

## SUPPLEMENTARY MATERIAL

### **Dietary vitamin A and visceral adiposity: a modulating role of the retinol-binding protein 4 gene**

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**Abbreviated title:** Dietary vitamin A and visceral adiposity

## EXTENDED METHODS

### *Vitamin A intake*

Energy intake and vitamin A intake were assessed with a 24-hour food-recall conducted in person by a trained nutritionist. Compared with food records, 24-hour food recalls have lower potential for interfering with dietary behaviour, as the food assessments occur retrospectively after consumption. The recall is typically conducted as an interview in person or by telephone [1,2], ideally, by a trained dietician; this was the case in the present study. The information is obtained with probing questions designed to encourage accurate reporting. Interviewers are knowledgeable about the local food availability and prevalent regional or ethnic food preparation. The recalls can be done quickly, typically in 20 minutes [3]. As such, they can be used across a wide range of populations, including children and adolescents.

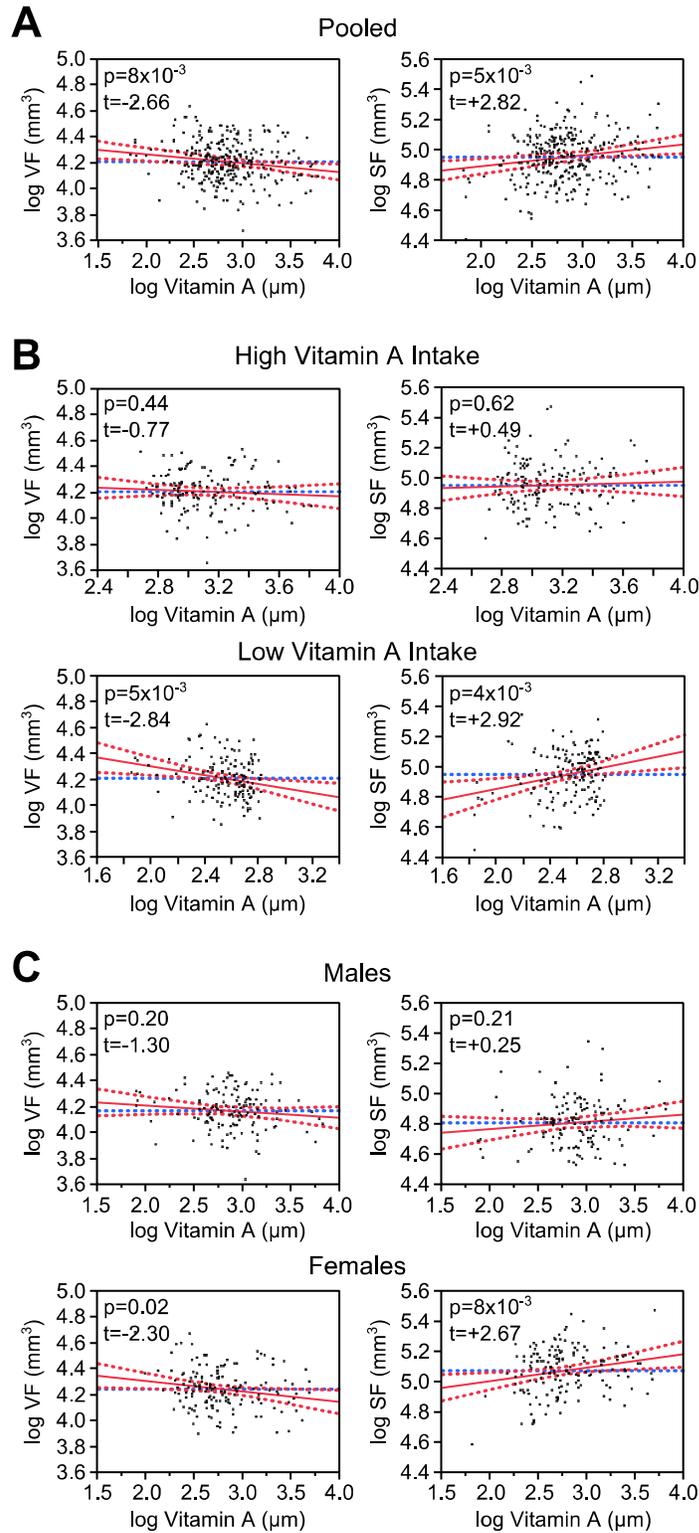
Under and over reporting of food and drink intake occurs with a 24-hour food recall, but an energy adjustment (e.g., analyzing relative rather than absolute macronutrient intake) can be made, which reduces this error[4]. For example, relative protein intake (i.e., percent energy intake from protein) determined with a 24-hour food recall was in close agreement to a biomarkers-based measure in the Observing Protein and Energy Nutrition (OPEN) study [5]. In the present study, vitamin A intake was adjusted for energy intake.

