The Effects of Amino Acids on Preimplantation Mouse Embryo Development

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Pre-implantation embryo development starts at fertilization and ends at the blastocyst stage. Assistive Reproductive Technology (ART) can replicate this in vitro. To ensure the survival of embryos with ART, a proper and effective culture medium is required. The oviduct secretes amino acids during pre-implantation embryo development, prompting speculation that amino acids can support in vitro pre-implantation embryo development. Studies have shown the supplementation of amino acids increases survival for cultured embryos after embryo transfer. To determine the effects of amino acids on pre-implantation embryos, 2-cell mouse embryos were cultured in KSOM medium with either amino acid (KSOM-aa) or without amino acid (KSOM) supplementation until the blastocyst stage. Morphological and molecular analyses were then performed. After natural mating, 2-cell mouse embryos were collected from the mother's oviduct. The embryos were then cultured in either KSOM or KSOM-aa for three days. During this time, stage development was recorded. At the blastocyst stage, embryos were collected for cDNA synthesis. Then, gene expression analysis was performed using four blastocyst-specific genes: Gata3, Cdx2, Nanog, and Pou5F1. This procedure was repeated five times with five different mothers. Twenty-five percent more embryos progressed to the hatching blastocyst stage in KSOM-aa than in KSOM. The hatching stage is the most advanced stage of pre-implantation embryo development. Embryos cultured in KSOM-aa showed higher expressions of the four blastocyst-specific genes. A higher expression of blastocyst-specific genes and further development indicate amino acids support embryo development. It can also be implied amino acids aid cell proliferation and quality in pre-implantation embryos.

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