

ORIGINAL RESEARCH COMMUNICATION

Adiponectin and adiponectin receptor gene variants in relation to resting metabolic rate, respiratory quotient, and adiposity-related phenotypes in the Québec Family Study^{1,2,3}

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Background: Despite adiponectin's presumed role in fatty acid oxidation and energy homeostasis, little is known about the effect of gene variants on substrate oxidation, energy expenditure, and adiposity-related phenotypes.

Objective: We examined the effects of genetic variation in adiponectin (*ADIPOQ*) and adiponectin receptors 1 and 2 (*ADIPOR1* and *ADIPOR2*) on resting metabolic rate, respiratory quotient (RQ), and adiposity-related phenotypes.

Design: We studied the associations of *ADIPOQ*, *ADIPOR1*, and *ADIPOR2* polymorphisms with resting metabolic rate, RQ, and body mass index, percentage body fat, sum of 6 skinfold thicknesses, waist circumference, and total, subcutaneous, and visceral fat in 759 participants in the Québec Family Study.

Results: The *ADIPOQ* 45T→G single-nucleotide polymorphism (SNP) was significantly ($P = 0.0002$ to 0.04) associated with overall adiposity and abdominal adiposity; the rare homozygotes (*G/G*) had a leaner phenotype than did the carriers of the common allele. One SNP each in the putative promoter of *ADIPOR1* (ie, -3882T→C) and *ADIPOR2* (ie, 1VS1-1352G→A) was associated with RQ ($P = 0.03$ and 0.04 , respectively), and the association was even stronger in nonobese persons ($P = 0.02$ and 0.003). Carriers of the common alleles (*ADIPOR1* T and *ADIPOR2* G alleles) had a lower RQ than did the rare homozygotes. A significant genotype-by-genotype interaction ($P = 0.0002$ to 0.02) was found between SNPs in the promoters of *ADIPOQ* (-3971A→G) and *ADIPOR1* (-3882T→C). Subjects carrying the minor *ADIPOQ* allele (*G* allele) who were rare homozygotes (*C/C*) for the *ADIPOR1* SNP had a higher RQ ($P = 0.003$) and greater overall ($P < 0.03$) and abdominal ($P < 0.05$) adiposity than did persons with other genotype combinations.

Conclusions: Previous findings that the *ADIPOQ* 45T→G variant contributes to overall fatness and abdominal obesity are confirmed. Moreover, variants in the promoter region of both *ADIPOR* genes contribute to substrate oxidation.

Key Words: Adiponectin • adiponectin receptor • resting metabolic rate • respiratory quotient • obesity • abdominal obesity • adiposity

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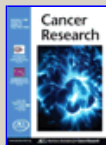
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