

## The mechanism of the effect of ginsenosides from Korean red ginseng by which TAG content is decreased in 3T3-L1 adipocytes

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Our previous studies showed that various ginsenosides decreased TAG level in 3T3-L1 adipocytes and up regulate the expression of mRNA for leptin which is known for lowering TAG content in adipocytes through transcriptional activation of the crucial genes involved in peroximal and mitochondrial  $\beta$ -oxidation. In the present study, to elucidate the mechanism by which TAG content was decreased in 3T3-L1 adipocytes, we examined whether ginsenosides modulated the expression of other adipokines besides leptin and transcription factors related to control of energy expenditure process because adipokines regulate adipocyte mass and increased energy expenditure may consume much TAG in adipocytes. The results showed that ginsenosides increased the expression of mRNAs for leptin, adipsin, and IL-6 and their corresponding proteins in 3T3-L1 adipocytes with decreased level of TAG content. In addition, ginsenosides also up regulated the expression of CREB and PPAR  $\delta$ , which are known to activate the cAMP-mediated lipolysis and increase the transcription of target genes of energy expenditure, respectively. We also measured the cAMP levels and could found out that ginsenosides increased the cAMP levels, significantly.

In conclusion, ginsenosides may control TAG content in differentiated adipocytes by up regulation of adipokines including leptin and transcription factors related to fat burn, and these process might be derived from the increased level of cAMP.

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