

## Ratio of plasma $\alpha$ : $\gamma$ -tocopherol and associations with indices of skeletal muscle mass

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Vitamin E is an anti-oxidant and anti-inflammatory agent and may therefore have a role in the prevention and treatment of muscle loss, a risk factor for sarcopenia<sup>(1)</sup>. We have previously shown a positive association between percentage fat-free mass (FFM) and dietary vitamin E intake<sup>(2)</sup>. This study aimed to investigate if the ratio of plasma  $\alpha$ - and  $\gamma$ -tocopherol (toc)<sup>(3,4)</sup> was also associated with three indices of skeletal muscle mass (SMM).

Analyses were conducted on a sub-sample from the EPIC-Norfolk cohort with available non-fasting plasma samples of cholesterol,  $\alpha$ - and  $\gamma$ -toc and who did not report vitamin E containing supplement use: 1,918 men and 1,563 women, (aged 39–79 y)<sup>(5)</sup>. At a second health check (2HC, aged 42–82 y), fat mass was measured using bioimpedance (TANITA Body Fat Monitor/Scale TBF-531), from which FFM (kg), FFM% (FFM ÷ total mass x 100) and FFM<sub>BMI</sub> (FFM ÷ BMI) were calculated. Analysis of covariance and linear regression were used to study associations of FFM% and FFM<sub>BMI</sub> with sex-specific quintiles of cholesterol-adjusted plasma  $\alpha$ : $\gamma$ -toc ratios, adjusted (\*) for age, smoking status, physical activity, social class, corticosteroid and statin use, plasma  $\alpha$ -toc, and menopausal and HRT status in women. The model for FFM additionally included FM.

Mean (SD) age at 2HC was 66.9 (7.6) years for men and 64.8 (8.6) years for women. Significant positive trends across quintiles of plasma  $\alpha$ : $\gamma$ -toc ratio were observed for FFM% and FFM<sub>BMI</sub> in both men and women. The differences between Q1 and Q5 for FFM% and FFM<sub>BMI</sub> were 1.6% and 1.3% in men and 4.9% and 4.6% in women, respectively.

	Ratio of plasma $\alpha$ : $\gamma$ -toc, adjusted for total cholesterol						p trend
	Quintile 1		Quintile 3		Quintile 5		
	Mean	SD/SE	Mean	SD/SE	Mean	SD/SE	
<b>MEN: <math>\alpha</math>:<math>\gamma</math> ratio</b>	8.54	1.41	14.42	0.79	28.46	19.73	
Plasma $\alpha$ -toc ( $\mu$ mol/mmol)	24.0	7.2	25.4	6.8	28.8	8.2	
Plasma $\gamma$ -toc ( $\mu$ mol/mmol)	2.92	1.14	1.76	0.49	1.12	0.40	
Dietary vitamin E (mg $\alpha$ -toc equivs/d)	10.4	4.5	11.3	4.8	12.4	5.1	
Weight (kg)	82.2	10.5	81.5	10.4	80.2	11.9	
Height (m)	1.73	0.06	1.74	0.06	1.73	0.07	
BMI (kg/m <sup>2</sup> )	27.3	3.1	27.0	2.9	26.7	3.4	
*FFM%	76.0	0.2	76.6	0.1	77.2	0.2	0.003
*FFM <sub>BMI</sub> (kg/(kg/m <sup>2</sup> ))	2.29	0.01	2.31	0.01	2.32	0.01	0.038
<b>WOMEN: <math>\alpha</math>:<math>\gamma</math> ratio</b>	8.70	1.52	14.78	0.84	29.97	29.18	
Plasma $\alpha$ -toc ( $\mu$ mol/mmol)	25.6	7.1	27.2	6.7	29.2	8.4	
Plasma $\gamma$ -toc ( $\mu$ mol/mmol)	3.04	1.08	1.84	0.46	1.08	0.33	
Dietary vitamin E (mg $\alpha$ -toc equivs/d)	8.7	3.8	9.2	3.6	9.7	3.7	
Weight (kg)	69.1	11.0	68.7	9.3	65.8	10.3	
Height (m)	1.60	0.06	1.60	0.06	1.60	0.06	
BMI (kg/m <sup>2</sup> )	26.9	4.0	26.6	3.3	25.6	3.6	
*FFM%	58.9	0.4	60.3	0.2	61.8	0.4	<0.001
*FFM <sub>BMI</sub> (kg/(kg/m <sup>2</sup> ))	1.52	0.01	1.56	0.01	1.59	0.01	<0.001

To our knowledge, this is the first time that a positive association between plasma  $\alpha$ : $\gamma$ -toc ratio and FFM% and FFM<sub>BMI</sub> has been observed in a UK population-based cohort and further research is on-going. These findings indicate that  $\alpha$ -toc may be more important than  $\gamma$ -toc but further analyses are warranted on the separate tocopherol fractions and other indices of body composition. Also, the bioavailability of vitamin E is influenced by a number of factors, including other nutrients, genetics, absorption, transport and metabolism<sup>(6)</sup>.

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