: Crude analyses; **Model 2:** Adjusted for Model 1 + age and sex; **Model 3:** Adjusted for Model 2 + BMI; **Model 4:** Adjusted for Model 3 + Total Meat Intake; **Model 5:** Adjusted for Model 3 + Trans-C18:1(n-9)

C14:0, C17:0, Trans-C16:1(n-7), Trans-C18:1(n-7) and CLA in plasma TG, and Trans-C16:1(n-7), Trans-C18:1(n-7), CLA, Trans-C18:1(n-9) in plasma PL were transformed before analyses. Dairy fat intake was transformed and adjusted for energy intake according to the residual method. β 's are standardized beta's.

Abbreviations: C14:0, Myristic acid; C15:0, Pentadecanoic acid; C17:0, Heptadecanoic acid; T-C16:1(n-7), Trans-Palmitoleic acid; T-C18:1(n-7), Vaccenic acid; CLA, Conjugated Linolenic acid; TG, Triglycerides; PL, Phospholipids; BMI, Body Mass Index; Trans-C18:1(n-9), Elaidic acid.

Supplementary Table S2B. Univariate regression analyses and multivariate models for the association between PL C14:0 and energy-adjusted dairy fat intake (g/d) stratified for males (n = 403) and females (n = 364)

	Males		Females	
	Std β	p-value	Std β	p-value
<i>Plasma PL</i>				
Model 1	0.264	<0.001	0.173	<0.001
Model 2	0.248	<0.001	0.147	0.003
Model 3	0.250	<0.001	0.148	0.003
Model 4	0.250	<0.001	0.141	0.004
Model 5	0.232	<0.001	0.147	0.003

Model 1: Crude analyses; **Model 2:** Adjusted for Model 1 + age; **Model 3:** Adjusted for Model 2 + BMI; **Model 4:** Adjusted for Model 3 + Total Meat Intake; **Model 5:** Adjusted for Model 3 + Trans-C18:1(n-9)

Trans-C18:1(n-9) in plasma PL was transformed before analyses. Dairy fat intake was transformed and adjusted for energy intake according to the residual method. β 's are standardized beta's. Abbreviations: C14:0, Myristic acid; PL, Phospholipids; BMI, Body Mass Index; Trans-C18:1(n-9), Elaidic acid.

Supplementary Table S3. Univariate associations of circulating potential dairy fat biomarkers with unadjusted total dairy intake, total dairy fat intake and intake of dairy product groups (g/d) in the Lifelines cohort study (n = 769)

	Potential Circulating Dairy fat Biomarkers											
	C14:0		C15:0		C17:0		T-C16:1(n-7)		T-C18:1(n-7)		CLA	
	Std β	p-value	Std β	p-value	Std β	p-value	Std β	p-value	Std β	p-value	Std β	p-value
<i>Plasma TG</i>												
<i>Total dairy intake</i>	0.092	0.01	0.140	<0.001	0.065	0.08	0.059	0.14	0.101	0.01	0.040	0.26
<i>Total dairy fat intake</i>	0.222	<0.001	0.257	<0.001	0.030	0.43	0.188	<0.001	0.261	<0.001	0.171	<0.001
<i>Skimmed dairy</i>	-0.044	0.22	0.12	0.74	0.036	0.33	-0.001	0.99	-0.041	0.26	-0.048	0.19
<i>Semi-Skimmed dairy</i>	0.082	0.02	0.027	0.45	-0.004	0.92	-0.023	0.57	0.016	0.66	-0.004	0.90
<i>Full Fat Dairy</i>	0.164	<0.001	0.155	<0.001	0.025	0.51	0.122	0.003	0.195	<0.001	0.120	<0.001
<i>Fermented Dairy</i>	-0.018	0.63	0.059	0.10	0.069	0.07	0.026	0.52	0.032	0.38	-0.012	0.75
<i>Milk</i>	0.118	0.001	0.080	0.03	-0.008	0.84	0.051	0.22	0.092	0.01	0.047	0.19
<i>Cheese</i>	0.164	<0.001	0.203	<0.001	-0.002	0.96	0.173	<0.001	0.198	<0.001	0.144	<0.001
<i>Plasma PL</i>												
<i>Total dairy intake</i>	0.092	0.01	0.143	<0.001	0.174	<0.001	0.054	0.14	0.111	0.002	0.079	0.03
<i>Total dairy fat intake</i>	0.198	<0.001	0.192	<0.001	0.127	<0.001	0.085	0.02	0.232	<0.001	0.228	<0.001
<i>Skimmed dairy</i>	-0.02	0.74	0.009	0.81	0.099	0.01	0.008	0.82	0.001	0.98	-0.008	0.83
<i>Semi-Skimmed dairy</i>	0.010	0.78	0.043	0.23	0.025	0.49	-0.020	0.59	-0.021	0.58	-0.021	0.56
<i>Full Fat Dairy</i>	0.142	<0.001	0.136	<0.001	0.071	0.05	0.060	0.10	0.170	<0.001	0.157	<0.001
<i>Fermented Dairy</i>	0.055	0.13	0.071	0.05	0.125	0.001	0.058	0.11	0.072	0.05	0.053	0.14
<i>Milk</i>	0.044	0.22	0.105	0.004	0.081	0.03	0.026	0.47	0.063	0.08	0.055	0.13
<i>Cheese</i>	0.166	<0.001	0.137	<0.001	0.066	0.07	0.061	0.10	0.163	<0.001	0.206	<0.001