Overall, the 24-hour food recalls are recognized as having high efficacy in comparing groups, high compliance rate, low bias, and minimal burden on subjects.

As day-to-day variation occurs in food intake [6], it is recommended that a minimum of 3 days (including 1 weekend day) are assessed to obtain data for habitual food intake of an individual. A single-day 24-hour food recall is suitable to describe group differences (defined, e.g., by genotype), as these are robust and less affected by within-person variation.

Finally, all our 24-hour food recalls were conducted during a hospital session of our study, which took place always on a Saturday because of the availability of the Chicoutimi Hospital MRI scanner. We believe that this organizational aspect of the study, which led to assessing diet on the same day of the week in all individuals, increased data uniformity and thus the likelihood of identifying biologically meaningful group differences (defined, e.g., by genotype).

**Figure S1. Depot-specific modulatory effect of TT-homozygous genotypes in pooled, high/low vitamin A intake and male/female groups**



**Table S1. Association between dietary intake of vitamin A and abdominal visceral and subcutaneous fat by RBP4 genotype and sex**

Variables	<i>C</i> -carriers			<i>TT</i> -homozygotes		
	Estimate ± SE	<i>t</i> -value	P-value	Estimate ± SE	<i>t</i> -value	P-value
<b>Males</b>						
Visceral fat (VF, mm <sup>3</sup> )	-0.120 ± 0.054	-2.24	<b>0.02</b>	-0.033 ± 0.077	-0.42	0.67
Subcutaneous fat (SF, mm <sup>3</sup> )	-0.092 ± 0.056	-1.64	0.10	+0.018 ± 0.081	+0.22	0.82
<i>VF- and SF-shared variances</i>						
VF predicted by SF (mm <sup>3</sup> ) <sup>a</sup>	-0.072 ± 0.044	-1.64	0.10	+0.014 ± 0.064	+0.22	0.82
SF predicted by VF (mm <sup>3</sup> ) <sup>b</sup>	-0.109 ± 0.049	-2.24	<b>0.03</b>	-0.030 ± 0.070	-0.42	0.67
<i>VF- and SF-specific variances</i>						
VF adjusted for SF (mm <sup>3</sup> ) <sup>c</sup>	-0.043 ± 0.025	-1.67	0.09	-0.047 ± 0.036	-1.30	0.20
SF adjusted for VF (mm <sup>3</sup> ) <sup>d</sup>	-0.019 ± 0.026	-0.70	0.48	+0.048 ± 0.039	+1.25	0.21
<b>Females</b>						
Visceral fat (VF, mm <sup>3</sup> )	-0.056 ± 0.037	-1.52	0.13	-0.013 ± 0.061	-0.21	0.83
Subcutaneous fat (SF, mm <sup>3</sup> )	-0.071 ± 0.041	-1.72	0.08	0.079 ± 0.058	+1.36	0.17
<i>VF- and SF-shared variances</i>						
VF predicted by SF (mm <sup>3</sup> ) <sup>a</sup>	-0.056 ± 0.033	-1.72	0.08	+0.062 ± 0.046	+1.36	0.18
SF predicted by VF (mm <sup>3</sup> ) <sup>b</sup>	-0.051 ± 0.034	-1.52	0.13	-0.011 ± 0.056	-0.21	0.83
<i>VF- and SF-specific variances</i>						
VF adjusted for SF (mm <sup>3</sup> ) <sup>c</sup>	-0.007 ± 0.023	-0.28	0.77	-0.081 ± 0.035	-2.30	<b>0.02</b>
SF adjusted for VF (mm <sup>3</sup> ) <sup>d</sup>	-0.022 ± 0.026	-0.85	0.40	+0.089 ± 0.033	+2.67	<b>8x10<sup>-3</sup></b>

All associations between dietary intake of vitamin A and visceral fat (VF) or subcutaneous fat (SF) were tested separately in *C*-carriers and *TT*-homozygotes of the RBP4 genotype rs10882272 using multivariate linear regression, while adjusting for age, sex, height, and energy intake; linear regression estimates with their standard errors, *t*-values and p-values are shown. Values of VF and SF were log transformed using logarithm with base 10.

