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The histone methyltransferase SMYD1 is induced by thermogenic stimuli in adipose tissue

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Background: Our study investigates how environmental factors, such as diet and temperature, influence gene expression in adipose tissue. This highlights the importance of adipose tissue as a sensor of the exposome and a key player in metabolic health. In particular, we show that a high-fat diet and cold exposure in mice can increase the expression of the histone methyltransferase SMYD1 and activate brown adipose tissue.
Methods and Results: C57BL/6J mice fed a high-fat diet and exposed to cold and 3T3-L1 cells stimulated to differentiate into white and beige adipocytes were used. SMYD1 expression increased in white adipose tissue (WAT) from mice fed a high-fat diet and in WAT and brown adipose tissue from mice exposed to cold, suggesting its role in thermogenesis. Accordingly, SMYD1 expression was significantly higher in beige adipocytes than in white adipocytes, and its silencing leads to a decrease in mitochondrial content and Pgc-1α expression. This effect was associated with a decreased accumulation of H3K4me3 (a marker for gene activation) within the Pgc1-α locus. This emphasizes the role of epigenetic mechanisms in mediating the effects of the exposome on gene expression.
Conclusions and Significance: These data suggest a novel role for SMYD1 as a positive regulator of energy control in adipose tissue and provide strong evidence for the link between the exposome and metabolic health. By examining the interplay between environmental factors, epigenetics and adipose tissue function, the study contributes to our understanding of how the exposome may influence disease risk and develop personalized health strategies.

Keywords: epigenetics • adipose tissue • browning • gene expression • histone methyltransferase

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