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Resveratrol regulates human adipocyte number and function in a Sirt1-dependent manner.

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Abstract

BACKGROUND: Caloric restriction leads to retardation of the aging processes and to longer life in many organisms. This effect of caloric restriction can be mimicked by resveratrol, a natural plant product present in grapes and red wine, which is known as a potent activator of sirtuin 1 [silent mating type information regulation 2 homolog 1 (Sirt1)]. OBJECTIVES: One main effect of caloric restriction in mammals is a reduction of body fat from white adipose tissue. We sought to identify the effects of resveratrol on fat cell biology and to elucidate whether Sirt1 is involved in resveratrol-mediated changes. DESIGN: Human Simpson-Golabi-Behmel syndrome preadipocytes and adipocytes were used to study proliferation, adipogenic differentiation, glucose uptake, de novo lipogenesis, and adipokine secretion. Sirt1-deficient human preadipocytes were generated by using a lentiviral small hairpin RNA system to study the role of Sirt1 in resveratrol-mediated changes. RESULTS: Resveratrol inhibited preadipocyte proliferation and adipogenic differentiation in a Sirt1-dependent manner. In human adipocytes, resveratrol stimulated basal and insulin-stimulated glucose uptake. De novo lipogenesis was inhibited in parallel with a down-regulation of lipogenic gene expression. Furthermore, resveratrol down-regulated the expression and secretion of interleukin-6 and interleukin-8. Sirt1 was only partially responsible for the regulation of resveratrol-mediated changes in adipokine secretion. CONCLUSIONS: Taken together, our data suggest that resveratrol influences adipose tissue mass and function in a way that may positively interfere with the development of obesity-related comorbidities. Thus, our findings open up the new perspective that resveratrol-induced intracellular pathways could be a target for prevention or treatment of obesity-associated endocrine and metabolic adverse effects.

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