

Activin A in Mouse Preimplantation Development and Reproduction: Deciphering the Role of Protein of Zygotic and Maternal Origin

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The successful development of a mammalian embryo relies on growth factors secreted by the mother's reproductive system and the embryo itself. Activin A is an example of such a multiple-source protein, which is widely expressed among mammals. Although dysregulation of the activin A signaling pathway in humans is correlated with the occurrence of miscarriages and ectopic pregnancies, due to the various origins of this protein, its exact role in mammalian embryonic development remains ambiguous.

To this end, we investigated the consequences of the deletion of zygotic protein in knockout mouse embryos, along with the results of the decreased level of activin A provided by the maternal reproductive system in a hypomorphic mouse model.

By combining a time-lapse imaging system and lineage-specific markers detection, we prove that zygotic activin A is dispensable for the preimplantation development of mouse embryos, however, this protein may be involved in the embryo implantation process, as indicated in the blastocyst outgrowth assay.

Furthermore, our findings highlight the importance of maternally provided activin A in mouse reproduction, as females with a hypomorphic mutation of the activin A gene display disrupted estrous cycles and significantly reduced fertility.

This study provides insight into the role of activin A in the earliest stages of mouse embryogenesis and reproduction and is the first one to distinguish the function of the zygotic and the maternally derived protein in these processes.

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