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Need for feeder-free culture system for stem cells

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Stem cells hold great potential in the treatment of various diseases. Isolation and cultivation of these stem cells is an important aspect of research and clinical application currently. In general, embryonic stem cells are isolated 3-5 days post fertilisation from a blastocyst containing an inner mass of cells that are totipotent (stem cell that has the ability to give rise to any cell type or a complete embryo). Similarly, adult stem cells are isolated from various types of adult cells, such as neurons, osteoblasts, etc. In order to generate specific cell types, stem cells are usually cultivated using feeder cells. These feeder cells are typically inactivated mouse fibroblast cells which act as the substrate for the growth and division of stem cells. Although very effective, these feeder cells which are of mouse origin, pose a serious ethical concern as they may transmit mouse-derived pathogens and viral contaminants to the cell culture. Though they are replaced with human-derived feeder cells, such as human fibroblast and umbilical stromal cells, there is still a potential risk of transferring human viruses to embryonic stem cells. Thus, to facilitate the development of clinical applications, a feeder-free culture system (which includes critical factors secreted by feeders) should be utilised. There are two types of media that can be utilised to produce feeder-free culture. They are defined media, which are serum-free media supplemented with fibroblast growth factors that inhibit the differentiation of stem cells, and conditioned media, which are the enriched cell culture media used as cell culture supplements. Synthetic cultures such as Matrigel are also used to produce feeder-free stem cell culture. However, recent studies have found the signals important for human embryonic stem cell culture, thus reducing the need for feeders and facilitating clinical applications.

Keywords: Feeder, Fibroblast, Feeder-free culture, Embryonic stem cells, Blastocyst

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