

Effect of MAT2A on Porcine Embryonic Development

Xiao-Han Li and Xiang-Shun Cui

Department of Animal Science, Chungbuk National University, Cheongju, South Korea.

Abstract

Methionine adenosyl-transferase 2A (MAT2A) is an essential enzyme that creates S-adenosylmethionine (SAM) by reacting methionine and ATP. MAT2A provides methylation donors (SAM) for histone and DNA methylation processes. Histone methylation plays a key role during zygotic genome activation (ZGA). However, the effect of MAT2A in porcine ZGA remains unclear. To investigate the function of MAT2A and the underlying mechanism in porcine ZGA, MAT2A was knocked down via dsRNA injection in the one-cell stage. MAT2A was highly expressed at every stage in porcine embryos. The percentage of four-cell stage embryos and blastocysts was lower in the MAT2A-knockdown group than in the control group. Notably, depletion of MAT2A decreased the levels of H3K4me₂, H3K9me_{2/3} and H3K27me₃ in the four-cell stage and MAT2A knockdown reduced transcriptional activity of ZGA gene. Furthermore, MAT2A knockdown led to a decrease in the expression of EED and EZH2. Additionally, MAT2A knockdown caused a significant increase in DNA damage and apoptosis. In conclusion, MAT2A is involved in the regulation of transcriptional activity and is essential for regulating histone methylation during porcine ZGA.

Keywords: MAT2A; SAM; Histone methylation; ZGA; early embryos.