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Development of Bovine Oocytes Cultured with Nicotinamide Monocleotide (NMN) Was Improved via Enhanced Mitochondrial Function

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Nicotinamide adenine dinucleotide (NAD+) and its metabolites function as crucial regulatory factors to maintain physiological processes, allowing cells to adapt to environmental changes such as nutritional deficiencies, genotoxic factors, disruptions in circadian rhythms, infections, inflammation, and exogenous substances. In this study, we examined whether an increase of NAD^+ level in oocytes lead to an improvement of blastulation after IVF.
Bovine cumulus–oocyte–complexes (COCs) were matured *in vitro* in the culture (IVM) medium supplemented with 0–100 μ M nicotinamide mononucleotide (NMN, a precursor to NAD^+). Matured oocytes were inseminated with the washed spermatozoa and cultured to assess the blastulation. Matured oocytes were also used to examine their NAD^+ content, gene expression pattern, reactive oxygen species (ROS) and ATP levels.
The addition of NMN to the in vitro maturation medium of bovine oocytes showed an increase in intracellular NAD^+ levels, leading to enhanced developmental competence to the blastocyst stage after in vitro fertilization. Transcriptome analysis revealed that the increase in intracellular NAD^+ levels led to the change of the mitochondrial function. Additionally, NMN supplementation increased ATP levels and decreased reactive oxygen species levels in oocyte. The results suggest that an increase of NAD^+ level in oocytes improve the post–fertilization developmental competence through mitochondria function.