C14:0, C17:0, Trans-C16.1(n-7), Trans-C18.1(n-7) and CLA in plasma TG, and Trans-C16.1(n-7), Trans-C18.1(n-7), CLA, Trans-C18.1(n-9) in plasma PL were transformed before analyses. Abbreviations: C14:0, Myristic acid; C15:0, Pentadecanoic acid; C17:0, Heptadecanoic acid; T-C16:1(n-7), Trans-Palmitoleic acid; T-C18:1(n-7), Vaccenic acid; CLA, Conjugated Linolenic acid; TG, Triglycerides; PL, Phospholipids.

Supplementary Table S4. Number of times each variable is selected after 1000 bootstrap attempts in the lifelines cohort (n = 769)

Variable	Number of times selected
<i>TG model</i>	
TG C14:0	292
TG C15:0	871
TG C17:0	91
TG T-C16:1(n-7)	173
TG T-18:1(n-7)	943
TG CLA	148
<i>PL model</i>	
PL C14:0	611
PL C15:0	786
PL C17:0	149
PL T-C16:1(n-7)	454
PL T-C18:1(n-7)	994
PL CLA	987
<i>TG+PL model</i>	
TG C14:0	337
TG C15:0	540
TG C17:0	90
TG T-C16:1(n-7)	146
TG T-18:1(n-7)	523
TG CLA	511
PL C14:0	232
PL C15:0	651
PL C17:0	182
PL T-C16:1(n-7)	454
PL T-18:1(n-7)	857
PL CLA	954

C14:0, C17:0, Trans-C16.1(n-7), Trans-C18.1(n-7) and CLA in plasma TG and Trans-C16.1(n-7), Trans-C18.1(n-7) and CLA in plasma PL were transformed (sqrt) before analyses. Dairy fat intake was transformed and adjusted for energy intake according to the residual method.

Abbreviations: TG, Triglycerides; PL, Phospholipids; C14:0, Myristic acid; C15:0, Pentadecanoic acid; C17:0, Heptadecanoic acid; T-C16:1(n-7), Trans-Palmitoleic acid; T-C18:1(n-7), Vaccenic acid; CLA, Conjugated Linolenic acid;

Supplementary Table S5. Univariate regression analyses and multivariate models to predict total dairy fat intake (g/d) with circulating fatty acids in plasma TG, plasma PL and a combination of the two in the Lifelines cohort (n = 769)

	Model 1			Model 2		Model 3	
<i>Plasma TG</i>	Std β	R²	P-value	Std β	P-value	Std β	P-value
TG C14:0	0.222	0.066	< 0.001	0.096	0.02	0.091	0.03
TG C15:0	0.257	0.084	< 0.001	0.125	0.02	0.117	0.02
TG C17:0	0.030	0.019	0.43	-	-		
TG T-C16:1(n-7)	0.188	0.045	< 0.001	0.013	0.80		
TG T-C18:1(n-7)	0.261	0.086	< 0.001	0.151	0.01	0.135	0.01
TG CLA	0.171	0.047	< 0.001	-0.047	0.32		
				R²=	0.104	R²=	0.103
<i>Plasma PL</i>	Std β	R²	P-value	Std β	P-value	Std β	P-value
PL C14:0	0.198	0.057	< 0.001	0.083	0.04	0.083	0.04
PL C15:0	0.192	0.054	< 0.001	0.090	0.04	0.095	0.02
PL C17:0	0.127	0.034	0.001	0.010	0.82		
PL T-C16:1(n-7)	0.085	0.025	0.02	-0.096	0.02	-0.096	0.02
PL T-C18:1(n-7)	0.232	0.070	< 0.001	0.167	0.001	0.167	< 0.001
PL CLA	0.228	0.070	< 0.001	0.123	0.003	0.123	0.003
				R²=	0.110	R²=	0.110
<i>Plasma TG+PL</i>				Std β	P-value	Std β	P-value
TG C14:0				0.120	0.04	0.129	0.003
TG C15:0				0.059	0.35		
TG C17:0				-	-		
TG T-C16:1(n-7)				0.013	0.80		
TG T-C18:1(n-7)				0.083	0.16	0.102	0.07
TG CLA				-0.122	0.02	-0.111	0.03
PL C14:0				-0.008	0.87		
PL C15:0				0.086	0.06	0.111	0.004
PL C17:0				0.024	0.62		
PL T-C16:1(n-7)				-0.087	0.05	-0.074	0.08
PL T-C18:1(n-7)				0.125	0.02	0.140	0.01
PL CLA				0.132	0.01	0.124	0.01
				R²=	0.130	R²=	0.128

