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Chapter 8K

Stem Cells and Their Use for the Treatment of Kidney Diseases

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What is a Stem Cell?

An entire organism develops from the inner cell mass of the blastocyst, a tissue formed in the time period between conception and uterine implantation. After implantation of the blastocyst to the uterus, the cells of the inner mass continually differentiate and proliferate to give rise to diverse cell types that become the various tissues in the adult body, such as heart, muscle, nerve, bone, cartilage, etc. Therefore, the cells of the inner mass are considered the "mother" stem cells having maximum pluripotency, from which all other tissue- or organ-specific stem cells of decreasing pluripotency arise until the formation of the finally differentiated cells, which constitute the adult organs. As such, a stem cell is the one present in the blastocyst, but in broader terms, cells at all stages of the embryonic development have been labeled as stem cells. For example, both the cells obtained from the blastocyst, which are clearly pluripotent, and the cells that are committed to form only the liver tissue (unipotent) have been called stem cells in the current literature. Sometimes the latter cells are appropriately called liver-specific stem cells (or progenitor cells). Notwithstanding the ambiguities in the nomenclature, stem cells are categorized as: (1) embryonic stem cells (mentioned above), (2) induced pluripotent stem cells, which are adult somatic cells induced into an embryonic state by artificial transfection of genes that impart pluripotency, and (3) adult stem cells (those derived from adult tissues which appear to show stem cell properties).

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