<sup>a</sup> – predicted value of VF from the linear regression model: VF ~ age + sex + height + SF;

<sup>b</sup> – predicted value of SF from the linear regression model: SF ~ age + sex + height + VF;

<sup>c</sup> – residual value of VF from the linear regression model: VF ~ age + sex + height + SF;

<sup>d</sup> – residual value of SF from the linear regression model: SF ~ age + sex + height + VF.

**Table S2. Association between dietary intake of vitamin A and abdominal visceral and subcutaneous fat by RBP4 genotype and by high/low vitamin A intake**

Variables	<i>C</i> -carriers			<i>TT</i> -homozygotes		
	Estimate ± SE	<i>t</i> -value	P-value	Estimate ± SE	<i>t</i> -value	P-value
<b>High Vitamin A Intake</b>						
Visceral fat (VF, mm <sup>3</sup> )	-0.031 ± 0.061	-0.51	0.61	-0.069 ± 0.102	-0.67	0.50
Subcutaneous fat (SF, mm <sup>3</sup> )	-0.020 ± 0.067	-0.30	0.76	-0.033 ± 0.103	-0.32	0.75
<i>VF- and SF-shared variances</i>						
VF predicted by SF (mm <sup>3</sup> ) <sup>a</sup>	-0.016 ± 0.053	-0.30	0.76	-0.026 ± 0.081	-0.32	0.75
SF predicted by VF (mm <sup>3</sup> ) <sup>b</sup>	-0.028 ± 0.055	-0.51	0.61	-0.063 ± 0.093	-0.67	0.50
<i>VF- and SF-specific variances</i>						
VF adjusted for SF (mm <sup>3</sup> ) <sup>c</sup>	-0.016 ± 0.034	-0.46	0.65	-0.041 ± 0.053	-0.77	0.44
SF adjusted for VF (mm <sup>3</sup> ) <sup>d</sup>	+0.008 ± 0.037	+0.21	0.84	+0.026 ± 0.054	+0.49	0.62
<b>Low Vitamin A Intake</b>						
Visceral fat (VF, mm <sup>3</sup> )	+0.025 ± 0.080	+0.31	0.75	-0.079 ± 0.111	-0.71	0.48
Subcutaneous fat (SF, mm <sup>3</sup> )	-0.031 ± 0.085	-0.36	0.72	+0.111 ± 0.113	+0.98	0.33
<i>VF- and SF-shared variances</i>						
VF predicted by SF (mm <sup>3</sup> ) <sup>a</sup>	-0.025 ± 0.067	-0.36	0.72	+0.088 ± 0.089	+0.98	0.32
SF predicted by VF (mm <sup>3</sup> ) <sup>b</sup>	-0.023 ± 0.073	+0.31	0.75	-0.071 ± 0.101	-0.71	0.48
<i>VF- and SF-specific variances</i>						
VF adjusted for SF (mm <sup>3</sup> ) <sup>c</sup>	+0.050 ± 0.043	+1.16	0.25	-0.170 ± 0.060	-2.84	<b>5x10<sup>-3</sup></b>
SF adjusted for VF (mm <sup>3</sup> ) <sup>d</sup>	-0.053 ± 0.045	-1.17	0.24	+0.179 ± 0.061	+2.92	<b>4x10<sup>-3</sup></b>

All associations between dietary intake of vitamin A and visceral fat (VF) or subcutaneous fat (SF) were tested separately in *C*-carriers and *TT*-homozygotes of the RBP4 genotype rs10882272 using multivariate linear regression, while adjusting for age, sex, height, and energy intake; linear regression estimates with their standard errors, *t*-values and p-values are shown. Values of VF and SF were log transformed using logarithm with base 10.

<sup>a</sup> – predicted value of VF from the linear regression model: VF ~ age + sex + height + SF;

<sup>b</sup> – predicted value of SF from the linear regression model: SF ~ age + sex + height + VF;

<sup>c</sup> – residual value of VF from the linear regression model: VF ~ age + sex + height + SF;

<sup>d</sup> – residual value of SF from the linear regression model: SF ~ age + sex + height + VF.

## REFERENCES

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