Model 1: Univariate linear regression analysis of the fatty acid with total dairy fat intake; **Model 2:** Multivariate model with all fatty acids from our population in one model; **Model 3:** Multivariate model with the best combination of fatty acids in our population (backwards regression).

C14:0, C17:0, Trans-C16.1(n-7), Trans-C18.1(n-7) and CLA in plasma TG and Trans-C16.1(n-7), Trans-C18.1(n-7) and CLA in plasma PL were transformed before analyses. Dairy fat intake was transformed. β 's are standardized beta's. Abbreviations: TG, Triglycerides; PL, Phospholipids, C14:0, Margaric acid; C15:0, Pentadecanoic acid; C17:0, Heptadecanoic acid; Trans-C16:1(n-7), T-Palmitoleic acid; T-C18:1(n-7), Vaccenic acid; CLA, Cis-9, Trans-11 Conjugated linoleic acid

Supplementary Table S6. Univariate regression analyses and multivariate models to predict energy-adjusted dairy intake (g/d) with circulating fatty acids in plasma TG, plasma PL and a combination of the two in the Lifelines Cohort (n = 769)

	Model 1			Model 2		Model 3	
<i>Plasma TG</i>	Std β	R²	P-value	Std β	P-value	Std β	P-value
TG C14:0	0.073	0.045	0.04	0.013	0.77		
TG C15:0	0.141	0.059	< 0.001	0.144	0.01	0.141	< 0.001
TG C17:0	0.066	0.043	0.08	0.051	0.21		
TG T-C16:1(n-7)	0.069	0.043	0.09	-0.039	0.45		
TG T-C18:1(n-7)	0.105	0.050	0.003	0.052	0.35		
TG CLA	0.053	0.042	0.14	-0.058	0.23		
				R²=	0.064	R²=	0.059
<i>Plasma PL</i>	Std β	R²	P-value	Std β	P-value	Std β	P-value
PL C14:0	0.080	0.046	0.02	0.020	0.62		
PL C15:0	0.143	0.060	< 0.001	0.057	0.20	0.075	0.07
PL C17:0	0.170	0.068	< 0.001	0.140	0.002	0.131	0.002
PL T-C16:1(n-7)	0.071	0.044	0.05	-0.033	0.45		
PL T-C18:1(n-7)	0.111	0.051	0.002	0.008	0.86		
PL CLA	0.082	0.046	0.02	0.047	0.27		
				R²=	0.075	R²=	0.072
<i>Plasma TG+PL</i>				Std β	P-value	Std β	P-value
TG C14:0				0.085	0.17	0.087	0.01
TG C15:0				0.039	0.54		
TG C17:0				0.011	0.79		
TG T-C16:1(n-7)				-0.038	0.48		
TG T-C18:1(n-7)				0.024	0.69		
TG CLA				-0.097	0.07		
PL C14:0				-0.034	0.51		
PL C15:0				0.062	0.19		
PL C17:0				0.147	0.004	0.177	< 0.001
PL T-C16:1(n-7)				-0.012	0.80		
PL T-C18:1(n-7)				0.006	0.91		
PL CLA				0.075	0.13		
				R²=	0.083	R²=	0.075

Model 1: Univariate linear regression analysis of the fatty acid with energy-adjusted dairy intake; **Model 2:** Multivariate model with all fatty acids from our population in one model; **Model 3:** Multivariate model with the best combination of fatty acids in our population (backwards regression).

C14:0, C17:0, Trans-C16.1(n-7), Trans-C18.1(n-7) and CLA in plasma TG and Trans-C16.1(n-7), Trans-C18.1(n-7) and CLA in plasma PL were transformed before analyses. Dairy intake was transformed and adjusted for energy intake according to the residual method. β 's are standardized beta's.

Abbreviations: TG, Triglycerides; PL, Phospholipids, C14:0, Margaric acid; C15:0, Pentadecanoic acid; C17:0, Heptadecanoic acid; Trans-C16:1(n-7), T-Palmitoleic acid; T-C18:1(n-7), Vaccenic acid; CLA, Cis-9, Trans-11 Conjugated linoleic acid