

Regulation of the Preimplantation Stage Embryonic Development

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The preimplantation phase is critical to the success of both implantation and embryonic development. To achieve successful implantation, the uterus and the embryo must synchronize both their development and their timing. The embryo has to cleave and be in the morula stage before it can collaborate with the uterus in the initiation of implantation. In mammalian system, only the blastocyst can attend to the implantation to the uterine lumen for the successful development. Therefore the fertilized embryos have to develop to the blastula stage according to the proper schedule. The cleavage shows the many specific morphological and molecular events including a specific mitotic cell division. From the beginning of development, biochemical modifications of maternal transcripts appear to have an important role in the regulation mechanisms which control the use of the maternal information. A high degradation of the maternal mRNA and modifications in the protein synthetic profile are seen in the transitory period between the exclusive dependence on molecules synthesized during oogenesis and the period in which the embryonic genome become active. Depending on mammals, this event takes place at a more or less advanced stage at the beginning of development. In the first stages of division, there are considerable inter-species differences, and intraspecies differences, depending on genetic differences. Besides during the early embryonic development, there is complementary action of paternal genomes. Therefore appropriate gene expression is vital for the regulation of developmental process. In addition to the genomic expression, the energy metabolisms and the environments are the key factors for early embryonic development, also. Developing embryos continuously dialogue with the maternal organism to prepare the suitable embryonic stages for implantation. For that purpose embryos are capable of very early synthesis of signals and receptors. After the in vitro culture methods are established, many developmental biologists tried to reveal the regulation mechanisms of the early embryonic development. However, the known genes are not many to explain the early embryonic development. To understand the regulatory mechanisms of the early embryonic development, molecular technologies are employed and revealed role of some genes. These are including the genes involved in junction, extracellular matrix, signal molecules like growth factors, cytokines or hormones, and transcription regulation factors. In here we introduced some genes which are expected to have critical role in the embryonic cell cycle regulation and prepare the implantation. These genes regulate the embryonic development as paracrine or autocrine factors. With the in vitro experimental models, the variation and timing and mechanisms of the animal models will help to elucidate the function of these genes. As can be seen from the well-characterized factors, these kind studies can facilitate identification of factors necessary in early embryonic developmental regulation and human implantation.