microRNA miR-27b impairs human adipogenesis and targets PPARγ

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Obesity has emerged as a global health problem with more than 1.1 billion adults to be classified as overweight or obese, and is associated with type 2 diabetes, cardiovascular disease, and several cancers. Recent findings indicate that microRNAs (miRNAs) – small non-protein-coding RNAs that function as post-transcriptional gene regulators – are involved in the regulatory network of adipogenesis. Whereas several mouse miRNAs have been identified very recently as adipogenic regulators, only a single miRNA is known so far to be functional in human adipogenesis as pro-adipogenic, thereby stimulating demand for studying the functional role of miRNAs during adipogenesis in human.

To identify miRNAs and potential direct target mRNAs that modulate human adipogenesis, we first screened for differentially expressed miRNAs and mRNAs during adipocyte differentiation of human multipotent adipose-derived stem (hMADS) cells. We identified miRNA-target pairs with reciprocal expression and revealed a putative regulation of adipogenesis by miR-27b. miR-27b levels decreased during adipogenesis of hMADS cells. Overexpression of miR-27b blunted induction of PPARγ and C/EBPα, two key regulators of adipogenesis, during early onset of adipogenesis and repressed adipogenic marker gene expression and triglyceride accumulation at late stages. PPARγ has a predicted and highly conserved miR-27b binding site in its 3´UTR and was indeed confirmed to be a direct target of miR-27b. Thus, these results suggest that miR-27b has an anti-adipogenic effect in hMADS cells which is mediated, at least in part, by suppression of PPARγ.

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